PEOPLE'S EMPOWERMENT IN DESIGN PROCESS THROUGH PRODUCT
PERSONALIZATION FOR SUSTAINABILITY

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ABSTRACT

**PEOPLE'S EMPOWERMENT IN DESIGN PROCESS THROUGH
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Product personalization has potentials in prolonging product lifetimes through strengthening person-product relationship. While designing products for sustainability, the factors such as local production, maintenance, repair, re-use, upgrade, etc. also need to be considered. In this context, this study focuses on the ways of empowering people in the design process through product personalization at the local level, and the implications of this for product design for sustainability. The study adopts *research through design* approach and *generative research* is integrated into this methodology. The study consists of two main components which are the preliminary study and the generative research. The preliminary study phase 1 and 2 explore the products personalized by people and the personalization process through semi-structured interviews and an online questionnaire conducted with people who personalize their products (e.g. furniture, electronics, etc.), respectively. In the generative research phase 1, a half-way lighting design exploration was developed and it was personalized by various participants in a design workshop and follow-up generative sessions. In the second and third phases of the generative research, two lighting design explorations were developed based on two diverse design scenarios, focusing on product personalization with the use of post-use materials and product personalization for practicing a craft skill, respectively. These were personalized by

the participants addressed in these scenarios in the generative sessions. The study reveals the dimensions of personalization important for sustainability and their interrelationships, sustainable design considerations for product personalization, and the ways of incorporating product personalization into design research for people's empowerment.

ÖZ

KİŞİSELLEŞTİRME YOLUYLA KULLANICILARIN TASARIM SÜRECİNDE SÜRDÜRÜLEBİLİRLİK İÇİN ETKİN KILINMASI

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Ürün tasarımında kişiselleştirme, kullanıcı-ürün bağını güçlendirme yoluyla ürün ömrünün uzatılmasında potansiyeli bulunan bir tasarım yaklaşımıdır. Sürdürülebilirlik odaklı ürün tasarımında, yerel üretim, bakım, onarım, yeniden kullanım, yükseltme vb. etkenlerin de göz önünde bulundurulması gerekir. Bu bağlamda bu çalışma, kullanıcıların tasarım sürecine yerel ölçekte kişiselleştirme yoluyla katılımını sağlamaya ve bu katılımın sürdürülebilirlik için tasarım açısından olası etkilerine odaklanır. Çalışmada *tasarım yoluyla araştırma* yaklaşımı benimsenmiş ve *yaratıcı tasarım araştırması* bu yönteme dahil edilmiştir. Araştırma, ön çalışma ve yaratıcı tasarım araştırması olmak üzere iki temel bölümden oluşur. Ön çalışmanın ilk ve ikinci aşaması, kullanıcılar tarafından kişiselleştirilen ürünleri ve kişiselleştirme sürecini sırasıyla, ürünlerini (örn. mobilya, elektronik ürünler, vb.) kişiselleştiren kullanıcılarla yapılan yarı-yapılandırılmış görüşmeler ve bir çevrim içi anketle araştırır. Yaratıcı tasarım araştırmasının ilk aşamasında, yarı tamamlanmış bir aydınlatma önerisi geliştirilmiş ve bir tasarım çalıştayı ve bireysel yaratıcı tasarım araştırmalarında tasarım önerileri kişiselleştirilmiştir. Yaratıcı tasarım araştırmasının ikinci ve üçüncü aşamalarında, sırasıyla kullanım sonrası aşamadaki malzemeleri kullanarak kişiselleştirme ve bir el sanatı becerisini kullanarak kişiselleştirme olmak üzere iki farklı tasarım senaryosu temelinde iki aydınlatma önerisi geliştirilmiş ve bunlar

senaryolarda ele alınan katılımcılar tarafından yaratıcı tasarım oturumlarında kişiselleştirilmiştir. Çalışma, kişiselleştirmenin sürdürülebilirlik için önemli olan boyutlarını ve bu boyutların birbiriyle ilişkisini, ürün tasarımında kişiselleştirme için sürdürülebilirlikle ilgili önemli tasarım ölçütlerini ve kullanıcıları etkin kılmak amacıyla kişiselleştirmeyi tasarım araştırmasına dahil etme yöntemlerini ortaya koyar.

Anahtar Kelimeler: Kişiselleştirme için Sürdürülebilir Tasarım Ölçütleri, Yarı Tamamlanmış Tasarım, Yerelleştirme, Tasarım Yoluyla Araştırma, Yaratıcı Tasarım Araştırması

To my family

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CHAPTER 1

INTRODUCTION

Current production and consumption practices that our economy is based on cause a massive damage on the environment including pollution, waste, climate change, resource depletion, etc., and they also have negative social consequences such as unfair distribution of wealth, unhealthy conditions of living, poverty, and inequalities. Although the environmental issues have been on the agenda within the last four decades (Sustainabledevelopment.un.org, n.d.), the concept of sustainability, which has emerged as the outcome of these negative consequences of human activity, is still being discussed today by many disciplines, since these problems are still on the rise. Design, being one of these disciplines, has a crucial role in contributing sustainability due to its guiding function and influence on the production and consumption of products.

In the current globalized mass production system, the resources are extracted in different countries, they are processed and transformed into products, which are produced somewhere else, and these products are distributed globally. This production system highly depends on transportation and fossil fuels, and it is destructive environmentally in terms of resource use, pollution, etc. On the consumption side, because of the limited service infrastructures for repair, maintenance, upgrade, adaptability, etc., and due to the rapid changes in fashion and technology, products cannot establish a long-term relationship with their users, ending up in landfills although some of them are still functioning (Chapman, 2010).

Short product life spans increase waste and the use of resources and energy, because as the products are discarded, new ones are produced to be consumed. In this sense,

increasing product life spans is crucial for sustainability. Early product replacement indicates a weakened bond between the user and the product (Chapman, 2010), and design for product personalization is proposed as one of the strategies for strengthening person-product relationship by many researchers (Niinimaki & Hassi, 2011; Fuad-Luke, 2010; van Nes, 2010; Mugge, Schoormans & Schifferstein, 2005). Although people can personalize their products to a certain extent through practices such as mass-customization, Do-It-Yourself (DIY), open design, etc., sustainability considerations are not the main focus of these practices (Ozan & Doğan, 2014). In addition, most of the contemporary products are designed for the masses, and they have limited or no space for people's intervention and personalization. Therefore, considering sustainability principles, designers need to look for the alternative ways of enabling personalization and empowering people in the design process in order to contribute to sustainability.

To this end, this doctoral study focuses on the ways of empowering people in the design process through product personalization at the local level and the implications of this empowerment for product design for sustainability. More specifically, product personalization is explored in terms of its implications for sustainable production and consumption and in particular, for prolonged product life spans. In the study, *product personalization* is defined by the author as; *a process during which a product's aesthetic and/or functional attributes are defined, adapted or modified by its user during design, use and/or post-use stages of the product life span, in order to increase product's personal relevance to its user, and during this process, user is involved as co-designer and co-maker of the product*. In product personalization, designer could empower people in the design process through leaving a space for reflecting their personal needs, tastes and preferences and increases opportunities and possibilities for people's intervention to products through design.

This empowerment also needs to be facilitated by the production system to address environmental, social and economic dimensions of sustainability and its personal

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meaning to individuals. Thinking in a smaller scale, a more localized system of production and services is crucial in order to contribute to three dimensions of sustainability. A localized economy predominantly depends on local resources, local production techniques and post-use services such as repair, maintenance, recovery, re-use, etc. Considering design at the local level brings about new design considerations, such as the *use of local materials*, *production at the craft and batch production level* and more *flexible, adaptable* and *upgradable* product solutions *tailored to diverse local needs, tastes and preferences* (Doğan & Walker, 2008). In addition, this approach emphasizes the *local skills* and *capabilities of people*. By thinking at the local scale, designers can facilitate the integration of people's local knowledge and skills into products through empowering them in the design process. In this way, more personally and culturally relevant and meaningful products can be created, which are also in line with the sustainability principles. Therefore, empowering people in the design process through product personalization at the local level may contribute to longer product life spans by strengthening the bond between the people, and when this is facilitated by the production and post-use services at local and regional levels, it has positive implications both environmentally and socially. To this end, localization and product personalization are discussed together within the study in order to address sustainable production and consumption holistically.

The thesis is a *research through design* study, during which theoretical insights are used to develop design propositions, and these propositions are used to develop theoretical insights further. The study includes the exploration of the important design considerations based on personalization and sustainability literature and an exploratory study, exploration of people's needs for personalization through an online questionnaire, development of lighting design propositions, which can be produced and personalized at the local level, and the personalization of the design propositions by people through generative research sessions to revisit the theoretical and practical outcomes of the study. The reason why the lighting category is selected for exploring product personalization is that, this product category may provide more opportunity

for exploring the local skills, the use of local materials and production techniques compared to the other product categories (e.g. electronics, household appliances).

1.1. Significance of the Subject

Exploration of product personalization in terms of its contribution to design for sustainability through generating product design solutions that can be locally designed, produced, maintained, adapted, upgraded and personalized for diverse user needs with *research through design* approach, and evaluating the implications of the outcomes of this process for sustainability through people's involvement in design process form the basis of this study. In this context, the study is significant both theoretically and practically. Firstly, although there are studies and design explorations developed for product personalization with a focus on sustainability such as *half-way design approach* (Bernabei & Power, 2013; Fuad-Luke, 2009) and the design approaches enabling the use of local knowledge and skills (Walker, 2006), so far, there has been no comprehensive design research exploring and reflecting on the implications of product personalization at the local context for design for sustainability through an in-depth exploration of people's interactions with design explorations that can be personalized. For this reason, the study would provide theoretical insight and practical outcomes for product personalization and its implementation as a strategy for design for sustainability. Secondly, the integration of the use of local skills and production techniques into the study reveals personalized design explorations specific to this geography, which provides a locally relevant approach for product personalization. In addition, the use of *research through design* approach in the study may contribute to the literature on this methodology focusing on sustainability through setting an example for its use in combination with *generative research*. Finally, generating product design proposals enabling personalization may contribute to design practice through presenting pathways for designing products that can be personalized and that are in line with sustainability principles.

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1.2. Aim of the Study and the Research Questions

The aim of the doctoral dissertation is to understand the notion of product personalization, explore the ways of designing for personalization, and the implications of this for design for sustainability.

In this context, the main question of the study is:
How could designers empower people in the design process through product personalization at the local level, to contribute to the development of products that are in line with sustainability principles?

The sub-questions that are explored throughout the study are:
1. How does the product personalization process take place in daily life?
2. What are the dimensions of product personalization?
3. How can product personalization be facilitated through design with a focus on sustainability?

> 3.1 How can personalization of lighting products be facilitated through design with a focus on sustainability?
>
> 3.2 What are the implications of personalization of lighting products for sustainability?
>
> 3.3 What are the opportunities and limitations for incorporating product personalization into design process for sustainability?

4. What would be the means of incorporating product personalization into design research for people's empowerment?

1.3. Structure of the Thesis

The thesis begins with a review of literature and two exploratory studies including semi-structured interviews and an online questionnaire conducted with people who personalize their products. Then, the thesis continues with the generation of design

propositions and generative sessions, during which people with different skill levels personalize these design propositions. The literature review and the exploratory studies provide insights for generating design propositions. Design phases and the generative sessions progress iteratively, and theoretical and practical outcomes are refined and further developed in this way. The structure of the thesis is given in Figure 1.1

In Chapter 1, the significance, aim, and the research questions of the study are presented. Chapter 2 explains the key concepts relevant to the main research area, to form a basis for understanding the focus of this thesis. Then, product personalization, its dimensions and the current ways and approaches enabling personalization are discussed and analyzed, and design considerations important for personalization and sustainability are explained. In Chapter 3, information on research methodology is provided. Chapter 4 and Chapter 5 explain the methodology and the results of the preliminary study phase 1 and phase 2. In Chapter 6, 7 and 8, the methodology and the results of the three phases of the generative research are explained, respectively. Finally, in Chapter 9, conclusions drawn from the study are presented through revisiting the research questions, the contributions of the study to the literature are revealed, and the issues that can be explored in the further studies are specified.

1	**INTRODUCTION**
	Significance, aim and the research questions of the study

2	**LITERATURE REVIEW**
	Key concepts
	Product personalization and its dimensions
	Current practices and sustainability approaches enabling product personalization
	Design considerations for sustainability
	The analysis of the current practices and sustainability approaches enabling product personalization based on the dimensions of product personalization important for sustainability

3	**METHODOLOGY**
	Research design
	Research through design
	Exploratory, generative, evaluative research
	Explanation of the data collection and analysis methods used in the study

4	**PRELIMINARY STUDY PHASE 1**
	Semi-structured interviews with two people who personalize their products

5	**PRELIMINARY STUDY PHASE 2**
	Online questionnaire conducted with 15 people who personalize their products

6	**GENERATIVE RESEARCH PHASE 1**
	Development of the initial generative toolkit and the design workshop conducted with 10 people
	Development of the initial generative toolkit further and the individual generative sessions conducted with 2 people who have repair and craft skills

7	**GENERATIVE RESEARCH PHASE 2**
	Development of two design scenarios for two personas
	Development of a generative toolkit for the scenario nad persona 1:
	Personalization with the use of materials in the post-use phase
	Design workshop and individual generative sessions with six university students

8	**GENERATIVE RESEARCH PHASE 3**
	Development of a generative toolkit for the scenario and persona 2:
	Personalization with the use of embroidery skills
	Individual generative sessions with six women who have embroidery skills

9	**CONCLUSION**
	Dimensions and sub-dimensions of product personalization
	Sustainable design considerations for personalization
	Reflections on the research methodology

Figure 1.1. Structure of the thesis.

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CHAPTER 2

SUSTAINABILITY AND PRODUCT PERSONALIZATION

In this chapter, key concepts relevant to the research area, which are sustainable development, design and sustainability, extending product life spans, localization, and people's empowerment are defined and explained in order to form a basis for understanding the main focus of the study. Then, product personalization, its relation with design for sustainability and the dimensions of product personalization emerged from the literature, and the preliminary study are discussed. In addition, current practices and design approaches enabling personalization are revealed, and design details enabling product personalization in these approaches are analyzed. Finally, the practices and approaches are evaluated based on the dimensions of product personalization and their implications for sustainability are discussed.

2.1. Sustainability and the Important Concepts

The term sustainable development was first used in the Brundtland Report published by World Commission on Environment and Development in 1987. In the report, sustainable development was defined as; "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: p. 43). The definition was addressing two concepts; intergenerational and intra-generational needs, and limitations on the environment's ability to meet these needs. The term sustainable development mainly embodies three interrelated areas which are; environmental management, social justice and equity, and economic development. In addition to these, Walker (2011, p.127) indicates that, "sustainability has to be relevant and meaningful to the individual person" and to this end, he adds a fourth dimension for sustainability, which is personal meaning.

Today, there are people living in poverty, who are under-consumers, and they cannot meet their basic needs. Based on the data from 2017, the richest 8.6 % of the world accounts for 85.6 % of global wealth (Inequality, 2017). Poverty brings about low living standards, health and education problems. On the other hand, the over-consumers directly and indirectly have impacts on the environment and on the under-consumers (Fuad-Luke, 2009). This indicates that, sustainable development requires different strategies for different contexts and all dimensions of it are interrelated, and need to be addressed simultaneously.

2.1.1. Sustainability and Design

Product design aims to create wellbeing through meeting specific needs of people and while doing this, creates products to be produced by the means of production. During this creation process, designers make decisions regarding the materials to be used, the way the products are produced, used and disposed, which have both environmental and social impacts. Therefore, design has critical and guiding effects on the production and consumption of products, and the consequences of these practices. Although these consequences were not foreseen in the early days of industrialization, as the environmental and social issues have become evident, designers have begun to question their role and responsibility for sustainability. Sustainability is addressed in the design field since the last four decades and various approaches were developed, each focusing on innovation at different levels, such as product level, products and service level, spatio-social innovations level and socio-technical system innovations level (Ceschin & Gaziulusoy, 2016).

Victor Papanek was the pioneer, who addressed the role of industrial designers for sustainability. In his book Design for the Real World (1971), he emphasized the designers' moral and social responsibility in shaping the environment and society. However, earlier attempts for achieving sustainability in the design and production practices in the 80s and 90s, mainly focused on assessing and reducing the

environmental impacts and products' resource intensity without an emphasis on the social dimensions of sustainability such as human needs and well-being. As Cooper (2000) states, in the 80s, public awareness on environmental problems increased and green consumerism emerged, which resulted in the introduction of green products with limited improvements for reduced environmental impact such as redesign of the products and the production processes and replacing materials with the ones with lower environmental impacts or reducing energy consumption. In the 90s, green design transformed into eco-design, which was focusing on the products' environmental impacts throughout their life cycle. By the end of the 90s, various approaches were developed under the theme of design for sustainability, such as emotionally durable design (Chapman, 2005), design for sustainable behaviour (Bhamra, Lilley & Tang, 2011), which put an emphasis on the social aspects such as human needs and behaviour, wellbeing, etc., in addition to economic and environmental dimensions. In addition, new design approaches for sustainability emerged which focus on the people's participation, such as co-design, social design and slow design (Fuad-Luke, 2009) and systemic approaches were developed such as *Cradle-to-Cradle* (McDonough & Braungart, 2002) and *Biomimicry* (Benyus, 1997). Today, many design researchers (Fuad-Luke, 2009; Walker, 2006; Chapman, 2005; Manzini & Jegou, 2003) agree that, design can foster social and environmental change through new approaches, visions and understandings, which are different from the existing ones and that, current design, production and consumption practices need to be reconsidered.

2.1.2. Sustainable Consumption and Production (SCP)

In order to achieve sustainable development, both sustainable production and consumption of products are required. The most common definition of the term sustainable consumption and production is:

the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations.

<div align="right">(IISD, 1994)</div>

Together with the elimination of poverty and resource management, sustainable consumption and production, constitutes the most significant goals for sustainable development according to Johannesburg Plan of Implementation which was adopted at the World Summit in 2002 (Johannesburg Declaration, 2002). Once again, SCP was reemphasized at Rio +20 Summit in 2012, and 10-year framework of programmes (10YFP) was developed in order to achieve SCP (10YFP, 2012). Lastly, in 2015, sustainable consumption and production was listed as one of the 17 sustainable development goals for the year 2030 by UNEP (UNEP, 2015).

As in the definition, sustainable production and consumption are inseparable for sustainability, since increase in waste and resource consumption would continue, as long as overconsumption exists no matter how the products are sustainably produced. Cooper (2005) argues that, increased product life spans incorporating eco-efficiency and slow consumption strategies can lead to sustainable consumption. Although there are many strategies to increase product life spans such as increasing reliability and durability, ease of repair and maintenance, upgradability, re-use and designing for variability (van Nes, 2010), these need to be combined with strategies that affect user behavior. To this end, design strategies addressing both sustainable consumption and production holistically may be valuable for sustainability, since these two processes are interrelated. In this context, localization and product personalization were discussed together in this study.

2.1.3. Extending Product Lifetimes

Short product lifetimes, which is one of the major problems associated with the contemporary products, result from the factors related to current production system

and consumption patterns, which creates a throwaway culture (Cooper, 2005). Increasing product life spans is crucial for sustainability, since new resources and energy are required during the production of new products, and the premature or rapid replacement of products increases waste. Products become obsolete due to various reasons such as technology, aesthetics and fashion, lack of maintenance and repair, economic considerations and social factors (Burns, 2010; Walker, 2006; Cooper, 2005).

It is important to indicate that, today's throwaway culture roots in a strategy that has been carried out since 1930s, in order to overcome economic crisis and foster consumption, which is called *planned obsolescence*. The term was popularized and explained by American industrial designer Brooks Stevens in 1958 as; deliberate introduction of new products, which make the previously owned products considered out of date, although they may not so (Packard, 1960). Today, whether it is planned or not, products become obsolete in short period, since manufacturers continue to offer products with small technological and aesthetical alterations to make profit and consumers respond to these changes by replacing their products with newer ones.

While there are various studies explaining replacement behaviour and obsolescence in the literature (Burns, 2010; Mugge et al., 2005; van Nes & Cramer, 2005; Verbeek & Kockelkoren, 1998; Packard, 1960), the factors affecting product replacement can be listed as; improvements in technology and fashion, which cause early replacement of products that are still functioning due to the obsolescence of desirability (Packard, 1960) or completing their psychological life span (Verbeek & Kockelkoren, 1998), the reduced quality (wear and tear, break down), high cost of repair and maintenance compared to replacement cost, and introduction of better functioning products, which makes the existing product inefficient to use (Mugge et al., 2005). Eternally Yours, a group of Dutch designers founded in 1995, emphasizes that, the most important factor affecting product longevity is the psychological life span. They also suggest creating a bond between user and the product through focusing on forms and materials (e.g.

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leather, wood, etc.) which can create longevity while aging gracefully, and focusing on signs elicited by the products and the relationships, which to be maintained between companies and customers (Verbeek & Kockelkoren, 1998). Chapman (2005) suggests the development of emotionally durable objects, which creates engagement at a deeper level for longer product life spans.

Mugge et al. (2005) lists design strategies for increasing product life spans as increasing reliability and durability, providing easy maintenance and repair, implementing a long-life guarantee, offering an adaptable, upgradable, modular product structure, offering variation to the owner in terms of parts so that the user can use different variations, offering a classical design, and strengthening the person-product relationship. Similarly, van Nes and Cramer (2005) list design strategies for longer product life spans as design for reliability and robustness, design for reparability and maintenance, design for upgradability, design for product attachment, and design for variability.

From the sustainability viewpoint, increasing durability and reliability and implementing a long life guarantee may not necessarily increase the product's life span, since there are various factors affecting product replacement such as technology, fashion, etc. Especially for electronic products, which are vulnerable to technological updates, these strategies may not be effective to extend product lifetimes. Providing easy maintenance, repair, upgradability, adaptability and modularity have many potentials for sustainability, in terms of meeting the changing needs, tastes and preferences of people, and for increasing product life span. However, these strategies require a more localized system of production and services to be effective, since when these services cannot be provided locally, the environmental and social problems resulting from the externalized production and transportation of goods would still exist. In addition, people would continue to buy newer products instead of using these services, since they would be difficult to access.

Strengthening the bond between the user and the product, increasing product attachment and creating emotionally durable products, which are also the basis of this study, have potentials for sustainability, since they may postpone or even prevent product replacement contributing to the efficient use of resources and the creation of a more meaningful material culture.

To achieve a strong person-product relationship, Mugge et al. (2005) propose two main design strategies, which are designing products which remind of memories and designing personal products. To remind memories via products, they propose that, designers can develop products which are shared or used in a group setting, and products which have special odours that may arouse certain feelings. For designing personal products, they suggest production of different variations of products in a limited number, empowering people in the design process, and creating products which become personal through usage (e.g. a pair of jeans). Similarly, Schifferstein and Zwartkruis-Pelgrim (2008) suggest that, designers can evoke memories or enjoyment through products in order to lead product attachment.

Most of these strategies address embedding personal meanings to products, which is a challenging task for designers, since meaning and emotional response are beyond designer's projection and effect, and they are mostly elicited by users (Desmet, Overbeeke & Tax, 2001). In this sense, empowering people in the design process and enabling them to design, make and transform their products, and create personal narratives through these processes can contribute the establishment of stronger emotional bonds between the people and the products.

2.1.4. Localization and Sustainability

Although, globalization provides people the opportunity of accessing the same goods everywhere, it is clear that, it has brought about many negative consequences for sustainability such as income inequity and poverty, which affects people's well-being,

and it also causes environmental destruction through intense transportation and extensive resource use. Freer trade and improved transportation links enable richer countries to sell their products in various regions, which increases competition and reduces prices. This results in the reduction of the effectiveness of local markets and local producers and therefore, widens the income gap between the rich and the poor. In addition, the people's wages reduce and labour becomes cheaper, which is socially destructive. Externalized production is a consequence of globalization, which refers to companies have their products or product components produced in countries where labour costs are low. This is similarly the case for resource extraction and waste management, which are also externalized. This results in pollution and low living standards in these countries. Even in the Western countries, this externalization results in unemployment and income gaps (Morelli, 2007).

While globalization brings about diversity in terms of artefacts, it also hampers the existence of unique lifestyles and diversities (Wells, 2013). As Walker (2006) indicates, sustainability approaches need to be specific to geographies and cultures. Each society has its own dynamics and particular problems associated with sustainability, which necessitates particular solutions. As Fuad-Luke (2009) states, different strategies should be followed for over-consumers (reducing consumption) and under-consumers (focusing on meeting the basic needs).

Walker (2011, p. 127) indicates that, "sustainability has to be relevant and meaningful to the individual person", and he adds a fourth dimension for sustainability, which is *personal meaning*. While product personalization can contribute to sustainable consumption through strengthening person-product relationship and contributing to the construction of a personal meaning, the production of the products also need to be in line with sustainability criteria. Many contemporary products cannot establish a long term relationship with their users, since they are produced for masses, having similar aesthetical and functional attributes, which make them almost uniform. Their disguised components and culturally neutral designs, their polished and perfect

surfaces which lose their newness when damaged, and their lack of adaptability and upgradeability for technology and fashion weakens the relationship with their users (Walker, 2006). In this sense, considering its environmental, social and economic benefits, localization brings about new opportunities for design for sustainability also in terms of personal meaning.

In contrast to one-size-fits-all perspective of globalized mass production, localization may provide solutions specific to diverse places, diverse needs and cultural taste. Considering the drawbacks of globalization for sustainability, a more localized economy mainly depending on locally available materials (natural materials available in the environment or materials that can be produced locally), local production capabilities, and local skills as well as local service and post-use opportunities such as repair, re-use, maintenance, upgrading, recovery and re-manufacture, has the potentials for meeting the diverse needs and cultural preferences of people, reducing environmental damage through reduced transportation and packaging, internalizing the environmental impacts and using resources sustainably, increasing self-reliant and participative communities and providing employment at the local and regional levels. In such a system, product components that cannot be manufactured locally, can be obtained from elsewhere and products can be assembled locally (Doğan & Walker, 2008). It can be concluded that, sustainability requires thinking in a smaller scale and localization can be a route for a more sustainable living. Incorporating the 'local' into product design may result in more sustainable and culturally relevant products.

In order to create products in a localized system, designers need to re-evaluate their design considerations, which will be far more different than those for the mass production system. Compared to the mass produced products, which are highly uniform in their aesthetic appearance, materials and functionalities, products created within a localized system at the batch production level can offer diversity in these characteristics with a focus on cultural needs and tastes (Doğan & Walker, 2008).

Considering the possibilities that the localized production and service systems offer such as flexibility, adaptability, upgradability, re-use, etc., designers can create more flexible design solutions which can be personalized and empower people to reflect their tastes and needs, which result in more personally meaningful products. These products can also be adapted and upgraded at the local level to meet the changing needs and tastes (in the early design and use phases of the product) or can be transformed into new products in the post-use phase. This would result in increased product life spans through meaningful and evolving person-product relationships. To conclude, product personalization needs to be rethought within a localized system of production in order to contribute to both sustainable production and consumption.

2.1.5. Empowering People for Sustainability

Sustainability requires people's involvement in the development process and change in understandings in the way people live. In this sense, empowering people for participation in the development process is crucial. Empowerment is defined as:

> "a multi-dimensional social process that helps people gain control over their own lives. It is a process that fosters power in people for use in their own lives, their communities and in their society by acting on issues that they define as important."
>
> Page and Czuba (1999)

In order to achieve a sustainable living globally, empowerment at the individual level needs to be transformed to a collective action. In order to lead empowerment, an enabling environment for people's participation needs to be created and in order to foster participation, people's capacity of knowledge and skills for change needs to be developed (UNECE, 2012). Therefore, at the core of empowerment, there is the transformation of people from passive to an active state. Sadan (2004) emphasizes the need for empowerment of professionals to engage in the processes that empower people. Design being one of these professions, as Manzini (2007) indicates, should focus on developing *enabling solutions and systems*, which provide tools (e.g.

procedures, social networks, web platforms, local services, etc.) for enabling people to achieve results regarding their daily activities, using their capabilities. This approach proposes services that empower people to meet their needs and exploring this at the product level and providing people with empowering product design solutions can be explored to make positive contribution for sustainable living.

2.2. Product Personalization

Personalization is an umbrella term, which embodies various practices during which people make interventions to products, environments or systems at different levels. For this reason, it is important to clarify the concept of product personalization addressed in this study through explaining the differences and similarities between these practices and approaches.

Blom (2000) defines personalization as changing a system's aesthetic or functional attributes to increase its personal relevance. In some of the studies in the literature (McKay, 2007) the term personalization is used in substitution for customization. In mass customization, which is a manufacturer-initiated strategy, people mostly select from a set of options of product parts (modules) defined by the manufacturer and finalize the product through combining the modules according to their preferences. As Sel (2013) indicates, customization is one of the means of enabling personalization. Fox (2001) separates the concepts of personalization and customization through defining the former as giving design authority to customers and the latter as providing design choice to customers. Personalization can also be a user-initiated practice as in Do-It-Yourself (DIY) and open design practices, during which people design, adapt or modify a product or a system according to their preferences. In addition, people can make small interventions to products in daily life, in order to fit them to their tastes and needs. In all of these practices, people are active participants in the design process at different levels.

Another approach, which empowers people in the design process is co-design, which is defined by Sanders and Stappers (2008) as a process during which designers and non-designers are collaboratively involved in the whole stages of design process. Therefore, designers and non-designers are in communication with each other during the co-design process. In this study, co-design approach is adopted to develop design propositions that enable personalization. During the development of the design propositions, I collaborated with non-designers, and the design explorations evolved based on the feedbacks provided by the participants during the generative sessions.

In each practice discussed above, people are active participants at different phases of product life span. For instance, in most of the mass customization practices, people are active participants during design or assembly stages (Da Silveira, Borenstein & Fogliatto, 2001). In DIY, people may combine different parts to design an ad-hoc product or they may improve a product feature during use or post-use phase. In co-design, people are actively involved in the design phase.

Another classification is suggested by Sel (2013) which is pre-purchase and post-purchase personalization. According to this classification, mass customization is mostly a form of pre-purchase personalization, whereas people's interventions to products independent of the manufacturer is classified as a form of post-purchase personalization. However, there are personalization practices, which cannot be involved in this categorization such as open design. Currently, with the development of digital manufacturing technologies, people can manufacture their own products and in open source practices such as those performed in online platforms (e.g. Openstructures.com, Instructables.com), there may not be even a purchase of a product.

Although Blom's (2000) definition explains personalization generally, in this study, product personalization is defined more specifically as *a process during which a product's aesthetic and functional attributes are defined, adapted or modified by a*

person during design, use and/or post-use stages of product life span, in order to increase its personal relevance, and the person is involved in this process as co-designer and co-maker of the product. During this personalization process, which is designer-initiated, people are both mentally and physically involved. Thus, product personalization discussed in this study differs from the customization practices, during which people are only mentally involved in the personalization process. The difference of the approach discussed in this study from DIY is that, this practice is user initiated and there is no involvement of the designer. Instead, people are designers and makers of the products in these practices.

2.2.1. Product Personalization, Attachment and Longevity

Product personalization can positively influence product lifetime through increasing the potential of person-product attachment. A strong bond between the person and the product may result in postponing product replacement, since the person attached to the product may show behaviours such as caring for, maintaining and repairing the product (Schifferstein & Zwartkruis-Pelgrim, 2008; Mugge et al., 2005). The study of Mugge et al. (2005) reveals that, students who were attached to their backpacks tried to postpone their disposal. In the study they found that, students were attached to their backpacks, because (1) the product gave them pleasure through its functional and formal qualities, (2) the product evoked memories related to a past event or a person and, (3) it was self-expressive. In this sense, the knowledge of why people develop attachment to products can be transformed into design strategies for longer product lifetimes. Exploring the possible determinants of product attachment and their impact on the degree of attachment, Schifferstein and Zwartkruis-Pelgrim (2008) found that, memories and enjoyment positively influenced product attachment. Based on this finding, they propose several design strategies for product attachment such as designing products that evoke enjoyment and/or memories, products that are shared with others and products that accumulate memories reflecting their history.

In product personalization, people adapt products to their personal tastes, so the personalized product has the potential of giving pleasure/enjoyment to its owner through its unique characteristics. In addition, the personalization process itself can be a potential positive memory for the person on its own and through reflecting the personal taste of the person, product may become self-expressive. Thus, product personalization has the potential of addressing the determinants of attachment discussed above.

Mugge, Schoormans and Schifferstein (2009a) explain how personalization results in a stronger emotional bond between the person and product. According to the authors, the effort spent in the personalization process directly and indirectly affects the emotional bond between the person and the product. Through spending a longer time with the product during personalization process, people establish an emotional bond with the product and through the self-expressive value of the outcome, the effort invested indirectly affects the strength of the emotional bonding. The authors state that, mental effort is often more effective in strengthening person-product relationship than the physical effort, since the creative involvement of the person in the process may result in self-expressive and unique products. Apart from self-expression, Mugge et al. (2005) claim that, personalized products symbolize a personal accomplishment to their owners which results in product attachment. To this end, they suggest designing products which could symbolize a person's skills and talents, in order to make the person feel pride of his/her personal accomplishment. The relationships between product personalization, product attachment and product lifetimes were summarized in Figure 2.1 below.

Although the investment of effort during the product personalization process can be effective in strengthening person-product relationship, people may feel frustrated by the personalization process, as the required effort increases. In addition, the product personalization process may result in the spoilage of the product, when the target people are not skilled enough to make design interventions on the products (Mugge et

al., 2009a). Thus, it is important to match the effort required with people's skills, motivations, and experiences, when designing for personalization.
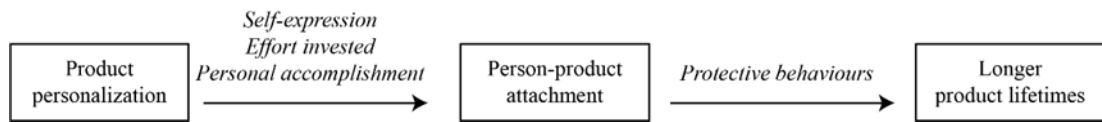
Figure 2.1. Relationship between personalization, attachment and product lifetime.

