Aalto University
School of Arts, Design
and Architecture

After Ikea-effect - Making as a tool for co-creating irreplaceable products

Saara Ollila/2021

After Ikea Effect –
Making as a tool for co-creating irreplaceable products

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Abstract

The fast pace of contemporary life has driven consumers to seek experiences and meaning by actively engaging in the co-creation of their own possessions. Self-made products are often considered precious for their symbolic character, narrative, or emotions that they might be associated with. While the effort invested in the making process may foster the emotional connection with the purchased product, the users increased responsibility in the making process brings out new challenges to meet.

This thesis investigates the formation of an emotional product attachment and the factors leading to a meaningful and lasting person-product relationship in collaboration with the user. To explore and further understand this relationship, the thesis relies on the phenomenon of the IKEA-effect and focus on the processes where the user has an extensive role in making. Moreover, this study explores the effects of user participation in different stages of a product design process.

This research is conducted as an empirical study and the data collection began with an online survey, concentrating on the growing role of the user in creating products. The purpose of the survey was to uncover the factors and events that lead to the abandonment of an extensive making process. For expanding the quantitative survey data, eight respondents received a design probe toolkit for making a product while documenting observations throughout the process. Lastly, these participants used an online customization tool for designing a product, similar to the outcome of the probe toolkit. The collaborative probe task was completed with interviews about the connection of the events of the making process and the qualities of the formed person-product relationship.

The results of the design probe toolkit propose a thorough conception of the slow making process and together with the self-customized products enable a speculative juxtaposition of self-crafted and -designed products. Furthermore, the results suggest that extensive making processes often lead to unfinished creations. However, a successful completion is found to build a strong foundation for a lasting person-product relationship, to foster the feeling of competence and to increase motivation for maintaining and repairing a product if it breaks. Engaging in a long making process leads to a higher familiarity and appreciation for the material and by shaping these time-consuming making processes, designers can facilitate the co-creation of lasting person-product relationships.

Keywords ikea-effect, product attachment, person-product relationship, collaborative design, participatory design, user participation, consumer behavior, hand knitting, DIY-products

Abstrakti

Arjen tahdin jatkuva kiihtyminen on innoittanut kuluttajia siirtymään kohti hitaampaa, kokemuksia ja merkityksellisyyttä painottavaa kuluttajakäyttäytymistä. Käyttäjän rooli tuotemuotoiluprosessissa kasvaa, ja sosiaaliset muutokset kuten kokemusyhteiskuntaan siirtyminen, ilmenevät kuluttajien lisääntyvässä valmiudessa nähdä vaivaa kulutustuotteidensa eteen. Itsevalmistettuja tuotteita arvostetaan niiden symbolisen luonteen ja valmistusprosessiin liittyvien tarinoiden ja muistojen myötä. Vaikka osallistuminen tuotemuotoiluprojektin valmistusvaiheeseen voi edesauttaa kuluttajan ja tuotteen välisen tunnesiteen muodostumista, saattaa vastuullisten valmistusprosessien myötä ilmetä uudenlaisia haasteita.

Osallistavia suunnittelumenetelmiä hyödyntäen, tämä opinnäytetyö tutkii määritteleviä tekijöitä ja reunaehtoja kuluttajan ja tuotteen välisen tunnesiteen taustalla. Tutkimus perustuu olemassa olevaan tietoon Ikea-efektistä ja keskittyy muotoiluprosesseihin, joissa käyttäjällä on merkittävä rooli tuotteen valmistuksessa. Opinnäytetyössä tarkastellaan käyttäjän osallistumisen vaikutusta syntyneeseen tunnesiteeseen tuotesuunnitteluprosessin eri vaiheissa.

Työn empiirinen tutkimusosa ja datankeruu alkoi verkkokyselyllä, keskittyen käyttäjän kasvavaan rooliin tuotteiden valmistusprosessissa. Kyselyn tarkoituksena oli kartoittaa keskeisiä syitä pitkäkestoisen ja työlään käsityöprojektin keskeyttämiselle. Kyselystä kerättyä tutkimustietoa pyrittiin täydentämään muotoiluluotaimien avulla, joita osallistujat käyttivät apunaan käsintehdyn tuotteen valmistuksessa. Käsityön valmistuttua osallistujat suunnittelivat kyseistä tuotetta vastaavan tuotteen kustomointityökalun avulla. Tutkimuksen viimeinen vaihe toteutettiin haastattelemalla osallistujia sekä valmistus- että suunnitteluprosessiin osallistumisen merkityksestä käyttäjän ja tuotteen välisen tunnesiteen kehittymiselle.

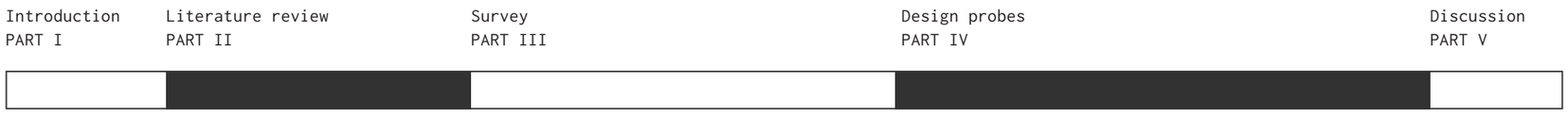
Työn tulokset osoittavat, että vaikka työläät käsityöprojektit jäävät usein keskeneräisiksi, luo valmiiksi saatettu projekti vahvan pohjan käyttäjän ja tuotteen väliselle suhteelle, mahdollisesti edistäen tuotteen pitkäikäisyyttä. Positiiviseksi koettu valmistusprosessi voi motivoida käyttäjää pitämään tuotteesta parempaa huolta, ja korjaamaan tämän sen rikkoutuessa. Työn tulokset viittaavat myös pitkäkestoiseen valmistusprosessiin osallistumisen johtavan korkeampaan arvostukseen työstettyä materiaalia kohtaan. Tutkimustulosten mukaan muotoilijan on mahdollista myötävaikuttaa tuotteen käyttöikään osallistavan suunnittelun keinoin.

Thank you

Heidi Paavilainen, my supervisor, and advisor, who made the thesis process as positive as it could have possibly been. Brage, for the encouragement, insight, and patience along this process in lockdown. Ada, for your great help and advice.

I am very thankful to all the respondents for the effort and thorough answers to my survey, and a special thanks to the participants who became an integral part of the study. Without you this wouldn’t have been possible.

My friends and family, I’m grateful for all the remote support I’ve received during this project.



PART I

Introduction

Before the second industrial revolution and the transition to mass production, products were made in a higher degree of variation based upon the requirements of the consumer. Despite the high cost, handmade items were manufactured to meet the consumer demand, furthering the creation of an emotional bond with the crafted product. While enabling low-cost production and higher productivity, the mass production era left consumers with a limited product selection and a decreased chance of forming emotional connections with the products. (Mugge *et al.*, 2009: Wang *et al.*, 2017).

The society is answering to the production overload by shaping efficient industrial processes and reusing or innovating new materials, but the changes might not affect the consumer choices, the product lifespan, and quantity of consumption. Presenting conscious consumption through critique with such expressions as *"the management of greed"* does neither offer a solution nor positively motivate the consumers in need of a change. (Jackson, 2005.) While new technology is undeniably an important tool in modifying manufacturing processes, Hebrok (2014) highlights the weight of social factors and human behavior when defining the environmental impact of a product. Finally, Senego *et al.* (2018) argues that the sustainable value of a product can only be affected by understanding consumer behavior, and notes that after purchase the full responsibility of repair, maintenance and disposal is passed to the user.

The current trend of slow movement has resulted in a new concept generated in the consumer product market. Finnish fashion designer Teemu Muurimäki in collaboration with Swedish finance company Klarna, has come up with a concept of *"making your own high fashion"* (Teemu Muurimäki x Klarna), where the consumer can buy the supplies and instructions for a DIY high fashion clothing (Muurimäki, 2020). A young Finnish company called *Lova* offers consumers knitting kits and patterns, encouraging them to knit their own garments as they work towards being *"a future kind of garment company"* (Lova, n.d.). As a consequence of COVID -19 lockdowns, many of us have been engaging in nostalgic "slow living" activities such as gardening, knitting and baking. This pandemic might have given a boost for the starting DIY trend and made consumers more open to try such time-consuming activities.

1 Teemu Muurimäki x Klarna
High fashion is self-created -campaign
Klarna.fi (2020)

The growing role of the user in collaborative product design processes might encourage the formation of emotional connections with items and have a positive influence on both customer satisfaction and product longevity. Several studies have proved that taking part in the physical creation leads to a disproportionately high valuation of a product and consequently furthers the emotional attachment between a person and a product. In 2012, Norton, Mochon and Ariely named this psychological bias the **Ikea-effect**, that has also been shown to occur through using online mass customization tools, with no requirement of a physical interaction with the product during the process (Norton *et al.*, 2012; Atakan *et al.*, 2014). Studying this phenomenon for gaining further understanding of the influence of user collaboration in both making and designing stage of the process could provide designers tools for extending the product life after purchase.

On the other hand, people who are not experienced in the field of making may find that they do not have the skills or patience required for a successful execution of a crafting project and thus, some projects may be left unfinished. The studies about the Ikea-effect have been conducted with inexpensive products in a short timeframe, and not with larger and time-consuming projects such as knitting a garment or creating pottery. A project of this scale could lead to encountering unexpected incidents, which have not been defined. In this research I investigate a product design process where the user has an extensive role in the manufacturing stage and aim to identify the connection of events in the making process and the formed person-product relationship. A closer exploration of the extended making process may help to recognize the events and obstacles causing interruptions, and by finding solutions for reshaping the process, help preventing the abandonment of the project and the consequent material waste.

This thesis starts with a literature review for building a conceptual framework, the background of the topic as well as the motivation behind the selected research problems. I explore the determinants of product-attachment that both extend the product lifespan and could be utilized through participatory design. The positive effects of user involvement in creation of emotional connections with products encouraged this review of the current perception of collaborative product design processes.

I used the craft of hand knitting as a research tool throughout the thesis, and therefore started the empiric study with a survey targeted for knitters. The survey was conducted for gathering knowledge about the happenings during independent and time-consuming knitting processes and providing statistical data about the proportions of these occurrences (Ahmad *et al.*, 2019).

Design probes were chosen as a research method both for the duration of the required user participation and the restrictions defined by the pandemic, and since the toolkits were performed remotely, I interviewed each participant after completing the task. While designers often use probes for engaging users to ideate, create and inspire, they can also be used as tools for gaining understanding about the process. (Mattelmäki *et al.*, 2016; Wallace *et al.*, 2013.)

RESEARCH QUESTIONS

Does extensive consumer participation affect negatively to the outcome?

When does Ikea-effect encourage lasting person-product relationships?

PART II

Literature review

Today, a vast number of functional products are replaced by ones with updated technical qualities or a difference in appearance. To avoid the environmental impact associated with a short product lifespan, strategies aiming to lengthen the service life of durable products through emotional attachment are needed. (Van Nes & Cramer, 2005; Mugge *et al.*, 2009.)

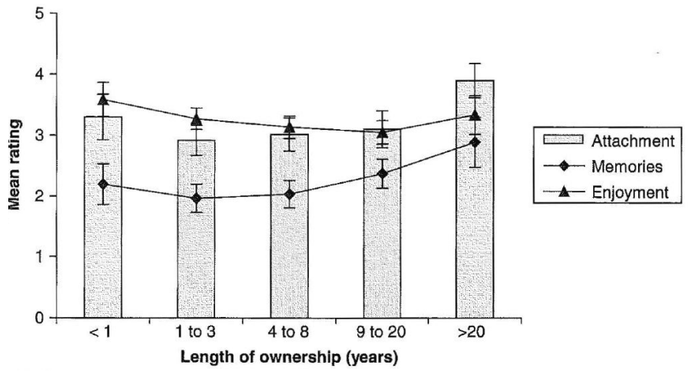
While the world is facing challenges relating to climate change and a pandemic, conscious consumers seem to be shifting towards more responsible consumer behavior and longing for meaningful and emotional connections with the purchases made. Therefore, it is beneficial for designers to recognize the value of product-attachment, already early in the design phase, by understanding the reasons why emotional connections shape user experiences and the service life of products.

Product attachment

Product attachment is the emotional connection between a human and an object, and there are several factors that may affect the strength and continuity of this relationship (Schifferstein & Zwartkruis-Pelgrim, 2008). A strong emotional attachment towards product often leads to a postponed replacement, due to a higher willingness to maintain and take care of the product and repair it when it breaks. These special products often evoke positive feelings among their owners, while the products with lower or nonexistent emotional attachment are believed to provoke neither negative nor any feelings at all. As an exception, some negative feelings, such as grief related to the passing of a loved one, are proved to potentially increase the meaningful emotional connection. (Mugge *et al.*, 2008)

Merely experiencing positive feelings towards a product a few times does not designate a strong emotional attachment, as the formation of a product-attachment may require time and repetitive encounters through ownership (Park *et al.*, 2007; Pierce *et al.*, 2002). These interactions may be encounters of any kind, for example the use of a product, physical handling such as cleaning, repairing, or customizing, or even displaying, discussing, or photographing them (McCracken, 1986). Consequently, actions of care, such as maintenance and delayed replacement, might not occur over a momentary feeling of joy. (Mugge *et al.*, 2008) However, Chapman (2010) argues that even a strong product attachment does not ensure a prolonged ownership or guarantee that the product is well maintained. According to Schifferstein and Zwartkruis-Pelgrim (2008) a strong emotional attachment to a product may cause the owner to be unwilling to dispose of it, even after it is no longer functional. The practical functionality of the product must be exceptional in relation to other similar products, if it is to positively affect the degree of product attachment (Schifferstein & Zwartkruis-Pelgrim, 2008).