2.2.2. Dimensions of Product Personalization

Currently, there is only one study (Mugge, Schoormans & Schifferstein, 2009b) which explores the dimensions of product personalization. The authors reveal the dimensions of personalization through carrying out a card-sorting task including 42 personalized and mass customized products. These dimensions are *mental effort, physical effort, flexibility, initiation, goal of personalization, personalization moment and deliberateness*.

Mental effort is the level of creative involvement and *physical effort* is the physical involvement of the user (Mugge et al., 2009b). *Flexibility* is defined as the flexibility of the product for personalization for several times and it is indicated that, with more flexibility, products that are adaptable to changing needs and less susceptible to fashion changes, can be created. Moreover, the authors state that, flexibility may reduce the perceived risk of breaking down the product. *Initiation* refers to the person who initiates the personalization process such as user, designer or manufacturer. *Personalization moment* is defined as the phase that the personalization occurs and identified as; before purchase, after purchase-before usage and during usage. However, personalization can also be in the post-use phase of a product's life-span. For instance, in DIY projects, people convert the products that completed their life span into functional objects through repurposing them. *Goals of personalization* are defined as utility-related and appearance-related goals. In other words, they refer to

the purpose of personalization, which can be either changing the functional properties or aesthetic properties of a product. The authors indicate that, interventions to products' appearance may be more effective in strengthening person-product relationship, since the former's visibility to others and expressiveness of person's identity is more apparent. *Deliberateness* refers to whether there is a deliberate user input or not. For instance, through gracefully aging materials, product becomes personalized without user's input. This is out of the scope of the personalization concept in this study, which requires active involvement of people in the design process.

Based on these dimensions, Mugge et al. (2009b) associate design strategies with various target users. For instance, they propose that, if personalization process requires a high level of mental involvement, than this might be more suitable for people who have high level of expertise with the relevant product. On the other hand, they suggest that, personalization process which requires a high level of physical involvement might be preferable for people who are interested in DIY practices. They indicate that, a product that can be flexibly personalized for more than once may be interesting for people who are seeking variety, whose needs quickly change or people who are sensitive to fashion changes. Finally, in terms of goal of personalization, they suggest that, designers can focus on personalization of appearance if their target group has a high level of self-expression needs and on personalization of functional attributes, if their target group has functional needs.

Within the context of this doctoral thesis, a preliminary study was conducted to understand the concept of personalization and to explore its dimensions through investigating the products that are personalized by people. The details of the methodology and the results of the preliminary study were discussed in detail in Chapter 4. The dimensions of product personalization emerged from this preliminary study are, *product life span phase that the products are personalized, goal of personalization, method of personalization, nature of intervention, skills used in the*

personalization process, type of effort spent during the personalization process, and *benefits of personalization.* These dimensions were also explained in detail in Chapter 4.

2.3. Current Practices and Sustainability Approaches Empowering People in the Design Process

Currently, people can make interventions to the products in a range of practices. In addition, there are various sustainability approaches that enable product personalization at the local level. The role of user, designer and maker varies depending on the nature of these practices and approaches, and it is clear that, users are becoming more active participants in the design process. In this chapter, firstly these practices and sustainability approaches were explained through product examples, and their implications for sustainable consumption and production were discussed. Then, these practices and sustainability approaches empowering people in the design process were analyzed based on the dimensions of product personalization important for sustainability, which emerged from the literature and the preliminary study.

2.3.1. Current Practices Empowering People in the Design Process

Currently, people are empowered in the design process through various customization practices. In addition, people empower themselves and engage in practices such as Do-It-Yourself (DIY) and open design, which result in individually or collaboratively created products. In this section, these practices were explained in detail.

2.3.1.1. Mass Customization

Mass customization is a manufacturer initiated strategy and it provides competitive advantage for companies through meeting specific customer needs while staying in

the limits of mass production (Da Silveria et al., 2001). It is applied in many sectors such as; automotive, clothing, electronic consumer goods, sports equipment, footwear, etc.

In mass customization, the customizable options and the extent of modification can vary depending on the product, which also determine the intervention stage of the customer to the customization process (Blecker & Abdelkafi, 2006). As the degree of customization increases, the customers can be involved in the earlier stages of product development (Badurdeen & Liyanage, 2011). Gilmore and Pine (1997) classify mass customization practices as *collaborative* (direct interaction between the customer and the manufacturer), *adaptive* (customers adapt the products during use phase), *cosmetic* (providing variety in presentation of the product for different customers) and, *transparent* (inconspicuous provision of customized products or services to customers). However, mass customization is mostly applied by providing customers with optional product characteristics as modules and a base structure, and customers create products combining these modules on this structure before or after purchase. With the advence of the Internet, the preferences of customers can be collected in an automatic way. This type of customization, which is most widely applied, takes place in the assembly stage. The already fabricated single parts are assembled according to the order of the customer and the finished product is packed and sent to the customer (Coletti & Aichner, 2011).

There are various classifications for mass customization strategies in the literature based on the level of customer's involvement into various stages of design and production process, manufacturing strategies, modularity and where customization takes place (Sel, 2013; Da Silveira et al., 2001; Gilmore & Pine, 1997). Sel (2013) proposes three dimensions for analyzing mass customization strategies which are; degree of customization offered, customer type and timing of customization activity. Sub-dimensions for each dimension are displayed in Table 2.1.

Table 2.1. Dimensions of mass customization (adapted from Sel, 2013).

Degree of Customization Offered	High level, with minimal limitations	Mid level, Customization confined to obligatory surfaces/components	Low level, Customization confined to a defined surface / component + optional extras
Customer Type	Individual	Non-individual; wholesaler, big retailer or corporate customer	-
Timing	Post purchase	Pre-purchase	-

In high level mass customization, customers can define the customizable parts, customization area and options provided. This type of customization can also be classified as pure customization and a wide range of interventions can be made by customers. Vestel Fashion TV is an example of this type of customizaton, which was developed through the collaboration of Vestel with Fashion TV in the early phases of and during the design process (Sel, 2013). In mid-level customization, customers can customize the predefined areas and most of the product attributes remain as the core structure (Sel, 2013). Mi Harden Adidas shoes (Figure 2.2) can be customized in terms of style, color and material and customers can add their name, a country flag or a team logo on a predefined surface. In low level customization, areas and options that the customers can customize are pre-defined, and customers select from and combine the available options before or after purchase.
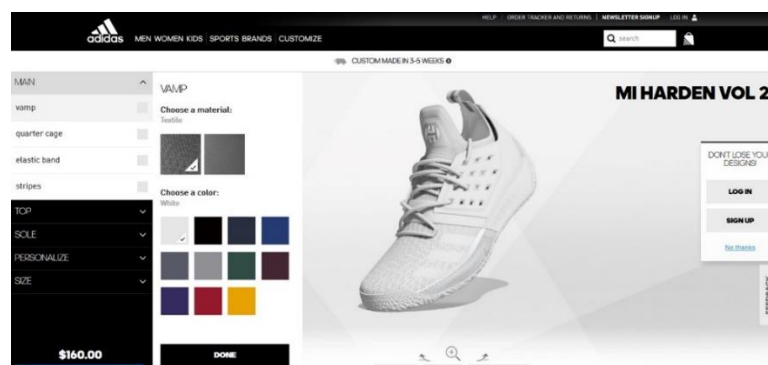
Figure 2.2. Mi Harden customization interface (retrieved from adidas.com, on 7.8.2018).

Customer type can be an individual or can be a wholesaler or a corporate-customer. When it is individual, a closer fit between the expectations of the customer and the product can be achieved (Sel, 2013). Considering the available examples, it can be concluded that, mass customization can be realized in design, production, assembly, delivery and use phases. Sel (2013) classifies these as pre-purchase and post-purchase customization. In customization before purchase, customer customizes the product and the customization work is carried out by the manufacturer. In post-purchase customization, company offers customizable options which can be customized by the customer after purchase. It allows repeated customization during the use phase of the product.

Although mass customized products may provide a higher level of fit between the people and the products compared to the mass produced ones, people's involvement in the design process remains generally limited with combining the predefined options, and the investment of mental and physical effort is low. To this end, mass customized products may not guarantee a strong person-product relationship. In addition, local production and post-use services need to be integrated with this approach to achieve efficient use of resources, upgradability, adaptability, maintenance and repair, and to eliminate the environmental drawbacks of transportation.

2.3.1.2. Unique Customization

Similar to mass customization, there is a core structure in unique customization, and customers can make design interventions on this structure. What differentiates this practice from mass customization is the scale of production, which is one-off production scale in this case.

With the advent of digital production technologies and the use of Web 2.0 technology, today, people have the opportunity of being involved in the design process using

digital tools, creating unique products and having them made by manufacturers. Companies such as Shapeways and Nervous System offer customers digital tools to create customized products and produce them using digital manufacturing (Bunnell & Marshall, 2009). Shapeways offer 3D CAD designs and their printing, and people can also upload their own files or change or create designs using the online tool (Bunnell & Marshall, 2009). Nervous System offers interactive applets, inspired by natural processes and patterns as design tools and produce products using digital manufacturing technologies (Figure 2.3).

The use of digital design tools provides users with an engaging customization process and highly customized outcomes. The uniqueness of the outcomes makes the products more personally relevant and this may affect the emotional relationship between user and the product positively. However, these outcomes are randomly generated and without taking into account design considerations for sustainability such as local manufacturing, local needs and skills, upgrading in the use phase, etc.
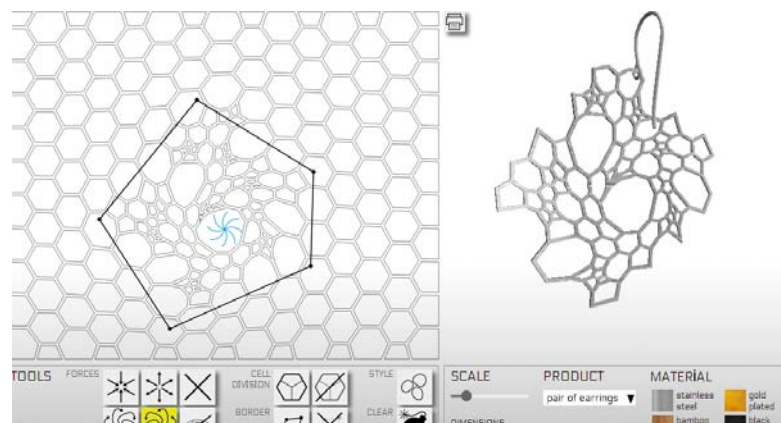
Figure 2.3. Nervous System Radiolaria applet (retrieved from n-e-r-v-o-u-s.com, on 22.10.2013).

2.3.1.3. Do It Yourself (DIY)

Wolf and McQuitty (2011; p.156) define DIY as behaviors where "individuals engage raw and semi-raw materials and component parts to produce, transform, or reconstruct material possessions, including those drawn from the natural environment." In DIY practice, people become designers, makers and users. Individuals engage in DIY activities for various reasons such as; marketplace motivations (stock-outs, unavailability of goods), for leisure and recreation, the satisfaction from completing a project well, to enhance self-identity (Wolf & McQuitty, 2013), economic reasons and lifestyle choice (Williams, 2004). With the advent of internet and digital manufacturing technologies, DIY practice has become a collaborative activity, during which people are inspired by the works of others, create products and share ideas. There are numerous DIY websites, such as Instructables (Figures 2.4 and 2.5), DoItYourself.com, etc. which provide people with detailed illustrations, instructions and creative ideas on product repair, maintenance, design, re-use, re-contextualization, etc.

Compared to customization practices, which are manufacturer-initiated, DIY is a user-initiated practice, and the user may become the designer and the maker of the product, or just adapt an available design template developed by others. This indicates, the mental and physical involvement of people in DIY is higher than those in the customization practices, which may result in a stronger person-product relationship. However, sustainability is not the main focus of DIY practices.
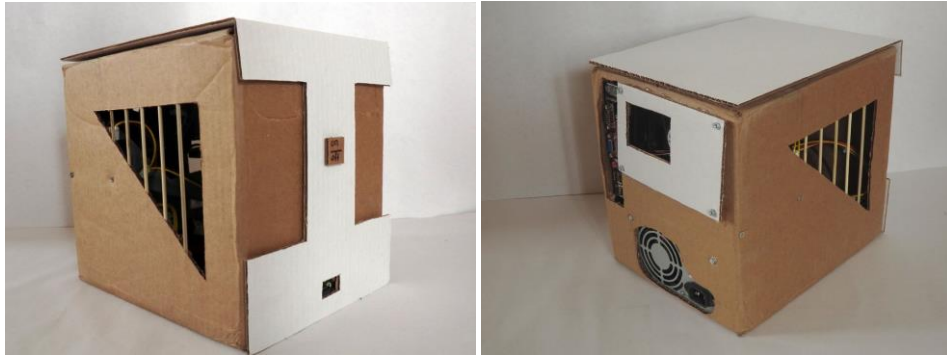
Figure 2.4. The Cardboard Computer (retrieved from instructables.com, on 28.10.2013).

Figure 2.5. Electric Trike on the cheap (retrieved from instructables.com, on 28.10.2013).

2.3.1.4. Open Design

Open design is defined as a type of design process in which anybody, novice or professional, is collaboratively involved in to develop something (Tooze et al., 2014). There are websites such as Designbreak, where people collaborate on science, social and engineering projects, share files and ideas, including sustainability issues. Openstructures is another open source platform based on a modular construction

model, where everyone can design parts, components and structures on the basis of one shared geometrical grid.
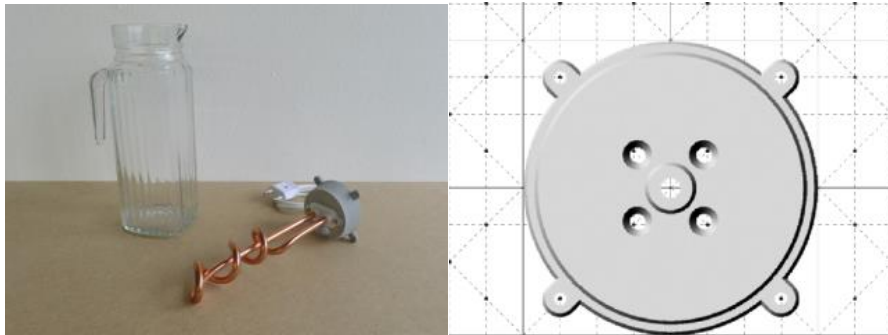
Figure 2.6. Transparent kettle (retrieved from openstructures.net, on 28.10.2013).

Figure 2.6 displays a design of a kettle part from the website openstructures.net, which can be produced via 3D printing and with a resistor attached on it. This part can be attached on different containers to build a kettle and people can change its dimensions according to their needs. In this example, designer, who can be any person with technical and 3D modelling skills, provides the data of a locally designed and made (3D printed) connection part of a kettle that can be completed through the use of another product part. In Figure 2.7, the designer, who can be any person with technical and basic digital drawing skills, provides people with the data of a finished product as a design template. The dimensions of each part are provided to people, so that they can build their own container.
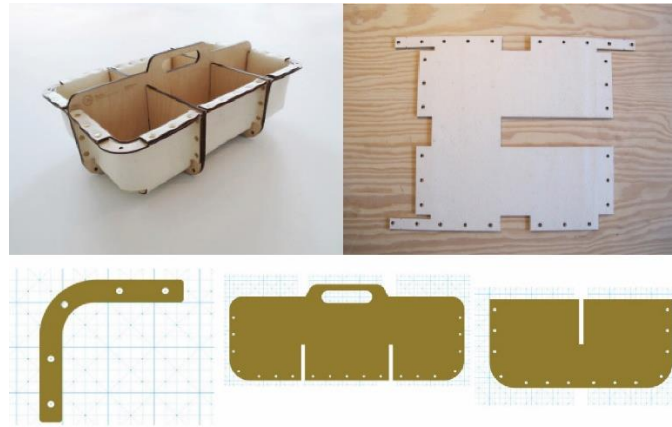
Figure 2.7. Providing product parts as a template (retrieved from openstructures.net, on 24.05.2015).

Unfold Stratigraphic Porcelain series (Figure 2.8) is another example that shows how the objects can vary through producing at different locations with different 3D printers with different accuracies and with different porcelain types. Through sending the same file to small scale producers around the world and allowing them to choose the materials and machines without changing the data, the following outcomes were obtained.

Figure 2.8. 3D printed Stratigraphic Porcelain series by Unfold (retrieved from dezeen.com, on 31.05.2014).

Open design approach is similar to DIY, in the sense that, people are more actively involved in designing and making processes of the products, which may lead to a strong person-product relationship. In addition, open design enables the use of local

manufacturing techniques and adaptability to different user needs, which are important considerations for design for sustainability. Bakırlıoğlu (2017) indicates that, the modularization of product parts in open design enhance their repairability. However, a limitation of open design is that, people need to have specific skills and knowledge, such as software skills or manufacturing and assembly knowledge to design an object or change the design data, which limits the creative involvement of people who do not have these skills in the design of open solutions. Thus, for those people, the level of mental effort in the design phase of open parts would remain low. However, open design has many potentials for product personalization, since it proposes the rethinking of the structural parts of the products and offers flexible product structures which can facilitate the replacement of product components. This flexibility can result in structural and aesthetic variety in products, and facilitates product personalization in the use phase.

2.3.2. Sustainability Approaches and Design Explorations Empowering People in the Design Process

The examples explained in this section consist of various approaches and design propositions developed by designers and integrate various scales of design and production. In addition these practices directly involve product personalization at the local level or have potentials for it, during which both designers and people become co-designers and co-makers of products.

2.3.2.1. Half-way Products

A halfway product enables people to complete the designing and/or making process of the product, which is designed/made/manufactured so far. During the completion of the product, user engages in a more tangible and creative process of designing and making. Although the result may not be perfect, it is highly personal and reflects the person's creativity, stories and mistakes in the process of completing the product (Fuad-Luke, 2009). Bernabei and Power (2013) name this approach as *user*

completion, which consists of two components, a design kit and product characteristics enabling people to finish the product. With the objects explained below, people add new meanings to their products and for some of them, they can re-create the product in the use stage by making interventions.

Figure 2.9 displays Natalie Schaap's halfway chair named "An Affair with a Chair". User can complete the main chair structure in the way he/she desires through connecting different locally available materials/parts on it, in order to make it usable. During the design and making process, the batch produced chair structure designed by the designer is combined with local materials produced with different scales of production such as mass or one-off production.

Figure 2.9. An Affair with a Chair by Natalie Schaap (reproduced from Fuad-Luke, 2009).

Martin Ruiz de Azua's Tache Naturelle (Figure 2.10) provides people with a biscuit fired vase and user completes its decoration by secreting it in external environment, letting the nature to complete the decoration and putting its patterns on it. In this example, product variations are created depending on the geography and craft design and production is integrated with people's creativity and locality.

Figure 2.10. Tache Naturelle by Martin Ruiz de Azua (reproduced from Fuad-Luke, 2009).

Do Create is a series of products created by the designers of Droog Design which enable people to personalize products at the local level. 'Do Hit' chair by Marijn van der Poll (Figure 2.11) is a metal cube, which is converted to an armchair when user shapes it with a sledge hammer. It integrates a component produced with batch/one-off production with people's hands-on skills.

Figure 2.11. Do Hit chair by Marijn van der Poll (retrieved from droog.com, on 28.10.2013).

Do Scratch by Marti Guixe (Figure 2.12) is a black painted transparent box, which can emit light when the user scratches it. The lamp enables personalization through its

treatable surface characteristic. This example also integrates a component produced with batch/one-off production with people's hands-on skills.

Figure 2.12. Do Scratch lamp by Marti Guixe (retrieved from droog.com, on 7.8.2018).

Garland Light by Tord Boontje (Figure 2.13) is a continuous metal strand with floral patterns and user wraps it around a light bulb and can change its form. It requires the combination of the metal strand with a mass produced lamp.

Figure 2.13. Garland Lamp by Tord Boontje (reproduced from Mugge et al., 2009b).

Figure 2.14. ProdUSER by Tristan Kopp. Mass produced connection parts and their mold supplied by the designer, user completes the bicycle using old bicycle parts locally (retrieved from designboom.com, on 7.8.2018).

ProdUSER (Figure 2.14) is designed to involve the end user in the design and making of a bicycle through providing only its connection parts for the junctions of the four tubes that form the bicycle frame. In order to construct the bicycle, user can use old bicycle parts or any other materials in tubular form such as tree branches or bamboo tubes. In this bicycle, batch produced connection parts can be integrated with components produced at mass, batch or craft level.

Figure 2.15. Stitch Light, Pop Light, and Hybrid 3D printed woven vessels (Bernebei & Power, 2017).

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Bernabei and Power (2017) develop a series of half-way products, which can be personalized through the use of different skills (Figure 2.15). Stitch Light involves aluminum spinnings in different forms which can be combined in different ways and personalized further through the use of embroidery skill. Pop Light is a semi-perforated cardboard lighting, which can be assembled by the user and personalized through removing the circular cardbard pieces. Hybrid 3D printed woven vessels involve 3D printed parts with slots on them and the user can produce the vessels through 3D printing and then insert flexible materials into the slots of the 3D printed parts (Bernabei & Power, 2017). This example reveals the potential of open design in product personalization. People can change the form, color and the material of the 3D printed vessels and through integrating these parts with different flexible materials, diverse products can be created.

The half-way design examples discussed in this section reveal that, they differ from each other in terms of the method of personalization applied, mental and physical effort invested, required skills, nature of intervention, and flexibility of personalization. The examples show that, different methods of personalization such as integrating parts with a product, surface treatment, or changing the form of a product can be used in the personalization process. In addition, examples in Figure 2.9, 2.14 and the Stitch Light and Hybrid 3D printed woven vessels in Figure 2.15 may require a higher level of physical and mental effort than the others, which may be challenging for some people. On the other hand, some of the examples require certain skills such as drawing (Figure 2.12) and technical skills (Figure 2.14). These may be difficult to personalize for people who do not have these skills, or the result may not be satisfactory for these people, and this may negatively affect the person-product relationship. Thus, while developing such products, it is important to consider the fit between the difficulty of the personalization task and the target people's motivation and skill levels. Moreover, while some of the half-way design examples can be personalized more than once in the use phase (e.g. Figure 2.9, 2.13, and 2.14), some of them enables an intervention that could be made only once (e.g. Figure 2.10, 2.11,

and 2.12). From the sustainability viewpoint, adaptability of the products in the use phase can better meet people's changing needs, and enables upgrade, repair, and maintenance of the parts, which may prolong product life span.

2.3.2.2. Integrated Scales of Design and Production (ISDPS)

ISDPS focuses on combining the most appropriate aspects of different scales of production; craft, batch and mass production, by putting an emphasis on the 'local' in order to design culturally appropriate products and offer post-use and assembly processes at the local and regional levels. The approach is based on combining the benefits of mass produced uniformity and the benefits of local and regional diversity in order to address three dimensions of sustainability (Doğan, 2007). It supports the use of locally available materials, production techniques and skills, while addressing diverse user needs and particularities of a place; which has social, environmental, economic and cultural benefits.

Environmentally, ISDPS contributes sustainability by using resources effectively, internalizing the environmental impacts and providing repair, re-use, recovery and upgrading at the local and regional levels. In terms of social aspects, it creates skilled employment at the batch production level and offers design solutions for diverse and culturally relevant user needs. It reflects true social, economic and environmental costs by not depending on externalized production and contributes the development of an economy predominantly relying on batch production and services and creating opportunities for high skilled employment (Doğan & Walker, 2008).

ISPDS approach provides variety in products, in the sense that when different local materials or product parts are combined with the same mass produced part, diverse design solutions can be obtained, which are continuously adaptable and upgradable at the same time. In this sense the approach empowers people in the design of the products through this continuous adaptation, upgradability and diversity, which

reflects cultural tastes, needs and preferences. In addition, the use of local materials, which are familiar, and design features that enable upgradability and adaptability, facilitate user comprehension. The proposed approach has many potentials for design practice, since it integrates different production methods and uses local knowledge as an input in product design and also addresses design considerations for the use and post-use phases of the products.

The Panel Play (Figure 2.16), which is developed by Doğan (2007), integrates mass produced electronic hardware into a batch produced laser-cut panel. The variable size and apertures of the panel enable user to arrange the electronic components in different ways and adapt to different products. The panel can be produced from locally available various materials and can be treated in different ways, such as locally designed and printed graphics, lamination, varnish or painted surface by local artists, which enables user to reflect personal tastes and preferences. In addition, both mass produced parts and expressive parts can be renewed, re-used and upgraded (Walker, Doğan & Marchand, 2009).
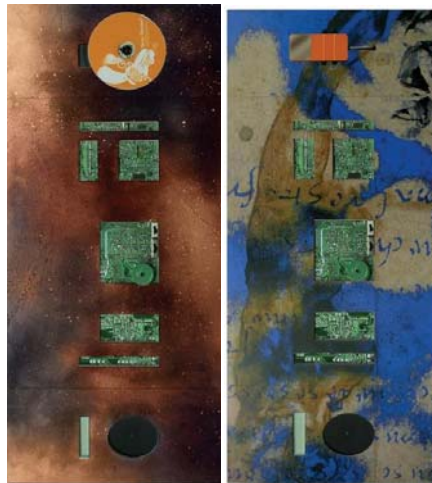
Figure 2.16. Panel Play by Çağla Doğan (retrieved from Doğan, 2007).

2.3.2.3. Engaging and Evolving Design Solutions

Stuart Walker proposes design explorations developed through *research through design* approach, during which the product explorations informed by theoretical ideas are created, and these products further develop the theoretical ideas. Exploring the contemporary products, which have limitations in terms of upgradability, adaptability and personal meaning, Walker (2011) suggests product solutions that are more engaging and evolving. Engaging products require regular attention, concentration and involvement of user in the design and use phase. For technological products, he proposes that engagement can be a supplementary of the primary purpose of the product, such as wind-up radio, requiring person's involvement while operating the radio. In order to increase the product engagement, he suggests greater functional clarity, explicitness and product comprehension, enabling the user to understand the function of the product, its components, its use and information about its replacement and upgradability. He argues that, designers should reconsider the purpose and meaning of technological products and look for the ways of revealing human potential and sense of meaning. This would result in greater emotional durability and longer product life spans.
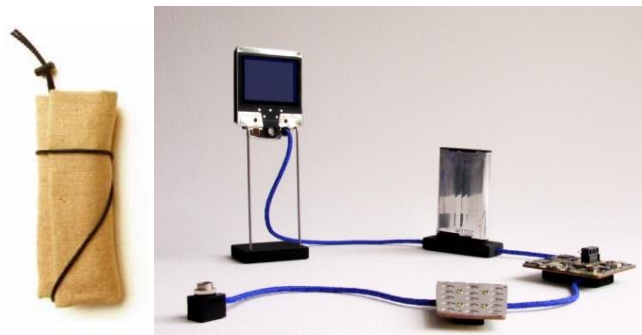
Figure 2.17. Pouch Phone – Evolving and engaging mobile phone (reproduced from Walker,2011).

Walker (2011) also emphasizes the need for evolving products, which can be adapted and upgraded according to changing tastes and technological advances over time. He

proposes technological product solutions that can be incrementally changed through the replacement of components rather than the whole product, and indicates that loosely connected product parts and flexible product enclosures that allow this adaptability can be considered to create evolving solutions. Pouch Phone in Figure 2.17 is a design exploration focusing on upgradability and it includes mobile phone parts which are wrapped in a fabric. The loosely connected phone parts can be upgraded and the packed in various enclosures. Walker also explores the evolving nature of products in terms of the transformation of them in the post-use phase by re-using and re-contextualizing products.

Engaging and evolving product solutions empower people in the design process, through revealing functional and aesthetic parts explicitly and increasing user's comprehension regarding the product. People can personalize the aesthetic and functional parts through adaptability and upgradability. Although the design of functional parts require technical skills and can be defined by designer, people can also design the arrangement of these functional components. The increased user comprehension for the product may also increase the opportunities for product repair and maintenance.

2.3.2.4. Locally Tailored Design Explorations

With a particular emphasis on the 'local', Stuart Walker explores issues such as aesthetics; personal/cultural tastes, product longevity and meaning in material culture through design explorations (Figures 2.18, 2.19). The resulting products reflect sustainable design solutions such as products with integrated mass produced and locally available parts, aesthetic components which facilitates personalization, technological components that are upgradable, products that are re-contextualized and re-used and compositions combining the old and the new. Moreover, these locally

tailored design explorations facilitate user comprehension and participation with their unconcealed electronic components and their upgradability and adaptability.

Figure 2.18. Three White Canvas Clocks (reproduced from Walker, 2006).

Figure 2.19. Winelight (reproduced from Walker, 2011).

2.3.2.5. Ephemeral Objects

Proposed by Walker, ephemeral objects (e.g. Figure 2.20) are design explorations based on the ephemeral use of objects and its ephemeral existence as an object in a functional composition (Walker, 2006). After the use of the object is ended, it is reintegrated back to the environment or its original context with little adverse effect. In this approach, objects that are already serving a purpose are re-contextualized to serve another purpose and after their use is ended, they can continue to serve their

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initial purposes. This requires user's creativity, improvisation and contribution at the local level. The main point in the ephemeral objects is the use of mass produced components in a variety of functional compositions rather than use these in only one context (Walker, 2006). In parallel with the other works of Walker, this approach also focuses on the *local*. Mass produced components are combined in a composition through a local making process to serve another purpose. The objects are re-contextualized and they gain new meanings.

Figure 2.20. Off the Shelf Clock – an exploration of ephemerality (reproduced from Walker, 2006).

2.3.2.6. Family of Objects

With a main focus on sustainable consumption, Family of Objects is a set of design explorations developed by Anne Marchand (2008), which re-contextualizes existing products that have become value-less and readily discarded. Questioning what we value, the approach re-considers the unvalued objects in new contexts and combines concepts such as the old and the new and diversity and homogeneity, so that they become useful objects again (Marchand & Walker, 2007). These explorations show possibilities for re-valuing the existing products which are considered to be old and prolong their life span. In this sense, through adapting these strategies, designers can increase the possibilities of design interventions to contribute to new understandings of old and new, and aesthetics of sustainability. Moreover, this approach empowers

people by encouraging re-valuing their products with simple interventions and through personalization at the post-use level, objects with new meanings reflecting individual tastes can be created locally. The product examples include, old dining chairs revalued by adding a set of covers at the back of each chair (Figure 2.21), drinking glasses and tableware (Figure 2.22), which are collected and revalued by the use of the same surface treatment to each object to form a family of objects.

Figure 2.21. Family of dining chairs (reproduced from Marchand, 2008).

Figure 2.22. Family of drinking glasses and cutlery pieces (reproduced from Marchand, 2008).

These solutions are locally achievable design interventions, which can be adapted to diverse user needs, tastes and preferences with the use of few materials, while contributing product longevity. The approach can contribute to sustainability at the local level, by providing possibilities for re-valuing the old, low-value products in new

contexts at the post-use phase. Since localization brings user closer to design and production services, designers can provide local design services and create products with sustainability considerations by collaborating with people.

2.3.2.7. Post-Use Design

Post-use design thinking, which also focuses on sustainable consumption, is an approach focusing on increasing product life spans through integrating post-use solutions for products into the early stages of design process, and therefore enabling users to re-use a product after its initial use phase (Figure 2.23). In this approach, both use and post-use solutions for a product are considered in the early stages of design process. In this way, users are empowered to design and transform their products in the post-use phase through incorporating various product accessories and materials that are locally available (Coşkun & Doğan, 2010a; Coşkun & Doğan, 2010b). In addition, the emotional bond between the user and the product is aimed to be fostered through user intervention. This transformation can also be facilitated through the post-use services at the local and regional levels, using locally available resources (Coşkun & Doğan, 2010b). Coşkun and Doğan (2010a) reveal that, this approach can be applicable for glass packaging industry and implications of this approach for other product categories can be explored.

Figure 2.23. Rakı bottle reused as water bottle – Fabric cover hides the label on the glass
(reproduced from Coşkun, 2010).

Considering all the examples displayed above, it can be concluded that, user intervention takes place at a varying degree in each practice. In the following section, these practices will be analyzed in-depth based on the dimensions of product personalization extracted through the literature and the preliminary study in order to evaluate their implications for design for sustainability.

2.4. Design Considerations for Sustainability

In the previous section of the study, various design for sustainability approaches that empower people in the design process were investigated. These approaches were, integrated scales of design and production for sustainability, locally tailored design explorations, post-use design, family of objects and half-way products. In these approaches, various design considerations for designing products in line with sustainability are addressed. These design considerations can be grouped under two main headings, which are product longevity and localization, and can be summarized as follows:

Product longevity
- Increasing understandability of the product for maintenance and repair
- Increasing accessibility of the product parts for maintenance and repair
- Strengthening person-product relationship
- Evolving, upgradable and adaptable products for changing needs

Localized design, production and post-use services
- Enabling people to use their skills and knowledge in design, production, maintenance and repair
- Use of locally available materials (natural, manufactured materials, re-used materials, etc.)
- Use of local production techniques
- Use of local skills

- Use of local post-use services for maintenance, repair, recovery and reuse of the parts.
- Integrating different scales of design and production
- Adaptability and upgradability for local and regional needs and tastes
- Effective use of resources

These design considerations derived from the design for sustainability literature were considered in the design process of the lighting design explorations.

2.5. Ways of Enabling Product Personalization at the Local Level

The analysis of the existing examples in terms of their characteristics enabling personalization reveals three main methods of enabling personalization at the local level. These are designing a finished product as a design template, designing a half-way product, and enabling personalization in the post-use phase.

Designing a finished product as a design template: One way of enabling product personalization is designing a finished product, which can be easily produced by people locally and providing its instructions, dimensions, etc. to people, so that they can build their own (e.g. Figure 2.7). These design templates can be available to people as an open source design, so that they can change the sizes, materials and forms used in the design, or they can be designed and produced by designers and provided to people for product adaptation and personalization. However, compared to the previous case, people's mental effort may remain less in this case.

Designing a half-way product: The second way of enabling product personalization is designing a half-way product, which can be completed by people locally. This can be achieved in different ways which are:
- designing only the connection parts or some of the product parts, and user joins different product parts using these parts, which can be made available to people

as an open source design or they can be designed and produced by designers and provided to people (e.g. Figure 2.14, 3D printed vessels in Figure 2.15),

- providing a main structure enabling different parts/materials to be connected on it (e.g. Figure 2.9, Stitch Light in Figure 2.15),

- designing a product which can be personalized by the local environment (e.g. Figure 2.10),

- designing a product that can be shaped to become functional (e.g. Figure 2.11),

- designing a product with treatable surface characteristics (e.g. Figure 2.12),

- designing a product/product part that can be completed through the use of another product/part (s) (e.g. Figures 2.13 and 2.20), and

- designing a product that can be functional through the removal of some of its parts (e.g. Pop Light in Figure 2.15).

Enabling personalization in the post-use phase: Finally, designing a product with two life spans (real use and post-use) and leaving a space for people's intervention in the post-use phase of the product, providing accessories, clean surfaces for treatment for the reuse of the product (e.g. Figure 2.24), enabling people to combine the old product with new product parts/products/surface treatments (e.g. Figures 2.22 and 2.23) can be the ways of empowering people to personalize their products in the post-use phase.

2.6. Analysis of the Current Practices and Design for Sustainability Approaches based on Dimensions of Product Personalization

In this section, the practices and design for sustainability approaches explained above were analyzed based on the dimensions of product personalization and the important sustainability considerations emerged from the literature review. The purpose of this analysis is to discuss the implications of these practices and design approaches for product personalization with an emphasis on design for sustainability. In Table 2.2,

design considerations derived from the design for sustainability literature, and the dimensions of personalization emerged from the personalization literature are displayed. Some of the dimensions emerged from the sustainability literature are related with those emerged from the personalization literature, and these are placed next to the corresponding dimension emerged from the personalization literature. Table 2.3 displays the analysis of the current practices based on the personalization dimensions and sustainability considerations.

Table 2.2. Dimensions of product personalization for sustainability.

Dimensions from personalization literature (Mugge et al., 2009b)	Dimensions from design for sustainability literature	Description of the dimension
Goal of personalization	-	Whether the aim of personalization is aesthetic or functional
-	Skills	Type of skills required in the personalization process
Mental Effort/Physical Effort	-	Creative and physical involvement of the person in the personalization process
Personalization moment and Flexibility	PLS phase that a product is personalized	The product lifespan phase(s) that a product can be personalized
Initiation	Role of manufacturer, user, designer	The roles of manufacturer, user and the designer involved in the personalization process
-	Production scales involved	Production scales used to produce a product that can be personalized
-	Purpose of initiation	The main motivation behind the initiation of the personalization process
-	Limitations for sustainability and strong person-product relationship	Limitations of the personalization practices and approaches for sustainability

Table 2.3. Analysis of the current practices based on dimensions of product personalization for sustainability.

	MASS CUSTOMIZATION	UNIQUE CUSTOMIZATION	DIY	OPEN DESIGN	SUSTAINABILITY APPROACHES ENABLING PRODUCT PERSONALIZATION
PURPOSE	Market Differentiation	Market Differentiation	Self Motivation/Self Expression	Self Motivation/Self Expression	Sustainability - Personal/Cultural Meaning
REQUIRED SKILLS	Not required (Mostly predefined parts are combined)	Not required (Indefinite & Random)	Craft Skills and Hands-on Skills	Expertise in software, digital tools and technical - mechanical experience	Not explored May require hands-on/craft skills/design skills
EFFORT	Mental Effort (Before Purchase) Mental and Physical Effort (After Purchase)	Mental Effort	Physical Effort, Mental Effort	Physical Effort, Mental Effort	Physical Effort, Mental Effort
SCALES OF PRODUCTION	One-off/Batch/Mass	One-off	**Parts:** Craft (All) Craft & Batch & Mass Pro. Mass Pro. (All) **Result:** One-off /Batch	One-off (Mainly) Batch (Can be) -Reused parts -Rapid prototyped -Mass produced/Off the shelf -Craft prod. Parts	Craft/Batch/Mass
PLS STAGES	Design/Assembly/Delivery/Use	Design	Design/Use/Post-Use	Design/Use/Post-use	Design/Use/Post-use
GOAL OF PERSONALIZATION	Aesthetic and Functional	Mainly aesthetic May involve functional	Aesthetic and Functional	Aesthetic and Functional	Aesthetic and Functional
ROLE OF MANUFACTURER	Provides the tools for customization and manufactures the product	Provides the digital tools for customization, optimizes the product for production and manufactures it	- No specific role	- Manufacturer is user - Manufactured part can be combined with products produced with mass/batch/craft production.	Batch producer can adapt designer's template based on user's need.
ROLE OF DESIGNER	Defines the default product characteristics and the product part modules	Defines the core product characteristics open to customization and the method of customization	User is designer, may provide templates for other users	Designer is user	Designer provides template or connection parts or half-way product
ROLE OF USER	Mostly combines the modules to finalize the design of the product	Modifies the default product attributes	- Designs and makes the product (free exploration) or - Adapts another user's design template	- Designs and makes the product or - User adapts another user's design and makes it or - User makes the product based on another user's design template	**User:** **1.** Finalizes the design of the product (halfway), user may produce the open source parts **2.** Adapts (during the design stage) the product based on his/her needs (ISDPS, design explorations for sustainability, halfway) through: - Personalized graphic applications and surface finishing - Arranging the functional components - Adapting through the use of personally available materials or product parts **3.** Transforms the product during use and post-use stage through - Changing the aesthetic and functional components (ISDPS, halfway, design explorations) - Incorporating new components or surface finishing to old/used product (post-use and family of objects)
LIMITATIONS	Limited with the pre-defined options unless it is pure customization	Limited with the pre-defined options	Limited with the modification or adaptation of the contemporary products unless it is completely made through the use of craft skills	Design stage is limited with the use of software skills, use of plastics	Not applicable

Purpose of Initiation. While in mass and unique customization the purpose is market differentiation through offering customized products to customers based on their needs and preferences, in DIY and Open Design, the purpose is self-expression or meeting a specific need, which cannot be met through the available products. In the design approaches involving product personalization, the focus is on sustainability and incorporating personal meaning to products. Since mass customization is a profit-focused practice, economic considerations are more prominent than environmental and social considerations. DIY and Open Design involve the creation of personal and unique objects. In this sense, personal meaning is more prominent. From the sustainability viewpoint, design approaches involving product personalization have many potentials in providing solutions in line with economic, environmental and social and personal dimensions of sustainability, since they aim to address these issues. In addition, DIY and open design examples can provide designers with people's needs and reasons for product personalization, which could be considered as design criteria during designing for personalization.

Required Skills. The use of local skills is important for sustainability, since the integration of the local skills can contribute to both economic and social dimensions of sustainability. In this sense, DIY, open design and sustainability approaches may have promising implications for sustainability, since they require the use of personal and local skills (craft, hands-on, design skills, software skills). In addition, the use of personal skills and the uniqueness of the outcome may positively contribute the person-product relationship, while creating a feeling of accomplishment.

During mass and unique customization processes, users do not need any specific skills, since in most cases of mass customization, customers combine the predefined parts according to their preferences, and in unique customization they modify the predefined product parts. The outcome in the unique customization is randomly generated. DIY requires the use of craft and hands-on skills, and therefore, a more tangible interaction exists between the user and the product. However, people can

adapt the designs of other users as well in DIY and the outcome may not be unique. Nevertheless, in each case, there is an incorporation of hands-on skills. Open design requires an expertise in software use, drawing skills and technical and mechanical experience in the creation of unique products. This may be a limitation for product personalization, since only people having these skills can create unique products. Although the skills required in the personalization process, which are involved in the sustainability approaches, have not been explored yet, the examples show that, they may require craft, hands-on and design skills, which is important for their implications for all dimensions of sustainability.

Effort. As explained in the literature review, as the amount of effort spent during product personalization, the product becomes more self-expressive, and the emotional bond between the user and the product becomes stronger. In addition, the mental effort spent during the personalization process is more effective in creating stronger emotional bonds than the physical effort spent, since the user is creatively involved in the process, resulting in unique products with self-expressive value.

Mass and unique customization require certain amount of mental effort, since the customer tries to find the best fit into his/her taste. However, compared to other practices which include user's direct involvement in the creation of tangible artifacts, the amount of mental effort spent in mass and unique customization remains low. In this sense, the level of product attachment may be lower in customized products compared to the other practices discussed above. Norman (2004) also states that, customization practices may not lead to attachment, since the outcomes are not completely personal. In addition to these, physical effort is required in post-purchase customization, and also in DIY, Open Design and sustainability approaches, since people engage in the process of making the product.

Scales of Production. Scales of production involved have significant environmental and social impacts as explained in the literature review. For this reason, incorporating

local production techniques, skills and post-use services, and the use of local materials are major focuses of the sustainability approaches. In this sense, these approaches which involve product personalization at the local level promise solutions in line with sustainable production and consumption. They integrate craft, batch and mass production techniques and mainly use locally available materials.

In mass customization, the resulting products can be produced through one-off, batch or mass production, depending on the customization strategy and the type of customer (individual or company). However, when it is one-off or batch production, time and cost advantages of mass customization may be lost. The benefits of mass customization for sustainability over mass production are described by Badurdeen and Liyanage (2011) as; the effective use of resources and inventory reductions due to just-in-time production, the minimization of reverse flow of products from the customers and energy savings due to the ready to use manufacturing. Although there might be a decrease in material and energy use per product, increase in product variety and the number of products could increase environmental impacts of production (Doğan & Walker, 2008). In addition, transportation costs (both economically and environmentally) resulting from frequent distributions, whether the manufacturing of components and the use of other resources are externalized or not (if the manufacturing is not centralized and parts are produced according to predicted demand), and whether the companies have locally available post-use and repair services, make the mass customization questionable in terms of sustainability. In order to integrate sustainability principles into mass customization, Badurdeen and Liyanage (2011) propose redesigning the customized products for multiple life cycles, collecting the products at the end of use, use of recyclable materials and re-manufacturable components, and focusing on easy disassembly. However, in order to collect the products at the end of use, the companies need to have locally available services.

Products created through unique customization are produced at one-off scale, since they are customized according to the preferences of individual customers. If the production is not made locally, this practice remains environmentally destructive, since it depends on transportation. As the use of digital manufacturing technologies is becoming widespread, this practice can be facilitated by localized production systems. Bunnell and Marshall (2009) indicate that, the design data can be sent to local manufacturers, tailored to local needs, products can be produced when needed, and the negative environmental impacts of storage and transportation can be diminished or eliminated. In addition, new practices based on skilled digital crafting and batch production may appear. However, from the sustainability viewpoint, the main problem appears in the materials used in the digital production technologies, mainly the use of thermoplastics and photopolymers, and health considerations such as toxic fumes arising from the use of these materials. There are attempts for using organic and recyclable materials in these technologies, which are at the experimental stage and in the future, environmental impacts may be reduced in this way (Bunnell & Marshall, 2009; Drizo & Pegna, 2005).

In DIY, products can be created through three different ways:
- all parts can be craft produced;
- or craft, batch and mass produced parts can be combined;
- or all parts can be mass produced.

The resulting product made through DIY can be in one-off scale or it can be produced at batch scale for more than one user. Although the main motivation of DIY practices is not addressing sustainability issues, the resulting products can embody sustainability considerations, such as material re-use and recovery, etc. Besides, these practices take place in the local context. DIY practice clearly shows the changing role of users to designers and makers, and designers can inspire by these solutions to create a more sustainable material culture.

In open design, the outcome is mainly at one-off scale but can also be at the batch scale. Similar to DIY, products produced at various scales such as re-used, rapid prototyped, batch/craft/mass produced, parts can be combined. As Fuad-Luke (2009) indicates, sustainability requires collaboration in various levels; local, regional, national and international, and it necessitates specific knowledge and know-how of different geographies and cultures. In this sense, open design platforms have potentials in working on the sustainability issues collaboratively. Developing open design considerations for sustainability, Bakırlıoğlu (2017) suggests the development of open parts that can be produced locally by people or local producers with the use of locally available materials and skills, and combining open parts with mass produced parts that have generic assembly details to integrate sustainability with the open design approach.

Product Life Span Stages that Personalization Occurs. As indicated in the literature review, customization can take place during design (pure customization), assembly (most of the customization practices), delivery (at point of sale) or use phase (post-purchase). Unless it is pure customization, during which highly personal products can be achieved, in other types of customization, the outcomes are limited with the combination of the predefined product modules. In addition, in pre-purchase customization, design interventions can be made once, whereas in post-purchase customization intervention can be more than once, although it is limited with the offered modules. Despite the customization process and the outcome can create an emotionally positive value for the customer at the buying stage, it may not continue in the use phase, as the product gets old or wear away, and cannot meet the changing needs, tastes and preferences of the user.

Unique customization can be carried out only in design stage through the use of digital tools. User cannot make any interventions on the product after purchase. However, in terms of design attributes, it offers more personal characteristics compared to mass customized products.

The other practices (DIY, open design and sustainability approaches) offer user intervention in design, use and post-use stage. While some of the half-way products can be personalized only in design stage, some others such as Schaap's chair (Figure 10) can be personalized both in design and use phase.

From the sustainability viewpoint, transformation of products in the use phase, reusing product components, upgradability, etc. are important considerations in terms of longer product life spans and efficient use of resources. In this sense, product personalization taking place in different stages of product life span, as in some of the half-way design examples, in DIY and open design (the reuse and recontextualization of product components) may positively contribute sustainable production and consumption.

The Nature of User's Design Intervention. This dimension refers to whether the design intervention of the user is aesthetic and/or functional. As the level of design intervention increases, people can adapt the products based on their needs, changing tastes and preferences, which is important for prolonged product life spans. Except for the unique customization, all practices involve aesthetic and functional intervention at varying degrees. The examples of unique customization show that, mainly aesthetic interventions take place in this practice. The main difference between customization and the other practices is the means for achieving aesthetic and functional interventions and the level of intervention. In mass and unique customization, design interventions are mainly made through the use of digital interfaces, and the level of intervention is limited with the predefined options. In DIY, and sustainability approaches, there is a physical intervention by the user and the level of it is higher, since the user is the designer and the maker of the product. Open design may involve both digital and physical interventions, and the level of intervention is also higher compared to customization, since data files can be modified or adapted by different users.

The Role of Manufacturer. In mass and unique customization, the manufacturer is the maker of the product and provides the tools for customization. The tools may be digital interfaces or catalogues displaying the product modules. In DIY and open design, the user becomes the maker of the final products. In product personalization, on the other hand, the user is the co-maker of the product, during which designer or manufacturer can also be the maker. Integrating the user into the making process may lead to a more engaging product experience for the user, and during the making process, people can create highly personal products through creating personal narratives.

The Role of Designer. The role of designer also varies depending on the practice. In mass and unique customization, designer defines the core product characteristics, product part modules (if they exist) and the method of customization. In DIY and open design, user becomes designer and through the use of different skills, such as hands-on, craft and software skills, unique products can be created. In sustainability approaches enabling product personalization, designer provides the user with the template or connection parts or the half-way product (in a tangible form or as a digital file), and the user further adapts and designs the product. Thus, both of them become co-designers.

The Role of User. User's involvement in the design process increases from the left side to the right side of the Table 2.3. As stated in the literature, the user's involvement is crucial for sustainability socially and in terms of the personal relevancy of sustainability to the individual.

In mass customization, user mostly combines the product modules to finalize the design of the product through the tools provided by the manufacturer. Similarly, in unique customization, user modifies the default product attributes that are defined by the designer.

The other practices require more active involvement of the user in the design process. In DIY, people can design and make products or they may adapt another user's design offered as a template. In open design, user involvement can occur in three ways. User can be the designer and maker of the product or user can adapt and modify a product designed by another user and then make it, or user can produce a product designed by another user through the use of various manufacturing techniques. In sustainability approaches enabling product personalization, user involvement increases more and it can take place in the following ways:

1. User finalizes the design of the product through the use of locally available materials, through removing parts from the product (halfway products), if the halfway product is provided as a digital file, user can produce it.
2. User adapts (during the design stage) the product based on his/her needs (ISDPS, design explorations for sustainability, halfway) through:

      - Personalized graphic applications/surface finishing

      - Arranging the functional components

      - Adapting through the use of personally available materials/product parts
3. Transforms the product during use and post-use stage through

      - Changing the aesthetic and functional components (ISDPS, halfway design explorations)

      - Incorporating new components or surface finishing to old/used product (post-use and family of objects)

Limitations. Each practice has some limitations regarding the implementation of product personalization. Mass customization is limited with the predefined options, unless it is pure customization. Even if it is pure customization, the person is not involved in the making process of the product, and the invested effort by the person is limited. Similarly, unique customization has limitations for personalization, since it is also limited with pre-defined options, although more personally relevant outcomes can be achieved compared to mass customization.

Unless DIY products are created through the use of craft produced parts, it is limited with the modification or adaptation of the products, which are not designed for product personalization.

The limitation of open design for product personalization for sustainability is mainly related to the skills and knowledge it requires in the design stage. Since open design may necessitate software skills, and manufacturing and assembly knowledge in the design stage of the products, only people who have these skills can be creatively involved in the design process. People who do not have these skills can only produce the open solutions developed by others or have them produced by local producers, and their creative involvement may remain low.

The limitations of sustainability approaches enabling product personalization have not been explored yet, since they are the propositions of designers and require user intervention in order to see the outcomes and their limitations.

It is important to note that, Table 2.3 has been generated through the analysis of the existing practices enabling product personalization. To this end, new considerations regarding the dimensions of product personalization for sustainability may appear, as new ways of enabling personalization are included in the analysis.

CHAPTER 3

METHODOLOGY

In this chapter, the research methodology followed throughout the study is explained. In addition, a review of literature on *research through design* and design research were revealed, and the methods of data collection and data analysis used in the study were described.

3.1. Research Design

This research is a qualitative study, which adopts *grounded theory* framework, *research through design* (RTD) approach and, *generative research* integrated into RTD process. During the research process, theoretical ideas elicited from the literature and exploratory research were used to create lighting design explorations. These explorations were further developed through generative sessions, during which people personalized the design explorations. In this process, the theoretical knowledge and the personalized design explorations mutually informed each other, and generative research was used to refine design explorations and also the theoretical ideas. This process is presented in Figure 3.1.
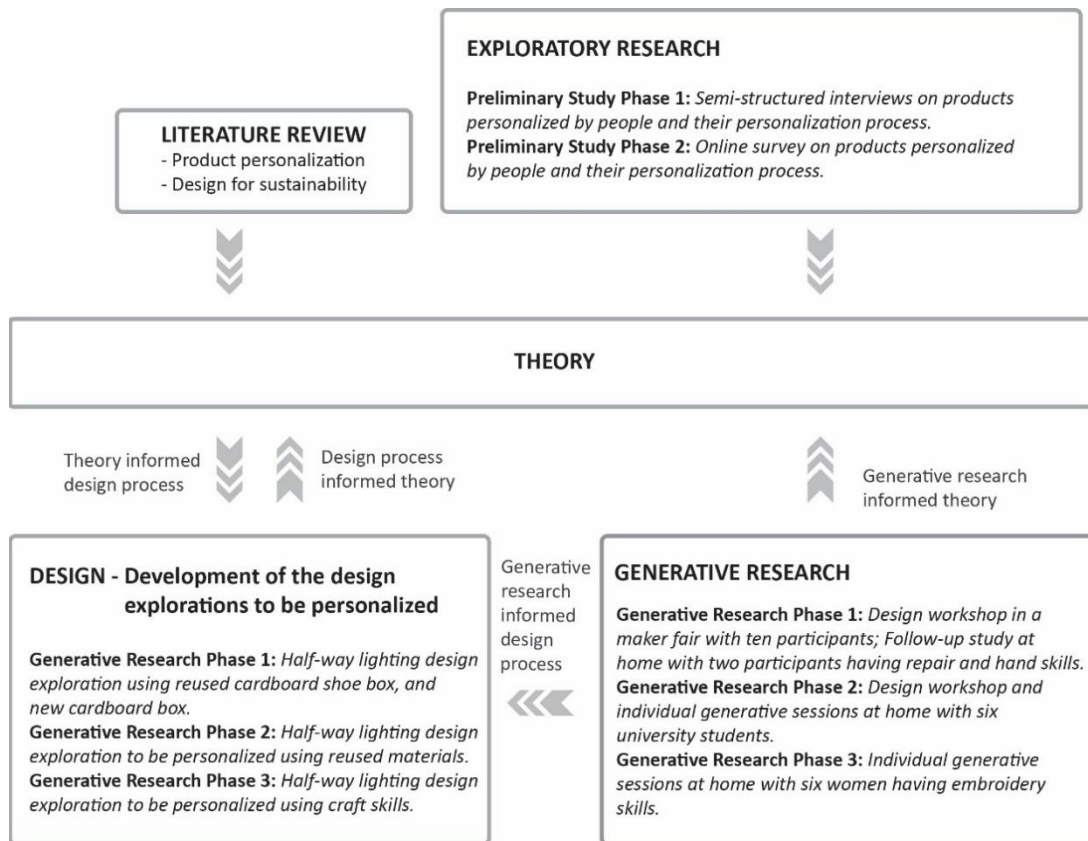
Figure 3.1. Research through design process in the study.

In the study, I adopted *grounded theory* as the research framework for the design of data collection, sampling, and the final data analysis procedure. *Grounded theory* was developed and defined by Glaser and Strauss (1967; p. 1) as "the discovery of theory from data—systematically obtained and analyzed in social research". The characteristics of *grounded theory* I adopted in this study are *theoretical sampling*, *simultaneous progression of data collection and data analysis*, *open coding* of the data and, *cross-comparison of the cases* involving generative research, which were carried out in the generative research phase 2 and 3. *Theoretical sampling* means that, initial data collection and analysis determines the data collection and analysis procedures in the next phase of the research (Glaser & Strauss, 1967). In the study, each case was designed based on the findings of the previous phase. This required the parallel progression of data collection and analysis for determining the design of the subsequent study.

The study is composed of two main phases, which are the preliminary study and the generative research. The starting point of the thesis was the insights that I gained from the design for sustainability literature emphasizing the personal and cultural meaning of the products, and my observations about people's interventions to mass produced products, which could occur to a certain extent. Based on this insight, I formed a conceptual framework regarding the methodology of the study. However, as the study progressed and as my knowledge about the research area grew, I refined and modified some of the methods that I used in the study, which is one of the characteristics of qualitative research. In order to form a theoretical foundation for my study, firstly I carried out a literature review on sustainability, personalization and the practices, approaches and product designs mainly empowering people in the design process. The literature review helped me develop the design considerations important for sustainability and product personalization.

In parallel with the literature review process, I conducted the first phase of the preliminary study to explore the first group of research questions focusing on the products that people personalize in daily life, and the details of the personalization process. Conducting semi-structured interviews with two participants, I explored these issues in detail through the photographs of the products that the participants personalized (Chapter 4, Section 4.4). The details of this study and my reflections on the methodology were provided in Chapter 4 in detail. The preliminary study phase 1 helped me further develop the dimensions of product personalization. In addition, the outcomes of this phase enabled me to plan the second phase of the preliminary study (online questionnaire).

In the second phase of the preliminary study, I conducted an online questionnaire which explored the products personalized by people. I asked the participants why and how they personalized their products, and I requested the photographs of the products via e-mail. The details of this study were provided in Chapter 5. The online questionnaire helped me to gain insights into issues such as the methods of personalization by product category, skills that people could use during personalization and people's personalization goals. I used the knowledge gained through this online questionnaire in the generative research phase 1 for developing a

half-way lighting design for a design workshop and its follow-up study, and in the generative research phase 2, for developing design scenarios and personas.

In the generative research phase 1, which I explained in Chapter 6 in detail, I explored the concept of half-way design and the design of generative sessions in two stages. Using the knowledge gained from the online questionnaire and the literature, I developed a half-way lighting design exploration, which was personalized by ten people in a maker fair organization, which was carried out as a design workshop. The personalized products and my reflections regarding the design and the generative session led to the further development of the half-way design and the refinement of the generative session design. Considering the findings of this phase, I developed the half-way design exploration further, and carried out generative sessions with two people. After these sessions, I realized that, I needed to develop specific contexts and scenarios for the design explorations and further develop them based on these scenarios.

In the generative research phase 2, which I explained in Chapter 7 in detail, firstly, I developed five design scenarios and personas based on people's personalization goals extracted from the online questionnaire. Then, analyzing these scenarios based on the sustainability considerations, I eliminated some of them, and focused on two scenarios, which are product personalization using materials in the post-use phase, and product personalization using craft skills. In addition, I refined the design of the generative sessions. Then, I further developed the design exploration used in the previous phases considering the first design scenario and conducted generative studies with six university students sharing a home with their friends.

After analyzing the results of the second phase of the generative research, I developed another design exploration for the second design scenario. This focused on enabling the use of craft skills in product personalization, and I conducted generative sessions with six women having embroidery skills in the third phase of the generative research. The details of this study were provided in Chapter 8. I determined the number of scenarios to be used in the design process and so the number of designs to be developed according to theoretical saturation. At the end of this study, I conducted a cross-case

analysis with a focus on generative research phase 2 and 3 to reveal the prominent similarities and differences between these two cases.

In the conclusion chapter (Chapter 9), I revisited the research questions and revealed the insights I gained through the whole study. Figure 3.2 displays the flow of the research phases and the research questions that were explored during these phases.

RESEARCH QUESTION

How could designers empower people in the design process through product personalization at the local level, to contribute to the development of products that are in line with sustainability principles?

THEORY

LITERATURE REVIEW

- Design considerations for sustainability
- Dimensions of product personalization

PRELIMINARY STUDY PHASE 1: SEMI-STRUCTURED INTERVIEWS

- Dimensions of product personalization
- Insights for the subsequent phase

PRELIMINARY STUDY PHASE 2: ONLINE QUESTIONNAIRE

- Design scenarios and personas for the generative research phase 2 and 3
- Potential participants for the subsequent phases

1. How does the product personalization process take place in daily life?
2. What are the dimensions of product personalization?

DESIGN & GENERATIVE SESSIONS

GENERATIVE RESEARCH PHASE 1

Development of the generative toolkit 1 ▶ Design workshop

Development of the generative toolkit 2 ▶ Follow-up generative study (at home)

Reflection on design process, refinement of theory, explorations and the generative sessions

Generation of design scenarios and personas

DESIGN & GENERATIVE SESSIONS

GENERATIVE RESEARCH PHASE 2

Development of the generative toolkit 3 for design scenario 1 ▶ Design Workshop

GENERATIVE RESEARCH PHASE 3

Development of the generative toolkit 4 for design scenario 2 ▶ Generative sessions (at home)

Reflection on design process, refinement of theory, explorations and the generative sessions

Drawing conclusions and refinment of theory

3. How can product personalization be facilitated through design with a focus on sustainability?

  3.1 How can personalization of lighting products be facilitated through design with a focus on sustainability?

  3.2 What are the implications of personalization of lighting products for sustainability?

  3.3 What are the opportunities and limitations for incorporating product personalization into design process for sustainability?

4. What would be the means of incorporating product personalization into design research for people's empowerment?

Figure 3.2. Research methodology of the study.

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3.2. Research through Design

The term *research through design* originates from Christopher Frayling's (1993) categorization of design research, which he adapted from Herbert Read's (1948) categorization for art education. Frayling proposes three types of design research, which are *research into design*, *research through design* and *research for design*. According to this categorization, *research into design* refers to research focusing on the design activity itself or subjects such as design history or design philosophy. During this type of research, researchers explore the subject as an outsider (Jonas, 2015), who are mostly from other disciplines such as historians, anthropologists, etc. (Findeli et al., 2008). *Research for design* refers to research for improving the practice of design, and it may reveal outcomes such as frameworks, design recommendations, etc. (Zimmerman, Stolterman & Forlizzi, 2010). Jonas (2015) states that, researchers may provide knowledge for the designers in this type of research.

Walker et al. (2009) define *research through design* as a research approach during which theory development and design practice mutually inform each other. Walker (2011) states that, a theoretical foundation, creative engagement in the design process and the generation of design propositions in tangible form are required in *research through design*. In this type of research, designer is actively involved in both design and research process (Jonas, 2015). Archer (1995) names this type of research approach *research through practice* (here the term practice may refer to design or another practice) and regards it as a form of action research during which research progresses systematically through practice and its goal is to generate communicable knowledge. Similarly, Durrant, Vines, Wallace and Yee (2017) characterize *research through design* as a type of research which is practice-based and which results in transferrable knowledge. *Research through design* is defined by several authors (Jonas, 2015; Walker, 2011; Forlizzi, Zimmerman & Stolterman, 2009) as a designerly way of generating knowledge with a focus on wicked problems (Rittel & Weber, 1972) which are unclear and messy. According to Jonas (2015), designers/researchers are creatively involved in *research through design* process rather than approaching the research subject from outside. It is also indicated that, this exploratory approach is an iterative process (Forlizzi et al., 2009) and ontologically deals with exploring potential

futures, preferred states and how it will be, rather than how it is (Godin & Zahedi, 2014; Forlizzi et al., 2009).

Frens (2007) states that, knowledge in two different levels can be generated through this type of design research. These are the aspects of products themselves and the design process during which these products are created. Similarly, Findeli, Brouillet, Martin, Moineau and Tarrago (2008) argue that, *research through design* needs to involve both research for and into design. Likewise, Zimmerman et al. (2010) indicate that, *research through design* can result in both theory for and theory on design as well as a design proposition for a preferred state.

There are also some challenges addressed in the literature regarding the lack of a concrete and agreed upon methodological framework for *research through design*, trustworthiness of its outcomes, and possibility of theory remaining implicit.

In terms of methodology, *research through design* has similarities with *grounded theory* (Godin & Zahedi, 2014) and *action research* (Godin & Zahedi, 2014; Stewart, 2014). It has the goal of building theory as in *grounded theory* and aims to change the reality through practice as in action research. Walker (2011, p. 85) proposes that, *research through design* involves the phases of "theory development, conceptual design, reflection and theory development". Reflection is a key element of *research through design* studies and according to Schön's (1983) *reflective practice* theory, designers engage in a continuous and reflective conversation with the situation during the design process. According to Schön, two types of reflexive action take place during the reflective practice, which are *reflection in action* and *reflection on action*. *Reflection in action* takes place during practice, in the time of a decision or action and this is based on tacit knowledge, whereas *reflection on action* takes place after certain decisions are made and the practitioner reflects on these decisions (Schön, 1983). In this study, I also made reflections while developing the design explorations, and after completing the generative sessions during which the participants personalized the design explorations. For instance, when developing the generative toolkits through making models, I noted my reflections (in action) about my explorations on a diary to clarify what worked and what did not (Figure 3.3). In addition, I recorded my thinking

process through sketches on a sketchbook. For reflection on action, I took notes on my diary after conducting the generative sessions, and created tables to compare them and to evaluate my research process (Figures 3.4 and 3.5).

Figure 3.3. Reflections in action noted on the diary.
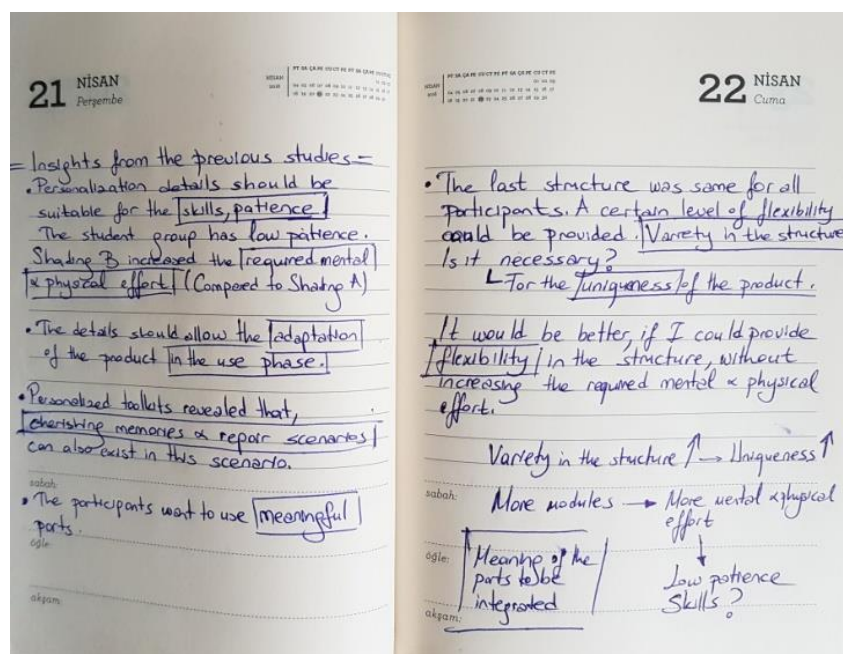
Figure 3.4. Reflections on action noted on the diary.

Figure 3.5. Reflection on action - Analysis of the design process.

Archer (1995) indicates that, this approach is mostly non-objective and situation specific, and depending on the place, time, people and circumstances, the results may vary and therefore generalization of the findings of this type of study is difficult. Gaver (2012) also suggests that, theoretical outcomes of *research through design* is likely to be provisional rather than being verifiable. Defining design and *research through design* as generative, Gaver argues that, refutability is against the nature of *research through design*, since it deals with what might be rather than what is, as in the science research. Similarly, Walker (2011) characterizes *research through design* outcomes as illustrative and particular to context rather than being prescriptive and generalizable.

Finally, the documentation of the knowledge generated during *research through design* process is addressed as a critical issue by researchers (Brown et al., 2017; Kelliher & Byrne, 2015; Godin & Zahedi, 2014; Dalsgaard & Halskov, 2012; Zimmerman et al., 2010; Pedgley, 2007), since when the process is poorly documented, this may cause this knowledge remain implicit within the design propositions. This is a risk for a researcher conducting a *research through design* study, since design propositions are the means for generating design knowledge rather than being the final objective (Godin & Zahedi, 2014) and poor documentation may also reduce the trustworthiness of the study. Pedgley (2007) indicates that, *research through design* has an autobiographical nature involving self-accounting and self-

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analysis processes, and methodological transparency is necessary for the credibility of the research. To this end, Pedgley proposes the use of diaries for researchers who conduct research individually to record their research procedure as a reflective practice. Dalsgaard and Halskov (2012) indicate that, besides the wicked problems dealt with during the design process, designers also face wicked problems of doing research during *research through design* approach. They suggest that, the documentation both results in insight about the research area and forms the evidence for the insight gained through the research.