Product attachment can be divided into four categories: **pleasure** (enjoyment), **self-expression**, **group affiliation** and **memories**. From these four categories, the products that are appealing to users' self-expression and memories are most likely to become *irreplaceable* to the owner (Mugge *et al.*, 2008). While it may be difficult for designers to influence the memories that users experience over the product ownership, they should aim to stimulate the sense of joy by combining aspects of usability and pleasure (Mugge *et al.*, 2008).



2 Attachment, memories and enjoyment as a function of length of ownership
Product Experience (2008) p. 431

"An irreplaceable special possession is one that a consumer resists replacing, even with an exact replica, because the consumer feels that the replica cannot sustain the same meaning as the original."

(Grayson and Shulman, 2000, p. 17).

A category of products that is commonly associated with self-expression is *clothing*. Clothes might have different premises as products than for example common household articles, and thus the determinants of emotional attachment may appear differently for clothes (Niinimäki & Armstrong, 2013). People often use clothing to express their identity and desired selves to others and might for example wear second-hand clothing to support their values (Pierce et *al.*, 2002; Mugge *et al.*, 2008). Niinimäki and Armstrong (2013) argue that the product appearance, which in turn is affected by social factors such as trends, is significant in creating an emotional attachment to a garment. Using materials that age well, such as leather, may enable the product itself to represent the history and experienced memories through physical marks or traces of use. However, the traces of use are not something that everyone appreciates equally. (Mugge *et al.*, 2008; Chapman, 2008; Hebrok, 2014) Offering consumers products of timeless design might positively affect the product durability, as products seen as outdated are less likely to be used as trends change (Mugge *et al.*, 2008).

Both clothing and hand-made products are commonly associated with self-expression
Hand knitted woolen sweater

Handmade products are another category of products that are tied to self-expression, as they allow the maker to creatively engage in the process and express themselves through an object to bring out his or her identity. Pierce *et al.* (2002) suggest a psychological ownership can be developed through labor, and by seeing own creations in reality through the invested effort. Including the user in the realization stage of the process might also make the user feel a sense of belonging in a DIY-community (group affiliation), make them feel competent and proud (pleasure), and remind them of a positive learning experience through a making process (memories) (Mugge *et al.*, 2008). Consequently, including the user to actively participate either in the design or the realization phase of the process, could lead to the formation of a meaningful and lasting person-product relationship. With that said, Atakan *et al.* (2014) proved that including users to both the design and realization stages of a process did not result in an expectedly high valuation of the end-result.

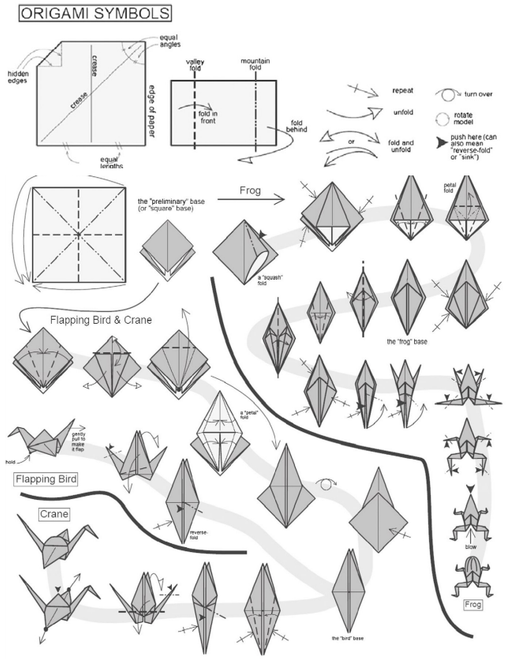
If a product manages to continuously surprise the owner in a positive way, the recurring joyful interactions might lead to a series of positive memories and thus a higher attachment towards it. Another way of facilitating experiences through design is by designing products that are suitable for gifts, souvenirs, or products that are usually shared with other people. (Mugge *et al.*, 2008; Chapman, 2008.) For example, the act of receiving a present is often a memorable event and might establish a meaningful emotional connection by associating the product to the person whom it was received from. However, Hebrok (2014) suggests there might be a downside in the emotional bonds encouraged by a personal relationship with the giver, since the nature of this product-attachment is dependent on the quality of the human-human relationship.

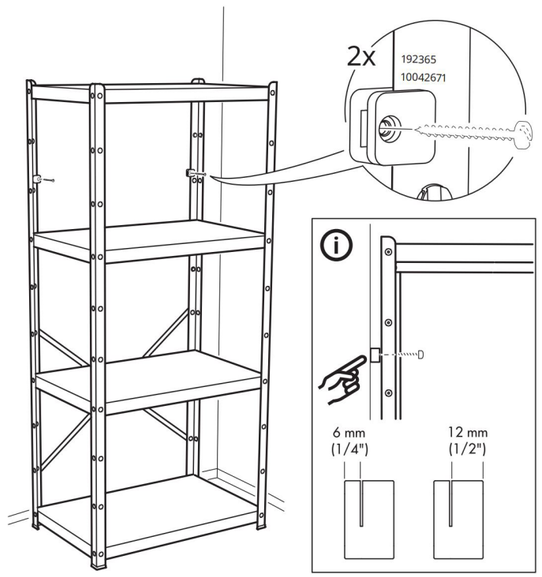
Ikea-effect

In 2011 Norton, Mochon and Ariely showed that people tend to disproportionately value products that they have participated in making. This psychological bias named after a Swedish furniture company was presumed to emerge for the invested effort and positive feelings evoked after completing an assembly project.

A case study where participants were asked to create origami animals, showed that the participants valuated their novice creations nearly five times higher than what other people would have been willing to pay. As other people saw these creations merely as amateurish creations, the makers wanted to ensure they get to keep them.

3 Origami symbols
Instructions for origami Experiment.
Norton et al. (2012) p.456
4 Ikea Ivar shelving unit
Product assembly instructions for Ikea Ivar - storage solution system
Ikea.com (2021)





The study further suggests that the effort put in by the participants only raises valuation when the product is successfully completed. When the participants did not get to finish or had to “unbuild” the product after the completion, the Ikea-effect would not take place. In these experiments the builder had no possibility to modify the outcome of the product, and by merely participating in the realization stage of somebody else’s design, even a poorly constructed object was valued as irrationally precious. (Norton *et al.*, 2012.) This psychological bias has later been proven to take place in online personalized product platforms and resulting in identification with the product, while participating only in the realization stage does not enable self-expression (Atakan *et al.*, 2014).

Ikea-effect in mass customization

Utilizing the Ikea-effect in personalization product platforms has been proven to lead to a higher willingness to pay, a deeper identification with the product and therefore a stronger product attachment (Ling *et al.*, 2020). Mass customization toolkits offer a possibility to “become a designer” without the need for further knowledge and commitment or having to engage in the making process yet leading to an assumption of being the originator of the product (Franke *et al.*, 2010). Piller *et al.* (2005) underline that even if the customization possibility might in some cases positively influence the product valuation, having too many choices may decrease the valuation of the result when the decision making is burdened by a large number of options. Lastly, according to Buechel and Janiszewski (2014) the ideal amount of the customization choices is yet to be discovered, since the need of variety and willingness to engage in the design phase differentiates among users with different personality traits.

Time, touch and effort

Franke *et al.* (2010) doubt that a brief use of an online mass customization tool can increase the product valuation equivalent to a physical labor done with a high level of time and effort. Research shows that people value products higher for simply because they own them (Wolf *et al.*, 2008; Reb & Connolly, 2007). The “endowment effect” has been proven to occur through tangible interactions with a product, even before actually owning the product. The power of physical touch has for long been utilized for boosting the sales by e.g. letting customers to test-drive cars and offering comfortable spaces in stores for familiarizing with the products (Wolf *et al.*, 2008). Ling *et al.* (2020) notes that the research results on the impact of time spent have inconsistencies in the product valuation. In fact, Peck & Wiggings (2006) has shown that more time spent in contact with a product adds to the product valuation, while Norton *et al.* (2012) proved that spending more time and effort with a task weakens the Ikea-effect. Furthermore, Marsh *et al.* (2018) established that the product valuation was not affected by the time and effort spent. It is important to point out that experiment 2 in the study of Norton *et al.* (2012) shows that the more time and effort spent with a task lead to a lesser valuation when the time was spent disassembling the products that the participants had built, leaving them with an unfinished product and therefore an unsuccessfully completed task. Thus, it could be argued that the effect of time spent to be positive when the task is completed successfully.

5 Herring girls knitting at Scarborough harbour, Yorkshire, c. 1910.
Published in History Today (2019) Unravelling the History of Wool

Knitting is a traditional textile crafting technique rooted in the remote history of various cultures across the world. Today, the trend previously run by older women, is taken over by all ages and genders for its' creative, meditative, and social effects. (Pavko-Čuden, 2017) Besides the haptic experience knitting can offer to balance the abstract knowledge work, this detailed and repetitive activity has been proven to have positive effect on health, happiness, and motivation. (Ahmas & Koivunen, 2020; Değirmenc, 2018)

Part III

Survey

The empirical study of this thesis started with an online survey targeted for knitters, highlighting the growing role of the user in creating products. As knitting processes are independent events that often happen at home behind closed doors, I started gathering quantitative information with a survey for gaining a wider perception of the happenings and possible setbacks of these processes and finding the makers' preferences for patterns and instructions. The survey sought to uncover the reasons behind the abandonment of knitting projects that lead to unfinished creations and wasted material. The reason for reaching out to respondents both from the knitting community and individuals interested in knitting and/or knitters of a lower skill level, was to not only understand the knitting process of a wide range of skill levels better, but to find participants for the next step of the study.

The main goals of this survey were to learn what makes people abandon their knitting projects, and what kind of instructions would be optimal for preventing the discontinuity of a knitting project. I hoped to find answers on both the preferences on instructions and knowledge about the process of the group of beginners and more experienced knitters. A knitting pattern is a component where the designer directly affects the process, and to be able to prevent the pattern being a factor leading to an abandonment of the project, it was necessary to understand the diverse impact of instructions on the process.

Previous research about the Ikea-effect proves that people value their amateurish creations over the ones made by experts, yet the Ikea-effect was discovered to appear even stronger among diy-enthusiasts. (Norton et *al.*, 2012) They further suggested that the increased feeling of competence may be one factor behind the bias. Therefore, I also reached out to beginner knitters for this study, with the assumption that these feelings may appear stronger in tasks where participants can learn new skills during the process. (Norton *et al.*, 2012) Experienced knitters often have great skill and knowledge about the technique, and by making a product below their skill level may not provoke these feelings of competence.

However, reaching out to knitters with all skill levels from early beginner to expert made it not only possible to analyze the results comparing the different skill levels, but to find out what kind of products beginner knitters (skill level =1-2/10) are willing to knit. In addition, the survey was conducted to gather knowledge that would objectively help to rule out as many disruptive factors of the process to not only make the experiment forthright for the participants but to be able to locate and concentrate on other possible obstacles occurring in their making process.

The survey was conducted via an online tool, Webropol, and could be answered using any smart device in approximately 2-5 minutes. It was shared in several personal social media profiles in Facebook, LinkedIn, and Instagram to reach potential respondents. In addition to this, the survey was shared in an Instagram account with a follower base (n=1000 followers) consisting mainly of knitting-enthusiasts and crafty people. The survey was also forwarded to two larger Facebook groups Tikkuröijypiiri (n=1700 followers) and Neulonta-group (n=44000 followers). When reaching out for respondents, I wrote a preview that was attached to the link informing about the nature, content, and the estimated duration of the survey.

The survey consisted of 12 questions in total, and several questions had an open comment box offering a chance to provide more information, experiences, or notes about the topic. The survey was designed to proceed due to the individual respondent's answers and to take shape depending on their selections. For continuity, specific answers had additional rules forwarding the respondent to a logical next question, so the survey modified due to the respondents' skill level and experiences. I used a three-level skill acquisition in the self-evaluation scale, considering 0-10 to indicate skill levels from beginner to expert (Aktas & Mäkelä, 2019). The scale represents the subjective development level of the acquaintance with knitting technique, while the final interpretation of the scale and know-how was made by the survey respondents. Beginner-level knitters are considered to have either no previous experience or competence for fabricating a product by following the given instructions, while expert-level knitters have the experience of advanced techniques and an ability to adjust patterns if desired, or no need for instructions at all. (Aktas & Mäkelä, 2019.)

Survey questions
The survey consisted of 12 questions including a chance to attend a knitting experiment

Survey questions

1. Have you ever knitted?

2. Would you like to try knitting?

3. What has stopped you from trying knitting?

4. How would you describe your skill level as a knitter?

5. Have you ever left a knitting project unfinished?

6. What stopped you from completing the project?

7. I prefer... 1=most preferred, 4=least preferred

Short and concise instructions

Long and detailed instructions

Instructions with pictures

Instructions with videos

8. Why didn't you start?

9. Do you have an example for easy-to-follow instructions?

10. I would like my next knitting pattern to be...

11. What would you like to knit in the future?

12. I would like to attend a beginner-friendly knitting research

A total of 196 respondents completed the survey in the time frame of 4 days. The introduction in the survey mentioned the chance to attend to a beginner friendly knitting research task, that included knitting of a beginner friendly product. 28% (n=55 participants) of the survey participants were willing to attend to the next phase of the research.

Question 12 *I would like to attend a beginner-friendly knitting research*
28% (n=55 participants) of the 196 survey respondents were willing to attend to the next phase of the research

Survey data analysis

While the survey targeted knitters, as well as people willing to try, only 1% (n=2) of the respondents did not try knitting before. This confirmed the decision of choosing participants of a low (1-2) skill level for the next phase of the study. These participants are already familiar with the rudimental techniques, allowing the learning to be focused on new knitting stitches and patterns and completing a product. Since the greater part of the respondents reported to have tried knitting before, the answers for questions 2. *(Would you like to try knitting?)* and 3. (What has stopped you from trying knitting?) did not offer valid research results.

The respondents with an affirmative reply for the question 1. *(Have you ever knitted before?)* were automatically directed to the question 4. (How would you describe your skill level as a knitter?) The results of this question show the average self-evaluated skill level of participants to be 6.1, scattered in the scale of 0-10.