Walker (2011) states that, evidence-based methods may not be effective for addressing environmental and social issues of sustainability. To this end, Marchand and Walker (2007) indicate that, sustainability requires new thinking and models, and *research through design* approach has the potentials for exploring new ideas to create the desired futures.

In this context, the *research through design* approach was adopted in this study, since this approach is suitable for exploring new ideas, potential futures and preferred states for sustainability. In addition, design for sustainability studies in the literature, which adopted this approach (Walker, 2011, 2006; Marchand, 2008; Doğan, 2007) prove that, the approach provides theoretical insight in tangible form and reveals new understandings for sustainability. In the following section, *research through design* studies focusing on design for sustainability are explained.

3.2.1. Research through Design Studies Focusing on Design for Sustainability

With a particular emphasis on the 'local', Stuart Walker (2011, 2006) explores issues such as aesthetics of sustainability; personal/cultural tastes, product longevity and meaning in material culture through *research through design* approach. For instance, in Figure 3.6, Walker investigates the use of locally available resources, combination of the old and new, upgradability, re-use, repair and reconfiguration of electrical products.

Figure 3.6. ReCast – MP3 speaker unit (reproduced from Walker et al., 2009).

His work has a theoretical background and the design proposition draws on the works of other researchers who study in the design for sustainability field (Walker et al., 2009). Walker explores and revisits these theoretical concepts through design explorations and provides a template that can be applied to different, locally available, low value products. This template is the combination of old products with new ones in a new context. In this example, he combines an old radio with an mp3 player and re-contextualize it in a new place in front of a decorative wall paper and on a shelf.

Another design for sustainability study adopted the *research through design* approach is Doğan's PhD study on *integrated scales of design and production*. The study begins with a field research, and interviews are conducted with designers, environmental specialists and managers at mass, batch and craft scale production. After this investigation, a design approach for sustainability, which integrates different scales of design and production, is developed. Panel Play concept (Figure 17) integrates mass produced electronic parts with aesthetically expressive parts which can be produced locally and both of these parts can be continually adapted, upgraded and renewed (Doğan, 2007). Various sustainability considerations are explored in this concept such as increasing user's comprehension on the product, local recovery and repair, adaptability to different needs and tastes and the use of local skills.

Another example for *research through design* with a sustainability focus is Marchand's PhD study (2008) on responsible consumption. The study begins with a participant observation among existing responsible consumer discussion groups to

gain insight on the attitudes and practices of responsible consumption. The study continues with in-depth interviews with responsible consumers to explore their material cultures regarding product longevity. Then, the data gathered through the first stage are explored through the creation of artefacts (Marchand, 2008). Marchand's approach re-values the old products that are not meaningful on their own, by giving them an aesthetic continuity in a similar group of products. The product examples include old dining chairs revalued by adding a set of covers at the back of each chair, drinking glasses and tableware, which are collected and revalued by the use of the same surface treatment to each object to form a family of objects (Figure 3.7).

Figure 3.7. Family of Objects (reproduce from Marchand, 2008).

All of these studies include an initial exploratory research phase such as theoretical inquiry and/or field research and theoretical insight are explored through the creation of conceptual objects, while during this creation theoretical insight are revisited and developed. In this study, in addition to exploratory research, generative research is also included in the *research through design* process, in order to gain insights about people's personalization process, motivations, emotions and tacit knowledge to reflect on and further develop the design explorations and the theoretical insights.

3.3. Stages of Design Research

Hanington (2007) proposes three stages of research and design in the design process which are *exploratory*, *generative* and *evaluative*. As can be seen in Figure 3.8, these research phases may overlap in terms of timing in the design process and the methods used, without having precise start and end points.
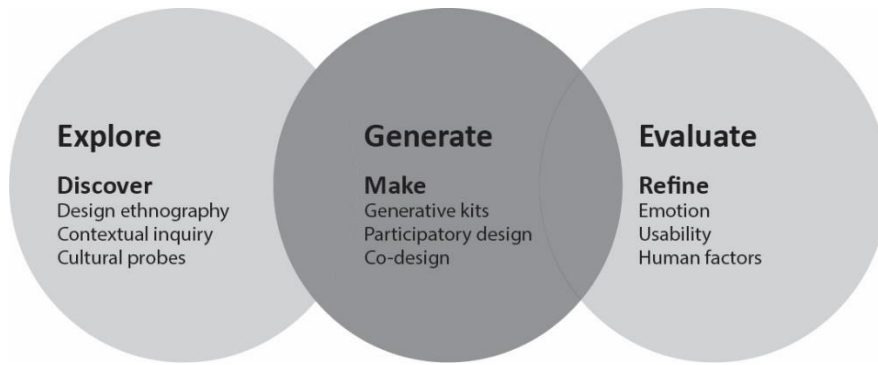
Figure 3.8. Model of design research (reproduced from Hanington, 2007).

3.3.1. Exploratory Research

Exploratory research is conducted in order to gain knowledge regarding people, products and context, to form empathy with people and become familiar with the area of interest (Hanington, 2007). Conducted in the earliest phases of the design process, the focus can be on people and their daily lives, needs and wants, interaction patterns with products, context of use, and preferences (Hanington & Martin, 2012).

In exploratory research, ethnographic methods such as participant observation, user interviews and, methods such as contextual inquiry, cultural probes, artifact analysis and diary studies can be conducted. Since the outcomes of this type of research are expected to be design implications, Hanington and Martin (2012) suggest a flexible and not a strictly guided approach during exploration. They state that, synthesis process needs to be directed towards inspiration and the results of this type of research lay the foundation for generative research and development of concepts.

In this study, semi-structured interviews, online and printed questionnaires, diaries and photo studies were conducted in different phases for exploratory purposes and details of these were explained in data collection section of this chapter and in Chapters 4, 5, 6, 7, and 8.

3.3.2. Generative Research

Generative research, aims to gain an in-depth understanding of user needs and desires, and generate design concepts through participatory design practices (Hanington, 2007). Sanders (2008) states that, generative design research is a design-led approach with designers having a participatory mind-set. This type of research both enables designers to understand users in-depth and also generate new alternatives for product characteristics (Hanington, 2003) and potential future experiences, which are difficult to elicit through traditional research techniques such as interviews, observations and focus groups (Sleeswijk Visser, Stappers, Van der Lugt & Sanders, 2005). Generative research actively and creatively engages people in the early stages of design process, and often in the ideation and iteration phases (Lewitt & Richards, 2010; Sleeswijk Visser et al., 2005). Hanington and Martin (2012) state that, the insights gained through exploratory research may inform generative research possibilities and the methods used in the generative research may involve the ones used for exploratory research, such as diaries.

The tools used during the generative research approach aims to reveal people's tacit knowledge, latent needs, emotions, dreams and motivations. Through researching visually, designers can convert the visual information obtained through generative research into design considerations more naturally (Hanington, 2003). Moreover, the use of visual elements in the generative research enables participants to express themselves through means other than verbal (Lewitt & Richards, 2010). However, Lewitt and Richards (2010) also point out that, the value of this type of research is not within the solutions generated by the participants but within their explanations, which may reveal their thoughts, aspirations and priorities.

Generative studies can be carried out as design workshops or participatory sessions, where people are gathered to generate or adapt the artifacts. People can work individually or in groups and can generate abstract 2D or 3D artifacts such as collages, cognitive maps, diagrams, or 3D models. Diaries can be used in order to gain knowledge on people's experiences and emotions regarding an activity lasting for a certain period of time (Hanington, 2003). In addition, the participatory practices need

to be combined with the discussions involving participants throughout and after the sessions (Hanington & Martin, 2012).

There are different categorizations for the stages of generative research. Hanington (2007) classifies the stages of generative research as projecting and constructing. Projective stage is the earlier stage of generative research and in this stage, projective techniques such as collages, drawings, diagrams, images and text-based exercises are used to project people's thoughts, feelings and desires which are difficult to elicit through verbal means. In the constructing stage, design elements are provided to people in order to make them guide to concept development, the parameters of which are set during the projective stage. 3D modeling techniques such as Velcro modeling, which involves the building of 3D forms using attachable pieces, are used in this stage (Figure 3.10). Hanington & Martin (2012) note that, while developing generative toolkits, designers need to consider variety in concepts to be created through the interaction between the participants and the toolkit, without overwhelming them.

Figure 3.9. A Velcro modelling kit (reproduced from Hanington & Martin, 2012).

Lewitt and Richards (2010) suggests priming, dreaming and creating as the stages of generative research. Priming stage aims to prepare participants for the topic that will be explored by facilitating their ability to understand and reflect their current experiences, behaviours and thoughts and envision their ideals. Logs, diaries,

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workbooks, day-in-the-life exercises and photo documentation can be used as tools in this stage. Story-telling is suggested for group studies. Dreaming stage focuses on revealing the expected future experiences of people through understanding how they feel today and how they want to feel in the future. Collages and cognitive mapping can be used as tools to enable people to express their feelings and thoughts. After participants have an idea regarding their future expectations and ideals, in creating stage, solutions are built based on these ideals. Generative modeling techniques such as Velcro modeling can be used in this stage. During this stage, the focus is not on the created solutions but on how people explain their ideas, intents and priorities in relation to the created solution.

Sanders, Brandt and Binder (2010) propose a framework for generative research consisting of three dimensions which are form, purpose and context. Form refers to the form of actions participants carry out during an activity and it can be making, telling and/or enacting. Purpose is classified as probing, priming, understanding and generating. Context refers to where and how the tools and techniques are used and has four dimensions which are group size and composition, face to face vs. online, venue and stakeholder relationships. Form and context depend on the purpose of the generative research and the tools and techniques used for that purpose. Table 3.1 displays the tools and techniques classified by form and purpose, and Table 3.2 displays the tools and techniques classified by context by Sanders et al. (2010). The rows highlighted with grey display the tools and techniques used in this study. As shown in the table, 3D toolkit was used in the study both to understand the participants' experience with it and to generate new ideas, whereas the diaries were used to understand the participants' personalization experience. In terms of context, 3D toolkit was used both in group setting (design workshops) and individually, whereas the diaries were used individually by the participants.

For the analysis of the generative sessions, Hanington and Martin (2012) suggest that, visual outcomes of the generative sessions can be analyzed in combination with the verbal information provided by the participants. I adopted this approach while analyzing the results of the generative sessions conducted in this study (Chapter 6, Chapter 7, and Chapter 8). I analyzed the personalized design explorations and the

photographs of the personalization process in combination with the verbal data provided by the participants in the semi-structured interviews, and the diaries. In this study, two design workshops and three individual generative sessions were conducted as generative studies.

Table 3.1. The tools and techniques used in generative research (adapted from Sanders et al., 2010).

TOOLS AND TECHNIQUES	Probe	Prime	Understand	Generate
Making Tangible Things				
2D collages using visual and verbal triggers on backgrounds with timelines, circles, etc.	+	+	+	+
2D mappings using visual and verbal components on patterned backgrounds		+	+	+
3D mock-ups using e.g. foam, clay, Legos or Velcro-modeling			+	+
Talking, Telling And Explaining				
Diaries and daily logs through writing, drawing, blogs, photos, video, etc.	+	+	+	
Cards to organize, categorize and prioritize ideas. The cards may contain video snippets, incidents, signs, traces, moments, photos, domains, technologies, templates and what if provocations.			+	+

Table 3.2. The generative research tools and techniques classified by context (adapted from Sanders et al., 2010).

CURRENT APPLICATIONS OF THE TOOLS AND TECHNIQUES	Individual	Group	Face-To-Face	Online
Making Tangible Things				
2D collages using visual and verbal triggers on backgrounds with timelines, circles, etc.	+	+	+	+
2D mappings using visual and verbal components on patterned backgrounds	+	+	+	
3D mock-ups using e.g. foam, clay, Legos or Velcro-modeling	+	+	+	
Talking, Telling And Explaining				
Stories and storyboarding through writing, drawing, blogs, wikis, photos, video, etc.	+	+	+	+
Diaries and daily logs through writing, drawing, blogs, photos, video, etc.	+		+	+
Cards to organize, categorize and prioritize ideas. The cards may contain video snippets, incidents, signs, traces, moments, photos, domains, technologies, templates and what if provocations.	+	+	+	

Design Workshops. Design workshops are participatory activities mainly used in generative research during which participants, who are often non-designers, work with

designers on a design problem through using creative co-design methods. These methods may include the creation of collages, maps, diagrams, 3d models, storyboards and sketches. Through the use of these methods, people's needs can be understood, design implications can be revealed, or design concepts can be verified and refined (Hanington & Martin, 2012).

Table 3.3 summarizes the details of the design workshops conducted in this study. For data collection, I used the design explorations I developed in each phase as 3D toolkits. In addition, exploratory and evaluative questionnaires were used as data collection methods during these workshops.

Table 3.3. Summary of the design workshops conducted in the study.

Design Workshop 1 – Rethinking the cardboard shoe-box as a half-way design
Exploring the half-way design concept and product personalization through repurposing
10 participants at different ages and skill levels
Sen de Yap İzmir Maker Fair, Ege University ideEGE building, 29.04.2015, ~ 2 hours
Design Workshop 2 – Personalization of the refined cardboard half-way design exploration
Preparing the participants for the individual generative sessions
6 university students from Yaşar University (1 interior design and 5 industrial design students)
Yaşar University, room C108, 22.12.2016, ~ 3 hours

Individual generative sessions. Individual generative sessions were conducted in three generative research phases of this study, which took place at the homes of the participants. Table 3.4 summarizes these generative studies, the details of which were provided in Chapters 6, 7, and 8. In each session, the participants personalized a design exploration using the materials and the skills they had. For data collection, the design explorations developed in each phase of the study were used, and the participants documented their personalization process through diaries and photographs. In addition, in each individual generative session, semi-structured interviews were conducted with the participants at different phases of each study. The methodology for each individual session were explained in the relevant chapters of the thesis.

Table 3.4. Summary of the individual generative sessions conducted in the study.

Generative Research Phase 1 – Follow-up Study
Personalization of a half-way design exploration with the materials available at home
Two participants who have repairing and hand skills
25.5.2015 - 31.5.2015, Participants' homes, 1 week
Generative Research Phase 2
Personalization of a half-way design exploration by repurposing the materials available at home
Six university students
22.12.2016-28.12.2016, Participants' homes, 1 week
Generative Research Phase 3
Personalization of a half-way design exploration using embroidery skills
Six participants who have embroidery skills
2.8.2017-17.8.2017, Participants' homes, 2 participants - 4 days, 4 participants - ~ 10 days

3.3.3. Evaluative Research

Evaluative research is conducted to evaluate the concepts developed during design process against user needs and expectations through involving the potential users (Hanington, 2007). In evaluative research, usefulness, usability and desirability of a system, product or prototype can be measured. Evaluative research can be conducted iteratively to refine a design concept through its evaluation by potential users. When conducted after exploratory and generative research procedures, it enables designers to verify their design concept (Hanington & Martin, 2012). Evaluative research can be conducted in a strictly systematic manner as in lab testing, or it can be carried out in the real context of use or it may include both (Hanington, 2007). Methods of human factors research and usability testing can be listed as examples of evaluative research methods (Hanington & Martin, 2012).

In the study, I used printed questionnaires, diaries and think-aloud protocol for evaluative purposes, which were explained in the data collection section and Chapter 6, 7, and 8. All of these data collection methods were used as part of the generative session design, rather than being conducted for purely evaluative purposes such as evaluating the design exploration or processes. For this reason, these are placed between the generative and evaluative research area in Figure 36.

3.4. Data Collection

In this doctoral study, exploratory, generative and evaluative research methods were used to collect data from various participants. The findings of each case study informed the data collection and sampling procedure of the subsequent phase. Figure 3.11 displays the data collection methods used in the study in relation to the models of design research diagram developed by Hanington (2007). In this section, the data collection methods used in the study were defined, briefly explained, and the rationales for selecting these methods were revealed. Table 3.5 displays the data collection methods used in the specific phases of the study, the questions explored in each phase and the purpose of the studies. How these methods were used in the study and the details for each data collection were explained in Chapter 4, 5, 6, 7, and 8.
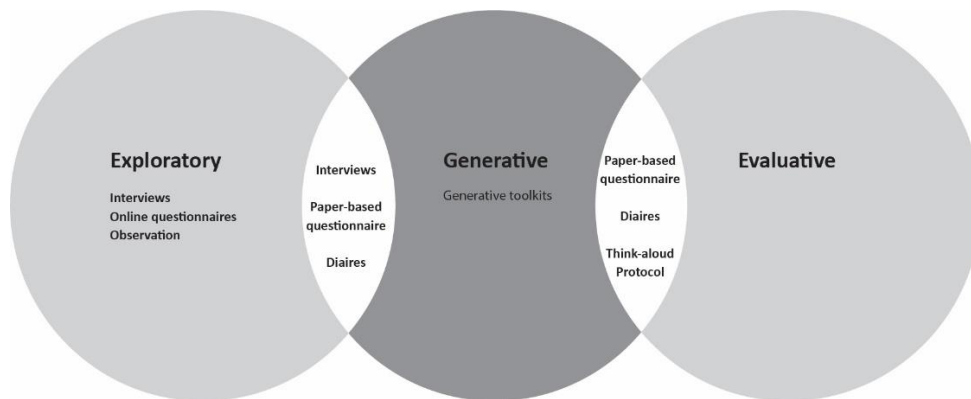
Figure 3.10. Data collection methods used in the study (adapted from Hanington, 2007).

Table 3.5. Data collection methods used in the study.

	Data Collection Method	Nature of Research	Questions	Purpose
Preliminary Study Pahse 1	**Semi-structured interviews**	Exploratory	How do people personalize their products?	- Gaining insight into people's personalization process and personalized products. - Exploring the dimensions of personalization.
Preliminary Study Pahse 2	**Online questionnaire**	Exploratory	How do people personalize their products?	- Gaining insights into people's personalization process and personalized products. - Identifying the potential means of enabling personalization. - Generating personas and design scenarios.
	Design Process			
Generative Research Phase 1	**Design workshop 1** - 3D toolkit - Questionnaire - Observation	Exploratory Generative Evaluative	- How can a half-way lighting be designed to enable personalization in the post-use phase? - How can the generative sessions be designed?	- Exploring the half-way design concept and repurposing (personalization in the post-use phase). - Exploring the important considerations for conducting the generative sessions.
	Design Process			
	Follow-up generative study - 3D toolkit - Diaries - Semi-structured interviews	Exploratory Generative Evaluative	- What are the implications of the changes made in the previous design for design for personalization and sustainability? - How do the participants with specific skills personalize the improved design exploration? - How do the participants evaluate the personalization process and the personalized design exploration? - If required, how can the design exploration and the generative sessions be improved?	- Exploring the implications of the new design details enabling personalization for design for personalization and sustainability. - Understanding the needs of the participants regarding the design exploration and personalization process. - Identifying the problems and potential solutions for improving the design exploration. - Identifying the problems and potential solutions for improving the generative research procedure.
	Development of Personas and Design Scenarios - Design Process for the First Design Scenario and Persona			
Generative Research Phase 2	- Online questionnaire **Design workshop 2** - 3D toolkit - Questionnaire - Observation **Individual generative sessions** - 3D toolkit - Diaries - Semi-structured interviews	Exploratory Generative Evaluative	- How do young people with limited income personalize their products? - What are the implications of the design exploration developed for the first scenario for design for personalization and sustainability? - How do the participants represented in the first persona personalize the design exploration? - How do the participants evaluate the personalization process and the personalized design exploration? - If required, how can the design exploration and the generative sessions be improved?	- Exploring the implications of the design details enabling personalization for design for personalization and sustainability. - Understanding the needs of the participants regarding the design exploration and personalization process. - Identifying the problems and potential solutions for improving the design exploration. - Identifying the problems and potential solutions for improving the generative research procedure.
	Design Process for the Second Design Scenario and Persona			
Generative Research Phase 3	**Individual generative sessions** - 3D toolkit - Diaries -Semi-structured interviews -Think aloud study	Exploratory Generative Evaluative	- What are the implications of the design exploration developed for the second scenario for design for personalization and sustainability? - How do the participants represented in the second persona personalize the design exploration? - How do the participants evaluate the personalization process and the personalized design exploration? - If required, how can the design exploration and the generative sessions be improved?	- Exploring the implications of the design details enabling personalization for design for personalization and sustainability. - Understanding the needs of the participants regarding the design exploration and personalization process. - Identifying the problems and potential solutions for improving the design exploration. - Identifying the problems and potential solutions for improving the generative research procedure.

Interviews. Interview is a widely used method in qualitative research for obtaining rich and in-depth data regarding a research topic (Rossman & Rallis, 2012). Interviews are conducted for understanding people's experience, opinions, attitudes, and perceptions about a topic or design (Hanington & Martin, 2012). Don and Petrick (2003) state that, user interviews provide in-depth data for design input through eliciting user needs and goals by focusing on how people carry out their current tasks independent of the product to be designed. In this way, user's cognitive model can be understood. Interviews can be used as the primary approach in a study or they can be combined with other methods as well (Rossman & Rallis, 2012; Robson, 2002).

Interviewing process can be strictly guided by predetermined questions or flexible and loosely outlined (Hanington & Martin, 2012; Ireland, 2003). Interviews for exploratory research can be flexible and unstructured, whereas in studies which require consistency between the cases, structured formats may be more suitable (Hanington & Martin, 2012). In semi-structured interviews, researcher has the control over the topics to be discussed, yet the participants can bring forward new directions (Cook, 2008). During semi-structured interviews, the researcher asks predetermined and open-ended questions to interviewees (Ayres, 2008). For in-depth interviewing, it is suggested to use an interview guide which involves the set of questions or topics to be asked to interviewees, ask open-ended, descriptive questions, let people talk and probe for details and more specific descriptions (Taylor, Bogdan & DeVault, 2016; Ayres, 2008).

In this study, semi-structured interviews were used in the preliminary study phase 1 and the three phases of the generative research. The reason why I adopted semi-structured approach is that, these studies were exploratory, and the main focus was an in-depth understanding of the participants' personalization experiences. For this reason, I used a loose outline for the interview questions, while being open to new dimensions brought forward by the participants. Table 3.6 summarizes the interviews conducted in different phases of the study. The preliminary study phase 1 was exploratory and the aim was in-depth understanding of the personalization process and people's experience, feelings and opinions about product personalization. To this end, semi-structured interviews were conducted with two people who personalized their

products. In the three phases of the generative research, semi-structured interviews were conducted during and at the end of the generative sessions to explore people's personalization experience with the design explorations generated for the study, and to obtain people's evaluations about the design explorations. Therefore, in the latter phases, interviews were used for both exploratory and evaluative purposes and through combining with other data collection methods such as diaries.

Table 3.6. Semi-structured interviews conducted during the study.

Preliminary Study Phase 1
Exploring people's personalization process and personalized products
Semi-structured interviews with two people who personalize their products
8.05.2013, about 30 minutes, Atılım Üniversitesi, participants' office
Generative Research Phase 1 – Follow-up Study
Exploring people's personalization experience with the generative tool
Semi-structured interviews with two people who have repairing and hand skills
During and after the generative study
26.5.2015, 28.5.2015, 31.5.2015, Participants' homes
Generative Research Phase 2
Exploring people's personalization experience with the generative tool
Semi-structured interviews with six university students who personalized the generative tool
After the generative study
29.12.2016, Yaşar University, Researcher's office
Generative Research Phase 3
Exploring people's personalization experience with the generative tool
Semi-structured interviews with six women who have embroidery skills and personalized the generative tool
After the generative study
Between 9.8.2017 - 22.8.2017, Participants' homes, ~ 30 minutes each

Questionnaires. Questionnaire is one of the methods used in survey research and can be conducted on paper or online (Julien, 2008). It aims to collect self-report information from people about their opinions, behaviours, feelings, and attitudes and they may be conducted for both exploratory and evaluative purposes. Questionnaires enable the researcher to collect large quantity of data (Hanington & Martin, 2012). In questionnaires, it is important to ask clear and understandable questions, since

clarifying questions during research is not possible for the researcher. Questionnaires may include open-ended, closed-ended and fixed-choice questions (Phellas, Bloch & Seale, 2011). Online questionnaires are cost-effective, fast and practical for researchers, since reaching a variety of respondents in different geographies is easy. They reach the respondents through a link to the web page of the questionnaire. The most important limitation of the online surveys is that, they can only be conducted with people who have internet access (Julien, 2008), and they may not provide an in-depth understanding regarding the latent needs and preferences of the participants. In this study, printed and online questionnaires were used in different phases. Table 3.7 summarizes the questionnaires conducted during the study.

Table 3.7. Details of the questionnaire studies conducted in the study.

Preliminary Study Phase 2 – Online questionnaire
Exploring daily products personalized by people and their personalization process
10.12.2014 - 22.12.2014, 17 participants
Generative Research Phase 1 – Printed questionnaire
Making people focus on the generative study and obtaining their evaluations about the personalization process with the generative tool
29.04.2015, Sen de Yap İzmir Maker Fair, 10 participants
Generative Research Phase 2 – Online questionnaire
Exploring the product types personalized in the post-use phase by university students and recently graduated people who have limited income, and their methods and goals of personalization
05.02.2016 - 6.03.2016, 13 participants
Generative Research Phase 2 – Printed questionnaire
Having the design workshop process evaluated by the participants
22.12.2016, Yaşar University, room C108, 6 participants

Two online questionnaires were conducted in the study, specifically in the preliminary study phase 2 and the generative research phase 2. The questionnaires were prepared using Google forms. The first online questionnaire was an extension of the preliminary study phase 1 and aimed to find out the personalized products by people, and people's methods and goals of personalization (Appendix B). The second online questionnaire, which included the same questions, focused on the personalized products by people who were represented in the first design scenario and persona, (university students with a limited income who share a home with their friends) and their methods and

motivations for product personalization (Appendix H). The use of online questionnaire was especially suitable for this group, since they commonly and frequently use computers, smart phones and internet. The aim in conducting online questionnaires was to reach a higher number of people who personalized their products, since finding people who engage in personalization in a limited geography was difficult. In addition, the online questionnaire conducted in the second phase of the generative research helped me find one of the participants participated in the generative sessions conducted in this phase.

Printed questionnaires were used in the design workshops carried out in the generative research phase 1 and 2. In the design workshop conducted in the maker fair, a printed questionnaire was used to make people focus on the generative study and obtain their evaluations about the personalization process (Appendix C). People responded the two questions at the beginning of the study, before beginning the personalization process, and responded the three evaluative questions after the session ended. In the design workshop conducted in the second phase of the generative research, I used a printed questionnaire at the end of the generative session to take students' evaluations of the design workshop (Appendix L). Questionnaires were suitable instruments for these workshops, since there was time constraint and they were quickly completed by the participants.

Observations. Being an exploratory data collection method, observation is based on careful examining and systematic recording of the phenomenon under investigation (Hanington & Martin, 2012). In qualitative research, it aims to capture what happens as it is, without predetermined structured categories. The data collected through observation are recorded as field notes (McKechnie, 2008) and can be used for design inspiration (Hanington & Martin, 2012).

In the study, I carried out observations during the design workshops and recorded my observations as field notes on a notebook (Figure 3.12). The purpose of these observations was to document participants' behaviour, actions and comments that attracted my attention as the event was happening. This helped me to remember what happened during the workshops, and reflect on my observations later.
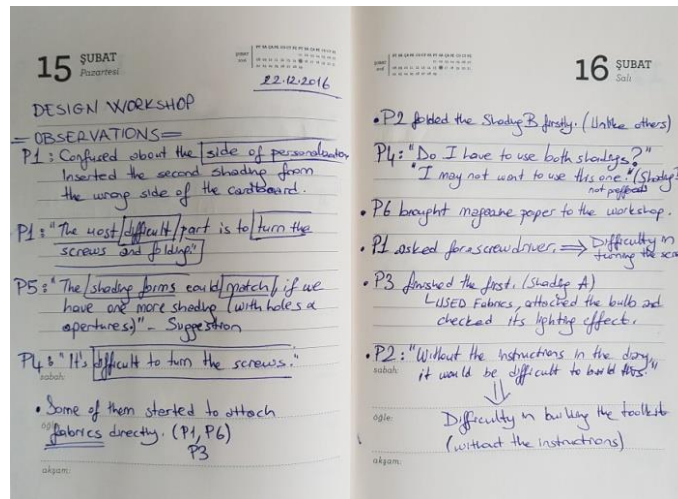
Figure 3.11. Observation notes taken on the diary.

Toolkits. Creative toolkits consist of a set of elements developed for generative research, which can be modelled and creatively played by the participants. They enable designers to understand people's thoughts, emotions, desires, which cannot be understood through verbal means and traditional research instruments (Hanington & Martin, 2012). Methods involving making things can enable people to creatively express themselves and the artefacts created by people can also foster designers' creativity (Sanders & William, 2001). Flexible modeling, Velcro modeling and collage kits involving two and three dimensional abstract elements which can be combined to create 3D models and collages are examples of toolkits used in design research. The kits can also be created using existing parts, constructive play materials such as Legos and real materials (Hanington & Martin, 2012). An improved and more structured version of Velcro modelling also exists, which is called experience reflection modelling (ERM). Developed by Turhan (2013), it is a method that can be used in the early phases of the design process, which combines various tools and techniques such as 3D modelling, interviewing and video recording to uncover the user knowledge.

In this study, design explorations developed for personalization were used as toolkits in the generative research phases. Figure 3.13 displays the toolkits used in the study. The purpose of using these toolkits in the study was to explore people's personalization experiences, and develop sustainable design considerations important for personalization. In addition to the toolkits, I provided additional materials and tools

such as fabrics, magazines, scissors, etc. for people to personalize the design explorations in the design workshops. The development process of each toolkit were explained in Chapter 6, 7, and 8. The toolkits personalized by the participants in each phase, enabled me to understand the needs of the participants while personalizing a product, to refine the design exploration, and develop design considerations for personalization.
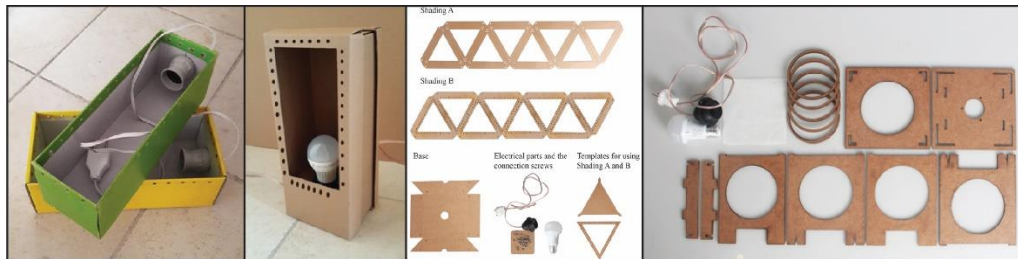
Figure 3.12. The toolkits used in the study.

Diaries. Diaries are instruments filled by the participants at certain periods of time and may involve text and photographs generated by the participants themselves (Hanington, 2003). Through diaries, designers can learn about people's thoughts, experiences, feelings and behaviours at key moments in daily life. Participants may be asked to fill the diary when they perform a certain behaviour, interaction or encounter a product or situation, or regularly such as at certain times of the day. Diaries generally include an explanatory page about the research subject, instructions on how and when to make an entry, a sample entry, and brief questions. Diaries can be used for exploratory purposes to understand users, or they can be used in generative research to prepare the participants for participatory sessions. In addition, they can also be used in evaluative research to obtain feedback from users. Diaries are filled with pen traditionally, but they can also be enhanced through the use of technology. People can take digital photos and send them via mail or they can upload them on a web-page, or applications for digital devices can be used to create diaries in digital format (Hanington & Martin, 2012).

In the individual generative sessions conducted in the first, second and the third phases of the generative research, printed diaries were used to enable the participants to

document their personalization process (Appendix G, M, P). The diaries were used both for exploratory and evaluative purposes. Through the diaries, I collected the details of the participants' personalization process, the problems they encountered, and their suggestions regarding the design exploration and the research process. I asked people to fill out the diaries, when they made an intervention to the design exploration. In addition, I also requested the photographs of each intervention, and they sent them to me via an online app (Figure 3.14). Each generative study enabled me to refine the diaries for the subsequent phase.
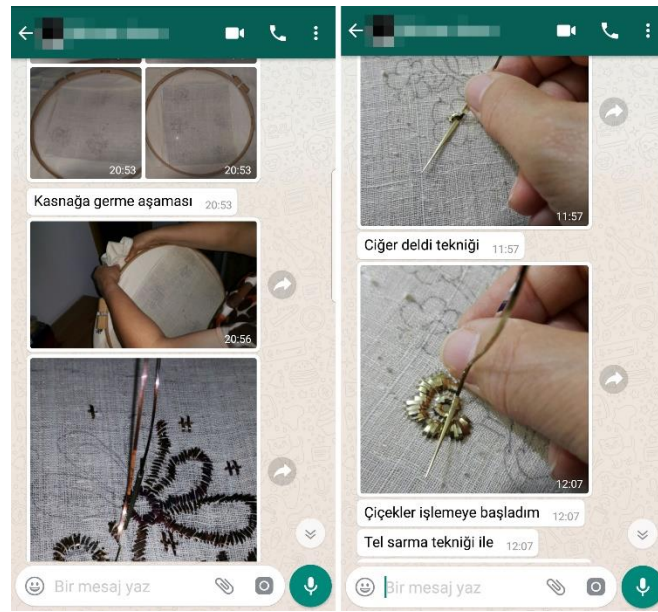
Figure 3.13. Photographs and explanations sent by a participant via the online app.

Think-aloud Protocol. Think-aloud protocol is an evaluative method originated from usability field, during which people verbalize the actions they do and what they think while performing a task. With this method, positive and negative aspects of a product or interface can be understood. In addition, think-aloud protocol enables researchers to observe the completion of a task by the participants. The protocol can be concurrent or retrospective. In the former, participants verbalize what they are doing while performing the task, and in the latter, they comment on what they did, after completing the task, while watching the recorded process (Hanington & Martin, 2012).

In this study, I conducted a concurrent think-aloud protocol with six participants in the third phase of the generative research, after the individual generative sessions and the follow-up interviews were completed. My purpose of using think-aloud protocol was to verify the information given by the participants in the diaries and the follow-up interviews for *triangulation*, observe the attachment and detachment process of the structure and the personalized parts on the design exploration by the participants. Since I could not observe the personalization process throughout the generative sessions, which took place at participants' homes, think-aloud study enabled me to see how the participants interacted with the design exploration. During the think-aloud study, I asked the participants to perform specific actions with the design exploration and talk about what they were doing. In addition, using an interview guide (Appendix R), I asked additional questions regarding their personalization process. The details of this study were given in Chapter 8.

3.5. Documentation of the Research Process

Throughout this *research through design* study, I documented my research process on a notebook and a sketchbook. In addition, voice and video recordings were used during different phases of the data collection process.

I used an A4 size sketchbook for documenting the sketches I made in the design process and the sketch analysis I carried out in the specific phases of the study. It also includes brief notes related to sketches and design considerations, and the photographs of the 3D models made during the design process (Figure 3.15).
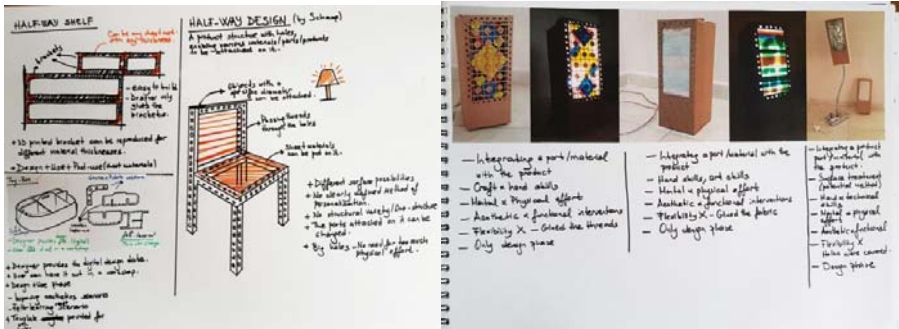
Figure 3.14. Sample pages from the sketchbook.

I recorded my reflections, observational notes, and discussions with my supervisor on an A5 size notebook (Figure 3.16). I used this notebook in parallel with the sketchbook and as ideas were generated, I wrote down related notes on this diary. To understand the relationship between the sketches and the reflections, I also noted the dates of the sketches on the pages of the diary and the sketchbook. This enabled me to see the phases of the research process as a whole.
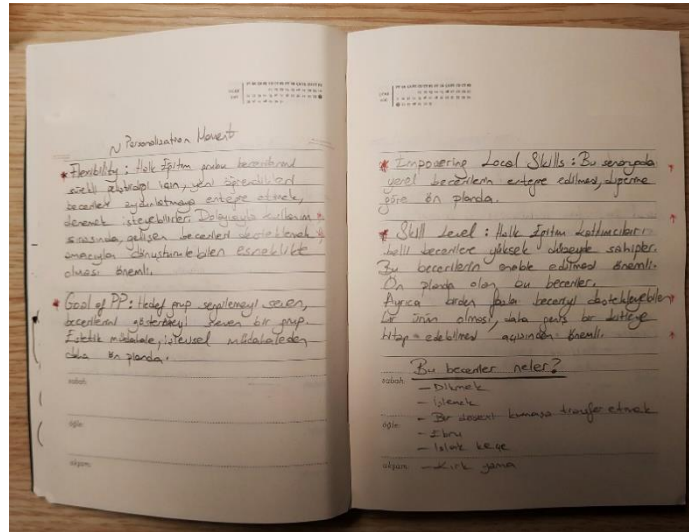
Figure 3.15. Notebook used for documenting the research process.

Audio recording was used for recording my discussions with my supervisor and for the semi-structured interviews conducted in different phases of the study. The design workshops and think-aloud protocol were video recorded.

3.6. Data Analysis

Data analysis procedures followed in the study were qualitative content analysis and cross-case analysis. Content analysis is the process of reducing data through a systematic procedure of coding and categorizing to find out themes and patterns in the data and the relationships between the themes (Julien, 2008). The data to be analyzed can be in the form of text, audio recordings, art works or artifacts (Julien, 2008; Krippendorff, 2004). Content analysis is used to deeply understand and describe a phenomenon through the interpretation of the data (Cho & Lee, 2014). During the

analysis, information that is explicitly stated and/or inferred through interpretation can be derived (Julien, 2008; Hsieh & Shannon, 2005). The general steps of content analysis include selection of unit of analysis, generation of categories, and formation of themes. In the end, content analysis results in themes explaining the meaning of the data, and answering the research questions (Cho & Lee, 2014).

In content analysis, coding procedure can be conventional (inductive), directed (deductive) or summative (Hsieh & Shannon, 2005). In this study inductive and deductive coding procedures were applied in different phases. Conventional content analysis aims to describe and gain a richer understanding about a phenomenon on which theory is limited. Codes are generated directly from the data, without using predetermined codes. Directed content analysis is used to validate or refine an existing theory. An initial coding scheme based on the key concepts in prior research or existing theory is generated before the analysis. Then, these concepts and also the ones emerge in the data are coded during the analysis (Hsieh & Shannon, 2005). In some of the phases (Generative research phase 1, 2, and 3) both inductive and deductive coding approaches were used. In these cases, inductive approach aimed to generate knowledge related to people's personalization process, and how to design for personalization in consideration of sustainability (Figure 3.17). Then, through deductive coding, personalization process and the design explorations were analyzed based on the dimensions of personalization important for sustainability, to evaluate the implications of the personalization process and the personalized products based on sustainability considerations (Figure 3.18).

Participant	Quote	Code	Category
P3	I attached magazine paper. I liked its lighting effect.	Lighting effect	Design considerations
	I love fashion and these pages involve the products I like. I have too many things to insert as waste materials, but I did not want to use them, since they have no importance for me. I used the pillow case, since I used it since my childhood and I love it. I also attached something I bought from Prague, which I love so much.	Self-expressiveness of the materials	Design considerations
	Then the light amount was high. So I added a square magazine paper on the top surface.	Light coming out of the top surface	Problems about the design details

Figure 3.16. Inductive analysis of the interview data.

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P	Personalized toolkit	Method of Personalization	Goal of Personalization	Skills	Effort	Nature of Intervention	Flexibility	Production Scales	PLS Phase
P3		Integrating a part/material with the product	Increasing product's fit to person, self-expression, cherishing memories	Hand skills	Mental & Physical	Aesthetic & Functional	More than once	Mass+mass	Design & Use

Figure 3.17. Deductive analysis of the personalized toolkits.

At the end of the generative research phase 3 (Chapter 8, Section 8.7), I conducted a cross-case analysis, which was adopted from the *grounded theory* framework, and compared the categories of each case in order to identify the commonalities, differences and, relationships between the cases in order to discuss the insights I gained from the whole research process.

Table 3.8 displays the data analysis procedures followed in each phase of the study and the research questions explored. The details of the data analysis in each phase were explained in the relevant chapters of the study (Chapters 4-9).

Table 3.8. Summary of the data analysis procedures followed in the thesis.

	Research Question(s)	Data Collection Methods	Data Analysis
Preliminary Study Phase 1	RQ 1: How does the product personalization process take place in daily life? RQ 2. What are the dimensions of product personalization?	Semi-structured interviews	Inductive CA
Preliminary Study Phase 2	RQ 1: How does the product personalization process take place in daily life? RQ 2. What are the dimensions of product personalization?	Online questionnaire	Deductive CA
Generative Research Phase 1	RQ3: How can product personalization be facilitated through design with a focus on sustainability? RQ 4. What would be the means of incorporating product personalization into design research for people's empowerment?	**Design Workshop** Printed questionnaire Toolkits Observations Video recordings	Inductive & Deductive CA
		Individual Generative Sessions Semi-structured interviews Diaries Toolkits	Inductive & Deductive CA
Generative Research Phase 2	RQ3: How can product personalization be facilitated through design with a focus on sustainability? RQ 4. What would be the means of incorporating product personalization into design research for people's empowerment?	Online questionnaire **Design Workshop** - 3D toolkit - Questionnaire - Observation - Printed questionnaire **Individual generative sessions** - 3D toolkit - Diaries - Semi-structured interviews	Inductive & Deductive CA
Generative Research Phase 3	RQ3: How can product personalization be facilitated through design with a focus on sustainability? RQ 4. What would be the means of incorporating product personalization into design research for people's empowerment?	**Individual Generative Sessions** - 3D toolkit - Diaries -Semi-structured interviews -Think aloud study	Inductive & Deductive CA
		Comparison of the findings of each case	Cross-case comparison

3.7. Trustworthiness

In qualitative research, trustworthiness of a study is measured by transferability, credibility, dependability, and confirmability. Transferability refers to applicability of the findings of a qualitative study to alternative contexts (Given & Saumure, 2008). Transferability can be increased through providing thick description regarding the context, sampling and the research design to make the readers to decide whether the study is transferable or not. In addition, purposeful sampling which is selecting the most representative participants for the research design, can increase the transferability of a qualitative study (Jensen, 2008). In this study, transferability was achieved through thick description of the data, methodology, sampling, settings and procedures. In addition, rationales for selecting the specific participants were explained for meeting the criteria of theoretical sampling. Credibility implies the consistency between participants' responses and the researcher's interpretations of them, and it is related to whether the research design make sense for the participants and the reader (Jensen, 2008). Triangulation, member checking, displaying quotations relevant to the interpretations, and peer debriefing are the ways of increasing credibility of a qualitative study (Cho & Lee, 2014). In this study, credibility was tried to be increased through using various data collection methods for triangulation. For instance, in the two phases of the preliminary study, the same research question was explored through different data collection methods, which are semi-structured interviews and online questionnaire. In addition, in the generative research phases, data collected through diaries were verified by the follow-up interviews and for the final phase, both using interviews and think-aloud protocol. Moreover, I provided quotations from the participants' responses during explaining the findings resulted from the data analysis. Dependability relates to supplying adequate information on the research methodology so that others can follow the same procedure, reflecting on the procedures followed in the study, and being aware of and tracking and explaining the changes made in the study based on the changing context in naturalistic inquiry (Jensen, 2008). In this study, I thoroughly described the procedures I followed in the

study in detail, I reflected on these processes, I documented my research process in a notebook, and explained the changes I made in the methodology due to changing research context in the different phases of the study. Confirmability deals with the question of to what degree the research results are based on the expressions of the participants and not changed due to researcher's bias, and how objectively the study was designed and conducted. Triangulation, explaining the researcher's effects of his/her beliefs and limitations in the study, detailed description of the methodology, and audit trail are the ways of increasing confirmability in qualitative research (Shenton, 2004). In the study, I used methodological triangulation and explained the limitations of the study to address confirmability.

CHAPTER 4

PRELIMINARY STUDY PHASE 1

The aim of the first phase of the preliminary study is to understand the product personalization process in daily life in detail. More specifically, how and why people personalize their products, how the personalization process begins, develops and ends, and how and to what extent people personalize mass produced products are the main focus of the preliminary study phase 1. The literature review provided me with a theoretical background on the various dimensions of product personalization, general goals for personalization, the effects of personalization, and the potential ways of designing for personalization proposed by designers. However, the studies in the literature mainly focus on a certain aspect or phase of the product personalization process such as the effects of personalization on people and products at the end of the process or the important dimensions of personalization for strong user-product relationship. I realized that, there was a need to understand the product personalization process holistically through investigating all phases of the personalization process and factors involved in the personalization experience. In addition, it was important for me to understand the methods and skills used during personalization process, people's needs for product personalization and to what extent these needs can be met through mass produced products to develop design considerations for the design phase of the study. Finally, I explored whether other dimensions of product personalization exist or not, in addition to the dimensions specified in the literature. To this end, the first and the second research questions of the study was explored in detail in this phase.

1. How does the product personalization process take place in daily life?
2. What are the dimensions of product personalization?

4.1. Sampling

To understand how product personalization takes place with everyday products, I needed to find people who personalized their products. To this end, the sampling procedure was criterion sampling, and people who met the criterion of engaging in product personalization were interviewed.

The study was carried out with two female participants, who were fashion design educators in a private university, and at the age of 52 and 60 respectively. These two participants were selected for the study for three reasons. Firstly, they had personalized objects in their offices and homes, secondly they had design background, which helped me to communicate easier and conduct the interviews more productively, and finally, they were creative individuals, who had a range of skills, such as design skills, craft skills, and hands-on skills, which enabled me to explore the skills involved in their personalization process further.

4.2. Data Collection

This study was an exploratory study, and in-depth understanding of the personalization process was the main purpose. For this reason, I collected data through semi-structured interviews focusing on the products personalized by the participants and their personalization process. Both interviews were conducted on May 8, 2013, in the participants' offices in Atılım University, and each lasted about half an hour.

Before conducting interviews, I explained the aim of the study to the participants, defined product personalization, asked them for the products they personalized, and requested the photographs of these products as specified in the interview schedule (Appendix A). Each participant sent the photographs of their personalized products to me via e-mail before the interviews, and I conducted the interviews through using the photographs of the products.

I prepared the interview questions considering the research questions and divided them into two groups. The first group of questions explored the initial attributes of the products, which enabled me to learn the production method and the initial aesthetic, functional and other product qualities that would be important in understanding the personalization process and the final product. The second group of questions was directly related with the personalization process, and these questions were the main questions that would provide answers for understanding the personalization process in depth. Although I conducted the interviews using the predetermined interview questions, I also prompted the participants when I needed more explanation about their responses, and I also paid attention to the new dimensions brought forward by the participants during the interviews. During the interviews, audio recording was used, and additional notes were taken on the interview schedule.

4.3. Data Analysis

I analyzed the data through inductive content analysis. All the codes were generated from the data without any assumptions and pre-determined codes, since the purpose of the study was to gain a rich understanding about the product personalization process.

After verbatim-transcribing all the data gathered from the interviews, I read them through to have a general understanding about the participants' responses. Then I carried out an inductive coding process, reading the transcripts line by line. I identified the initial categories and their properties, and then I coded the second transcript based on these emerging codes. When data did not fit in the existing categories, I added new ones for them. During the coding process, besides coding the manifest content, which was explicitly stated by the participants, I also looked for the implicitly stated meanings in the data, which was the latent content. I used MS Office Excel for the coding process. I transferred the units of analysis (paragraphs, sentences used by the participants) in an Excel sheet in relation to the relevant participant and the product.

Then I coded these data units, formed the sub-categories through grouping and revising the codes, and finally generated the categories and themes (Figure 4.1).

Participant	Product Code	Product	Quote	Code	Sub-category	Category	Theme
P1	PR1	Dresser	*I attached the handles later.*	Mounting parts on a product	Integrating a part/product with another product	Method of personalization	Personalization process
P1	PR1	Dresser	*In time, I started to use the pointed parts on the top to hang my necklaces, bags and, cigarette cases*	Hanging parts on a product	Integrating a part/product with another product	Method of personalization	Personalization process
P1	PR1	Dresser	*I can change the color if the surface gets damaged in the future.*	Surface treatment (painting wood)	Surface treatment	Method of personalization	Personalization process
P1	PR1	Dresser	*Maybe I could mount a sliding drawer apparatus in the future.*	Mounting parts on a product	Integrating a part/product with another product	Method of personalization	Personalization process
P1	PR2	Refrigerator	*I was sticking the magnets I brought from abroad and children's paintings etc.*	Sticking parts on a product	Integrating a part/product with another product	Method of personalization	Personalization process
P1	PR2	Refrigerator	*I painted circles in different sizes. I put my magnets on it again.*	Surface treatment (spray painting)	Surface treatment	Method of personalization	Personalization process
P1	PR2	Refrigerator	*If I get bored, maybe I can paint it black, and make shapes in white or a light color using a template.*	Surface treatment (spray painting with templates)	Surface treatment	Method of personalization	Personalization process

Figure 4.1. Analysis of the preliminary study phase 1 in Excel.

4.4. Results of the Preliminary Study Phase 1

The analysis of the data revealed nine categories, and these were grouped under three main themes, which are *product, person*, and the *personalization process*. These are also the three components of the concept of product personalization. Table 4.1 summarizes the themes, categories and sub-categories emerged in the study.

Table 4.1. Themes and categories emerged in the preliminary study phase 1.

Product	Personalized product category	Furniture, white good, package, and a decorative object
	Product attributes enabling personalization	Material properties, product size, product color, local production, oldness of the product
	Personalized product's life span phase	Design, use, post-use
Person	Goal of personalization	Increasing product's fit to person, saving a product for environmental concerns, self-expression, and cherishing memories
	Benefits of personalization (product-related)	Product's fit to person, hedonic benefits, perceived uniqueness, and self-expressiveness
	Benefits of personalization (process-related)	Hedonic benefits, creative fulfillment, and emotional connection with the product

Personalization process	Method of personalization	Integrating a part/material with the product and surface treatment
	Nature of intervention	Aesthetic and functional
	Skills used in the personalization process	Hand skills and craft skills
	Effort spent in the personalization process	Mental effort and physical effort

4.4.1. Product

Three categories emerged under the theme of *product*, which are *personalized product category*, *personalized product's life span phase*, and the *product attributes enabling personalization*.

4.4.1.1. Personalized Products

The four personalized products were in four different product categories, which were furniture, white goods, package and a decorative object. The products personalized by the participants (Figure 4.2-4.5) were as follows:

Figure 4.2. Participant 1 – Product 1.

The dresser in Figure 45 was produced by a craftsman locally by bringing two separate dressers together. The participant indicated that, she had bought it as a half-way

product, without the knobs, since the modern looking knobs offered by the craftsman were in contrast to the traditional look of the furniture. After purchase, she attached ceramic knobs in different colors and forms to the dresser. This is an example of *integrated scales of design and production*, since the user integrated the dresser which is produced at the craft scale with mass produced knobs.

Figure 4.3. Participant 1- Product 2.

The surface of this 21-year-old refrigerator (Figure 46) was spray painted by the participant in 2012, since it lost its new appearance as a result of the yellowish stains on its surface. The participant also continued to personalize it through sticking magnets and paintings after painting it.

Figure 4.4. Participant 2 – Product 1.

The flowerpot (Figure 47), which was made of clay, was repaired by its owner using plaster, painted with acrylic paint, and then decorated with bird figures cut out of paper napkins. Participant 2 decorated this cardboard box (Figure 48) with felt, fabric and leather pieces, after using it while moving her house, and she used it for storage.

Figure 4.5. Participant 2 – Product 2.

4.4.1.2. Product Attributes Enabling Personalization

Product attributes enabling personalization listed by the participants as the *material properties, product size, product color, local production,* and *oldness of the product*. *Material properties* are the major product attributes that enable people to personalize the products. *Paintability of the metal and clay* (refrigerator and pot)*, magnetism of the metal* (refrigerator)*, adhesional surface of the cardboard* (box), and *repairability of the clay* (flower pot) were mentioned as the material attributes enabling personalization. *Product size* was mentioned as an enabling attribute for the personalization of the refrigerator and the cardboard box. The participants indicated that, since the surface size was large enough, they could more easily make interventions. The solid white *color* of the refrigerator was mentioned as an attribute enabling personalization by Participant 1, since it was easy to color through painting. Participant 1 stated that, she purchased the dresser as a half-way product (without its knobs) from a local manufacturer, and this feature enabled her to personalize it in the

design phase. Finally, for the *refrigerator*, *its age,* which was 21 years, enabled Participant 1 to paint it comfortably. The participant indicated that, if it was new, she would not temp to paint it. The participants also mentioned some limitations they encountered during their personalization process, which are not directly related with the attributes of the products they personalized, but related with the materials and parts they used for personalizing their products. The lack of variety in mass produced furniture knobs, and unhealthiness of spray painting at home were mentioned as personalization limitations by the participants.

4.4.1.3. Personalized Product's Life Span Phase

Design, use and post-use phases were the main phases of the product life span in which the products were personalized. Table 4.2 summarizes the product life span phase that the products were personalized. The dresser was personalized, firstly in the design phase, through attaching knobs, and then in the use phase, through hanging bags and necklaces on it. The refrigerator was personalized in the use phase. The flower pot and the cardboard box were personalized in the post-use phase.

Table 4.2. Product life span phase that personalization occurs.

	Design	Use	Post-use
Dresser	+	+	-
Refrigerator	-	+	-
Flower pot	-	-	+
Cardboard box	-	-	+

4.4.2. Person

This theme refers to user-related dimensions of product personalization. The categories emerged under the theme of *person* are *goal of personalization* and *benefits of personalization. Goal of personalization* refers to the reasons why a person personalizes a product, and *benefits of personalization* refers to the benefits received as a result of product personalization.

4.4.2.1. Goal of Personalization

Participants' responses revealed four main goals of personalization, which are *increasing product's fit to person*, *saving a product for environmental concerns*, *self-expression*, and *cherishing memories*.

Increasing product's fit to person involves two sub-categories, which are *improving aesthetic qualities* of the product, and *improving functionality* of the product. During the interviews, *improving aesthetic qualities* appeared to be as the major goal for personalization, since it was mentioned for all of the products. Painting the refrigerator, attaching knobs which fit to dresser's craft details, painting and decorating the flower pot, and covering the cardboard box with fabrics were the interventions participants made for improving the aesthetic qualities of these products. Participant 1 also made an intervention to *improve the functionality* of the dresser through attaching jewellery and bags on it. In addition, Participant 2 stated that, she would *improve the functionality* of the cardboard box through sticking Velcro on the top surface. *Saving a product for environmental concerns* was specified as another major goal of personalization, and it was mentioned for refrigerator, pot and cardboard box. The participants mainly indicated that, it would be more meaningful to save a product that could still function instead of discarding it for saving the environment. Participant 1 also indicated that, she makes interventions to her products to add something reflecting herself. To this end, *self-expression* can be listed as another goal of personalization. Finally, Participant 1 stated that, she attached magnets she bought from abroad, and pictures of her children on the refrigerator to *cherish* her *memories*, which is identified as a goal of personalization in the study.

Some of the goals emerged in the study such as *increasing product's aesthetic or functional fit to person* directly originate from the product characteristics, such as wear in the product, or a product part which does not fit to person's taste, or which do not meet his/her functional needs. On the other hand, some of the goals such as *self-*

expression and *cherishing memories* originate from the personal needs and values, independent from the product. For these goals, the product becomes a tool for realizing these goals. For instance, sticking magnets and pictures on a refrigerator is a goal coded as *cherishing memories*. In this case, it is the large metal surface that meets this goal, not the refrigerator. Therefore, there may not be a direct relationship between people's goals of personalization and the personalized product's aesthetic or functional qualities. On the other hand, a relationship may exist between people's characteristics and values, and their interventions. Mugge et al. (2009b) examplifies this proposing that, people who need a high level of self-expression may prefer to make aesthetic interventions on products. In this study, a similar relationship was observed for the Participant 1, who stated that, she liked to express herself via the products, and so she changed the knobs of her dresser, which was mainly an aesthetic intervention. Moreover, some of the goals co-exist in the personalization process of products. For instance, while Participant 2 wanted to personalize the broken flower pot to save it for environmental concerns, she also aimed to improve its functional and aesthetic features.

4.4.2.2. Benefits of Personalization

Benefits of personalization are grouped under two categories, which are *product-related* and *process-related benefits*.

Product Related Benefits

Product-related benefits are the benefits a person gains through the product qualities that are improved as a result of the personalization process. These are *product's fit to person*, *hedonic benefits*, *perceived uniqueness*, and *self-expressiveness*.

Product's fit to person increases in two ways, which are through *improved aesthetic qualities* and *improved functional qualities* of the product. Both of the participants stated that, all of the four products' aesthetic qualities were improved as a result of the

personalization process, and in this way their products became more suitable to their taste. Through personalization, the form, color and overall unique appearance were improved. In addition, Participant 1 stated that, through attaching her bags on the dresser, she improved the functionality of the product, and Participant 2 indicated that, through repairing the flower pot with plaster, she improved its functionality.

Hedonic benefits are the emotional benefits that a person gains via the result, the personalized product. *Happiness* was the hedonic benefit that the participants obtained via the personalized products. The participants mentioned happiness as a benefit for the dresser, refrigerator, and the flower pot with the following responses:

Participant 1: "When I look at the dresser, I feel happy. Using the dresser in this way (through attaching bags and jewellery) makes me happy.
Participant 2: "The result I obtained (after the personalization process) made me happy".

One of the participants mentioned *perceived uniqueness* as a benefit resulting from the personalized product, and it appeared in two ways, which are *perceiving the personalized product unique*, and *perceiving the self unique via the product*. Firstly, the participant thought that the refrigerator she personalized became unique after personalization. Secondly, she indicated that, she felt special via the dresser saying that "I feel special and different." In addition, she felt unique via the refrigerator she personalized stating that, "No one has this refrigerator".

Finally, *self-expressiveness* was mentioned as a benefit by Participant 2. She thought that, the colors of the personalized flower pot and the cardboard box expressed herself stating that, "The colors (of the flower pot) express my personality" and "It became a box colorful like me".

Process Related Benefits

Process-related benefits are the benefits a person obtains through the personalization experience. These are *hedonic benefits, creative fulfillment,* and *emotional connection with the product*.

Besides the *hedonic benefits* gained through the personalized product mentioned above, Participant 2 indicated that, she felt *pleasure* during the personalization experience. The following responses reflect this type of benefit:

"While I am making this (flower pot), I enjoyed the process very much".

"When I was covering the box, I enjoyed very much".

Creative fulfillment is another proces-related benefit, which refers to the satisfaction and proud the participants experience as a result of achieveing something. Participants expressed their creative fulfillment through the following responses:

Participant 1: "I feel proud when people say "how nice, you made this dresser beautiful".

Participant 1: "This idea belongs to me (painting the refrigerator). I made this".

Participant 2: "Producing an idea satisfied me".

The participants provided responses indicating their *emotional connection with the products* they personalized. Based on the participants' responses, this emotional connection seems to result from the personalization process. However, the personalized product itself might also be influencing this emotional bonding, as indicated by Mugge et al. (2009a). The following responses indicate the participants' emotional connection with their products.

Participant 1: "There is an emotional connection between me and the dresser. I embrace it since I personalized it."

Participant 2: "I spent effort on this cardboard box. For this reason, it is valuable to me."

The benefits emerged in this study overlap with the studies in the literature, which are about the benefits and perceived value received through the mass customization process (Merle, Chandon & Roux, 2008; Schreier, 2006). During the analysis, I used the category names in these studies for some of the benefits. Schreier (2006) lists the benefits related to mass customization as the *functional benefit* (improved fit between the person and the customized product), *perceived uniqueness of the customized product*, the *process benefit* (benefits obtained through the customization process), and the *pride of authorship* benefit (one's feeling of pride due to designing a product). Elaborating Schreier's categories, Merle et al. (2008) categorizes two types of value received through mass customization which are mass-customized product value and mass-customization experience value. The former includes *utilitarian value* (improved fit between the person and the customized product), *interpersonal differentiation* (feeling different from others due to customized product), and *self-expressiveness* (product's ability to express the person). The latter includes *hedonic value* (pleasure, excitement, etc. felt during the customization process) and *creative fulfillment* (feelings of pride, satisfaction and accomplishment due to creative involvement in the customization process). The comparison of these two studies and the preliminary study phase 1 were summarized in Table 4.3.

Table 4.3. Comparison of the benefits of product personalization and mass customization.

Schreier (2006)	Merle et al. (2008)	Preliminary Study Phase 1
Functional benefit	Utilitarian value (Product-related)	Product's better fit to person (Product-related)
Perceived uniqueness of the self-designed product	Interpersonal differentiation (Product-related)	Perceived uniqueness (Product-related)
-	-	Hedonic benefits (Product-related)
-	Self-expressiveness (Product-related)	Self-expressiveness (Product-related)
Process benefit	Hedonic value (Experience-related)	Hedonic benefit (Process-related)
Pride of authorship	Creative fulfillment (Experience-related)	Creative fulfillment (Process-related)
		Emotional connection with the product (Process-related)

Product's fit to person emerged as a product-related benefit in this study corresponds to Schreier's *functional benefit* and Merle et al.'s *utilitarian value*. Unlike the two mass customization studies, which associate the hedonic benefits only with the customization experience, in this study *hedonic benefits* resulting from both the personalized product and the personalization process were identified. *Perceived uniqueness of the product and the self* also correspond to Schreier's *perceived uniqueness* category and Merle et al.'s *interpersonal differentiation* category. *Self-expressiveness*, which was identified as a value in the study of Merle et al. (2008), also appeared as a product related benefit in this study. *Process-related hedonic benefits* found in this study correspond to Schreier's *process benefit of self-design* and Merle et al.'s *hedonic value*. Creative fulfillment corresponds to Schreier's *pride of authorship benefit* and Merle et al.'s *creative fulfillment*. In addition to these, it was found that, product personalization process resulted in a stronger emotional connection between the person and the product.

4.4.3. Personalization Process

This theme involves what happens during the personalization process. The categories grouped under this theme include *methods of personalization, nature of intervention*, *skills used in the personalization process*, and *effort spent in the personalization process*.

4.4.3.1. Method of Personalization

The participants personalized the products using mainly two different methods. These are *product personalization through integrating a part/material with the product* and *surface treatment*.

Integrating a part/material with the product

This method refers to integrating a part/material with another product in a permanent or temporary way. It is found that, a product or a part is integrated with a product in

diverse ways, such as through assembling a detachable part on a product (dresser knobs), sticking parts on the surface of another product using adhesives (flower pot, cardboard box), and sticking magnets on a metal surface (refrigerator). Figure 4.6 displays the products personalized through this method.

Figure 4.6. Integrating a part/material with the product.

In the dresser case, Participant 1 attached locally available knobs on the dresser, and she hung her bags and necklaces on it. The same participant personalized her refrigerator through this method, attaching magnets and pictures on the surface of it. In both case, the interventions are temporary, and the participant can change the personalized parts whenever she wants. Participant 2 stuck bird figures cut out of napkins on the flower pot, and stuck fabric, felt figures and leather on the cardboard box. These are the examples of *integrating a part/material with a product* in a permanent way.

Surface Treatment

Surface treatment refers to the interventions that the participants make through changing the surface quality of an object in a permanent way. Figure 4.7 displays the products personalized through this method. One surface treatment technique was elicited from the interviews, which is *painting the surface* of a product. Refrigerator was personalized through spray painting, and flower pot was personalized through painting with acrylic paint after being repaired with plaster.

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Figure 4.7. Products personalized through surface treatment.

Painting appears to be a common personalization method for products, since it was mentioned by the participants as applicable to most of the products (i.e. refrigerator, dresser, flower pot, food cans). It is revealed that painting is applied completely or partially, and during painting, *acrylic, spray or wood paints* can be used, and it can be applied *with templates* to create patterns. *Wood, metal, clay, plastic and cardboard materials* were mentioned as paintable materials by the participants.

The participants also talked about the potential methods that they could apply to the objects in the future. These methods were also among the two categories of methods of personalization emerged in the study. Participant 1 talked about painting the refrigerator in black and applying the spray paint patterns using a template (*surface treatment*). She also suggested the integration of mass produced drawer rails to the furniture to easily open and close the drawers (*integrating a part/material with the product*). For the cardboard box, Participant 2 suggested sticking Velcro to open and close the lid (*integrating a part/material with the product).*

Although some of the methods (e.g. changing a knob of the dresser) could be applied by anyone using basic skills, some of them (e.g. napkin decoupage, selecting and applying acrylic paint) required some experience, knowledge and craft skills. To this end, it can be proposed that, the methods of personalization may be defined and influenced by people's skills and knowledge. Thus, while enabling product

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personalization through using certain methods, designers need to consider the skills of the target people.

Another finding of the study was that, while attaching product/parts on another product might be permanent or temporary, surface treatment was an intervention, which was permanent. This implies that surface treatment methods and the methods involving permanent attachment of parts on a product may affect the flexibility of product personalization, since the personalized part can be changed only once. This may be undesirable from a sustainability viewpoint, since the product loses its adaptability for changing needs and tastes, which may impact the longevity of the product.

Another factor that influenced the participants' methods of personalization was the product characteristics. For instance, the knobs could be attached on the dresser, since there were defined places for the knobs, and the refrigerator could be decorated with magnets, since its surface was metal.

4.4.3.2. Nature of Intervention

Nature of intervention refers to whether the intervention is aesthetic or functional. The aesthetic and functional interventions were defined as *goal of personalization* in the study of Mugge et al. (2009b). However, the goals of personalization may be beyond the aesthetic and functional goals. Therefore, I preferred to code the kind of interventions people made to the products as *nature of intervention*. While aesthetic intervention refers to interventions which change the appearance of the product, functional interventions are the interventions which improve or change the function of the product. In the study, aesthetic interventions appeared to be more common than the functional ones, as improving aesthetic qualities of the products was the major goal for both participants and for all the products. In addition, Participant 1 made a functional intervention on the dresser, through attaching her bags and jewellery on it,

which added an extra function to the dresser. Participant 2 also stated that, she considered adding Velcro to close the box, which would be a functional intervention.

The type of interventions is directly related with people's goals of personalization. Some of the relationships between people's goals of personalization and their interventions are apparent. For instance, if the goal is to improve the aesthetic qualities of the product due to wear, naturally, an aesthetic intervention is made by the person. However, the exploration of the relationship between people's more personal goals (such as self-expression or cherishing memories) and the nature of their interventions may provide clues for developing design details for personalization accordingly. Moreover, the skills of people and the methods they use during personalization process also determine the nature of their intervention. For instance, Participant 2, who has the craft skill of napkin decoupage used this as a method on the flower pot, which was an aesthetic intervention.