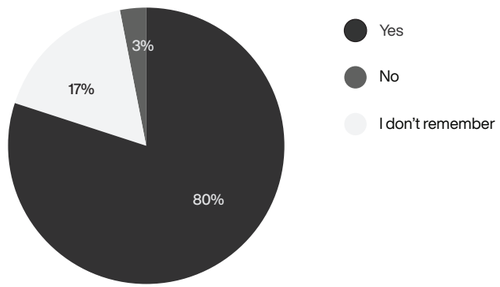
The results revealed that 80% (n=156) of the respondents *have left a knitting project unfinished*, where a percentage of 17% (n= 33) reported to never have left a knitting project unfinished, leaving 3% (n=5) not remembering whether it has happened or not. *(figure: Question 5)*

The next question (*What stopped you from completing the project?)* offered a chance to choose and optionally explain what the main reasons were for abandoning the project, and a total of 290 options were chosen by 156 respondents. *(figure: Question 6)*

69% (n=108) of the participants answered to have abandoned a project because of *losing their interest*. The answers of the optional text field revealed the main reasons were the project being too repetitive, boring, or time-consuming, often mentioning products where two similar shapes are needed e.g. socks or sleeves for a cardigan. Several respondents wrote to have found a more interesting project to work on, leaving the other project unfinished. Taking a long break from a project was also mentioned to often be leading to the abandoning of a project. In consideration of the possibility for multiple selections, the final decision for not finishing the project might have been caused by a combination of different factors. 43% of the respondents that had abandoned a project for *losing their interest*, did additionally select the options of *I didn't like the look of the unfinished product* and 29% that *it took too much time to complete*.

As previously mentioned, other notable reasons for abandoning the project were *disliking the looks of the unfinished product* (38% n=60), and the *project taking too much time to complete* (24% n=37). The selection of *disliking the looks of the unfinished product* was further explained for discovering the unfit or disliked color, size, or design of the chosen pattern. Frequently mentioned reasons for the *project taking too much time to complete* were choosing a product above current skillset, or too large and time-consuming, e.g. a blanket. Materials or tools of poor quality were also noted to have caused an abandonment of a project.

Nonetheless, it was often commented that unfinished product has been *"frogged"*, as in the material being unraveled and reused in another project, while many were still hopeful to return to finish the product later. Two participants had continued a project after a three-year break and one wrote to have completed a sweater after 28 years from starting. To mention a downside of the slow process, one respondent explained to have outgrown the size of the product before it was ready.

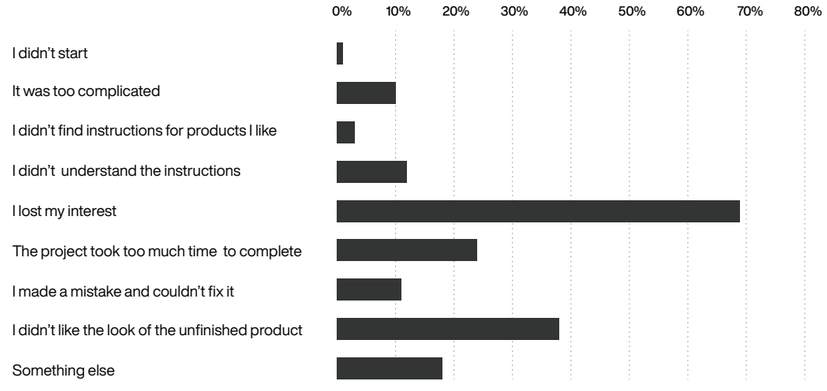


Question 5 *Have you ever left a knitting project unfinished?*

18% (n=28) participants selected the answer *Something else* writing additional reasons for leaving a project unfinished, such as running out of yarn in the middle of the process. This often became a problem when the needed color had run out of stock, or the manufacturing of the yarn had been completely discontinued. Yarn is dyed in batches marked on skeins with lot numbers, and due to the dyeing process of natural material the colors between batches can vary, making it impossible to find an identical colored skein after the needed batch has been sold out. Other reasons mentioned under *Something else* were back or neck pain, avoiding or not knowing how to sew knitted parts together, or just entirely forgetting the project exist.

Only 1% (n=2) of respondents reported to *not having started* the whole process of making before abandoning the project, which led the results from next question of *"Why didn't you start?"* to be too narrow for reliable analyze. 12% (n=19) had abandoned a project due to *not understanding the instructions*, 10% (n=15) because of the project turned out to be *too complicated*, and 11% (n=17) for *making a mistake and not being able to fix it*.

A total of 1% (n=2) participants abandoned the project *before starting*, and 3% (n=4) after unsuccessfully trying to *find instructions for products they liked*. These results indicate that the events leading to an abandonment of a project mainly occur after starting the project, and the interest and motivation for making rarely wear off immediately after purchasing the yarn and equipment. This might also be a consequence of a relatively high material costs, that could lead to a higher commitment with a material when the paid price could cause the starting of a project to almost be seen as a liability.

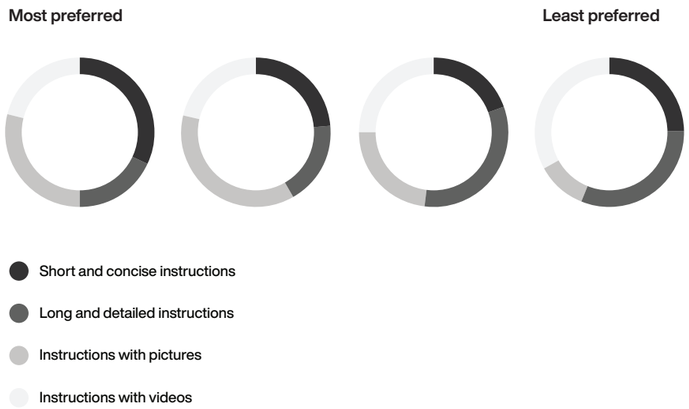


Question 6 *What stopped you from completing the project?*

As 32% of the participants chose the *short and concise instructions* for their most preferred type of a pattern, 29% would choose to go with *instructions with pictures*. 21% of the knitters prefer *instructions with videos* the most, when 18% had chosen the *long and detailed instructions* to be the most preferred. *(figure: Question 7)* The answers prove that every maker has a different preference for the features of instructions. The survey does not exclude using additional methods in the process, and the results do not reveal the use of other sources in addition to the preferred option. It is to be taken into consideration that one might prefer short and concise instructions but would additionally use e.g. Youtube-videos to support the process. Including a selection of features in knitting pattern instructions might have become less relevant for the large variety of additional material available online.

The outcome of this ranking question complemented with the previously presented result of only 12% (n=19) of the participants having abandoned a project due to *not understanding the instructions* might suggest that the features of instructions are rarely the only cause for an abandonment of a project. 11% of the participants chose the instructions with pictures as the least preferred (4.) type of instructions, which may indicate the pictures attached in a pattern are hardly seen as disadvantage. The results of this question do not reveal further preferences for features of instructions, such as terminology and chosen language.

To strengthen the conclusion about the features of instructions being unlikely the only cause for abandoning a project, a total of 92 (=47%) participants shared an example for easy-to-follow instructions. The answers written to the text field covered dozens of different knitting pattern designers, which might imply the successful project has been selected by the looks of the product rather than the simpleness of instructions.
Designers or websites mentioned by several participants were Novita (n=18), Petiteknit (n=12), and Niina Laitinen (n=6), and more than once named were Drops (n=3), The Knit Purl Girl (n=3), Wool and the gang (n=3), Sheep and stitch (n=3), Witredesign (n=2), Purl Soho (n=2), Sari Nordlund (n=2) and Jessie Mae (n=2). In addition to these, multiple designers and websites were mentioned once. The most often mentioned Novita shares Finnish instructions from several designers with various products in their website, while Petiteknit sells knitting patterns in 8 different languages, offering variety for a large audience, and explaining the popularity.

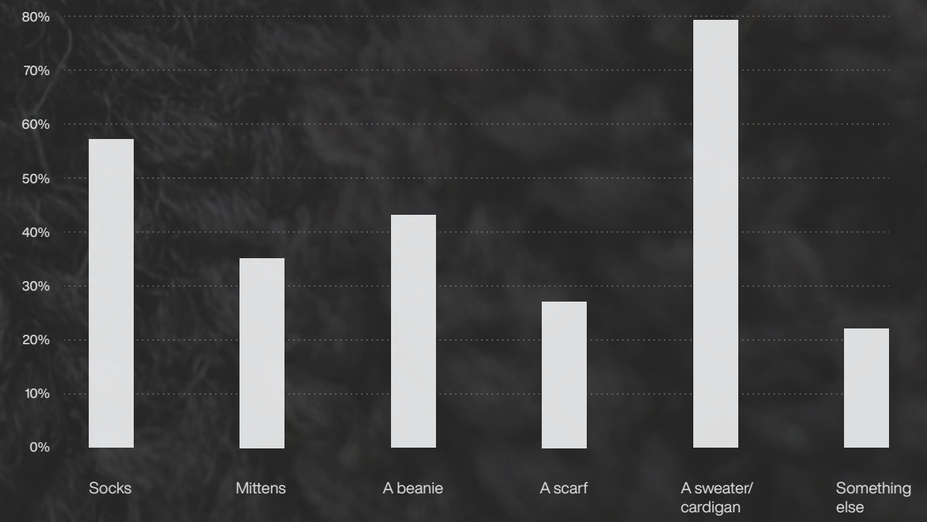


Question 7
7. I prefer... 1=most preferred, 4=least preferred

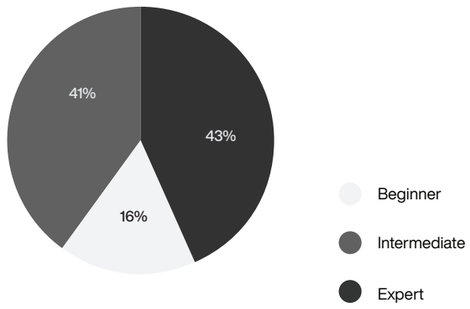
42% (n=82) of the participants answered that they preferred an *easy and simple pattern* for their next project, when 45% (n=87) would like to engage themselves with a *challenging pattern that requires focus*. In the free field of *"something else"* three respondents wrote that they had simultaneously had projects of both kinds, to be able to choose according to their current mood and effort level, and eight to prefer patterns with both challenging and simple elements for balance and maintaining interest through the process. This result does not suggest that the knitters would always prefer the selected choice but rather represents the level of effort they're willing to put in their next project. 3 respondents expressed unwillingness to follow any pattern but preference towards designing their own ones.

To the question: *"What would you like to knit in the future?"* 195 respondents had selected a total of 514 options, showing that there are often multiple products the knitter is willing to make in the future. *(figure: Question 13)* To the free selection of *"something else"* participants had added products such as *a dress, a blanket, baby clothes, pants, a balaclava,* and *clothes for dogs*. Several participants mentioned to be willing to knit e.g. clothes for themselves, but do not believe to have the required skillset yet. 79% (n=154) of the respondents were willing to knit a sweater, which may establish the trend of the handmade garments and everyday clothing, and the act of knitting is not seen to be limited to woolen socks any longer.

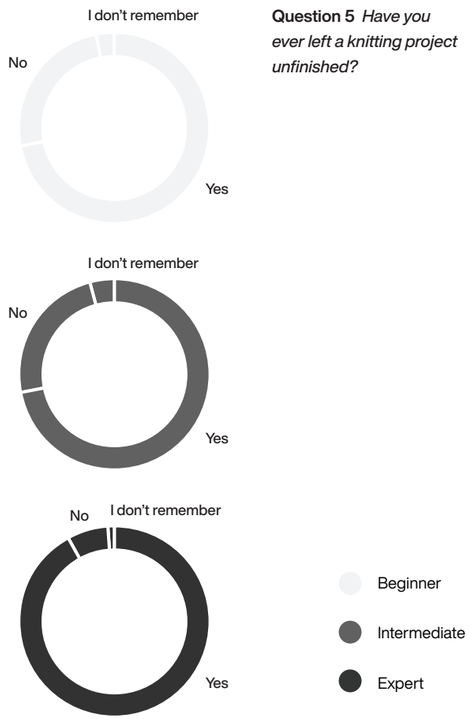
Question 13 *What would you like to knit in the future?*
Number of respondents: 195
Selected answers: 514



Question 4 *How would you describe your skill level as a knitter?*
The structure of self-evaluated skillset of the respondents



Question 5 *Have you ever left a knitting project unfinished?*



Cross tabulation

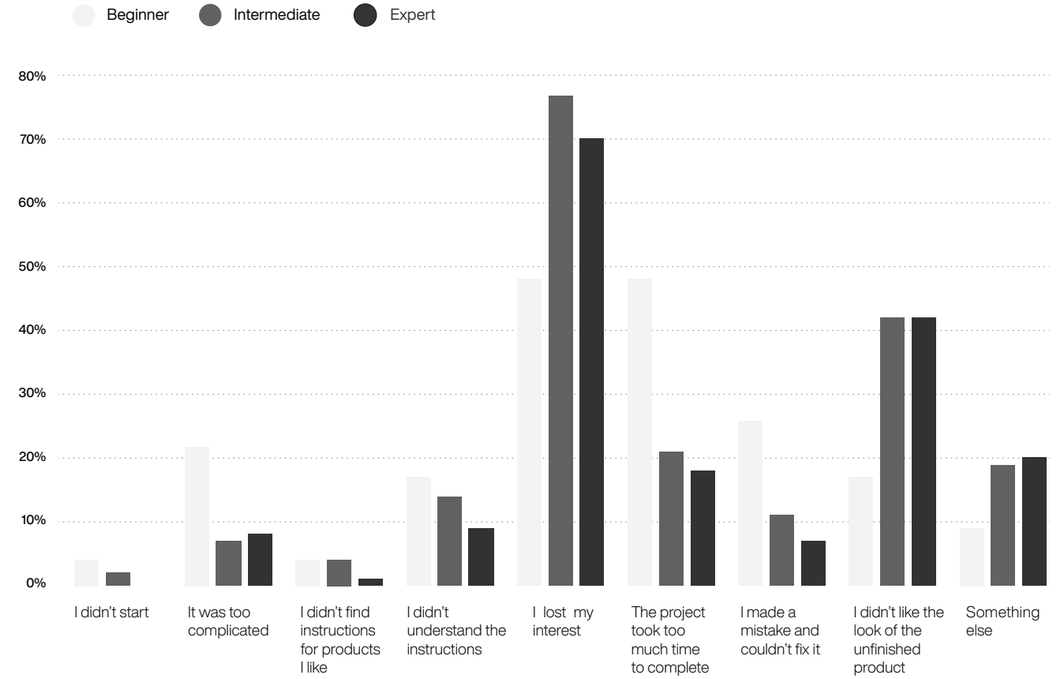
For comparing the quantitative data of the survey, I divided the respondents to 3 groups based on their skill level: **Beginners** (n= 32, skill level 0-3), **Intermediates** (n= 79, skill level 4-7), and **Experts** (n=83, skill level 8-10). A total of 194 respondents answered yes to the question 1. *Have you ever knitted before?* which directed them to the further questions about the skill level. *(figure: Question 4)*