4.4.3.3. Skills

During the personalization process, the participants used certain skills at different levels. I categorized these skills as *hand skills*, and *craft skills*. I defined the hand skills as the skills that require the use of a tool at a basic level and at a certain level of precision. In this study, attaching a knob to a dresser, spray painting a refrigerator, and covering a cardboard box through cutting fabrics in a certain dimension can be examples of this type of skills. Craft skills refer to the skills that require a certain level of familiarity with and knowledge of materials. In this study, using plaster to repair a flower pot, painting it with an acrylic paint, decoupaging napkins are used as craft skills.

The participants used some methods of personalization as an extension of these skills during the personalization process. While designing for personalization, the capabilities and skill levels of target people become important, since when the skill

level required in the personalization process exceeds the target people's capabilities, the process may result in frustration (Mugge et al., 2009b). Exploring the skills of different people is also important in terms of identifying the local skills that can be enabled during the personalization process by designers to design for sustainability.

4.4.3.4. Effort

During the personalization process, participants spent *mental* and *physical effort* at varying levels for different products. In the study, it appears that, all of the products require mental and physical effort for their personalization. In all of the products there are design decisions based on the users' tastes and preferences, and as the participants also become makers, they spend physical effort while making the products. Especially, the personalization process of the flower pot and the cardboard box required a certain level of physical effort for painting the pot, cutting materials in certain dimensions, and sticking them on the surfaces of the objects. Considering these cases, it can be proposed that, people who have craft skills tend to spend a higher level of physical effort during the personalization process. This supports the study of Mugge et al. (2009) suggesting that, people who are interested in DIY may be more willing to spend physical effort, and those who have expertise in a certain product category may tend to spend more mental effort during product personalization process. Thus, the relationship between people's skill levels and their tendencies to spend mental and physical effort during the personalization process can be considered while designing for personalization.

4.5. Discussion

The main purpose of this study is to understand how the product personalization process takes place in daily life, and which factors are involved in this process. The study reveals that, product *personalization process* begins with people's *goals for personalization*, which are people's needs to be met through personalization. Then, people make *interventions* to products using their *skills* and *knowledge*, using *methods*

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that are the extension of these skills and knowledge, and they spend *mental and physical effort* during this process. At the end of the process, people obtain *benefits* resulting from the personalized product and the personalization process.

I classified the findings of the study under three themes, which are *product*, *person*, and the *personalization process*. Some of the categories under these themes, which are *personalized product's life span phase*, *goals* and *benefits of personalization*, *method of personalization*, *nature of intervention*, *skills*, and *effort* emerged as the dimensions of personalization. Thus, in addition to the dimensions of personalization in the literature, this study revealed additional personalization dimensions. The two other categories emerged in the preliminary study phase 1, which are *personalized product categories* and *product attributes enabling personalization* may not be regarded as the dimensions of personalization, since they were specific to the products discussed in the study.

As discussed in Chapter 2, Section 2.2.2, the study of Mugge et al. (2009b) reveals seven dimensions of personalization. These dimensions may offer various design strategies for product personalization (Mugge et al, 2009b). Among these dimensions, *goal of personalization, mental* and *physical effort,* and *personalization moment* were in common with the categories emerged in the preliminary study phase 1, corresponding to the dimensions of *nature of intervention, effort,* and *personalized product's life span phase* respectively. *Initiation*, *deliberateness*, and *flexibility* dimensions, which existed in the study of Mugge et. al (2009b), did not emerge in this study, since all of the interventions were user initiated, deliberately made, and the products were not flexible to personalize more than once, since they were not designed for personalization. In addition to the dimensions in the literature, new dimensions emerged in this study, which are the *skills* used during the personalization process, the *goal of personalization*, *benefits of personalization*, and the *method of personalization*. Table 4.4 displays the comparison of the dimensions of personalization emerged in this study and the study of Mugge et. al. (2009b).

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Table 4.4. Comparison of the dimensions of personalization.

Mugge et al. (2009b)	Preliminary Study Phase 1
Personalization moment	Personalized product's life span phase
-	Goal of personalization
-	Method of personalization
Goal of personalization	Nature of intervention
-	Skills used during personalization
Mental effort/physical effort	Mental effort/physical effort
-	Benefits of personalization
Initiation	-
Deliberateness	-
Flexibility	-

The three categories emerged under the *product* theme are *personalized product category*, *personalized product's life span phase*, and *product attributes enabling personalization*. Considering the *personalized product categories* emerged in the study, which are furniture, white good, package and a decorative object, it is not possible to state that certain product categories enable a higher level of personalization. However, some product attributes were stated to be helpful by the participants during the personalization process, such as *material properties, product size, product color, local production,* and *oldness of the product*. These product qualities were considered in the design phase, while developing the generative toolkits, which were explained in detail in Chapter 6, 7, and 8. In addition, the study reveals that, product personalization can take place in design, use and post-use phase of the product life span.

The categories emerged under the theme of *person* include *goal of personalization* and *benefits of personalization*. The study revealed that, people personalize their products to *increase the product's fit to themselves*, *to save a product*, for *self-expression*, and to *cherish memories*. Among these goals, improving the aesthetic qualities of a product, which is a sub-category of *increasing the product's fit to person,* is the most mentioned goal by the participants, which was stated for all of the products. In addition, it is found that, a person may personalize her/his product to achieve more than one goal. Moreover, the study reveals that, *increasing the product's fit to person*

is a function and aesthetic-related goal, and the three remaining goals are personal goals. This indicates that, a product may be personalized not only for improving its qualities but also for personal reasons independent from the product qualities. Understanding people's goals of personalization may provide insigths into people's needs, which is important when designing for personalization. To this end, exploration of these goals with more people may reveal some common needs for personalizing the products. *Benefits of personalization* found in the study involve *product-related* and *process related benefits*. These benefits appear to be directly related with the studies regarding the benefits and perceived value received from the mass customization. In addition, the study reveals that, the emotional connection between the participants and their products are strengthened through the personalization process.

The categories classified under the theme of *personalization process* involve, *method of personalization*, *nature of intervention*, *skills*, and *effort*. The study reveals two main methods of personalization, which are *integrating a part/material with the product* and *surface treatment*. The former one can occur in a permanent or temporary way, whereas the latter is a permanent intervention, which may affect the flexibility of product's personalization more than once. When parts on which surface treatment applied cannot be changed, this may negatively influence product's adaptability to changing needs and tastes, which may not be desirable from the sustainability viewpoint. Moreover, it is found that, the methods of personalization may be influenced by the skills and knowledge of people. Thus, while designing the methods of personalization, the skills of the target people need to be considered. The exploration of the personalized products with a larger sample group may reveal more different methods of personalization, which may help designers to select methods that are familiar with target people, that enable the use of local skills, and that are more in line with the sustainability principles. The study also reveals that, the *nature of intervention* during the personalization process can be *aesthetic* and/or *functional*. Moreover, the skills used in the personalization process by the participants involve the *hand skills* and the *craft skills*. Since the study was conducted with two participants,

who have similar backgrounds and skills, it may be necessary to explore the skills that people have with more participants. To this end, expanding the study may reveal diverse skills used by people during the personalization process. Finally, it is found that, the participants invested both *mental* and *physical effort* during the product personalization process.

This study provided me with an in-depth understanding of the personalization process. It revealed new dimensions for personalization, and I could also make an initial attempt to establish the relationships between these dimensions. Firstly, people's needs appear as *goals of personalization*, and these goals can determine the *nature of intervention* and the *methods used in the personalization process*. *Methods of personalization* are also determined by people's skills and knowledge, and the product attributes. Moreover, *methods of personalization* can affect the *flexibility* of the product for personalization more than once. The study also reveals that, people's *skills, knowledge and expertise* may affect their tendencies to spend *mental* and *physical effort* during the personalization process, the *methods of personalization* and the *nature of intervention*.

From the sustainability viewpoint, the results of the study indicate that, product personalization results in an emotional connection between the product and the person, which can positively influence the product lifespan. In addition, Participant 2 repaired and personalized a broken flower pot and a cardboard box which were in the post-use phase. Through the participant's interventions, the two products became functional and usable again, and the lifespan of them was prolonged. However, for some products, for which energy consumption is critical such as the refrigerator, personalizing the product in the use phase and extending its lifespan may not be a meaningful action. To this end, while developing personalization strategies, the product category also needs to be considered.

Based on the findings of this phase, I decided to reiterate this study with the involvement of more people, to diversify the product personalization cases and the sub-dimensions of personalization, and to develop design considerations for the first generative toolkit.

CHAPTER 5

PRELIMINARY STUDY PHASE 2

As an extension of the first phase of the preliminary study, in this second phase, I investigated the products personalized by people, and explored how and why people personalized their products through an online questionnaire conducted with a higher number of people. More specifically, the study aimed to gain a deeper understanding about the dimensions of personalization emerged in the preliminary study phase 1, and to refine the conclusions drawn from the previous phase through the exploration of a higher number of personalized product examples (Chapter 5, Section 5.4). In addition, I aimed to find people who could participate in the generative studies through this study. In this phase, I explored the same research questions investigated in the preliminary study phase 1, which are given below:

1. How does the product personalization process take place in daily life?
2. What are the dimensions of product personalization?

5.1. Data Collection

Since mass produced products are not designed for personalization, and the personalization process requires time and effort, it is difficult to find people who make interventions to their products. For this reason, an online questionnaire was developed and used as the data collection tool in order to reach a higher number of people who personalized their products. The questionnaire was prepared on Google Forms, and shared on Facebook on December 10, 2014 and the Facebook page of Buğday Ekolojik Yaşamı Destekleme Derneği, which had an interest in sustainability. At the beginning of the questionnaire, the aim of the study, the definition of product personalization, information on the confidentiality of the study and contact information were provided.

The questionnaire consisted of nine questions, three of them on personal information, three of them on product personalization, two of them requesting participation for further studies, and one requesting photographs of the personalized products. The scope of the questions is given below, and the complete questionnaire is provided in Appendix B. Since this study was an online questionnaire, and people might avoid answering too many questions, some of the interview questions asked in the preliminary study phase 1 were eliminated. For instance, the benefits of personalization, which emerged from the previous study through the participants' evaluations on the personalized products, and the product attributes enabling personalization could not be explored in the online questionnaire.

The scope of the survey questions

1. Age range

2. Gender

3. City of residence

4. Product categories that are personalized (check boxes)

- Furniture
- Lighting
- Small home appliances
- Packaging
- Personal accessories
- Transportation vehicles
- Electronic products
- Clothing
- Home accessories
- Sports equipment
- White goods
- Other

5. Methods, product parts and materials used during personalization of each product (open ended question)

6. Reasons for personalization for each product (open ended question)

7. Permission for participation in the further studies (Yes or No)

8. E-mail address of the participant

9. Request for the photographs of the personalized products

5.2. Sampling

Criterion sampling was used as the sampling procedure, and only people who met the criterion of engaging in product personalization participated in the research. At the beginning of the online questionnaire, it was clearly stated that, only the participation of people who personalized their products was required.

5.3. Data Analysis

Since this study aims to refine the conclusions drawn from the preliminary study phase 1, I analyzed the the participants' responses through deductive content analysis, based on the themes and categories emerged from the literature review and the preliminary study phase 1. The categories below correspond to the dimensions of personalization discussed in the previous chapter. The themes and categories used for analysis are as follows:

- PRODUCT

    Personalized product category

    Product life span phase that the product is personalized

- PERSON

    Goal of personalization

- PERSONALIZATION PROCESS

    Method of personalization

    Skills used during personalization

    Effort spent during personalization

    The nature of intervention

I coded only the responses of the participants who provided the photographs of their personalized products, since it was difficult to understand the personalization process in detail without the photographs. Although I used a deductive approach, I looked for additional categories and sub-categories that could emerge in the data, which could be coded as a new category.

During the analysis process, firstly I prepared separate Excel sheets for each category based on which the participants' responses and the personalized products would be analyzed. Then, I transferred the responses of the participants to relevant sheets, and I analyzed each product and the response based on each dimension of personalization (category). Figure 5.1 displays a part of the Excel sheet prepared for the dimension of method of personalization.

METHOD OF PERSONALIZATION						
Participant	Age	Gender	Product Category	Product	Quote	Method of P.
P1	26-30	M	Electronic Products	TV	I started using my 37-inch TV as a table by placing it with its screen on the top.	Changing the context of use
P1	26-30	M	Clothing	T-shirt	I painted a white t-shirt with a stain on it using spray paint and made it usable again.	Surface treatment
P1	26-30	M	Clothing	T-shirt	I painted a white t-shirt with a stain on it using spray paint and made it usable again.	Re-use
P3	21-25	M	Clothing	Sock	I made an elbow pad through cutting the tips of the worn socks to prevent friction when I am doing sports. I also had the chance of fixing my MP3 player on this.	Changing the form of the product
P3	21-25	M	Clothing	Sock	I made an elbow pad through cutting the tips of the worn socks to prevent friction when I am doing sports. I also had the chance of fixing my MP3 player on this.	Changing the context of use
P3	21-25	M	Vehicle	Bicycle	Bicycle grips start to melt and deform over time. I preferred to stick tape instead of buying a new one. The grip became better and softer.	Integrating a part/material with the product

Figure 5.1. Analysis of the data based on method of personalization.

After analyzing the data based on each category, I compiled all the categories and sub-categories emerged for each theme in one sheet, to explore the relationships between them. Figure 5.2 displays a section of the compiled data sheet. While exploring the potential relationships between the categories (e.g. goal of personalization and the nature of intervention), I explored the frequency of emergence of each sub-category

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of a category (e.g. aesthetic and functional interventions) for the sub-categories of the other category (e.g. improving aesthetic qualities of a product).

| Participant | Age | Gender | PRODUCT | | | PERSON | | PERSONALIZATION PROCESS | | | |
			Product Category	Product	PLS phase	Goal of P. Category	Goal of P. Sub-category	Method of P.	Skills	Effort	Nature of Intervention
P1	26-30	M	Electronic Products	TV	Post-use	Meeting a need with an available product/part	Product-related	Changing the context of use	No skill	Mental & Physical	Functional
P1	26-30	M	Clothing	T-shirt	Post-use	Increasing product's fit to person (Improving aesthetic qualities)	Product-related	Surface treatment / Re-use	Hand skill	Mental & Physical	Aesthetic
P3	21-25	M	Clothing	Sock	Post-use	Meeting a need with an available product/part (Cost constraints of the new)	Product-related	Changing the form of the product / Changing the context of use	No skill	Mental & Physical	Functional
P3	21-25	M	Vehicle	Bicycle	Use	Meeting a need with an available product/part	Product-related	Integrating a part/material with	No skill	Mental & Physical	Aesthetic & Functional
P4	26-30	F	Furniture	Coffee table	Post-use	Increasing product's fit to person (Improving aesthetic qualities)	Product-related	Surface treatment / Integrating a part/material with the product	Craft skill	Mental & Physical	Aesthetic

Figure 5.2. Compiled themes, categories and sub-categories.

5.4. Results of the Online Questionnaire

The results of the study include the responses of participants who filled out the questionnaire between the dates of December 10, 2014 and December 22, 2014. 31 people (23 female and nine male) participated in the online questionnaire. However, the responses of 15 people (nine female and six male) were considered in the analysis, since they provided the photographs of their personalized products. Some of the participants provided information for more than one product, and the total number of personalized products were 39.

No additional categories emerged in the online questionnaire. However, new sub-categories emerged for some of the categories. Table 5.1 summarizes the themes, categories and sub-categories found in this study. In the following sections, the results are presented based on the themes explained above.

Table 5.1. Themes and categories emerged from the online questionnaire.

Product	Personalized product category	Packaging, clothing, home accessories, furniture, vehicles, lighting, electronics, personal accessories, and white goods
	Product life span phase that the product is personalized	Use, post-use
Person	Goal of personalization (function and aesthetic-related)	Increasing product's fit to person, meeting a need with an available product, saving a product due to its aesthetic qualities
	Goal of personalization (personal)	Process enjoyment, saving a product due to environmental concerns, saving a product due to its sentimental value, having a unique product, learning a craft skill, cherishing memories
Personalization process	Method of personalization	Integrating a part/material with the product, changing the product's context of use, surface treatment, changing the form of the product, and reusing the product
	Skills used in the personalization process	No specific skill, hand skills, craft skills, and technical skills
	Effort spent in the personalization process	Mental effort and physical effort
	Nature of intervention	Aesthetic and functional

5.4.1. Product

The *product* theme involves the *personalized product categories* and *personalized product's life span phase* categories.

5.4.1.1. Personalized Product Categories

The results of the study indicate that, packaging is the most commonly personalized product category among the sample (11 out of 39 products). All of the packages were personalized in the post-use phase, after completing their initial purpose of use. Since most of the packaging products continue to be functional after being used (e.g. glass jars and bottles, cardboard boxes, and pet bottles), people try to personalize them through re-using or repurposing them. In addition, since packaging products are costless, people might be comfortably making interventions on these products, without the fear of spoiling them. The other personalized product categories were clothing, home accessories, furniture, vehicles, lighting, electronics, personal accessories, and white goods. However, it is difficult to tell how commonly these product categories are personalized by people based on the findings of the study. No examples obtained

regarding small home appliances and sports equipment categories. Figure 5.3 illustrates the number of the personalized products by product categories. The details about the personalized products are provided in Section 5.4.3.
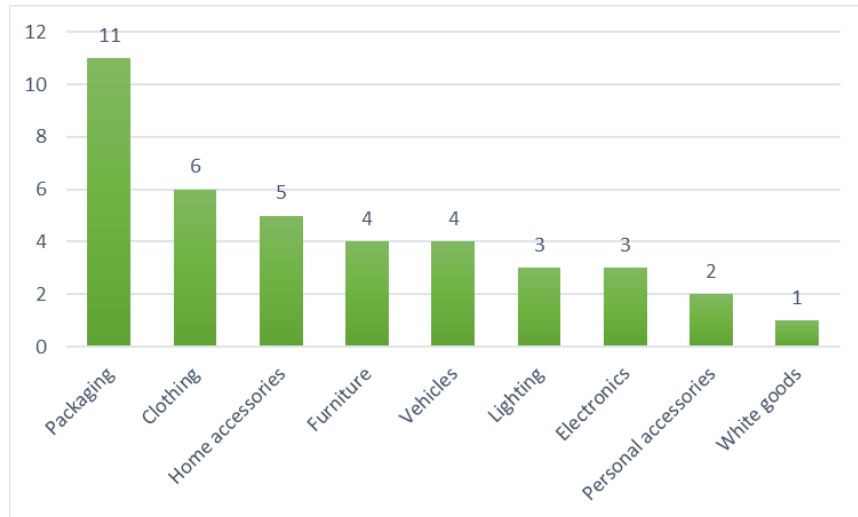
Figure 5.3. Personalized products by product category.

5.4.1.2. Product Life Span Phase that the Products are Personalized

It was found in the study that, the participants personalized their products during *use (17 products)* or *post-use phases* (22 products). No product examples obtained which were personalized in the design phase, as these products are not designed for product personalization. Figure 5.4 displays the personalization phase by product categories.
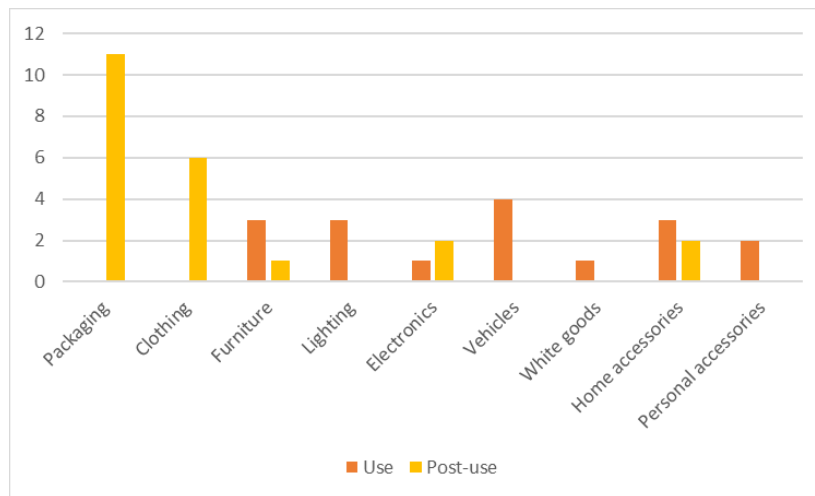
Figure 5.4. Product life span phase that the products are personalized.

As can be seen in Figure 5.4, packaging and clothing products were only personalized in the post-use phase. On the other hand, lightings, vehicles, white goods, and personal accessories were personalized only in the use phase. Some product categories involve examples personalized in use or post-use phases, which are furniture, electronics and home accessories.

While it is difficult to establish a relationship between the product categories and the life span phases in which each product category is commonly personalized, it is still possible to make such inferences for some product categories. For instance, the packages in the study were only personalized in the post-use phase. This is generally the case for the personalization of the packaging products by people, since the products in the package have to be used up in the use phase of the package, in order to be repurposed/re-used. Another finding of the study was that, lighting, vehicle, white good, and personal accessories were personalized only in the use phase. Since lighting, vehicle, and white good products are discarded or replaced when they complete their life span, people make interventions to them during use phase.

5.4.2. Person

In the preliminary study phase 1, two person-related categories had emerged, which were *goal of personalization* and *benefits of personalization*. In this online study, only the *goals of personalization* were explored, and the questions for the benefits of personalization were eliminated. Thus, *goal of personalization* is the only category for the person theme in this study.

5.4.2.1. Goal of Personalization

In the preliminary study phase 1, four goals of product personalization were identified. These were *increasing product's fit to person* (*improving aesthetic and/or functional qualities*), *saving a product for environmental concerns*, *self-expression*, and *cherishing memories*. These goals also emerged in the online questionnaire in addition to the other personalization goals, which were newly identified. As a result of the emerging goals in this study, I made a new categorization for people's personalization goals, which are *function and aesthetic-related goals* and *personal (meaning and value-related) goals*. Some of the products were personalized due to more than one goal. The goals of personalization are displayed in Table 5.2.

Table 5.2. *Goals of personalization.*

Function and Aesthetic-Related Goals	Personal (Meaning and value-related) Goals

Increasing product's fit to person (14 products)
 	
  - Improving aesthetic qualities (12 products)
  - Improving functional qualities (six products)
 	
Meeting a need with an available product (ten products)
 	
  - Cost constraints of the new (five products)
  - Lack of an available product (one product)
 	
Saving a product due to its aesthetic qualities (five products)
	Process enjoyment (eight products)
	
	Saving a product (two products)
	  - Environmental concerns (one product)
	  - Product's sentimental value (one product)
	
	Having a unique product (five products)
	
	Learning a craft skill (four products)
	
	Cherishing memories (one product)

Function and aesthetic-related goals are the goals originated from the certain characteristics of the product. This characteristic can be a product's aesthetic value, a defect or a breakdown of the product, as well as the ability of a still functioning product to meet a need without paying a cost for a new product or to substitute another product due to its form or function. I categorized the *function and aesthetic-related-related goals* as *increasing product's fit to person*, *meeting a need with an available product*, and *saving a product due to its aesthetic qualities*.

Increasing product's fit to person is the most frequently mentioned goal by the participants. This involves two major sub-goals, which are *improving product's aesthetic qualities* and/or *improving product's functional qualities*. The participants specified some reasons for improving their products' aesthetic qualities, such as covering a defect on the product, adapting the product to the context of use, making the product look fashionable and new, covering the brand name, repairing the product, and generally adapting the product to personal taste. Some of the participants personalized their products to improve their functionality, and achieved ease of use, repaired them, and improved the performance of their products.

Another *function and aesthetic-related goal* was to *meet a need with an available product*, which was mentioned for ten products. For four products, the participants stated that, they personalized the product using an available product due to cost constraints of buying a new product. In addition, one participant stated that, he repurposed his A5 size leather portfolio, since there was a lack of an available product on the market which would fit to his taste.

Saving a product due to its aesthetic value was also mentioned for five products as a personalization goal. Table 5.3 displays the participants' quotes in relation to their personalization goals.

Table 5.3. Function and aesthetic-related personalization goals.

Goal	Quote
Increasing product's fit to person (improving aesthetic qualities)	"The drawer knobs were too ugly. I selected knobs with different colors and patterns and made them more suitable for my room and my personal taste". "I brought a new appearance to my old furniture which does not fit to my room".
Increasing product's fit to person (improving functional qualities)	"I renewed the spark plugs and tyres of my car for a better performance". "I hung a felt part to make the lighting easy to turn on".
Meeting a need with an available product (Cost constraints of the new product)	"Using the box as a table, I got rid of extra table cost". "I repaired my bike's grips using tape in a costless way".
Meeting a need with an available product (Lack of an available product)	I transformed an A5 portfolio into a Kindle cover, since I could not find a product that fit to my taste."
Saving a product (aesthetic value)	"This glass package looked appealing to me and I wanted to continue to use it."

Personal goals are the goals originated from the personal motivations and values, rather than directly from the product characteristics. These goals may have more implications for encouraging product personalization, since they are high-level needs and meeting these needs may result in stronger person-product relationship. These are *process enjoyment*, *saving a product for environmental concern*, s*aving a product due to its sentimental value*, *having a unique product*, *learning a craft skill*, and *cherishing memories*.

Process enjoyment was the most frequently mentioned personal goal of personalization (for eight products). Participants indicated that, they personalized their products, simply because they enjoyed the personalization process. *To have a unique product* was another goal of personalization, which was mentioned for five products. In these cases, the participants wanted to have products special to themselves. Some of the participants stated that, they personalized their products *to learn or practice a craft skill* (four products). Another personalization goal was to *save a product* and keep using it *due to environmental concerns* (one product), and *due to product's sentimental value* for the person (one product).

The last personal goal of personalizationidentified in the study was *cherishing memories* (one product) through the intervention made on the product. Table 5.4 displays the participants' quotes in relation to their personal personalization goals.

Table 5.4. Personal goals of personalization.

Goal	Quote
Process enjoyment	"I have this lighting repaired, because I like repairing things."
Saving a product (environmental concerns)	"I was looking for ways of reusing the packages instead of wasting them. I had washed and stocked them. I decided to use them as flower pots as seeds were available."
Saving a product (sentimental value)	"This needlework is important to me and I wanted to keep it".
Having a unique product	"I also wanted to use a unique product, that's why I personalized this scarf."
Learning a craft skill	"I wanted to learn the wet felt application and used this old scarf for trial."
Cherishing memories	"I put a sticker on my phone. This sticker reminds me of the old days I spent with my friends."

5.4.3. Personalization Process

In the preliminary study phase 1, four process-related categories emerged, which are the *method of personalization*, *skills used during product personalization*, e*ffort spent during product personalization*, and the *nature of intervention*. In this online questionnaire, I also analyzed the personalized products based on these themes.

5.4.3.1. Method of Personalization

The results of the study indicate that, there are five methods that people tend to use to personalize their products. These are *integrating a part/material with the product* (23 products), *changing the product's context of use* (18 products)*, surface treatment* (eight products)*, changing the form of the product* (five products)*,* and *reusing the product* (three products). Some products were personalized through the use of more than one method.

Integrating a part/material with a product is found to be the most common method of personalization in the study, and 23 out of 39 products were personalized in this way. This method can be applied in various ways through the actions such as *sticking (magnets, stickers, materials), sewing, decoupage, tying, mounting (e.g. wheel rim of a car, knob of a furniture),* and *joining (parts of a phone charger),* depending on the product category. Figure 5.5 displays the product examples personalized with this method.

| Covering the worn bicycle handle through sticking tape | Sewing parts on a scarf | Sticking stickers on a car, mounting new wheel rims | Mounting new knobs on a furniture |

Figure 5.5. Integrating a part/material with a product.

While people personalized their products with this method, they integrated products/parts in the same or different production scales. Although the production scale of some of the personalized products were unclear, three different variations of integration were identified in terms of the production scales. These are integrating a mass-produced product with a mass-produced part, integrating a mass-produced part with a one-off part, and integrating a one-off product with a one-off part (Figure 5.6).
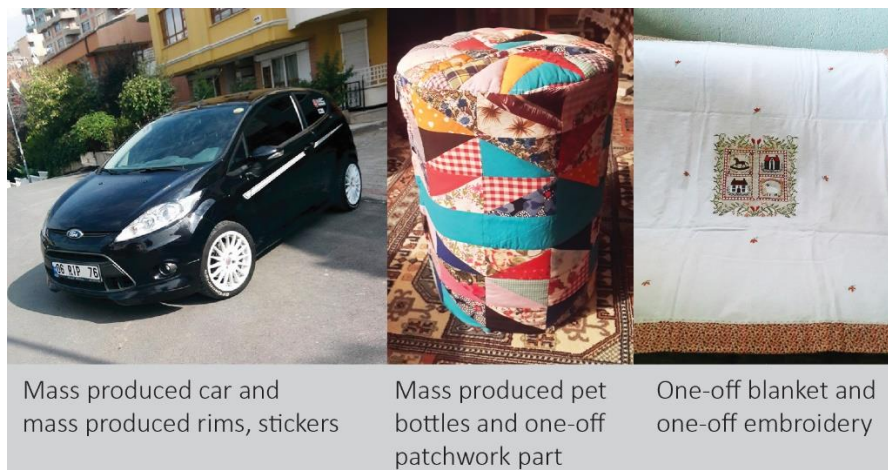
Figure 5.6. Integration of different scales of production in personalization.

Examining the personalized products, production scales of which could be identified, it appears that, the most common way of integrating the production scales is integrating two or more mass produced products/parts. In addition, it seems that, the rarest integration is between two products/parts both of which produced at one-off scale. As the products produced in one-off scale are rare, and may demand specific skills in their production, the integration of one-off products is also rare. Some of the participants had their products integrated with other products/parts in the local workshops.

Changing the context of use is another method of personalization. 18 products were personalized with this method, and they were all repurposed. In some of the repurposed products, there was no aesthetic or functional intervention directly, but instead, people adapted the products to different contexts of use to meet their needs and they assigned new functions to them. Figure 5.7 displays the product examples personalized with this method. On the other hand, in some cases, the products were repurposed through a functional or aesthetic intervention (Figure 5.8). The examples include a sock cut to be used as an elbow pad, a glass package painted to be used as a pen holder, a stretch film cylinder covered with paper to be used as a decorative object, pet bottles covered with patchwork to be used as a pouff, a cup and its saucer combined

with pipes to be used as a lighting, a lace moulded to be used as a bread basket, and a sock cut to be used as a lavender container.

Figure 5.7. Changing the context of use with minimal interventions.

Figure 5.8. Changing context of use with functional and aesthetic interventions.

Surface treatment emerged as another method of personalization in the study for eight products. These methods also vary depending on the product category. The examples of surface treatment methods include spray painting a T-shirt, applying wet felt on a scarf, painting a phone cover with acetate pen, and applying wood aging on furniture, which are displayed in Figure 5.9.

Figure 5.9. Products personalized through surface treatment.

Another method of personalization is *changing the form of the product*, which is observed in five products. The participants changed the form of the products through cutting with scissors, and one participant shaped a lace through moulding it with sugared water. In all of these examples, the products' context of use also change. Figure 5.10 displays the product examples personalized with this method.

Figure 5.10. Changing the form and context of use of a product.

The last method of personalization found in the study is *reusing a product*. Three products were personalized in this way. Figure 5.11 displays the product examples personalized with this method. One participant re-used the pillows of his old coach on the new one, one participant re-used a wine bottle as a syrup bottle, and one participant spray painted his stained T-shirt and re-used it. Similar to the repurposed examples, in the first two examples of re-use, the participants did not make a direct intervention to the products. Instead, they use the products as they are, assigning a function similar to

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the original function of the object. In the T-shirt example, the participant made an aesthetic intervention on the product to re-use it.

Figure 5.11. Reusing a product.

I also explored the relationship between the goals and the methods of personalization through examining the frequency of use of the methods for each personalization goal. Based on this analysis, I found that, people who personalize their products to meet a need with an available product, mostly change the product's context of use. Integrating a part/material with the product and surface treatment were found to be the primary methods for improving aesthetic qualities of the product, while integrating a part/material is more frequently used. This may be due to the fact that, surface treatment methods may require a higher skill level and be more difficult, compared to integrating a part/material with a product. In addition, all of the people who wanted to improve the functionality of their products integrated a part/material with them. For five products saved due to their aesthetic values, changing the context of use was used most as the personalization method. It is difficult to discuss the relationship between the methods and the other goals of personalization, since I could not find a prominent method of personalization used by the participants for these goals.

When I examined the relationship between the product categories and the personalization methods, the study revealed that, integrating a part/material with a product could be applied most of the product categories, which were packaging, vehicles, lighting, furniture, clothing, electronics, home accessories, and white goods at different levels (Figure 5.12). Moreover, changing the product's context of use (repurposing), appeared as the main method of personalization for the packaging category (Figure 5.13).
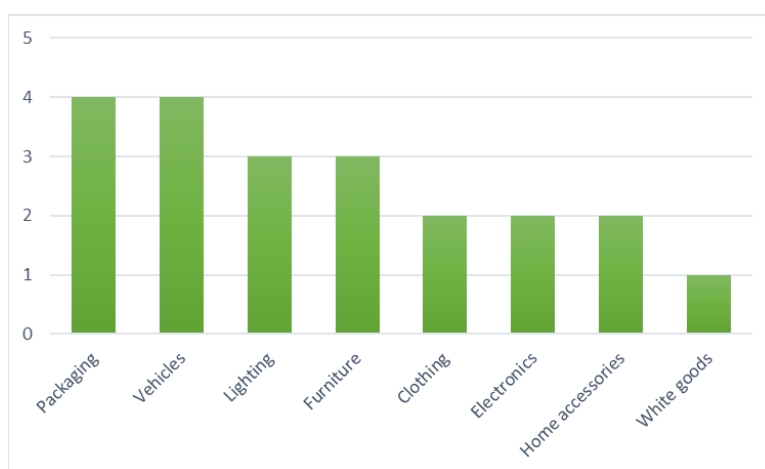
Figure 5.12. Integrating a part/material with the product by product category.
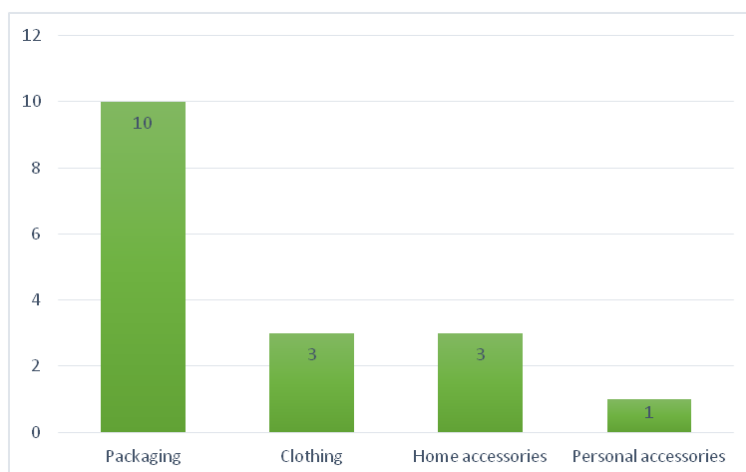
Figure 5.13. Changing the context of use without intervention by product category.

Finally, changing the form of the product was used for clothing such as socks and T-shirt, and home accessories, such as lace. These are all textile products, and people could change the form of these products. It is difficult to establish a meaningful relationship with the other personalization methods and the product categories with the existing examples, and more product examples are needed to make such inferences. In the following section, I analyzed the methods of personalization by product category. This analysis provided me insights into the possibilities and limitations in the personalization of different product categories.

Methods of Personalization for Packaging. The personalized packaging products were pet bottles, plastic and ceramic yogurt package, cardboard stretch film cylinder, cardboard boxes in different sizes, and glass bottles and jars. The personalization methods used for the packaging products were changing the context of use (ten products), integrating a part/material with the product (four products), surface treatment (two products), and re-use with a minimal interventions (one product). In some products, more than one personalization method were identified.

As can be seen in Figure 5.14, most of the packaging products (ten products) were personalized through changing the context of use, without any direct intervention on the products or with aesthetic and functional interventions. With this method, new functions were assigned to the products by the participants, and the life span of these products were extended. The methods in the figure involves, using a cardboard package for storage, a glass bottle as a vase, a ceramic yoghurt package as a pencil holder, a cardboard box as a TV table, a plastic yoghurt package as a flower pot, a cardboard box as a cat toy, a glass package as a pencil holder, pet bottles as pouff structure, and a strecth film cardboard roll as a decorative object.
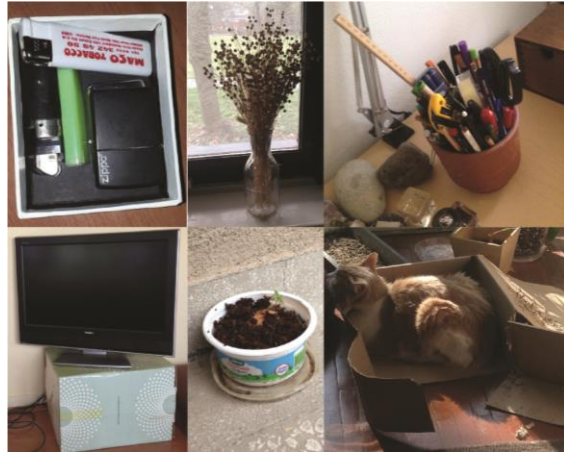
Figure 5.14. Changing the packaging products' context of use.

Figure 5.15 displays the packages personalized through integrating a new part/material with the product. Figure 5.15 involves pet bottles used to make a puff structure and covered with one-off patchwork fabric and leather parts and zippers, and sticking colorful papers and ribbons on a stretch film cylinder to use it as a decorative object. In the latter one, varnishing was also applied as surface treatment, and the object was both functionally and aesthetically enhanced. Unlike the previous method, in this method there are aesthetic interventions which require craft skills. Similarly, the life span of these packages was extended and new functions were assigned to them. The last method of personalization for the packaging products was re-use with a minimal intervention, which was observed for one glass bottle (Figure 5.16). The participant re-used the wine bottle as syrup bottle and extended the life span of the package.

Figure 5.15. Integrating a part/material with a package.

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Figure 5.16. Re-using a glass package.

Method of Personalization for Clothing. The personalized clothing products were worn socks, old T-shirts, shorts, and a scarf. The personalization methods used for the clothing products were changing the form of the product (three products), integrating a part/material with the product (three products), changing the product's context of use (three products), and surface treatment (two products).

In Figure 5.17, the clothing products whose contexts of use were changed through changing their form are displayed. Thus, two methods of personalization exist at the same time. The images include a sock cut to be used as an elbow pad, a sock cut to be used as a lavender bag in the bathroom, and a T-shirt cut to be used as a neck collar. In all of these examples, the basic skill of cutting was used to transform the products. In this way, the life span of the products was extended and new functions were assigned to them.

Figure 5.17. Changing the form and context of use of the clothings.

Another method of personalization observed for the clothings were integrating a part/material with the product (Figure 5.18). The methods shown in the figure involve, integrating a ribbon with a cut sock, sewing laces on a scarf. The intervention for the first example is mainly functional, whereas in the other two products there are aesthetic interventions.

Figure 5.18. Integrating a part/material with a clothing.

The last method for clothing was surface treatment which was used for two clothing products (Figure 5.19). The methods in the figure include spray painting a T-shirt to cover the stains on it and applying wet felt on an old scarf. Both are aesthetic interventions, and basic and craft skills were used on the products respectively.

Figure 5.19. Surface treatment on clothings.

Methods of Personalization for Furniture. The personalized furniture products were a coffee table, a cabinet, a dresser, and a puff. The personalization methods used for the furniture were integrating a part/material with the product (four products), and surface treatment (one product), which were displayed in Figure 5.20. The first product is a coffee table on which both the methods of surface treatment and integrating a part with the product were applied through wood aging and decoupage techniques. The other three products are examples of integrating a part/material with a product, and these involve the methods such as sticking stickers on a cabinet, changing the knobs of a dresser, and combining a leather patchwork pouff with a craft work object.

Figure 5.20. Personalized furniture products.

Method of Personalization for Vehicles. The personalized vehicles include bicycles, an automobile, and a motorcycle. All of the transportation vehicles were personalized through integrating a part/material with the vehicle (Figure 5.21). In addition, one of the participants indicated that, she had painted her bicycle, but its photograph was not available. Thus, I also included surface treatment as a method of personalization for vehicles. The methods in Figure 5.21 involve, covering the worn handle of a bicycle with tape, sticking stickers on a motorcycle and a car, and replacing internal and external parts of the automobile. Differently from the first two examples, the automobile was also personalized through functional interventions.

Figure 5.21. Integrating a part with a vehicle.

Method of Personalization for Lighting. Lighting products were personalized through integrating a part with the product (Figure 5.22). The examples include a decorative felt part hung on a lamp, origami paper figures attached on a lamp, and a scarf used as a shading of a lamp shade.

Figure 5.22. Integrating a part with a lighting.

Method of Personalization for Home Accessories. The personalized home accessories were coach pillows, a tea pot, a blanket, a cup and saucer, and a lace (Figure 73). The personalization methods were re-using with a minimal intervention (one product), changing the context of use (three products), integrating a part/material with the product (two products), changing the form of the product (two products), and surface treatment (one product). As displayed in Figure 5.23, one participant re-used his old coach's pillows on a new coach. Three products' context of use was changed, which are the egg cup used as a tea pot lid, coffee cup and sprout combined with copper pipes to be used as a lighting, and a lace moulded with sugared water to be used as a bread basket. Integrating a part/material with a product was another method

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of personalization and one participant attached an old embroidery on a blanket, and one participant integrated a cup and sprout with copper pipes. Changing the form of the product was used in the laces, which were moulded with sugared water. In addition, the participant applied paint as a surface treatment on one of these laces.

Figure 5.23. Personalized home accessories.

Methods of Personalization for Electronics. Personalized electronic products were a TV, a charger and a mobile phone (Figure 5.24). The personalization methods in the figure involves, using a TV as a table (changing the context of use), interchanging phone charger's cable and head part, and integrating them (integrating a part/material with a product), and sticking stickers on a mobile phone (integrating a part/material with a product).

Figure 5.24. Personalized electronic products.

Method of Personalization for White Goods. As displayed in Figure 5.25, one refrigerator was personalized through attaching stickers, photos and magnets on it (integrating a part/material with a product).

Figure 5.25. Personalized refrigerator.

Method of Personalization for Personal Accessories. The personalized personal accessories involve a mobile phone cover and an A5 portfolio (Figure 5.26). The phone cover was personalized through painting with acetate pen (surface treatment), and the portfolio was personalized through using it as a Kindle cover (changing the context of use).

Figure 5.26. Personalized personal accessories.

5.4.3.2. Skills Used in Product Personalization

In the preliminary study phase 1, two levels of skills are identified, which are *hand skills* and *craft skills*. In addition to these findings, the online questionnaire revealed two more levels of skills which the participants used during the personalization process. The skill levels identified in this study are *no specific skill*, *hand skill*, *craft skill*, and *technical skill*.

21 out of 39 products that are personalized by the participants do not require the use of specific skills. In other words, the interventions applied to these products can be achieved by anybody. Each product category includes such examples. These types of interventions include assigning a different function to a product without changing its appearance such as cutting socks, sticking tape on bicycle grips, sticking stickers, magnets, and post-its.

Some of the personalization methods require hand skills, which need a certain level of precision and/or use of a hand tool. The examples of the use of this type of skill include spray painting with a specific aim (e.g. writing a word, painting the same shape), cutting and sticking leather parts on a bicycle grip, painting with acetate pen with a specific shape in mind, cutting a t-shirt into stripes in similar width, making paper collage, moulding a lace with sugared water, and applying varnish on the surface of a product. Some of the products were personalized through the use of craft skills, which require the knowledge of and experience in materials and techniques. These skills involve sewing, glass painting, wood ageing, applying decoupage, and applying wet felt. There are also product examples where both hand skills and craft skills are combined. These are pouffs made out of bonded pet bottles covered with patchwork parts.

Finally, there are personalization examples which require technical knowledge and skills. I defined the technical skills as skills requiring technical knowledge regarding a product, and use of tools, methods or machinery at a more advanced level. For instance changing the plug, tires, exhaust pipe of an automobile to increase its

performance require technical knowledge. In addition, combining metal parts with ceramic parts, drilling the bottom of the ceramic cup requires technical skills and knowledge of joining and cutting techniques.

Based on this categorization of people's skills, I tried to explore how the level of intervention differ among the product categories. To this end, three levels of intervention were identified; low, medium and high. Low level of intervention includes the interventions that can be achieved by anybody. Medium level of intervention includes the interventions that require hand skills and precision. High level of intervention includes the products personalized by integrating craft and technical skills. Table 5.5 summarizes the level of intervention by product category.

As can be seen in the table, there are product examples that are personalized in all three levels in packaging, lighting, home accessories, clothing, and vehicles categories. Furniture category does not include medium-level intervention, but there may exist examples of this level of intervention in this category. White goods and electronic products are difficult to personalize in high-level, and their personalization is limited with surface treatment and interchanging the attachable parts, since their components are mostly hidden, making functional intervention on them is difficult, and this requires technical skills and knowledge. Although no example was provided for the personal accessories personalized in high-level, examples for such products may also exist.

Table 5.5. Level of intervention by product category.

Product Category	Low	Medium	High
Packaging	Repurposing a cardboard box as a toy Re-using wine bottle as syrup bottle	Paper collage on the cardboard stretch film cylinder	Applying glass painting to a jar Using pet bottles as pouff structure
Lighting	Binding a felt part to the lighting	Attaching origami shapes to a lighting	Attaching a scarf on a lampshade structure
White goods	Sticking magnets on a refrigerator	-	-
Electronic Products	Using a TV as a table Interchanging the charger parts Sticking stickers on a mobile phone	-	-
Home accessories	Using pillows of an old couch on another couch Ephemeral use of an egg cup on a teapot as a lid	Giving form to a lace with sugared water	Sewing a handmade stitchery on a handmade blanket
Clothing	Converting a sock to an elbow pad through cutting	Spray painting a T-shirt	Attaching lace to old jean shorts Applying wet felt on a scarf
Personal accessories	Using A5 portfolio as a Kindle cover	Painting a mobile phone cover with acetate pen	-
Furniture	Attaching knobs on a dresser Sticking stickers on a cabinet door	-	Renewing a nesting table through decoupage and wearing Combining a (one-off) leather patchwork with a (one-off) furniture
Transportation Vehicles	Taping the bicycle grips Sticking stickers on a motorbike	Spray painting a bike	Changing the inner and outer parts of an automobile

The methods of personalization may be an extension of people's skills. To this end, I analyzed the methods of personalization based on the skill levels that I categorized before in Table 5.6.

Table 5.6. Methods of personalization by the skill levels.

Method of Personalization	Skill Level Low	Skill Level Medium	Skill Level High
Integrating a part/material with a product	11 products	2 products	14 products
Changing the context of use	11 products	2 products	5 products
Surface treatment	-	5 products	3 products
Changing the form of the product	2 products	1 product	1 product
Re-using a product	2 products	1 product	-

According to Table 5.6, integrating a part with a product mostly require a low skill level (e.g. sticking magnets, stickers on objects, changing the knobs of a dresser, etc.) or a high skill level (e.g. making decoupage on a jar or a furniture, sewing lace on a cloth, etc.). In addition, there are few examples for this method requiring a medium skill level, such as covering a bicycle grip with leather or attaching origami parts on a lighting. Thus, this method of personalization can be used by people who have different skill levels in different ways, which can be considered when designing for personalization.

Changing a product's context of use is a method which can be mostly applied with a low skill level, even without using any skills, when minimal intervention is made on the product. However, some of the personalized products were personalized through other methods to change their context of use. In these cases, medium and high-level skills were also used.

It appears that, surface treatment is a method mostly requiring a medium or a high level of skill. No example of surface treatment with the use of low skill was obtained in the study. To this end, surface treatment may not be an appropriate personalization method for people who are not skillful at it.

It is difficult to associate a certain skill level with the remaining two methods of personalization, which are changing the form of a product and re-using a product, since there are not so many personalized product examples.

5.4.3.3. Effort Spent in Product Personalization

All of the personalized product examples require mental effort, since they are modified for specific purposes, and they require creative involvement at different levels. Some of the examples mostly require mental effort with a very low level of physical effort, since they are personalized without any intervention, and the objects are continued to be used as they are. These are mostly repurposed and re-used products. Cardboard boxes used for storage or cat's toy, plastic yogurt package used as flower pot, glass bottles used as vase or syrup bottles, etc. are examples for such personalization examples. The remaining personalization examples both require mental effort and a higher level of physical effort, since people are both creatively and physically involved in the personalization process. However, in some examples, especially where the craft and technical skills are used, the level of physical effort is higher than the other personalized products.

I discussed in the preliminary study phase 1 that, there might be a relationship between people's skills and the effort they spend during the personalization process. Based on the findings, it can be inferred that, as the skill level required in the personalization process gets higher, the level of physical effort increases. However, it is difficult make such an inference in terms of the mental effort, since all of the personalized products required a certain level of mental effort, and it is difficult to measure the degree of the mental effort the participants spent through examining the products.

5.4.3.4. Nature of Intervention

During product personalization, people's interventions were only aesthetic (12 interventions), only functional (14 interventions) or both (15 interventions). Figure 5.27 displays the nature of intervention by product categories.

153
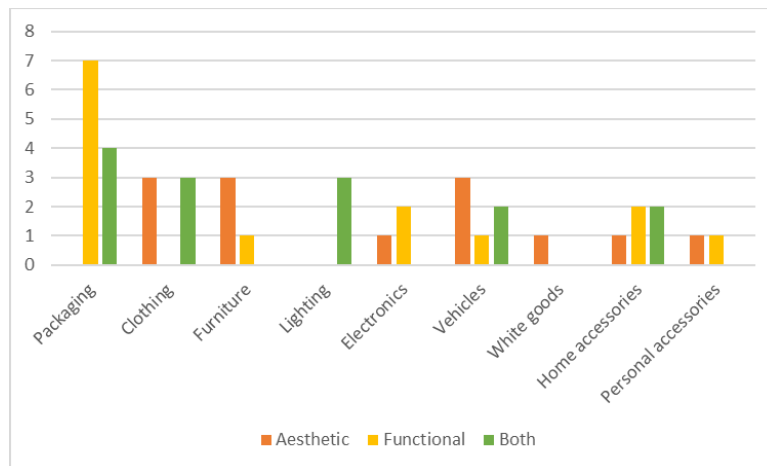
Figure 5.27. Nature of intervention by product categories.

Since most of the packaging products were repurposed, they were personalized through functional interventions, or both aesthetic and functional interventions. Clothing products were either continued to be used as clothing through aesthetic interventions, or they were transformed into new products through both aesthetic and functional interventions (e.g. cutting a sock to use it as an elbow pad). Furniture generally was personalized through aesthetic interventions such as decoupage, wood aging, or integrating new parts except for the cabinet door used as a reminder through the post-its stuck on it, which can be considered as a functional intervention. The lighting products were improved both aesthetically and functionally. The functional interventions for the lighting products were made for making the lighting easier to turn on, or improving the lighting quality, while the aesthetic interventions were all made through integrating new parts on the lighting. Electronic products were personalized through either aesthetic (sticking stickers on a mobile phone) or functional interventions (using a TV as a table, repairing a phone charger through integrating it with another charger's parts). Vehicles were personalized in all three ways. The aesthetic interventions on vehicles include stickers stuck on a bicycle and motorcycle, and leather covers on a bicycle grip. The functional interventions on vehicles include changing the inner parts of an automobile such as the spark plugs to improve the performance of the automobile.

Both aesthetic and functional interventions on vehicles involve sticking tape on a bicycle grip to improve its appearance and grip and changing the outer parts of an automobile such as exhaust pipe, rims and tyres. The only personalized white good was a refrigerator, on which stickers and photos were stuck as aesthetic interventions. Home accessories were also personalized aesthetically, functionally or both. Examples include, a blanket on which an embroidery was sewn, egg cup repurposed as a teapot lid, and lace painted and repurposed to be used as a bread basket. Finally, personal accessories were personalized through aesthetic or functional interventions. Examples include a phone cover painted with pen, and A5 portfolio repurposed as a Kindle cover. Although I could identify the interventions made on different product categories, more examples from each category are needed to identify whether certain product categories tend to be personalized through certain intervention types or not.

In the preliminary study phase 1, I discussed that, relationships may exist between people's personalization goals and the nature of their intervention. I analyzed the relationships between the goals of personalization and the corresponding interventions through examining the frequencies of them for each goal. Although more personalized product examples are still needed for proposing such relationships and the findings need further exploration, these are the initial paths that may guide the design phase. Table 5.7 displays the people's goals of personalization in relation to the nature of their interventions.

As can be expected, when the goal is to improve the aesthetic qualities of a product, the nature of intervention directly becomes aesthetic, and when the goal is to improve the functional qualities of the product, the intervention is functional. When the goal is to meet a need with an available product/part, people mostly make functional interventions, since the purpose is mostly to meet a functional need such as using a sock as an elbow pad in a costless way or repairing the grip of a bicycle with tape. In addition, when the goal is to keep a product due to its aesthetic qualities, functional interventions are mostly made, and the aesthetic qualities of the product is protected.

Using a glass bottle as a vase or using a ceramic package as a pen holder due to its aesthetic value can be considered as the examples of functional interventions made to the aesthetically appealing products.

Table 5.7. Goals of personalization in relation to nature of intervention.

	Goal of Personalization	Nature of Intervention	
		Aesthetic	**Functional**
Product Related Goals	Improving aesthetic qualities (12 products)	+ (12 products)	-
	Improving functional qualities (six products)	-	+ (six products)
	Meeting a need with an available product/part (ten products)	+ (four products)	+ (ten products)
	Saving a product due to its aesthetic qualities (five products)	+ (two products)	+ (five products)
Personal Goals	Process enjoyment (eight products)	+ (three products)	+ (seven products)
	Having a unique product (five products)	+ (five products)	+ (one product)
	Learning a craft skill (four products)	+ (four products)	+ (three products)
	Cherishing memories (one product)	+ (one product)	-
	Saving a product due to environmental concerns (one product)	-	+ (one product)
	Saving a product due to its sentimental value (one product)	-	+ (one product)
	Self-expression (one product)	+ (one product)	

Four people stated that, they enjoyed the personalization process. One of them personalized her five products only through repurposing and re-using without making direct interventions, and through assigning new or similar functions to them. On the other hand, three participants personalized their products through both aesthetic and functional interventions, using craft and technical skills. Based on these findings, it is difficult to establish a relationship between the goal of process enjoyment and people's interventions. On the other hand, having a unique product as a goal seems to result in mostly aesthetic interventions. This may be due to the fact that aesthetic interventions make the product's uniqueness more visible compared to the functional interventions. Learning a craft skill was another goal mentioned by three participants, and they made both aesthetic and functional interventions. However, aesthetic interventions are more visible through the use of craft skills, such as wet felt on a scarf, patchwork on a bottle structure, and lace shaped with sugared water.

For the other four personalization goals, which are cherishing memories, saving a product due to environmental concerns or its sentimenatl value, and self-expression, it is difficult to make inferences regarding their relationship with people's nature of intervention, since only one participant mentioned each of these goals.

Examining the relationship between the skill levels and the nature of intervention, I found that, the interventions which did not require the use of a specific skill are mostly functional (e.g. using an old TV as a table or re-using a wine bottle for another liquid), whereas interventions which required the use of craft skills are mostly aesthetic (e.g. applying wet felt on a scarf, covering a pet bottle structure with a patchwork part).

5.5. Discussion

The main purpose of this study was to refine the conclusions drawn in the first phase of the preliminary study through the exploration of a higher number of personalized products. In addition, I tried to generate design considerations based on the findings of this study for the design phase. No new dimension of personalization emerged in this study, and the results were discussed below based on the themes and categories emerged in the study and the relationships between the dimensions of personalization.

The *product* theme involves the *personalized product categories* and *personalized product's life span phase* categories. In the study, packaging is found to be the most commonly personalized product category (11 out of 39 products) by the participants. Based on the findings, it is difficult to identify how commonly the other product categories are personalized, since the number of the personalized products from these categories were limited. In addition, it appears that the participants personalized their products during *use* (17 products) or *post-use phase* (22 products). This is an expected finding, since the personalized products were not designed to be personalized in the design phase. The results also imply that, packaging category is only personalized in the post-use phase. Again, although the number of the personalized products was limited, lighting, vehicle, and white good categories tend to be personalized in the use

phase, since when these products lose their functionality and/or aesthetic qualities, they are commonly discarded instead of being personalized in the post-use phase.

With this study, I extended the sub-categories of personalization goals found in the preliminary study phase 1. As found in that study, people personalize their products not only due to *function and aesthetic-related* reasons, but also for *personal* reasons. Among the *function and aesthetic-related goals*, *increasing a product's fit to person* through *improving* its *aesthetic qualities*, and *meeting a need with an available product* were the most common goals. *Process enjoyment* appears as the most common *personal goal* in product personalization. The analysis of the relationship between the personalization goals and the nature of intervention reveals that, some goals mostly result in a certain type of intervention. Similarly, a relationship is found between some of the personalization goals and the methods. To this end, when designing for personalization, the goals to be achieved through personalization can be considered together with the nature of intervention required, and the methods to be used.

The categories emerged under the theme of the *personalization process* include the *method of personalization*, *skills used during product personalization*, e*ffort spent during product personalization*, and *nature of intervention*.

Five main methods of personalization emerged, which are *integrating a part/material with the product* (23 products), *changing the product's context of use* (18 products)*, surface treatment* (eight products)*, changing the form of the product* (five products)*, and *reusing the product* (three products). In some cases, more than one method were used for personalization. Among these, *integrating a part/material with the product* applied to most of the product categories, whereas *changing the product's context of use* was the main method for the packaging category. The products, whose forms were changed are all textile-based, such as socks and T-shirts. These findings may be helpful for the design phases of the study in selecting the methods of personalization.

Based on the findings, I identified four levels of skills used in product personalization, which are categorized as *nospecific skill (low-level)*, *hand skill (medium-level)*, *craft skill (high-level)*, and *technical skill (high-level)*. Most of the products in the study did not require the use of a specific skill. The craft skills emerged from this study are one of the most important input for the design phase. These skills are sewing, glass painting, wood ageing, decoupage, wet felt, patchwork and knitting lace. Enabling the use of such skills is important for sustainability, since the integration of these skills can contribute to both economic and social dimensions of sustainability.

When I analyzed the product categories based on the skill levels, I found that, packaging, lighting, home accessories, clothing, and vehicle categories can be personalized with all skill levels, whereas white goods and electronic products are mainly personalized using low-level skills, which may be the result of black box design model that makes the products complex for intervention.

The analysis of the relationship between the methods of personalization and the skills used in the personalization process reveals that, *integrating a part/material with the product* as a method is used by people who have all skill levels in diverse ways. In addition, the method of *changing the product's context of use* mostly requires a *low skill level*, whereas *surface treatment* mostly requires a *medium* or a *high-level skill*. These findings may be helpful for design for personalization, when enabling the use of the appropriate methods of personalization for diverse groups of people who have different skill levels.

It was found in the study that, people both invested *mental* and *physical* effort while personalizing their products. The findings indicate that, as the skill level required in the personalization process gets higher (e.g. products personalized through craft and technical skills), the level of physical effort increases.

Finally, it is found that, the nature of intervention in the personalization process can be aesthetic and/or functional. However, more product examples are needed to determine whether certain product types are personalized through certain type of interventions. The analysis of the relationship between the nature of intervention and skill level reveals that, when the intervention does not require the use of a specific skill, it is mostly functional, whereas when it requires the use of craft skills, the intervention mostly becomes aesthetic.

The findings of the two preliminary studies helped me to form the design considerations for personalization (Chapter 6-Section 6.1, Chapter 7-Section 7.3, Chapter 8-Section 8.2), which I considered when developing the generative toolkits in the subsequent phases of the study.

Although the second phase of the preliminary study enabled me to reach a higher number of people in a short time, I could not explore the personalization process of the participants in-depth as in the preliminary study phase 1, since it was an online questionnaire. In addition, since some of the participants did not provide the photographs of the personalized products, I had to eliminate their responses. Finally, since the study was conducted online, I could only reach people who have digital access.

CHAPTER 6

GENERATIVE RESEARCH PHASE 1

In this phase of the study, a lighting design exploration was developed considering the knowledge gathered through the literature review and the two preliminary studies. Then, this design exploration was used as a generative tool, and a design workshop was carried out during which participants personalized it. This workshop helped me understand what kind of design details may be provided for personalization, and how the generative sessions could be planned. Based on my reflections on the design and workshop processes, I further developed the design exploration and the generative research plan. In the follow-up study, two people were provided with the design exploration for personalization. In the first phase of the generative research, the following research questions were explored:

RQ 3. How can product personalization be facilitated through design with a focus on sustainability?

> RQ 3.1 How can personalization of lighting products be facilitated through design with a focus on sustainability?
>
> RQ 3.2 What are the implications of personalization of lighting products for sustainability?
>
> RQ 3.3 What are the opportunities and limitations for incorporating product personalization into design process for sustainability?

RQ 4. What would be the means of incorporating product personalization into design research for people's empowerment?

The reason why I selected the lighting category is that, this product category may provide more opportunity for exploring the local skills, the use of local materials and production techniques compared to the other categories (e.g. electronics, household appliances). In addition, in the online questionnaire, lighting was found to be one of the product categories which could be personalized by all skill levels. To this end, the personalization process of the lighting products can be more manageable for people with various skills, which is important for the generative sessions.

6.1. Development of the First Generative Toolkit

While developing the first generative toolkit, I used the knowledge I gained through the literature review and the two phases of the preliminary study. Besides, issues related to research design, such as sample and duration of the generative session that will be conducted affected some of my design decisions. Table 6.1 displays the factors affected the design considerations for the first generative toolkit.

Table 6.1. The factors affected the design considerations.

Research Design - Sample - Duration
Preliminary Study Phase 1 and 2 (Chapter 4 and 5) - Personalized product categories - Materials of the personalized products - Product attributes enabling personalization - Dimensions of personalization
Literature Review (Chapter 2) - Design considerations for sustainability - Ways of enabling product personalization

In this phase of the study, I aimed to gather information from as many people as possible through a design exploration to be personalized, to receive feedback about the design details enabling personalization, and to evaluate and improve the generative toolkit and the research design. For this reason, I developed the first generative toolkit for a design workshop that was held in the scope of a maker fair. The people participated in the workshop constituted a mixed group, who might have different skills. For this reason, I decided to develop a generative toolkit that can be personalized by any person, with the use of basic hand skills and simple tools. In addition, since the duration of the workshop was limited, it was important that, the personalization task could be completed in this limited time period.

The results of the online questionnaire revealed that, the product category which was personalized by the participants most was packaging, and the packaging products were personalized through repurposing in the post-use phase. To this end, I decided to develop a lighting design exploration which was made of a re-purposed package. The materials of the packaging products personalized in the online questionnaire were cardboard, glass, and plastic. Among these materials, cardboard was the easiest to work with for the participants, since it could be cut, folded, covered, etc. To this end, I decided to use cardboard material in the design exploration. Another insight gained through the online questionnaire was that, people could personalize the objects with large surfaces more easily. Thus, I looked for a cardboard package which had large surfaces, and decided to use shoe-boxes for the design exploration, which were in a managable size for the participants. In addition, shoe boxes are the packages commonly found in people's houses. Although, I used shoe-boxes for the design exploration, it can be produced using any cardboard box in other sizes.

When selecting the method of personalization for the design exploration, I considered the ways of enabling product personalization emerged from the literature review, and the methods of personalization emerged from the online questionnaire.

In the literature review, I had classified the ways of enabling personalization in three groups; which are *designing a finished product as a design template*, *designing a half-way product*, and *enabling personalization in the post-use phase*. I did not prefer to provide a finished product as a design template in the workshop, since it would limit the creative involvement of the participants. Since I decided to use a repurposed shoe-box for the design exploration, this approach was related to *enabling personalization in the post-use phase*. This approach included design approaches such as designing a product with two-life spans, leaving a space for people's intervention in the post-use phase, providing accessories for the personalization of the product, and enabling people to combine the old product with new product parts/products/surface treatments. Among these, I left a space for people's intervention in the post-use phase, and thus, the resulting toolkit is a half-way design exploration. In addition, I considered the commonly used methods of personalization emerged from the online questionnaire, which are *integrating a part/material with a product* and *repurposing a product*. These methods could be used by the participants who have low skill levels. Thus, I decided to combine all these findings regarding the method of personalization, and develop a lighting design exploration which can be made of a cardboard shoe box in the post-use phase, through intergating the old box with new parts.

To integrate parts with the shoe box, I needed to develop design details to enable people attach the parts on the box and transform the shoe box into a lighting. For this reason, firstly I opened a hole on the box for placing a light bulb, and drilled holes on the four sides of the shoe-box to enable the participants to create a light shade by passing materials through these holes. To make the passing materials through the holes easier, I considered providing metal rings that could be attached to the holes, when needed. The finalized design exploration was a repurposed cardboard shoe box, which can be converted to a half-way lighting through drilling holes on the box with the help of templates, and then passing materials through these holes to cover the front of the light bulb (Figure 6.1). In this way, I thought that, the materials passed through the holes can be changed whenever a person wants to change them.

Finally, I also thought about the design considerations important for sustainability emerged from the literature review. The design considerations such as increasing the understandability of the product, adaptability for the changing needs and tastes, use of local skills and locally available materials, and integrating different scales of design and production were considered in the design phase.

Figure 6.1. Generative tool developed for the first design workshop.

When the design exploration is evaluated in terms of the dimensions of personalization developed in Chapter 4, and the dimensions important for sustainability (Table 2.2), the *goal of personalization* is to *meet a need with an available product*. In addition, the *method of personalization* is *integrating a part/material with the product* and c*hanging the product's context of use,* and the *life span phase* of the product to be personalized is the *post-use phase*. To personalize the design exploration, *hand skills* are required, but it is predicted that, people who have no specific skill can also personalize it. The *effort* to be spent needs to be *mental and physical*. The *nature of intervention* can be both *aesthetic* and *functional*, and the design exploration can be personalized more than once (*flexibility*), since the parts attached using the holes can be changed, when needed.

In terms of the scales of production involved, the materials, parts, and the design exploration provided for personalization in the workshop are mass produced (shoe boxes, metal rings, ropes, ribbons, fabrics). However, the design exploration can also be personalized through the integration of the mass produced cardboard boxes with the parts produced in one-off or batch production scale. For this design exploration, there is no role of manufacturer, whereas designer can provide a template for opening the holes on various cardboard boxes, and people can adapt it through obtaining the template and the electrical parts, and through the use of personally available materials/product parts. Table 6.2 summarizes the evaluation of the design exploration in terms of the dimensions explained above.

Table 6.2. *The evaluation of the design exploration in terms of the dimensions of personalization important for sustainability.*

Goal of personalization	Meeting a need with an available product
Method of personalization	Integrating a part/material with the product and changing the product's context of use
PLS phase	Post-use
Required skills	Hand skills, no specific skill
Effort	Mental and physical effort
Nature of intervention	Aesthetic and functional
Flexibility	More than once
Production scales	Mass production
Role of manufacturer	-
Role of designer	Providing a template for opening the holes on various cardboard boxes
Role of people	Adapting the design exploration through obtaining the template and the electrical parts, and through the use of personally available materials/product parts.

6.2. Generative Session 1: Design Workshop

In this phase, I tried to collect data regarding the design details enabling personalization from as many people as possible. For this reason, the first generative session was carried out as a design workshop. In addition, I aimed to gain insights regarding the setup of the generative session. I conducted the design workshop "From Box to Lighting" within the scope of a Mini Maker Fair held in İzmir on 29 April 2015.

6.2.1. Sampling for the Design Workshop

10 people participated in the workshop, who were the first 10 people applied to the workshop via an online application form. Therefore, they had different skills and background, and they were at different ages, and the sampling strategy was availability sampling. Table 6.3 displays the age, gender, and occupation information of the participants. The child participant (P6) participated in the study together with his parent (P5).