Answers to the question *"Have you ever left a knitting project unfinished?"* showed that 92% of the Expert-level knitters remember to have left a knitting project unfinished, when 72% from both beginner- and intermediate-level knitters admitted on doing so. The result might indicate that this happens to most knitters despite the skill level but is yet to happen for some. *(figure: Question 5)*

The reasons for *"what stopped you from completing the project?"* varied slightly due to the self-assessed skill-level. Beginner knitters were more likely to drop the process for it *taking too much time to complete* (48%, n=11) than the intermediate and expert-level knitters (intermediate 21%, n=12, expert 18%, n=14) which might be a result of experience about the required time of the exercised technique. For beginners, the required time for completing a knitted project might come as a surprise, and lead to an abandoning of a project. A larger percentage of beginner-level knitters also responded to have abandoned a project because of *making a mistake and not being able to fix it*, or *the project being too complicated*, when these reasons were not as popular amongst intermediate- and expert-level knitters. *(figure: Question 6)*

Both intermediate- and expert-level knitters reported the prime reason for abandoning a project to be *"I lost my interest"* (intermediate 77% n=44, expert 70% n=53) and *"I didn't like the look of the unfinished product"* (intermediate 42% n=24, expert 42% n=34), when these options were selected by 48% (n=11) *"I lost my interest"* and 17% (n=4) *"I didn't like the look of the unfinished product"* of the beginners. The result of only 17% of beginners having abandoned a project because of *not liking the look of the unfinished product*, while 42% of both the intermediate- and expert-level knitters have done so and could indicate that the increased feelings of competence exceed the importance of the product appearance. 26% of the beginner knitters had abandoned a project after *making a mistake and not being able to fix it*. A higher percentage of intermediate and expert level knitters choosing the option *"I lost my interest"* could also suggest that for some hobbyists the joy of hand-knitting might exceed the necessity of the end-result and lower the motivation for finishing the product. However, this does not mean the material will not later be reused for another project.

Question 6 *What stopped you from completing the project?*
Cross tabulation



The responses of all skill levels to the question about preferences for different types of instructions *(short and concise, long and detailed, instructions with pictures, instructions with videos)* were extremely even, which led me to the decision of offering the participants several features such as both pictures and videos, concise instructions with a possibility to ask me for more details if needed for avoiding the abandoning of the project because of the quality or features of instructions.

While there is no significant difference regarding what products the participants want to knit in the future, 78% of beginner-level knitters would choose *an easy and simple pattern* for their next project, and only 9% of them would start *a challenging one that requires focus*, while only 22% of the expert level knitters would like to knit *an easy and simple pattern* for their next project. The fact that knitters with a self-assessed lower skillset in knitting chose *easy and simple patterns* would not only support their skill level, but might positively affect to the amount of abandoned projects, when it becomes less likely to quit as a consequence of a project *being too complicated, making a mistake and not being able to fix it*, or *product taking too much time to complete* with some exceptions such as a scarf, that could be categorized as a simple product yet still take a long time to finish. The most popular choices for future knitting projects by beginners were a *sweater/cardigan* (63%), *socks* (53%), and *a beanie* (53%), of which a beanie is technically and timewise the least laborious knitting project, and therefore a fitting product for the next phase of the research.

Discussion

According to a large number of respondents, the knitter community appeared to be highly communicative in their answers and seemed open for sharing their experiences. The respondents engaged generously in the task by sharing information of their experiences and knowledge in the optional text fields. A high number of respondents showed interest in continuing with the research, which offered me a chance to select the participants based on suitability for the research topic. Almost half (47%) of the beginner level knitters offered to attend to the knitting research, which might be a consequence of the restrictions and lifestyle defined by the pandemic jointly with the trend of slow-fashion and DIY-products.

Based on the experiences the respondents shared in the free text field, the knitting community appears to have respect for the slow process and the material; multiple participants mentioned to have continued an unfinished product after several years (n=5 respondents), expressed an interest in finishing an ongoing project later (n=9 respondents) - or having finished a project even after decades (n=1 respondent), while these questions were not asked in the survey.

"I see this more as a break"

"It' not unfinished, it's waiting to be completed. It might take a while..."

(survey respondents)

Many attendants wrote that even though they noticed that the product would not turn out as expected they disassembled the material, saving it for another project rather than disposing of it. Based on the responses the act of buying materials for a project almost without an exception (99%) led to the starting of a project, and the reasons for quitting the project took place somewhere in the making process. In the process of hand-knitting the complete responsibility of manufacturing is passed to the maker, which instead of leading to unnecessary material waste might result in an increased appreciation towards the material and the making process, as well as the end-result.

Many respondents revealed to have abandoned a project for it being too repetitive, boring, or time-consuming.
Hand knitted woolen scarf

What’s next

The survey results led me to choose a beanie to be the product for the knitting probe in the next phase of the research. It is a product that beginners are not only willing to try to make, but a product that fits their current skill set. A beanie as a wearable product might encourage repetitive interactions through use, and over time become associated with joyful memories experienced during ownership (Mugge *et al.*, 2008).

Respondents with a skill-level of 0-3 were more likely to abandon a project for it *taking too much time to complete* (48%). *A beanie* is one of the less time-consuming products to make, and out of the products the beginner-level knitters were willing to knit in the future, a beanie requires both less time and technique to complete. Other popular options being *a sweater/cardigan* (63%), and *socks* (53%) require knowledge of several different knitting techniques and contain repetition. Repetition was a common reason mentioned in the optional text field for not completing the product because of *losing interest*. Often the need of repeating the same shape twice for one project seemed to significantly lower the motivation for completing the project.

The respondents had an option to leave their contact information at the end of the survey in order to be a part of the next phase of the research. Out of the 55 registered respondents I contacted 8 participants with a skill level of 1-2 about the next step of the research. To the respondents that I could not include in the knitting experiment, I sent the pattern designed for the probe toolkit as a thanks for taking the survey.

PART IV

Design probes

The knitting probe toolkit participants' locations
The independent nature of the toolkit allowed remote collaboration

Knitting probes

After analyzing the survey results and selecting a beanie to be the end-product for the knitting probe toolkit, I chose eight survey respondents with a self-valuated skill level of 1-2/10 to continue with the study regardless of their age, gender, or location. After finishing the toolkits, I sent the packages by mail to Finland (3), Norway (1), Austria (1), Germany (1), Denmark (1) and United Kingdom (1), and the participants were given three weeks to independently complete the task.

Research method

The use of design probes as a research method was chosen to complement the quantitative survey data and offer qualitative research data of the extended user participation in the making process. To get a deeper understanding about the feelings, emotions, and experiences during a time-consuming making process the probes aim to uncover some of the events that influences the forming of a meaningful and lasting product ownership. In addition to a thorough understanding of the slow process, the use of probe tools results in a hand-made product made by the participants and offer a reference for understanding the person-product connection formed by participating in the manufacturing stage of a design process. Since the participants were given a task of knitting a beanie of someone else's design, the study results could show if the participants have modified the pattern or made design changes to the end-product that is better aligned with their own preferences.

The survey in the first phase of the research focused on uncovering the common factors of interferences in the extensive process of knitting a product. With the information gathered from the survey results I aimed to exclude or relieve the uncovered obstacles during the process, hopefully leading to an improvement in the fluency of the making process and discovering yet unidentified disruptions.

Materials & Tools

I started designing the probe toolkit by exploring the different tools and materials used in knitting. The survey revealed 48% of the beginner-level knitters had abandoned a project for both the project *taking too much time to complete* and for *losing their interest* which led me to start experimenting methods to reduce the time required for finishing the project. The beginner-level knitters abandoning a project for it *taking too much time to complete* might be a result of not yet having the knowledge of the technique and being surprised by the amount of time required to complete a hand-knitted product. My goal was to design a probe package as beginner friendly as possible, allowing the participants to complete the product hopefully followed by feelings of accomplishment and proudness of their own creation.

Knitting with thicker needles and yarn requires less effort and the working progress can be seen faster, which might encourage beginner-level knitters to continue the project. The knitting survey respondents revealed in the free text field of abandoning a project for it *taking too much time to complete* was often a result of starting a project that was too complicated and extensive for the current skill level. I wanted to create a beginner-level pattern that could be completed in a timeframe of roughly 3-10 hours depending on the maker, so I started experimenting with the use of large needles and thick yarn in knitting a beanie. I started my experiment with size 12mm knitting needles and a woolen yarn with a fitting thickness. I quickly learned knitting a small product like a beanie with 12mm needles resulted in a thick outcome with highly visible stitches, which could negatively affect to the outcome among inexperienced knitters. I wanted to find a balance between ergonomic and beginner-friendly tools, and an outcome that would be aesthetic yet not too revealing of possible errors.

I discovered that while the errors are easily revealed when working with thicker yarn, it enables high visibility for fixing possible mistakes, and the chance of an error is limited as unraveling and dropping stitches is reduced. The decision to use a thicker yarn would not only make the process faster, but hopefully prevent an abandoning of a project for *making a mistake and not being able to fix it*, which 26% (n=6) of the beginner level knitters reported to have done in the past.

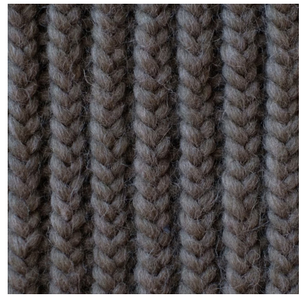
I knitted several test pieces with 12mm and 8mm knitting needles. For the desirable appearance and usability, I finally selected 8mm needles with 100% woolen yarn matching the needle size. For the knitting needles I chose to offer the participants wooden circular needles for better grip and preventing stitches sliding off while knitting the product.

Yarn colors that highlight the possible errors and roughness of hand knitting could lead to dissatisfaction towards the end-product. For serving versatile tastes and preferences in use I chose a melange dark shaded grey color that potentially moderates the possible irregularities yet does not negatively affect the visibility during making.

K=Knit
8 stitches and 13 rows
Needle size 12mm

K=Knit
WS/Wrong side
8 stitches and 13 rows
Needle size 12mm

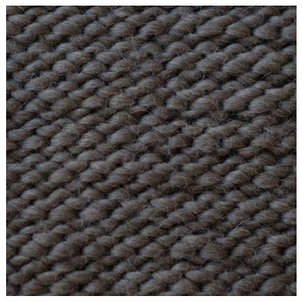
K1, P1
K1=Knit one, P1=Purl one
9 stitches and 12 rows
Needle size 12mm



K1B, P1
K1B=Knit through the back loop
P1=Purl one
13 stitches and 15 rows
Needle size 8mm

K1B, P1
K1B=Knit through the back loop
P1=Purl one
WS/Wrong side
13 stitches and 15 rows
Needle size 8mm

K/Knit
10 stitches and 16rows
Needle size 8mm



K/Knit
WS/Wrong side
10 stitches and 16rows
Needle size 8mm

K1, P1
K1=Knit one, P1=Purl one
11 stitches and 13 rows
Needle size 8mm

K2, P2
K2=Knit two, P2=Purl two
12 stitches and 15 rows
Needle size 8mm

Knit stitch patterns
Gauge 10cm x 10cm
100% wool, Color: misty green
Recommended needle size 12-15mm

As a response to the 48% of beginner-level knitters' answer of abandoning a project because of *losing their interest*, I added a fabric label to the probe toolkit to further establish the ownership and the proudness of the hand-making. The label would ideally encourage the participants to finish the product functioning as a "last touch" to confirm the product finalization. Franke *et al.* (2010) suggest that certificates or labels might function as a positive feedback about the process, which they believe strengthens the emotional connection towards the self-created product.

The labels came with a text "Handmade by me", and instead of a brand logo the label expressed the use of natural high-quality material and showed instructions of care to obtain a long product lifespan through maintenance. The commercial use of care labeling symbols is regulated and requires a paid license (kiwa.com). I was granted a written permission to use them without charge for non-profit research purposes.

Pattern design

The results from the knitting survey offered valuable guidance for designing the knitting pattern for the collaborative probe toolkit. As well as designing *an easy and simple pattern*, which 78% of the beginner level respondents would choose for their next project, I wanted the participants to eventually have a product they are willing to use.

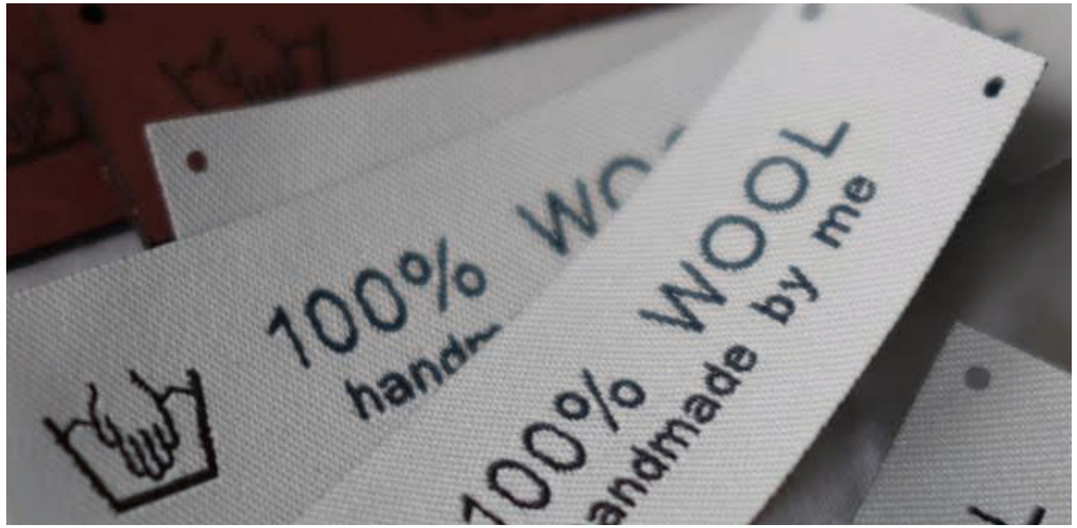
Based on the answers from the survey it became clear that *not understanding the instructions* rarely (12% of all participants) lead to an abandoning of the project, yet with the beginners the percentage was 17%. The preferences for different types of instructions varied and divided equally and showed that the preferences of features in patterns are not related to the skill level. For serving varying preferences comprehensively, I offered the participants a written instruction, a knitting chart, pictures, additional videos of used stitches, and a possibility to contact me for help.

After knitting and comparing several samples, I chose a 1x1 rib stitch pattern for the flexibility of the garment and adaptability for individual fit. Instead of a regular 1x1 rib stitch, a knitting pattern of 1 knit (k1) and 1 purl (p1), by twisting the knit stitches (knit 1 through the back loop= k1tbl) resulted in a smoother outcome with the same effort. Choosing a knit stitch pattern resulting in a neat result might offer the beginners feelings of competence and encouragement to continue.

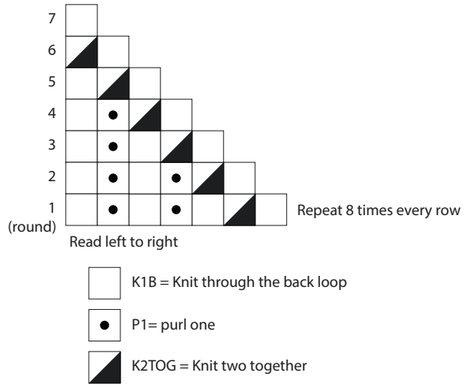
While the rib stitch pattern (k1, p1) results in ribbing of two identical sides, the one with twisted knit stitches (k1tbl, p1) creates a different pattern for each side of the garment. Folded beanies are often knitted in two parts, including a step of changing the knitting direction after finishing the folding. While the twisted ribbing consists of two varying textures, the effect of using a variety of techniques could be demonstrated while skipping the extra step of the process.

For the decreases in the beanie crown, I decided to use the technique requiring the shortest instructions. While I found the different decrease methods equally challenging, I tried to avoid writing long instructions to avoid giving the impression of a complicated task.

The prototype of the final beanie pattern knitted with the selected tools and material required approximately 150g wool, which led me to include 2 skeins (200g) of yarn for each probe toolkit.
The knitting tension of makers vary with each maker, causing variability in amount of yarn needed for completing a project. The spare yarn offered in the toolkit covers potential errors and prevents running out of material midst the project.
The final probe toolkit consisted of following materials: **Two skeins of yarn** (100g+100g Happy Sheep, Woolpower Big, 100% wool), **knitting needles** (8mm), **a sewing needle**, **thread**, **a label**, and **instructions**. Tools needed in addition but not included in the package were scissors and a measuring tape.



Knitting charts can help visualizing the knitting instructions
Variations between charts used in different countries might cause confusion among makers



The final probe toolkit consisted of following materials: *Two skeins of yarn, circular knitting needles, a sewing needle, thread, a label, instructions, and a maker's journal.*

BEGINNER BEANIE pattern

PATTERN

Note: This pattern is knitted the wrong side out.

BEGIN

Cast 64 stitches onto circular needles.
Round 1. *K1tbl, P1*
repeat from *-* to end of round
K1tbl= Knit one through the back loop
P1= Purl one
Repeat round 1 until the height of the piece is 26cm

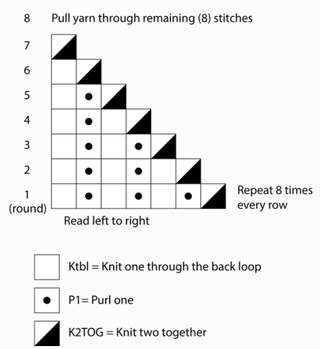
STITCHES USED IN THIS PATTERN

Ktbl= Knit through the back loop
P= Purl stitch
K2TOG= Knit two together

CROWN

Note: As the number of stitches decreases, circular needles will become too small for the circumference. It's possible to knit with circular needles until the end, by letting some of the circular needle wire outside the circumference.

(You can mark the starting stitch with a safety pin)
Round 1: Start from the beginning of the round, knit 6st according to pattern (*K1tbl, P1*), then K2TOG (Knit two together) - repeat (8 times) to end of round
Round 2: Knit 5st according to pattern, then K2TOG - repeat (8 times) to end of round
Round 3: Knit 4st according to pattern, then K2TOG, repeat to the end of round
Round 4: Knit 3st according to pattern, then K2TOG, repeat to the end of round
Round 5: Knit 2st according to pattern, then K2TOG, repeat to the end of round
Round 6: Knit 1st according to pattern, then K2TOG, repeat to the end of round
Round 7: K2TOG the whole round
Round 8: 8 stitches left.
Cut the yarn and pull it through the remaining stitches using a needle. Weave the loose ends inside the garment. Turn the beanie around.
Sew the label in the front of the beanie. Note the stretching of the beanie in use, while sewing the label.



BEGINNER BEANIE pattern

MATERIALS

200g WOOLPOWER BIG (100% wool)
8mm circular needles 20cm
Sewing needle + thread
Label

In addition:
Scissors
Measuring tape/ruler

15 stitches=10cm

15 stitches=10cm

GAUGE

15 stitches and 17 rows=
10cm in 1x1 rib unstretched

10cm x 10cm gauge is for ensuring that the size of the beanie pattern will be invariable. If your gauge has significantly more/less stitches & rows, you can increase/decrease the amount of starting stitches by +/-8

SIZE

One size, fits all (adults)

Rough measurements of the finished product:
Width: 22cm
Height (folded): 20cm
Height (unfolded): 28cm

Thank you for participating,

Saara

The knitting instructions sent to the participants as part of the probe toolkit
The pattern was printed out to make the process more convenient

Cable stitch pattern

Stockinette stitch pattern

Broken rib stitch pattern

Beaded rib stitch pattern

2x2 Rib stitch pattern

Knit stitch patterns
Gauge 10cm x 10cm
100% wool, Color: white
Recommended needle size 12-15mm

Braid stitch pattern

Andalusian stitch pattern

Seed stitch pattern

Simple seed stitch pattern

Customization Tool

In the third part of the study the participants used a mass customization tool to design a beanie, which they would receive after finishing the knitting probe. After the third part of the study each participant was left with two products; one they had made by themselves but not designed, and one they had designed but not attended in making.

Ling *et al.* argues that The Ikea-effect not only flourishes during acts of physical labor and making, but also occurs in towards products that are self-designed using mass customization tools (2020). Nonetheless, the impact of different forms of participation has not been investigated in parallel or with a goal of understanding consumer collaboration in creation of long-lasting products. While the research group of eight participants is not enough to provide statistical data about the value of user collaboration in each phase of a product design process, the study might provide a deeper understanding of the process and the quality of formed person-product relationships. Offering the participants two similar products which they have attended in creating in different ways could reveal unexplored feelings, experiences, and directions for future research about the topic. As Mugge *et al.* (2009) state, using qualitative research methods in understanding product attachment is indispensable, yet the research about the topic lacks the qualitative data required to fully understand the phenomena.

Creating the customization tool

I started designing the product customization tool by benchmarking timeless beanie designs, colors and popular knitting patterns used in beanies. Favoring timeless designs that continue being “socially accepted” might have a positive impact on the product longevity, while the decreasing interactions with the outdated product could weaken the product attachment (Mugge *et al.*, 2008). Based on my findings in the survey I ruled out the options which I expected to not be of interest to the of participants, such as multicolored beanies and ones without folded edges. I wanted to create a selection of alternatives that offered the participants several attractive and diverse products to choose from, resulting in a feeling of successful decision making. The final series of choices would optimally consist of a collection of classic patterns and color selection for versatile and lasting use.

Having too many options to choose from is believed to be leading to mass-confusion and paradox of choice, as the decision burdened by a large number of options is rather seen as a liability (Piller *et al.*, 2005; Schwartz, 2001, p.48). Too great of a selection might lead to questioning the choice that has been made and negatively affect the product satisfaction (Schwartz, 2001, p.147). However, recent research shows the larger volume of options lead to higher product satisfaction and more valuable person-product relationship, as it offers a higher chance for self-expression. (Ling *et al.*, 2020) Considering the variation in research outcomes I kept the number of choices in individual assortments limited, so the participant would not confront a feeling of mass-confusion in front of a large selection. To maintain the feeling of “self-design” I offered a chance to modify several features of the product within separate steps, such as pattern, color, and material of label.

Designing the beanies

I started to design the models for the beanie customization tool by experimenting different knit stitch patterns. I knitted several swatches to compare the different patterns and to fine tune the measurements for using them for a beanie. I had decided to use yarn of the same thickness than in the probe toolkit, to create comparable products. Since wool is a natural fiber and there are differences between colors and skeins, the end-results expectedly had some variation, while knitting with the fixed sized needles equalizes the variations. For decreasing the workload, I decided to knit the five beanie models using the light grey color, and digitally modify the color options over photographs of the prototypes. The beanie models chosen for the customization tool were *plain* (garter stitch, rib: k1tbl, p1), *small striped* (k1tbl, p1), *large striped* (k2, p2), *small cable* (twisted cable, rib: k1tbl, p1), and *large cable* (braid cable, rib: k1tbl, p1).

Small cable | Without pom pom | Orion blue | Genuine leather

Plain

Small striped

Large striped

Small cable

Large cable

Without pom pom

With pom pom

Light grey | Grey melange | Anthracite grey | Dark red | Dusty rose | Mustard | Dove blue | Orion blue

Woven

Genuine leather

Different options of the customization tool
allowed a total of 160 potential end-results from a multiple-choice of 4 features

The customization tool

consisted of four parts of selections: Design, pom pom, color, and label. I chose five beanie designs with differing character to avoid offering identical designs to choose from. The next step was to decide about a pom pom, followed by a color selection offering eight options to choose from. The color selection consisted of off-white/light grey, grey melange, anthracite grey, and dark red presented as traditional colors for beanies. Additionally, I had selected dusty rose, mustard, dove blue and orion blue to offer alternatives to the basic color palette, and increase the participants' sense of decision making. Lastly the participants got to choose from two different labels, an off-white woven one, and a brown one made of genuine leather. The labels contain the same information than the ones included in the probe toolkit, with the text *designed by me* instead of *handmade by me*. Considering all the possible outcomes with offered selections, the customization tool created in Webropol had a total of 160 potential end-results, from a multiple-choice of 4 features.

The participants designed their own beanies using an online mass-customization tool
The designs chosen by all (8) participants

Selected beanies

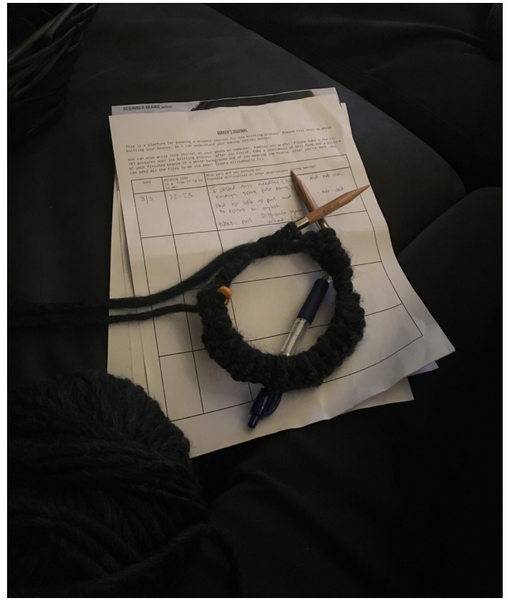
The beanies designed by the participants showed a large variety in selections about design (5/5), color (5/8), and label (2/2), yet all chose a beanie without a pompom, which may be a result of a current beanie trend. Out of eight participants two chose the plain beanie model, three the small striped one, one the large striped, one the small cable, and one the large cable. The colors chosen were off-white/light grey (n=1), anthracite grey (n=1), mustard (n=2), dove blue (n=2), and orion blue (n=2). While three of the participants chose the leather label, five selected the off-white fabric label. As the participants finished their beanie-designs, I would knit and send them before the final interview.

Interviews

Interviews were conducted as a supporting method for using design probes as part of the research. Probes in design research require a follow-up conversation for gathering comprehensive understanding about the process, as this task was being done remotely (Mattelmäki *et al.*, 2016). The objective of the maker's journal included in the design probes was to help the participants remembering the process and providing a deeper narrative about the project for the interview (Mattelmäki *et al.*, 2016). The interviews were held after the participants had both completed the knitting task and received the self-designed beanie.

The aim of the interview was to gain qualitative information about an independent and excessive making process, and the formation and variation of a person-product relationship. Understanding the experience with its successes and disruptions in relation to the outcome might further reshape the process for preventing factors leading to a weakened product affection or an abandoning of a project. The interview consisted of two parts and a total of 16 questions. The first part concentrated on the making process, and the second one focused on the emotional attachment formed during designing and making of the beanies.

The interview questions concentrated on the essential topics and aimed to encourage the participants to share comprehensive information about the experience and the formed person-product relationships. I wanted the participants to be able to freely voice their feelings, emotions and insights about the process and the end-products both separately and relatively. Interviews were conducted in English or Finnish and each interview lasted for 20-50 minutes depending on the participants' experiences and reflections. By facilitating a fluent communication and sharing about the process and emotions, I asked further questions based on the individual participants' answers.



Participants kept a maker's journal for remembering the feelings and occurrences of the process
Picture taken by a participant

Interview questions

PROCESS

1 *How do you feel about the process of making? How did it go?*
2 *Did you experience any surprises? Did something unexpected happen during the process? What? (problems with instructions, mistakes during making, any incidents/ obstacles that lead/almost lead you to an abandonment of the project, or made you want to continue)*
3 *Did you at any point want to quit the project? Why? Why didn't you?*
4 *Did your feelings about the product change in any way during the process?*
5 *Did the process of making change your point of view about handknitted products?*
6 *Did the project change your point of view about handmade items in general?*
7 *Did you use a different tool than mentioned in the instructions? What and why?*
8 *Did you make any design changes to the pattern on purpose or accidentally? What and why?*

FINAL PRODUCTS

9 *Now you have two beanies, one that you have knitted yourself, and one that you have designed yourself. If you could only keep one of them, which one would you keep? Why?*
10 *How do you feel about the products? Why? Do you have different feelings towards the products?*
11 *Do you want to use the products? Why/Why not?*
12 *If one of the products broke, what would you do? Would you do the same for each beanie?*
13 *How do you feel about the changes you made to the product? (If you made any)*

14 *Did you knit before?*
15 *Will you knit in the future?*
16 *Any other notes about the project?*

Interview questions
The interview consisted of 2 parts, first one cncentrating on the making process, and second one the final products

Seven out of eight participants finished the beanie in the given time frame. The participant with an unfinished beanie was determined to be continuing the process after the research.
Photos taken by the participants

Eight participants with a self-evaluated skill level of 1-2/10 (1/10 n=6, 2/10 n=2) were given three weeks to complete the task of knitting a beanie. *They were asked to document their journey with writing a project journal and taking photos of the product throughout the process.*
Photos taken by the participants

Many participants engaged in the research task with thoroughly documenting the process. *The participants were asked to take a photo of themselves wearing the final product.*
Photos taken by the participants

Eight participants with a self-evaluated skill level of 1-2/10 (1/10 n=6, 2/10 n=2) were given three weeks to complete the task of knitting a beanie. *They were asked to document their journey with writing a project journal and taking photos of the product throughout the process.*
Photos taken by the participants

Some of the participants engaged in the process with thoroughly documenting the process. *A participant received a self-designed beanie sent by mail.*
Photos taken by the participants

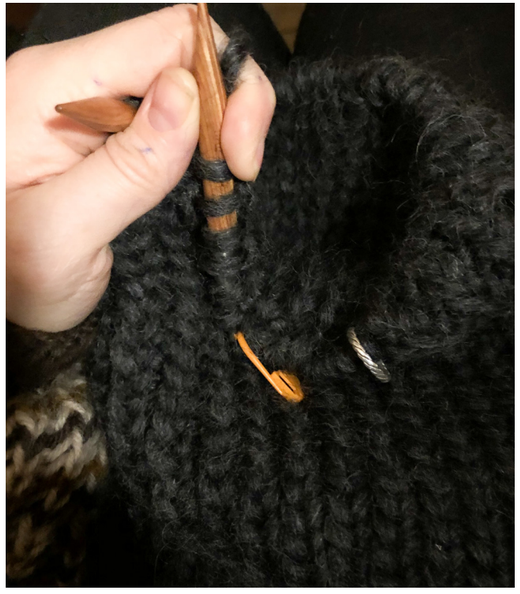
Tools & Instructions

While four participants said that they have only used the tools and materials provided in the toolkit, three said that they have used a bigger needle for weaving in the ends of the yarn. Two participants had changed the circular needles to knitting needles for the crown part of the beanie. In addition, several participants had used online translator and Youtube-tutorials, or alternatively asked my help for these steps.

All the participants followed the offered instructions to complete the project, many highlighting to not yet be able to make changes in knitting patterns on purpose. Minor design changes were made after the knitting part was completed, such as leaving the beanie “the wrong side out” contrary to the instructions (n=2), not attaching the label (n=4), or leaving the beanie unfolded (n=1). Participants explained that they had made the changes for aesthetic reasons.

Unintentional changes that the participants mentioned were a slight variety in the sizes of the final products due to the number of stitches or knitting tension, mistakes in the ribbing pattern, using different stitches than mentioned either in the ribbing or during increasing, or accidentally changing the knitting direction.

Process pictures
Some participants used additional equipment to assist the making process
Photos taken by the participants



Challenges

While some participants did not experience any significant surprises during the process, some reported that the most common causes for confusion or frustration were about the language of instructions, mistakes in the ribbing pattern, and striving for perfectionism. The difficulties of separating the diverse stitches and “reading” the pattern often led to making mistakes, and not being able to instantly discover them postponed the correction and made it more complicated. Many participants said that they learned to knit at school using terms and instructions of their native language, and had difficulties understanding the English instructions. Two participants reported to have ignored the instructions quickly after starting, which had left them with an unsuccessful outcome or were forced to start over several times. These participants said that they got excited about the progress, and impatient to go back to learn from the instructions. One participant reported to have started again several times for a perfect outcome, resulting in frustration and an extended break from the project. All participants said to have either suspected or found a previously made mistake but decided to continue rather than go back and fix it.

Process pictures
One participant said that the negative experience of repeatedly making the same mistake had discouraged to continue the project
Photo taken by a participant

Three participants said that they needed a break after confronting some obstacles yet did not consider to conclusively abandon the project. One participant said that the negative experience of repeatedly making the same mistake had discouraged them to continue the project. A weakened feeling of competence might lead to a longer break from a project and finally decrease the threshold for decisive abandonment of the project. Three participants said that they had taken a long break between finishing the knitting and weaving the loose ends and the label (if used). The discomfort of finalizing the product was also brought up by the survey respondents. One participant mentioned to enjoy knitting merely as an entertainment, and not for the final product.

Five participants mention to have no specific feelings towards errors in the product, if they do not negatively affect the use or are not highly visible. One participant mentioned that the roughness of the product rather added tactility to the product, highlighting it as something handmade. Two participants with product changes seen as negatively influencing the pattern, size or usability reported to be irritated with the errors. Participants who intentionally modified the product leaving the beanie “the wrong side out” contrary to the instructions, not attaching the label, or leaving the beanie unfolded, reported that the changes to positively influenced the product appearance.

Final products
Ignoring the instructions from the beginning lead to an unwanted end-result
Photo taken by a participant

Appreciation

Participants with recent experience of knitting did not find significant changes of perspective about hand-knitted products, yet all these participants mentioned the increased appreciation towards hand-knitted products after engaging with the technique for the first time. Participants with a previous experience of hand-knitting from elementary school noted to have had neither respect nor positive feelings towards the technique, after several failed knitting attempts with tools and materials that were too advanced. Therefore, many participants reported to have abandoned the thought of trying again and were both surprised and excited about the fluent progress in this task.

Even though the knitting toolkit was free-of-charge for the participants, four participants expressed that their subjective monetary valuation of hand-knitted items had increased. The participants with previous experience of knitting mentioned experiencing the effort and skill needed for completing a knitting project, as well as buying the materials for next project had added to the understanding about the value of the material. Two participants reported to have started paying attention to knitted clothing as an inspiration for a next project, rather than purchasing the products from the store.

Regarding the change of point of view about handmade items in general, the respondents with a previous experience of handmaking reported to already have had great respect towards hand-made items, assuming it to be a consequence of making. One participant expressed it to be difficult to transform the appreciation for hand-knitting to other crafting techniques, while one said the respect is there, but the valuation is more difficult without the experience of the particular technique. Two participants felt the increased feeling of competence followed by a successful knitting project encouraged to try other crafting techniques, while three attendants had been encouraged to attend to the knitting research after previous experience of e.g. crocheting. Several participants despite of previous experience of crafts mentioned that engaging with handmaking has influenced their consumer behavior in terms of understanding the value of material, effort, uniqueness, and the unique stories of handmade items. One participant said that they will take better care of handmade items in the future, while one noted to value brand less than handmade products and have started to be more willing to support craftsmen as *“there is a piece of the maker”.*

Proudness

The participants with a successful outcome reported to feel proudness of the outcome. During the process participants with a successful outcome mentioned going through feelings of curiosity about the end-result as well as happiness about own skills and seeing the progress. One participant reported to have also felt frustration during the process yet ended up with the feeling of proudness. Another participant said the perfectionism and the pressure of reaching a flawless outcome complicated the process and was in turn a feeling that had faded during making. However, one participant expressed to have felt more open about the outcome, because the materials and instructions were prearranged. The participant said the self-made choice of pattern and color in addition to investing in the materials and tools have negatively affected to previous processes of making.

Final products

One participant expressed to be more open for the end-result when someone else has made the desicions of the material & pattern for the product

Photo taken by a participant

"I become much more judging about the end-result like "why did I choose this?""

(Participant)

The participant with an unsuccessful outcome explained that once getting so excited about the fast and fluent progress it was difficult to go back to the instructions, eventually leading to negative feelings towards the end-result.

Feelings of competence

Franke *et al.* (2010) suggest, that positive feelings experienced during participation might establish an emotional bond with a product. Participants with a successfully completed product reported to have enjoyed the project and were left with a positive feeling about the process, even if they had experienced some obstacles on the way. One participant reported to have completed the project but understood upon completion that they had used a different stitch than what was described in the instructions, which in turn affected the outcome. This participant said that the altered appearance of the final product was irritating, but the act of finishing the product caused a sende of pride and joy towards it. The following feeling of competence had given encouragement to continue working with the technique and redefining the meaning of the "unsuccessful" outcome. Other participant with a completed project reported to have made several mistakes during the process, which led to both feeling satisfied for completing, and frustrated as those same mistakes could be seen in the end-result.

None of the participants reported that they wanted to abandon the project, including the participant who did not yet finish the project. The mentioned reasons behind encouragement to continue were fluency in the making, enjoying knitting as an activity, excitement over the new skill, seeing the progress, clear instructions, and curiosity towards the end-result.

Self-designed or self-knitted

Four out of the six participants who successfully completed the task said that they would prefer keeping the self-knitted beanie, because of the effort invested in the process. They had also grown an emotional attachment towards the product, a sense of pride, it fit well, and was versatile. Two participants said to prefer the self-knitted beanie for the color.

Two of the participants with a successfully finished project chose to prefer keeping the beanie they attended in designing. One participant told to already own a same-colored beanie than the self-knitted one, and therefore would want to keep the self-designed one. The participant further mentioned to prefer the color and appearance of the self-designed beanie. The other participant ended up choosing the self-designed beanie over the self-made one for a better fit, mentioning the self-made one is larger in size due to an error in making. The participant said to prefer the color of the self-designed beanie and to feel annoyed about the mistakes affecting the appearance and fit of the self-made product. Both participants choosing the self-designed beanie mention to not be willing to dispose of the self-made product but prefer to give it to a loved one.

The participant with an unsuccessful outcome preferred to keep the self-designed beanie for the appearance, fit and color yet said to be unwilling to dispose of the self-made one even though it cannot be used. The participant with an unfinished project would choose to keep the self-designed beanie for preferring the color but is willing to finish the beanie and give it to a loved one, if it turns out as a wearable product.

Final products

The participants who made creative choices during the knitting process showed more contentment towards the final product

Photos taken by the participants

Product attachment

All participants defined that the feelings towards different products were of a different nature, highlighting the difference in time and effort used in the participation. All participants mentioned to feel proudness of the completed self-made products despite of the outcome. Participants describe to have built a strong connection while physically making the product, even when preferring to wear the self-designed product.

Two participants felt that they had built a stronger connection with the handmade product highlighting the continuous reminder of the extensive process of making and feelings evoked. One participant said that even the process with an unsuccessful outcome derived the feelings of competence and proudness, and merely being able to complete a project encouraged to further explore the technique. One participant mentioned to have a stronger connection to the self-made beanie, yet some feelings are negative, while the feelings towards the self-designed beanie are only positive but appear weaker. The participant said to be continually reminded by the errors made during making, resulting in annoyance in addition to the proudness.

While all participants described the emotional attachment towards the self-knitted products to appear significantly stronger, the connection towards self-designed beanies was described that they were weaker or nonexistent. All participants invariably described to be pleased with the appearance of self-designed beanie, while two of them described to feel some level of proudness. One participant pondered that the act of self-designing might have added some value for the product, yet the memory of the process is absent. Another participant stated there is no emotional attachment to the self-designed one at all, even though it is the one preferred to be used. The participant with an unsuccessful yet completed outcome of the knitting project said that even though the handmade beanie cannot be worn due to the error, losing it would feel worse than if the self-designed one went missing.

Four participants said that they have no feeling of being the designer of the product, while remarking to have selected from a large variety of options, the options were fixed. One participant stated that the outcome of the customized beanie would have most likely looked the same if they were responsible for the whole design stage instead of using the customization tool, but the memory of effort and participation in the making process was lacking. One participant noted that not everyone can knit a beanie but can use a customization tool.

Use & maintenance

Out of the six participants that successfully finished the beanie, five said that they would be willing to use or had already been using both beanies, and one participant said to prefer wearing the self-knitted one. Two participants with an unsuccessful or unfinished outcome said to be willing to use or had already used the self-designed beanie. Two of the participants noted to have disliked wearing beanies before but been willing to use the ones self-knitted and self-designed obtained from the research.

All the participants that completed the knitting process believed to have the skills for repairing the self-made beanie

Photos taken by the participants

All the participants that completed the knitting process believed to have the skills for repairing the self-made beanie, three participants further noting to have the material and tools for it as leftovers from the process. Six participants said they would more likely fix the self-made beanie, as they know how it is constructed. Five participants told to possibly try to fix the self-designed beanie as well, yet do not have the yarn, skill, or interest for fixing it.

Three out of eight participants mentioned to often try repairing clothes rather than disposing of them, while one participant admitted to never have thought of repairing things but now understands they have the skill to do so. Several participants state they would rather repair the product they use more but may not have the skill and/or material for fixing the customized one. Three participants told that they are considering making a new product either with reused or new material, in case of the damage being too extensive.

Last questions

All participants said that they have knitted before attending this project. Two participants estimate the last experience in knitting happened several years ago, while the rest of the participants had begun exploring the technique recently. Several respondents mentioned that they have had a negative experience of knitting during elementary school, which had left them with an assumption of an overwhelmingly difficult technique.

All participants reported that they were willing to continue knitting in the future, and six out of eight participants have either already finished or started with another project after completing the research task.

Several participants mention that they have been motivated to complete the product when attending the research project, and gained experience and skills followed by positive feelings of competence and excitement to learn more. Two participants revealed the project would have most likely been left unfinished without a deadline, as they had doubts about their own skills or insecurity about the possible end-result. Participants thought that receiving a toolkit with required materials and tools allowed them to concentrate only on the making, and that the beginner friendly tools and the appealing material encouraged to finishing the project. Several participants recognized that finishing the product despite of the outcome brought them joy and the feeling of capability.

Products made by participants after finishing the beanie-project
Photos taken by the participants

PART V

Discussion & Conclusion

I discuss the findings of this study in the light of the previous research about the Ikea-effect and the elements encouraging a lasting emotional product-attachment. In this empirical study, I explored the Ikea-effect and the connections between emotional product-attachment and different participation methods in extensive making processes.

This study was conducted by utilizing both qualitative and quantitative research methods, and therefore all results do not offer reliable statistical data but may suggest future research avenues. It must be acknowledged that the participants of the probe toolkit were not randomly selected but voluntarily attended to the research project, perhaps due to a previous interest and appreciation for handmaking. All participants were beginner knitters with a self-evaluated skill-level of 1-2/10, and a future research could be valuable for examining the processes of higher skill-level groups. The interviews were conducted soon after the project ended, and only reveal the current point of view of the participants.

Eight beginner-level participants attended to both hand-knitting a beanie with the help of a probe toolkit and designing another one using an online mass customization tool. All (7) participants that completed the task in the given timeframe described the emotional attachment towards the self-knitted products to appear significantly stronger, than towards the self-customized one. Based on the findings of this study, I suggest that extensive user participation in the manufacturing stage of a product design process builds a strong foundation for a lasting person-product relationship.

This study further shows that the independent and time-consuming making processes often lead to unfinished creations. There are several reasons for abandoning a laborious project. Concentrating on strategies and solutions for these problems and facilitating product completions through emphasizing the different skill levels of individual makers, the desired outcome could be less unfinished products. The study indicates that the reasons for abandoning an extensive making task mainly occur after starting the process and the factors decreasing the motivation for completing the process emerge during the making. During this study, I designed a probe toolkit aiming to eliminate the factors leading to the beginner-level knitters to abandon their projects. The outcome indicates that offering beginners toolkits with pre-selected instructions, tools, and materials supporting their current skill-level could increase the chance of completing the project. Stimulating the beginners for successful completion of a project might not only facilitate the positive impact of the Ikea-effect but also encourage increased appreciation and further exploration with the material.

Buechel and Janiszewski (2014) argue that a laborious making process that allows self-expression leads to a higher appreciation and valuation for the materials that enable the making experience and encourage engaging in similar collaborative activity later. The results of the probes indicate that the making process might lead to an increased appreciation of the material even without a possibility to influence the outcome, although some participants refined the product to their personal preferences after finishing the knitting, e.g. decided to not attach the label, or leave the beanie unfolded. It is unclear if these minor modifications can be identified as customizing possibilities, and future research should explore the boundary conditions of the customization opportunity needed to fill the requirements for successfully engaging the participants in the making.

The knitters of higher skill levels more often abandon projects as they lose interest, as the project can be too repetitive, boring, or time-consuming. Buechel and Janiszewski (2014) further argue that enabling customization choices concurrently within the physical labor leads the makers to positively engage in the process and appreciate the materials that provided the experience. Knitters often use instructions made by designers, yet the selection of the pattern and color remains theirs, allowing them to “customize” the outcome as a way of self-expression. However, these decisions are often made before starting the knitting, and therefore may lead to both less joyful making process and a weaker growth of valuation of the material. Designing patterns with possibility of self-expression during the process might therefore lead to a satisfying process and increased product valuation. Dahl and Moreau (2007) proved that customers enjoy creative projects more without pre-determined outcomes and instructions, while offering this freedom in demanding techniques often requires a certain level of expertise.

The findings of this study suggest the Ikea-effect appears stronger among makers of low skill-levels. While Norton *et al.* (2012) proved that the physical production raises the product-valuation regardless of skill level, they also suggest one of the factors behind the psychological bias is a feeling of competence. This study shows evidence for the beginner-level knitters to be significantly less likely to abandon a project for being dissatisfied with the looks of the unfinished product, rather than knitters with more experience. This indicates that the proudness and feelings of competence followed by learning new skills, might raise the subjective valuation of a self-made creation, when it provides a learning opportunity. Therefore, it could be argued that these gained feelings of competence may deteriorate when the skill becomes more familiar (Norton *et al.,* 2012).

Norton *et al.* (2012) argued that the Ikea-effect only leads to a higher valuation of the product after a successful completion and the previously mentioned knitting-survey data indicates that in excessive making projects the Ikea-effect is likely to appear even before completing the project. To establish the survey data, the probe experiment showed that even the unfinished products with noticeable errors were not abandoned, but completed and perceived as special, often over a self-customized option. However, if the errors were recurring or negatively affected the functionality of the product, the Ikea-effect appeared weaker.

Offering beginners toolkits with pre-selected instructions, tools, and materials supporting their current skill-level might increase the chance of completing an excessive making project

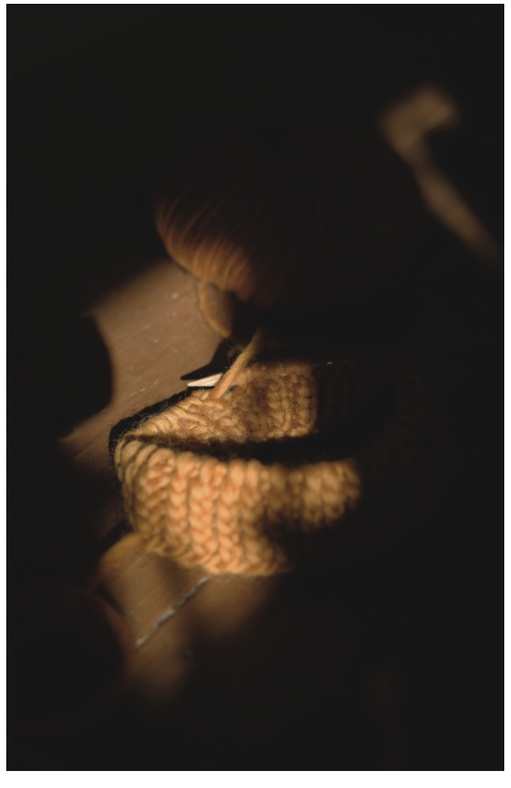
Photo of theknitting toolkit used in this study

The realization task in this study required significantly more time and effort than the customization task, and while Marsh *et al.* (2018) and Norton *et al.* (2012) argue that the invested effort does not determine the extent of the Ikea-effect, a previous study by Peck and Wiggings (2006) has shown that the time of physical interaction with products increases valuation. Based on the interviews the use of a short online customization tool required so little effort that it was perceived as irrational to compare it with hours of physical production. The physical effort invested in the process appeared to make the idea of discarding the self-made product difficult, even when it had little or no functional value. Furthermore, Norton *et al.* (2012) suggested that the research participants of their study might have overestimated the value of their creations merely for the fear of losing these hand-made objects. Based on these observations, the extensive effort invested during making might lead to a strong product ownership and possibly postpone the disposal of the product, but only if the project has been completed.

This study suggests that the familiarity and committed emotional connection towards the self-made beanie may develop during an excessive making process and appear regardless of the success of the outcome. However, errors significantly weakening the usability or appearance of the outcome might decrease the willingness to use the product, and eventually prevent maintaining the emotional connection formed during the making (Mugge *et al.*, 2005). Since the product attachment is believed to strengthen through continuous interactions and experiences associated with the product, the subjective value of the used product may increase over time (Mugge *et al.*, 2008). The beanies that were created during this process could be used in a follow-up scenario, for investigating their state and use in future research. Nonetheless, the continuous use may not be able to offer similar feelings of familiarity if the product is not self-made.

Fuchs *et al.* (2015) says that the high symbolic value of handmade products makes them attractive because they contain “love”. In many time-consuming craft techniques such as knitting, all products vary in appearance due to the hand-making, and the imperfections make the products unique. The signs of wear in old clothes may be associated with the experiences related to the product and bring joy during use by reminding the user of a positive memory (Mugge *et al.*, 2008). All participants in this study reported to have made mistakes during the making process. The mistakes made that did not negatively affect the functionality and appearance of the end-result were often viewed as “reminders of the process” and established the emotional attachment towards the product as it reminded them of when, where, and how their product was made.

Fuchs et al. (2015) says that the high symbolic value of handmade products makes them attractive because they contain *love*
Photo of one participant’s self-designed beanie in the making



Hebrok (2014) suggests that it is possible to lengthen the service life of products by considering the material and assembly technique in designing products. Easing the demanded time, skill and cost of maintenance and repair might encourage doing so. The extensive making process and the following feelings of competence and skills about the specific material and tools, indicates that the self-making might significantly lower the threshold of performing these actions of care and the maker often has the tools and materials required at hand.

According to the probe results a customization tool may not foster the feelings of competence. The self-customized products were merely liked, and one participant stated that “anyone can use an online customization tool, but not everyone can knit a beanie”. Wang *et al.* (2017) argues that the limited number of predetermined options within a mass customization tool may make the consumer feel like they are selecting rather than designing their product. This notion is coherent with the findings of this study. The self-made products may be used for displaying the proof of skills and competence, or is an initiator of conversation, and thus fosters the creation of joyful memories associated with the product. However, this aspect is lacking when the feeling of competence is not there. (Mugge *et al.*, 2008.)

Lastly, engaging consumers in designing products with online mass customization tools leads to a higher willingness to pay but aiming for an increased subjective value of the products may require a larger variety of options and effort. (Franke *et al.*, 2010; Ling *et al.*, 2020) The challenge for companies may lie in the fact that including consumers in the realization stage often leads to higher product valuation, but only occurs after the purchase. Companies appealing to the consumers' emotions through marketing strategies only to influence their purchase decisions, might not be as adequate as investing in a lasting consumer-relationship (Desmet, P., 2002). The self-assembly option, for example used by IKEA, enables companies to save costs as well as create product-attachment. Based on the previous research and the findings of this study, I suggest that involving users in the realization phase of the process might not only encourage the product longevity but provide value for both consumers and companies.

Final words

Throughout this study I have gained valuable knowledge about how to reshape collaborative design processes to engage users and influence the product experience, even after the product has been purchased. This experience has led me to believe that a designer can affect the relationship between person and product by facilitating for this relationship to take place. Exploring the Ikea-effect in collaborative design has led me to contemplate the bias we face as product designers. Does the Ikea-effect distort our objective view of the products we design? Through this experience I have gained new perspectives on my role as a designer, and I have gained insight into the different psychological aspects relating to consumer behavior.

References

Ahmad, S., Wasim, S., Irfan, S., Gogoi, S., Srivastava, A. & Farheen, Z. (2019). *Qualitative v/s Quantitative Research – A Summarized Review.* J. Evid. Based Med. Healthc., vol. 6, no. 43, pp. 2828-2832

Ahmas, K. & Koivunen, N. (2020). *The Ways of the Hand: Knitting and Handicraft as a Method of Research*. Using Arts-based Research Methods, p.147

Aktaş, B., & Mäkelä, M. (2019). *Negotiation between the maker and material: Observations on material interactions in felting studio.* International Journal of Design, vol. 13, no. 2, pp. 55-67

Atakan, S., Bagozzi, R. & Yoon, C. (2014). *Consumer participation in the design and realization stages of production: How self-production shapes consumer evaluations and relationships to products*, International Journal of Research in Marketing, vol. 31, no. 4, pp. 395-408

Buechel, E. & Janiszewski, C. (2014). *A Lot of Work or a Work of Art: How the Structure of a Customized Assembly Task Determines the Utility Derived from Assembly Effort*, Journal of Consumer Research, vol. 40, no. 5, pp. 960-972

Chapman, J. (2008). *Emotionally Durable Design: Sustaining relationships between users and domestic electronic products*

Chapman, J. (2010) *Subject/object relationships and emotionally durable design*. in Cooper, T. (Ed.): Longer Lasting Products: Alternatives to the Throwaway Society, Gower Publishing Limited, Farnham. pp. 61–76

Dahl, D. & Moreau, C. (2007). *Thinking Inside the Box: Why Consumers Enjoy Constrained Creative Experiences.* NA - Advances in Consumer Research, vol. 34 eds. Gavan Fitzsimons and Vicki Morwitz, Duluth, MN : Association for Consumer Research, pp. 659-662

Değirmenc, Z. (2018). *Positive effects of hand knitting on the psychology of people.* 49th IFKT International Congress "Stepping into the future..."

Desmet, P. (2002). *Designing emotions* (Ph.D. thesis). Delft University of Technology

Franke, N., Schreier, M. & Kaiser, U. (2010). *The "I Designed It Myself" Effect in Mass Customization.* Management Science, vol.51, no.1, pp.125-140

Fuchs, C., Schreier, M. & van Osselaer, S. (2015). *The Handmade Effect: What's Love Got to Do with It?* Journal of Marketing, vol 79, no. 2, pp. 98-110

Grayson, K. & Shulman, D. (2000). *Indexicality and the Verification Function of Irreplaceable Possessions: A Semiotic Analysis.* Journal of Consumer Research, vol. 27, no. 1, pp. 17-30

Hebrok, M. (2014). *Design for longevity: taking both the material and social aspects of product-life into account.* J. Design Research, vol. 12, no. 3. pp. 204-220

Jackson, T. (2005). *Live Better by Consuming Less? Is There a "Double Dividend" in Sustainable Consumption?* Journal of Industrial Ecology, vol. 9, no. 1-2, pp. 19-36

Ling, I., Liu, Y., Lin, C., & Shieh, C. (2020). *Exploring IKEA effect in self-expressive mass customization: underlying mechanism and boundary conditions.* Journal of Consumer Marketing, vol. 37, no. 4, pp. 365-374

Marsh, E., Kanngiesser, P. & Hood, B. (2018). *When and how does labour lead to love? The ontogeny and mechanisms of the IKEA effect.* Cognition, vol. 170, pp. 245-253

Mattelmäki, T., Lucero, A. & Lee, J.J. (2016). *Probing – Two Perspectives to Participation.* Collaboration in Creative Design. Springer International Publishing Switzerland 2016 P. Markopoulos et al. (eds.), pp. 33-51

Mccracken, G. (1986). *Culture and Consumption: A Theoretical Account of the Structure and Movement of the Cultural Meaning of Consumer Goods.* Journal of Consumer Research, vol. 13, no. 1, pp. 71-84

Mugge, R., Schifferstein, H. & Schoormans, J. (2005). *A Longitudinal Study of Product Attachment and Its Determinants.* E - European Advances in Consumer Research Volume 7, eds. Karin M. Ekstrom and Helene Brembeck, Goteborg, Sweden : Association for Consumer Research, pp. 641-647

Mugge, R., Schoormans, J. & Schifferstein, H. (2008). Chapter 17. *Product Attachment: Design Strategies to Stimulate the Emotional Bonding to Products.* Product Experience, pp. 425-440

Mugge, R., Schoormans, J. & Schifferstein, H. (2009). *Emotional bonding with personalised products.* Journal of Engineering Design, vol. 20, no. 5, pp. 467-476

Niinimäki, K. & Armstrong, C. (2013). *From pleasure in use to preservation of meaningful memories: A closer look at the sustainability of clothing via longevity and attachment,* International Journal of Fashion Design, Technology and Education, vol. 6, no. 3, pp.190-199

Norton, M., Mochon, D. & Ariely, D. (2012). *The IKEA Effect: When Labor Leads to Love.* Journal of Consumer Psychology vol. 22, no. 3, pp. 453–460

Park, C., Macinnis, D. & Priester, J. (2006). *Beyond Attitudes: Attachment and Consumer Behavior.* Seoul Journal of Business, vol. 12, no. 2, pp. 3-35

Pavko-Čuden A. (2017). *Multiple faces of contemporary hand knitting*. IOP Conf. Series: Materials Science and Engineering vol. 254, pp. 192014

Peck, J. & Wiggings, J. (2006). *It Just Feels Good: Customers' Affective Response to Touch and Its Influence on Persuasion.* Journal of Marketing, vol. 70, no. 4

Pierce, J., Kostova, T., Dirks, K. & Olin, J. (2002). *The State of Psychological Ownership: Integrating and Extending a Century of Research.* Review of General Psychology, vol. 7, no. 1, pp. 1-45

Piller, F., Schubert, P., Koch, M. & Möslein, K., (2005). *Overcoming Mass Confusion: Collaborative Customer Co-Design in Online Communities,* Journal of Computer-Mediated Communication, vol. 10, no. 4

Reb, J., Connolly, T., (2007). *Possession, feelings of ownership and the endowment effect.* Judgement and Decision Making, vol. 2, no. 2, pp. 107-114

Schifferstein, R. & Zwartkruis-Pelgrim, E. (2008). *Consumer-Product Attachment: Measurements and Design Implications. I*nternational Journal of Design, vol. 2, no. 3, pp. 1-14

Schwartz, B. (2004). *The Paradox of Choice: Why More Is Less.* New York: Ecco, 2004. Print. p.48, p.147

Sonego, M., Echeveste, M. & Debarba, H. (2018). *The role of modularity in sustainable design:* A systematic review. Journal of Cleaner Production, vol. 176, pp. 196-209

Van Nes, N., Cramer, J. (2005). *Influencing Product Lifetime Through Product Design.* Business strategy and the Environment vol. 14, pp. 286-299

Wallace, J., McCarthy, J., Wright, P. & Olivier, P. (2013). *Making design probes work.* CHI '13: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 3441–3450

Wang Y., Ma, Yang & Wang K. (2017). *Industry 4.0: a way from mass customization to mass personalization production,* Advances in Manufacturing, vol. 5, pp. 311-320

Wolf, J., Arkes, H. & Muhanna, A. (2008). *The power of touch: An examination of the effect of duration of physical contact on the valuation of objects.* Judgement and Decision Making, vol. 3, no. 6, pp. 476-482

Teemu Muurimäki x Klarna. (2020). https://www.klarna.com/fi/huippumuotionitseluotu/

Lova. https://www.lovaknitting.com/

Picture references

1 Teemu Muurimäki x Klarna
Klarna (2020) Retrieved from: *https://www.klarna.com/fi/blogi/huippumuoti-on-itse-luotu-kampanja-kaynnistyy/*

2 Attachment, memories and enjoyment as a function of length of ownership
Retrieved from: p. 431, *Mugge, R., Schoormans, J. & Schifferstein, H. (2008). Chapter 17. Product Attachment: Design Strategies to Stimulate the Emotional Bonding to Products. Product Experience, pp. 425-440*

3 Origami symbols
Instructions for origami Experiment. *p. 456, Norton, M., Mochon, D. & Ariely, D. (2012). The IKEA Effect: When Labor Leads to Love. Journal of Consumer Psychology vol. 22, no. 3, pp. 453–460*

4 Ikea Ivar shelving unit
Product assembly instructions for Ikea Ivar - storage solution system. Retrieved from*: https://www.ikea.com/gb/en/assembly_instructions/ivar-side-unit__AA-2171817-2_pub.pdf*

5 Herring girls knitting at Scarborough harbour, Yorkshire, c. 1910.
Unravelling the History of Wool. Published in History Today Volume 69 Issue 12 December 2019. Retrieved from: *https://www.historytoday.com/reviews/unravelling-history-wool*

BEGINNER BEANIE pattern

PATTERN

Note: This pattern is knitted the wrong side out.

BEGIN

Cast 64 stitches onto circular needles.
Round 1. *K1tbl, P1*
repeat from *-* to end of round
K1tbl= Knit one through the back loop
P1= Purl one
Repeat round 1 until the height of the piece is 26cm

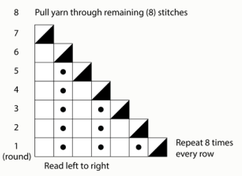
STITCHES USED IN THIS PATTERN

Ktbl= Knit through the back loop
P= Purl stitch
K2TOG= Knit two together

CROWN

Note: As the number of stitches decreases, circular needles will become too small for the circumference. It's possible to knit with circular needles until the end, by letting some of the circular needle wire outside the circumference.

(You can mark the starting stitch with a safety pin)
Round 1: Start from the beginning of the round, knit 6st according to pattern (*K1tbl, P1*), then K2TOG (Knit two together) - repeat (8 times) to end of round
Round 2: Knit 5st according to pattern, then K2TOG - repeat (8 times) to end of round
Round 3: Knit 4st according to pattern, then K2TOG, repeat to the end of round
Round 4: Knit 3st according to pattern, then K2TOG, repeat to the end of round
Round 5: Knit 2st according to pattern, then K2TOG, repeat to the end of round
Round 6: Knit 1st according to pattern, then K2TOG, repeat to the end of round
Round 7: K2TOG the whole round
Round 8: 8 stitches left.
Cut the yarn and pull it through the remaining stitches using a needle. Weave the loose ends inside the garment. Turn the beanie around.
Sew the label in the front of the beanie. Note the stretching of the beanie in use, while sewing the label.



Ktbl = Knit one through the back loop

P1= Purl one

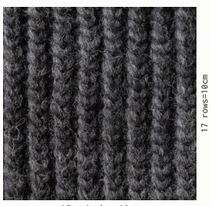
K2TOG = Knit two together

BEGINNER BEANIE pattern

MATERIALS

200g WOOLPOWER BIG (100% wool)
8mm circular needles 20cm
Sewing needle + thread
Label

In addition:
Scissors
Measuring tape/ruler



17 rows=10cm

15 stitches=10cm

17 rows=10cm

15 stitches=10cm

GAUGE

15 stitches and 17 rows=
10cm in 1x1 rib unstretched

10cm x 10cm gauge is for ensuring that the size of the beanie pattern will be invariable. If your gauge has significantly more/less stitches & rows, you can increase/decrease the amount of starting stitches by +/-8

SIZE

One size, fits all (adults)

Rough measurements of the finished product:
Width: 22cm
Height (folded): 20cm
Height (unfolded): 28cm

Thank you for participating,

Saara

MAKER'S JOURNAL

This is a platform for keeping a project journal for the knitting process. Please fill this up while knitting your beanie, so I can understand your making journey better!

You can also write this journal on your phone or computer, however you prefer. Please take a few (5-10) pictures over the knitting process. After you finish, take a scan/photo of this form and a picture of your finished beanie in a white background and of you wearing the beanie. After you're done, you can send all the files to me via email (saara.ollila@aalto.fi).

Date	Working time (e.g. from 17.15 to 18.00)	What part are you working on? Possible difficulties or other observations during making?

Date	Working time (e.g. from 17.15 to 18.00)	What part are you working on? Possible difficulties or other observations during making?

Knitting survey

Have you ever knitted? *

- ◯ Yes
- ◯ No
- ◯ I don't remember

Would you like to try knitting? *

- ◯ Yes
- ◯ No
- ◯ Maybe

What has stopped you from trying knitting? *

- ☐ I didn't have time
- ☐ It seemed to be too difficult
- ☐ I didn't find instructions
- ☐ I didn't understand the instructions
- ☐ Something else? _____

How would you describe your skill level as a knitter? *

Beginner [0] Expert

Have you ever left a knitting project unfinished? *

- ◯ Yes
- ◯ No
- ◯ I don't remember

What stopped you from completing the project? (Please describe in more detail) *

- ☐ I didn't start _____
- ☐ It was too complicated _____
- ☐ I didn't find instructions for products I like _____
- ☐ I didn't understand the instructions _____
- ☐ I lost my interest _____
- ☐ The project took too much time to complete _____
- ☐ I made a mistake and couldn't fix it _____
- ☐ I didn't like the look of the unfinished product _____
- ☐ Something else? _____

I prefer... *

1=most preferred, 4=least preferred

Short and concise instructions	◯ 1 ◯ 2 ◯ 3 ◯ 4
Long and detailed instructions	◯ 1 ◯ 2 ◯ 3 ◯ 4
Instructions with pictures	◯ 1 ◯ 2 ◯ 3 ◯ 4
Instructions with videos	◯ 1 ◯ 2 ◯ 3 ◯ 4

Why didn't you start? *

- ☐ I started with another project
- ☐ I didn't think I have the skills needed to finish the project
- ☐ I forgot about it
- ☐ I didn't have time
- ☐ I didn't understand the instructions
- ☐ I didn't need the finished product
- ☐ Something else? _____

Do you have an example for easy-to-follow instructions? (Website/designer /social media account etc.) *

- ◯ Yes, for example _____
- ◯ No

I would like my next knitting pattern to be... *

- ◯ Easy and simple pattern
- ◯ Challenging pattern that requires focus
- ◯ Something else? _____

What would you like to knit in the future? *

- ☐ Socks
- ☐ Mittens
- ☐ A beanie
- ☐ A scarf
- ☐ A sweater/cardigan
- ☐ Something else? _____

I would like to attend a beginner-friendly knitting research *

Includes knitting a beanie

- ◯ Yes
- ◯ No

To participate in the knitting research, you're welcome to leave your contact information here: *

The knitting research includes knitting a beginner friendly beanie and keeping a project diary. After finishing the project you'll get to des beanie and receive that one later (knitted by someone else). The research ends with a face to face (Zoom) interview about the process you have attended in making/designing. All materials are provided, and for you to keep.

I will contact the selected participants by e-mail.

First name	
Last name	
Mobile	
Email	
Address	
Zip code	
City	
Country	

Thank you! Please click the button below to submit your results.

Additional comments

(optional)

PROCESS

1. How do you feel about the process of making? How did it go?
2. Did you experience any surprises? Did something unexpected happen during the process? What? (problems with instructions, mistakes during making, any incidents/obstacles that lead/almost lead you to an abandonment of the project)
3. Did you at any point want to quit the project? Why? Why didn't you?
4. Did your feelings about the product change in any way during the process?
5. Did the process of making change your point of view about handknitted products?
6. Did the project change your point of view about handmade items in general?
7. Did you use a different tool than mentioned in the instructions? What and why?
8. Did you make any design changes to the pattern on purpose or accidentally? What and why?

FINAL PRODUCTS

9. Now you have two beanies, one that you have knitted yourself, and one that you have designed yourself. If you could only keep one of them, which one would you keep? Why?
10. How do you feel about the products? Why? Do you have different feelings towards the products?
11. Do you want to use the products? Why/Why not?
12. If one of the products broke, what would you do? Would you do the same for each beanie?
13. How do you feel about the changes you made to the product? (If you made any)
14. Did you knit before?
15. Will you knit in the future?
16. Any other notes about the project?