Table 6.3. Participants of the first generative session.

	AGE	GENDER	OCCUPATION
G1-P1	16	Male	High school student
G1-P2	17	Female	High school student
G1-P3	16	Male	High school student
G1-P4	17	Female	High school student
G1-P5	35	Female	Academician
G1-P6	9	Male	Primary school student
G1-P7	22	Male	University student
G1-P8	22	Male	University student
G1-P9	40	Female	Company manager
G1-P10	27	Female	Photographer

6.2.2. Duration and Setting of the Design Workshop

The design workshop was scheduled to begin at 14:00 and end at 17:00. However, it lasted shorter. People finished the personalization task in different durations, and the last participant finished her personalization task in about two hours.

The generative session was carried out in a closed room in İdeEge Building of Ege University. Participants sat around a table on which the design explorations to be personalized and the materials and tools needed for personalization were available (Figures 6.2 and 6.3).

Figure 6.2. Setting of the design workshop.

Figure 6.3. Participants in the setting of the design workshop.

6.2.3. Data Collection

During the design workshop, verbal and visual data were gathered from the participants through different means. The visual data were collected through the generative toolkit. In addition, video recording was used, and photographs were taken to record the participants' personalization process for collecting visual data. To collect verbal data from the participants, a printed questionnaire (Appendix C) was used.

Generative Toolkit. The generative toolkit used in the design workshop consisted of the lighting design explorations and the materials and the tools for personalizing them. In the workshop, I provided 10 design explorations made of shoe boxes. Thus, each participant personalized one design exploration. I opened the holes of the design exploration before the workshop, since it would be time consuming to open them during the workshop. In addition, I opened the holes for the light bulbs on different edges of the shoe-boxes in different sizes (Figure 6.4). The lighting design explorations prepared for the workshop consisted of a cardboard shoe box with holes, and the electrical parts connected to each other, which are the light bulbs, cables and the plugs.

Figure 6.4. Design explorations made of shoe boxes.

Since the generative session had to be carried out in a limited time period, the organizers of the maker fair and I provided the materials and tools needed to personalize the design explorations (Figure 6.5). These are listed in Table 6.4.

Table 6.4. List of the materials and tools provided for the design workshop.

Materials for shading	Materials and tool for joining the parts	Materials for shaping the materials
Felt clothes	Stapler	Scissors
Sack cloth	Metal rings	Rulers
Ropes in seven different colors and thickness	Silicon gun and silicon	Pens
Ribbons in five different colors	Adhesive	Cutters
Yellow beads		Puncher

Figure 6.5. Materials and tools provided for the personalization process.

Printed questionnaire. I used the printed questionnaire (Appendix C) to gather verbal data from the participants, and it included two personal questions, one demographic and five open-ended questions. The personal questions asked the names and e-mail addresses of the participants, which were used while sending the photographs of the personalized products to them. The demographic question asked the occupation of the participants. The initial two open-ended questions explored the context and purpose of use of the lighting design exploration that the participants would personalize. The purpose of these questions was to make the participants think about the design exploration that they would personalize before the personalization process, and define their design criteria.

The remaining three open-ended questions explored how the attributes of the personalized product reflected the design considerations that the participants defined, participants' evaluations of the personalized product, and the problems they encountered during the personalization process. These three questions were asked to gain insight into the evaluation of the participants regarding the personalization process and the resulting product.

Data Collection Procedure Followed in the Design Workshop. After all the participants arrived at the workshop room, I requested them to sit around the table. Then, I introduced myself, explained the aim of the session, asked for their permission for video recording and the photographs that would be taken, gave information about the the toolkit and the questionnaire, and asked the participants to select one of the boxes for personalization. Then, I distributed the questionnaires, and requested the participants to fill them, except for the last three questions.

After this process, the participants were asked to complete the design explorations based on the context and the purpose of use they defined, and their tastes and preferences, using the holes, metal rings, and the materials and the tools on the table. No intervention has been made to the participants during their personalization process, and they were asked to freely personalize the design exploration through using any of the materials provided.

When a participant finished her/his personalization task, I asked her/him to respond to the remaining three questions in the questionnaire. After each participant completed the personalization process, the photographs of the participants with their finished products were taken, and these photographs were sent them via e-mail.

6.2.4. Data Analysis

In the analysis process, the aim was to extract knowledge to be translated into design criteria to further develop the design exploration. I analyzed the verbal data in the questionnaires, and the visual data in the form of photographs and video recordings through content analysis and holistically through associating them. While analyzing the questionnaires, I used a deductive approach, focusing on the key concepts explored in the questionnaire. For this reason, I developed an initial list of categories based on the themes in the questionnaire, and defined them (Table 6.5).

Table 6.5. Initial list of the categories for the analysis of the questionnaires.

Category	Definition
Context of use	The context in which the lighting will be used.
Purpose of use	The purpose for which the lighting will be used.
Design considerations	The design considerations that the participants thought about during the personalization process.
Evaluations	Participants' evaluations about the personalized design exploration.
Problems	Problems encountered by the participants in the personalization process.

To analyze the questionnaires, I prepared an Excel sheet based on the themes I defined at the beginning. Then, I transferred the data into Excel, and coded them based on these themes. Since some of the participants did not respond to some of the questions, I left some of the cells blank. After developing the initial codes, I grouped some of them under sub-categories. For instance, I coded the problems such as *lack of a tape* and *lack of a special cable* as *lack of materials* under the sub-category of the *problems*. In addition, I grouped some of the sub-categories under categories. For instance, I grouped the problems such as *lack of materials*, *short duration of the workshop*, and *required skill level* under the *methodological problems* category. In addition, after the analysis, I included the themes of context and purpose of use into the theme of *participants' design considerations*, since most of the participants considered these in the personalization process. Finally, I renamed the theme of *participants' evaluations* as *benefits of personalization*, since the participant's evaluations were directly related to these. Figure 6.6 displays a section of the Excel sheet used in the analysis.

P	Participants' design considerations (Code)	Participants' design considerations (Category)	Problems encountered during the personalization process (Code)	Problems encountered during the personalization process (Sub-category)	Problems encountered during the personalization process (Category)
P1	Small shapes, dark colors	Purpose of use	Difficulty in cutting the materials	Required skill level	Methodological problems
P2	-	-	Lack of tape	Lack of materials	Methodological problems
P3	-	-	-	-	
P4	Color harmony with the room walls Form harmony with the other lamps in the room	Context of use	Difficulty in passing the ropes through the beads	Lack of materials	Methodological problems
P5	Colors, movement, the concept of nature, memories	Personal taste, purpose of use	-	-	
P6	Two functions	Purpose of use	-	-	
P7	Concepts from the nature	-	-	-	
P8	Making the bulb movable	Purpose of use	-	-	Methodological problems
P9	-	-	Short duration	Duration of the workshop	Methodological problems
P10	Light intensity-color relationship	Purpose of use	Gluing the fabric on the wrong side	Understandability of the design details	Problems about the design details

Figure 6.6. A section of the questionnaire analysis sheet.

I also analyzed the visual data, which are the personalized design explorations, and the video recordings through content analysis, using an inductive approach. For the analysis of the video recordings, I created an Excel sheet, and placed the key actions that each participant performed during the personalization process together with the photographs of the personalized design exploration. Then, I inserted my observational notes in relation to the participants' actions, and interpreted these observational notes. After this process, I coded my interpretations, and grouping the codes, I created the main themes. Figure 6.7 displays a section of the analysis sheet developed in Excel.
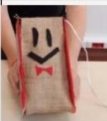
P	Personalized DE	Actions	Observations	Interpretations	Code	Theme
P1		Firstly covered the outer surfaces of the box through gluing felt. Covered the inside of the box with felt through gluing & stapling. Glued sack in front of the bulb. Decorated the shading through shapes cut out of felt.	During the covering process, the holes were covered with felt.	Since the box was a re-used box, he may wanted to cover the defects or stickers on the box. People might be influenced by each other. Participant could not understand the function of the design details.	Material selection, influence of others, Understandability of the design details	Design considerations Methodological considerations
			He had difficulty in cutting the fabric accroding to the dimensions of the box.	The skill level of the participant was lower than required.	Required skill level-sample relationship	Design considerations
			Although the inside of the box is not seen after the personalization process, he covered it.	The process was improvised and did not involve purposeful interventions.	Understandability of the design details Understandability of the goal of personalization	Design considerations Methodological considerations
			He covered the front of the bulb through gluing a felt part on the box, and he did not use the design details provided for personalization.	Since the holes were covered with felt, he did not use them while attaching the shading. He preferred a much more easier way of creating a shading, based on his skills.	Understandability of the design details Skill-sample relationship	Design considerations

Figure 6.7. A section of the analysis sheet prepared for the visual data.

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Finally, I analyzed the personalized design explorations based on the dimensions of personalization important for sustainability (Table 6.2), to explore to what extent my intentions overlap with the participants' personalization process, and identify the problematic areas.

6.3. Findings of the Design Workshop

In this section, I presented the results of the questionnaires, observations and the analysis of the personalized design explorations based on the dimensions of personalization separately in the following sections. Based on the participants' responses and my observations, I reflected on the design exploration and the research methodology.

6.3.1. Results of the Questionnaires

The analysis of the questionnaires revealed three themes, which are the participants' *design considerations*, *benefits of personalization*, and the *problems (encountered during the personalization process)*. Table 6.6 displays the themes and categories emerged from the analysis of the questionnaires.

Table 6.6. Themes and categories emerged from the questionnaires.

Themes	Categories
Design considerations	Personal taste, context of use, purpose of use.
Benefits of personalization	Product-related benefits (Product's fit to person, self-expressiveness)
Problems	Problems about design details, methodological problems.

6.3.1.1. Design Considerations

The analysis of the questionnaires revealed three *design considerations* taken into account by the participants during the personalization process. These are *personal taste*, *context of use*, and *purpose of use*. However, not all of them were considered by each participant, and four participants did not respond to the question exploring their design considerations.

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Table 6.7 displays the personalized design explorations in relation to the context and purpose of use defined by the participants, and the design considerations mentioned by the participants during the personalization process. In the table, C refers to context of use, P refers to purpose of use, and MDC refers to mentioned design considerations by the participants after the personalization process ended.

Although all of the participants might have personalized the design exploration based on their tastes, only one of them mentioned it in the questionnaires. Participant 5 stated that, while personalizing the design exploration, she used the colors and the nature theme which would relax her.

At the beginning of the design workshop, I asked the participants to define the context of use for the design explorations that they would personalize to make them think about the possible design features that the personalized product would have. Among the 10 participants, eight of them defined their contexts of use as their personal rooms, one defined it as buses, and one participant did not define any context of use. However, in the questionnaires, the context of use was mentioned as a design consideration by only one participant. Participant 4 stated that, she considered the colors of the walls and the other lightings in her room, while personalizing the design exploration.

While seven participants defined the purpose of use as task lighting, three participants defined it as a decorative lighting. In the questionnaires, five participants mentioned the purpose of use as a design consideration in their personalization process. Participant 1 stated that, he used dark colors since he was going to make a night lamp. Participant 5 stated that, she needed a decorative lighting, so she did not shade the light source. Participant 6 indicated that, he wanted to make a lighting, which can be used as a reading lamp and as a night lamp with a shading. Participant 8 stated that, he tried to make a lighting with a movable bulb, which can be pulled when the passenger needed to use it. Finally, Participant 10 responded that, she selected a shading material with a light color, so that the light would be intense.

Table 6.7. Personalized design explorations in relation to participants' design considerations.

Participant 1	Participant 2	Participant 3
C: Personal room P: Night lamp MDC: Purpose of use	C: Personal room P: Night lamp MDC: -	C: Personal room P: Reading lamp MDC: -
Participant 4	**Participant 5**	**Participant 6**
C: Personal room P: Decorative wall lamp MDC: Context of use	C: Personal room, on the wall P: Decorative direct light MDC: Personal taste, purpose of use	C: Personal room P: Reading lamp and night lamp MDC: Purpose of use
Participant 7	**Participant 8**	**Participant 9**
C: Personal room P: Reading lamp MDC: -	C: Bus P: Reading lamp MDC: Purpose of use	C: - P: Decorative lamp MDC: -
Participant 10		
C: Personal room P: Reading lamp MDC: Purpose of use		

6.3.1.2. Benefits of Personalization

Eight participants provided their evaluations of the personalized design explorations. The participants' evaluations were coded under the theme of *benefits of personalization*, since the evaluations were directly relevant to that theme. The participants mentioned only product-related benefits, which are *product's fit to person* and *self-expressiveness*.

In terms of the *product's fit to person,* three participants (P1, P6, P8) indicated that they were content with the design exploration, stating that the lightings they personalized looked beautiful (P1 and P6) and functional and effective (P8). On the other hand, P2, P4, P9, and P10 were not content with the result. The participants evaluated their lightings as *too childish*, *not so beautiful*, *ugly*, and *insufficient for reflecting light*, respectively.

Two participants (P3 and P8) commented about the *self-expressiveness* of the results, evaluating their personalized lightings as *reflecting their creativity* and *colorful personality*, respectively.

6.3.1.3. Problems Encountered by the Participants

Six participants mentioned the problems they encountered during the personalization process. I grouped them under two categories, which are the *methodological problems* and the *problems about the design details*. One of the *methodological problems* mentioned by two participants was the *lack of materials*. One of the participants stated that, she needed adhesive tape, and the other needed beads with larger holes. Another *methodological problem* mentioned by one participant was the *short duration* of the workshop. Finally, one participant stated that, he had difficulty in cutting the materials, which indicate that the *required skill level* might have been higher than the participant's skill level.

Only one problem about the design details was mentioned by one participant (P10). She indicated that, she glued the fabric on the wrong side of the design exploration, which implies that, the understandability of the design details was a problem.

6.3.2. Results of the Observations

The analysis of the observations revealed two themes, which are *design considerations* and *methodological considerations*. *Design considerations* emerged in the study were *material selection*, *understandability of the design details*, *required skill level-sample relationship,* and *seperation of the bulb and the part to be personalized.*

6.3.2.1. Design Considerations

Material selection emerged as a design consideration in the study, since most of the participants (six participants) covered the outer surface of the boxes partially or completely as an initial action in their personalization process (Figure 6.8). This may be resulted from the material of the re-used shoe-boxes, which had stickers and small defects on them. The deficiencies might have made the participants want to cover these. This also affected the use of the design details, since, the holes were covered with fabric during the covering process. On the other hand, the cardboard material enabled one participant to draw pictures on it for personalization, and this facilitated the use of surface treatment as a method of personalization, besides integrating a part/material with the product (Figure 6.9).

Figure 6.8. Participants covering the design explorations.
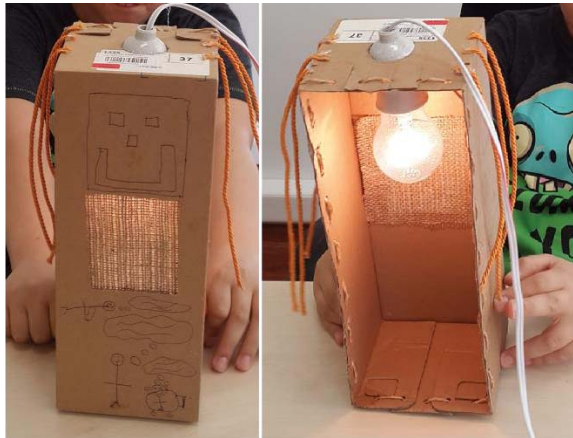
Figure 6.9. Drawing as surface treatment on the design exploration.

Another design consideration emerged from the study is the *understandability of the design details*. The holes provided for personalization were either covered with fabrics or filled with materials (Figure 6.10). As most of the participants covered the holes provided for enabling personalization, this indicated that, the function of the design details was not understandable enough for the participants. Although some of the participants shaded the light source, they performed this through gluing or stapling the materials on the box, instead of using the holes (Figure 6.11). In addition, five participants did not even shade the light source, which was an unexpected result of the study (Figure 6.12). Only two participants tried to use the design details as expected. However, the bulb could not be shaded properly (Figure 6.13).
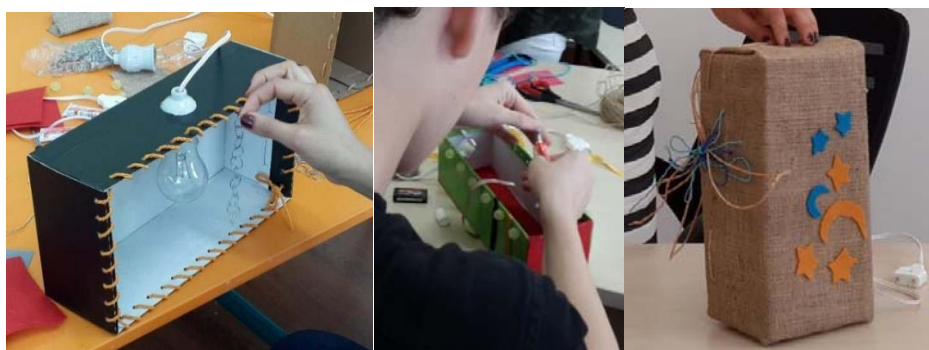
Figure 6.10. Holes covered in various ways.

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Figure 6.11. Materials stapled and glued on the boxes.

Figure 6.12. Lightings without shadings.
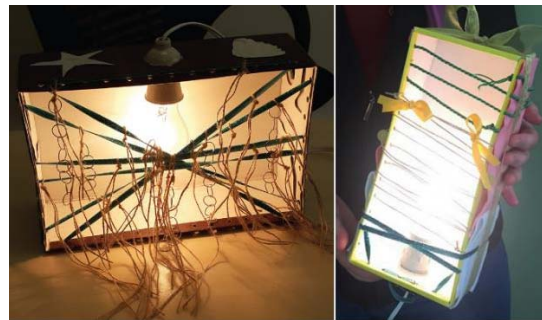
Figure 6.13. Partly shaded design explorations.

Required skill level-sample relationship is another design consideration emerged in the study. Although I considered the participants' skill levels before the session, some of them had difficulty in cutting the fabrics in desired dimensions. This reveals the necessity of providing templates for cutting materials and making the personalization process easier for them.

Finally, *seperation of the bulb and the part to be personalized* emerged as a design consideration, since the participants had difficulty in the personalization process, while the bulb was on the box.

6.3.2.2. Methodological Considerations

Methodological considerations emerged in the study include the *influence of others, understandability of the personalization task*, and the *tools and materials provided for personalization*.

Since six participants started to personalize the design exploration through covering the boxes, this may be a sign of the *influence of the participants on each other*. The participants might have been affected by each other, since they sat around a table, and could see what others were making.

Another methodological consideration was the *understandability of the personalization* task. Although I explained how the participants could personalize the design exploration at the beginning of the session, most of them did not use the design details as expected.

Finally, *the tools and materials provided* in the session is a methodological consideration emerged in the study. I had provided some tools and materials that might be necessary during the personalization process, such as staplers, adhesives, and various types of sheet materials. My prediction was that, the participants could pass the ropes and ribbons through the holes, and might want to attach additional materials on them using staplers, adhesives, etc. However, the use of these tools and materials prevented the use of the design details in most of the cases. Some of the participants might have preferred to glue or staple fabrics to shade the light source, since this was an easier method compared to passing materials through the holes. Thus, this issue may also be related to the required skill level and participants' motivation for spending physical effort.

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6.3.3. Analysis of the Results based on the Dimensions of Personalization

Table 6.8 displays the results of the analysis of the personalized design explorations based on the dimensions of personalization important for sustainability in relation to the considerations I defined previously in the design phase. Some of the previously defined dimensions, which are the *goal of personalization*, *product life span phase*, *production scales*, and the *roles of manufacturer, designer and the people* did not change at the end of the personalization process, since they were the invariable characteristics of the design exploration I defined earlier. Thus they are not involved in the table. However, I could compare the dimensions actively involved and can vary in the personalization process, which are the *method of personalization*, *required skills*, *effort*, *nature of intervention*, and *flexibility*.

Table 6.8. *Evaluation of the personalized design explorations in terms of the dimensions of personalization important for sustainability.*

	Before the personalization process	After the personalization process
Method of personalization	Integrating a part/material with the product and changing the product's context of use	Integrating a part/material with the product and changing the product's context of use, surface treatment, changing the form
Required skills	Hand skills, no specific skill	Hand skills, no specific skill
Effort	Mental and physical effort	Mental and physical effort
Nature of intervention	Aesthetic and functional	Only aesthetic (five participants), aesthetic and functional (five participants)
Flexibility	More than once	Once

Most of the participants (nine participants) integrated the materials provided with the design exploration and changed the context of use of the shoe-boxes. Only one participant used other methods such as surface treatment and changing the form of the design exploration through cutting away a surface from the box, besides integrating new materials with it. None of the participants used skills other than the skills defined earlier. In terms of effort, all of the participants invested mental and physical effort during the personalization process.

As for the nature of intervention, half of the participants only made aesthetic interventions, leaving the bulb without a shading and only decorating the boxes. The other half of the participants made both aesthetic and functional interventions, and they tried to shade the light source in various ways (Figure 6.14). Finally, although I defined the flexibility of personalization as more than once at the beginning, the personalized design explorations became objects that can be personalized only once, since the participants glued the materials on them.
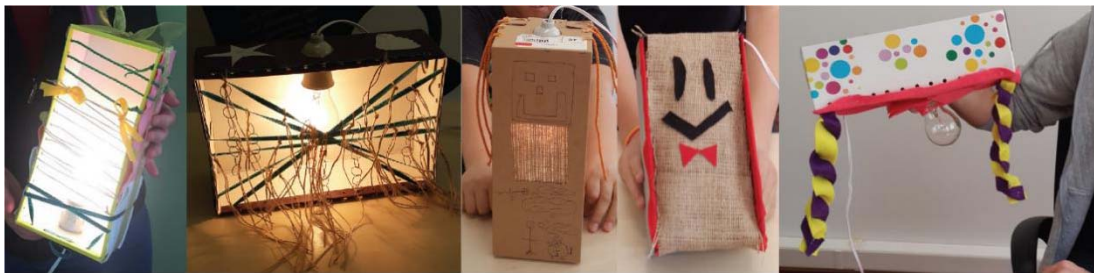
Figure 6.14. Aesthetic and functional interventions on the design explorations.

6.4. Reflections

The design workshop provided important insights in terms of the features of the generative toolkit and the set-up of the generative session, which are explained in the following section.

Reflections on the Generative Toolkit

Based on the findings of the study, I identified the features to be improved for the subsequent phase of the study. These features are;

- Understandability of the design details,
- Material selection,
- Required skill level-sample relationship,
- Separation of the bulb and the part to be personalized.

After the study, I realized that, most of the participants could not understand the function of the design details, since they used them in unexpected ways, some of them did not even use the details. The holes and the metal rings, provided for functional purposes, were mostly used for aesthetic purposes. This may be resulted from the design exploration on which the part that would be personalized was not clearly defined. To this end, it would be better to emphasize or separate the part to be personalized to increase the understandability of the design details via instructions and/or self explonatory design details for better interpretation and reflection.

Another finding was related to the material of the design exploration which was re-used. This may be the reason why most of the participants wanted to cover it as the first step in their personalization process. The participants might have tried to hide the package or old appearance of the box. Considering this, the material to be used in the subsequent phase can be reconsidered.

Although I considered that, people with low skill levels could personalize the design exploration easily, some of the participants had difficulties in cutting materials in certain dimensions. This problem could be avoided through providing templates for cutting the materials in accordance with the dimensions of the boxes. Moreover, some of the participants created a shading through gluing or stapling materials on the box, instead of passing materials through it. This may imply that, the method of personalization I provided, might have required a higher level of physical effort than I expected. To solve this problem, the design details can be made easier and accessible for personalization, or more skillful people, who have motivation for spending physical effort, can be involved in the next phase.

Finally, the participants had difficulties in personalization, since the light bulb was fixed on the box during the process. To avoid this problem, I decided to separate the part holding the bulb and the part to be personalized in the next phase, which aims to improve the understandability of the design details and ease of personalization.

Reflections on the Research Methodology

Arranging the first generative session as a design workshop enabled me to reach 10 people at the same time, and these people were interested in making things. Therefore, their motivation for the session was high. In addition, 10 personalized design explorations were obtained in two hours. However, the workshop revealed some methodological issues to be reconsidered in the subsequent phases. These issues involve;

- The influence of the participants on each other in the workshop environment,
- Understandability of the personalization task,
- Tools and materials provided for personalization,
- Use of the questionnaires,
- Duration,
- Sampling.

Observing the participants' personalization process, I realized that, they started with similar actions to personalize the object. This may imply that, they were influenced by each other, which affected their creativity and self-expression in the process. To avoid this, the generative sessions can be conducted with individuals separately, or at least the personalization task needs to be performed individually, without the influence of others.

The second methodological issue is the understandability of the personalization task. Although I made an introduction to the participants, and explained how they could personalize the design exploration, the results showed that, they could not understand that task properly. Half of the participants only decorated the objects through aesthetic interventions, instead of creating a shading on them. Thus, more information about how to personalize the design exploration can be provided in the written form or with the support of visuals in the subsequent sessions.

Another methodological issue to be reconsidered is related to the tools and materials provided. The tools and materials provided for joining the parts such as adhesives, staplers, etc. affected the use of the design details adversely. In addition, the use of adhesives affected the flexibility of personalization, and resulted in permanent interventions. Moreover, the compatibility between the materials (e.g. beads and ropes) needs to be considered, while providing materials for personalization in the workshops.

The use of the questionnaires was another methodological problem, since that did not provide meaningful data due to the participants' short and superficial answers. The participants did not properly respond to the questions after the session. This may be resulted from the timing of the questionnaires, which was just after the session. Since the participants engaged in an activity which required mental and physical effort during the personalization task, they were not willing to spend extra effort to fill out the questionnaires. To avoid this, in-depth interviews can be conducted to explore the participants' personalization process, and the participants can be provided with a certain amount of time before these interviews.

One participant stated that the duration was rather short, and it would be better to provide a longer duration to enable the participants to think about and personalize the design exploration thoroughly for getting more in-depth feedback from them. Despite the questions I asked in the questionnaire to make them think about a context and the purpose of use for the toolkits, the participants could not reflect on their design considerations on their personalized objects.

Finally, the sample needs to be reconsidered in accordance with the required skill level for the personalization task, if the design details will not be changed. Since some of the participants had difficulties in cutting materials, and some of them preferred to use simpler ways while attaching shadings in front of the bulb, this issue can be reconsidered in the following phases.

6.5. The Follow-up Study: Development of the Second Generative Toolkit

In the follow-up study, I developed the generative toolkit further and improved the design of the generative sessions based on the insights I gained through the design workshop. In this phase I explored the same research questions mentioned at the beginning of this chapter. I improved the generative toolkit based on the findings of the design workshop, considering the following design considerations:

- Understandability of the design details,
- Material selection,
- Required skill level and sample relationship,
- Separation of the bulb and the part to be personalized.

First of all, I separated the body of the toolkit and the parts to be personalized to increase the understandability of the design details, define the parts to be personalized more clearly, and preventing the difficulty of personalizing the toolkit while the bulb is fixed on the box. Thus, the parts to be personalized were transformed into two covers in the form of frames with rectangular apertures and holes on them, which can be placed in front of and behind the body holding the light bulb (Figure 6.15). In this way, I aimed to make people focus on the parts to be personalized, rather than the other parts of the toolkit. Moreover, the bulb and the parts to be personalized were separated in this way, which was another design consideration. These two covers could be personalized through passing materials through the holes as in the previous study. The reason why two covers were made was that, the second generative study lasted one-week. Therefore, two alternative cover variations were provided, in case the participants would like to personalize another cover, which would also provide more feedback regarding the alternative ways of personalization of the generative toolkit.
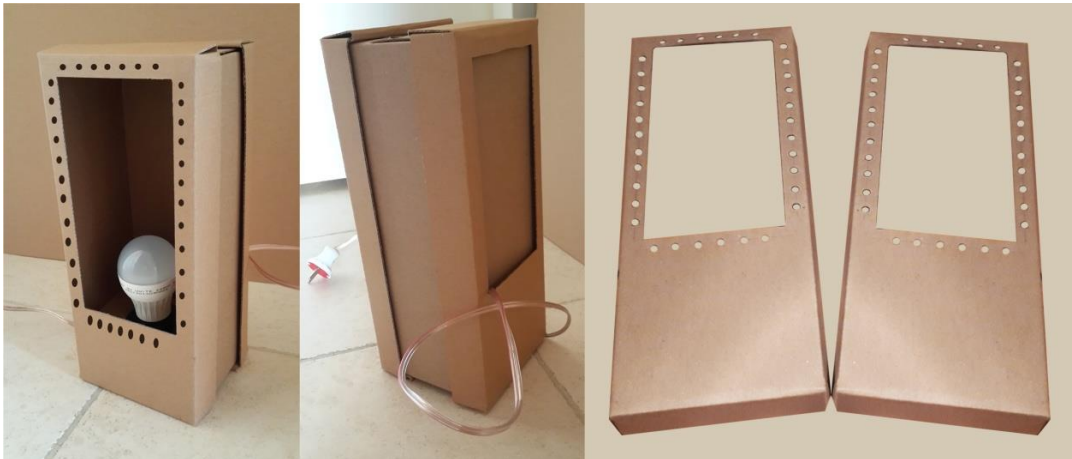
Figure 6.15. Generative toolkit improved for the follow-up study.

Another design consideration was the material of the generative toolkit. This time, I used 1 mm-thick new corrugated cardboard to make the box form, instead of reusing the cardboard shoe boxes. The toolkit was renewed in this way because, the participants in the first generative session tried to cover the outer surfaces of the re-used boxes, which had labels and small deformations. Through using new cardboard, I tried to make the participants focus on the parts to be personalized during the personalization process. I addressed the problem regarding the skill level-sample relationship, through changing the characteristics of the sample, which is explained in Section 6.6.1.

As another improvement in the toolkit, I placed the light bulb, which was in a hole on the box in the first generative toolkit, in a housing that can be placed inside the body, to make the toolkit more appealing (Figure 6.16). Accordingly, the cable of the lighting was passed through the inner side of the box. In this way, the plastic socket was hidden, which was visible in the first toolkit. This housing was placed inside the body and the apertures on the covers were made in a way that only the light bulb could be seen.

Figure 6.16. The housing used for the light bulb.

Finally, the 25W incandescent bulbs used in the first generative session due to cost constraints, were replaced with 6W LED bulbs, to prevent the overheating inside the cardboard box.

When the generative toolkit is evaluated in terms of the dimensions of personalization developed in Chapter 4, and the dimensions important for sustainability (Table 2.2), the *goal of personalization* is to *increase the product's fit to person through improving aesthetic and functional qualities of the toolkit*. In the design workshop, I had defined the *goal of personalization* as *meeting a need with an available product*. The reason why I changed it is that, this time I did not reuse a product, and thus, the new toolkit could not be readily available at home. For this reason, the purpose could be improving the aesthetic and functional qualities of a half-way toolkit provided by designer to increase its fit to the person who personalized it.

The *method of personalization* remained the same, which is *integrating a part/material with the product*. However, the other method defined in the design workshop, which was *changing the product's context of use is* not applicable for the second generative toolkit, since it is not a reused product. Thus, the *life span phase* of the product to be personalized was also changed and became the *design* and *use phase* instead of *post-use phase*. However, the parts that will be integrated with the toolkit can be in the *post-use phase*.

As the main method of personalization did not change, *hand skills* are still required to personalize the design exploration. However, people with higher level skills can also personalize the half-way design exploration. The *effort* to be spent needs to be *mental and physical*. The *nature of intervention* can be both *aesthetic* and *functional*, and the design exploration can be personalized more than once (*flexibility*), since the parts attached using the holes can be changed, when needed.

In terms of the scales of production involved, the generative toolkit is made of mass-produced cardboard material, but it can be integrated with the parts produced in mass/batch/one-off production scales. However, the half-way design can be an object produced in batch production scale by the designer. For this generative toolkit, the role of the manufacturer can be producing the cardboard toolkit or the manufacturer may not have a role, if the designer produces it. Thus, designer can provide a half-way design and can also produce it using laser cutter and create the 3D from through folding the cardboard parts. The role of the people is to complete the toolkit using the available materials and parts. The toolkit can also be provided online, and the people with technical skills such as using software and laser cutter, can produce it themselves. However, I eliminated this option, since the participants of this study did not have such skills. Table 6.9 summarizes the evaluation of the generative toolkit in terms of the dimensions explained above.

Table 6.9. The evaluation of the design exploration in terms of the dimensions of personalization.

Goal of personalization	Increasing the toolkit's fit to oneself through improving aesthetic and functional qualities of the toolkit
Method of personalization	Integrating a part/material with the product
PLS phase	Design and use
Required skills	Hand skills, craft skills, technical skills
Effort	Mental and physical effort
Nature of intervention	Aesthetic and functional
Flexibility	More than once
Production scales	Mass production can be integrated with parts produced in mass/batch/one-off production scales.
Role of manufacturer	Producing the cardboard toolkit or none
Role of designer	Providing a half-way design with the electrical parts, producing the cardboard toolkit or having it produced by a local manufacturer.
Role of people	Completing the half-way design using locally available materials/parts.

6.6. The Follow-up Study: Individual Generative Sessions

The aim of the second set of generative sessions were to gain insights on designing for personalization with a focus on sustainability through the personalization of the improved generative toolkit by people. Based on the findings of the design workshop, I also improved the design of the generative research process. Thus, I also aimed to explore the implications of the changes I made on the set up and facilitation of the generative sessions.

6.6.1. Sampling

In this phase, I tried to find more skillful participants, since some of the participants of the design workshop had difficulty in cutting the materials, and some of them were not willing to invest too much physical effort during the personalization process. For this reason, I looked for participants who had higher level of skills, such as craft skills and technical skills. Thus, the sampling procedure was theoretical sampling, since the participants were selected based on the findings of the previous phase. One female and one male participant who have craft and technical skills respectively were selected for this phase. The male participant has repairing skills and he is interested in DIY, collecting waste product parts and using them for making things. The female participant is an art teacher and has craft and artistic skills. Table 6.10 displays the participants by their age, gender, skills and occupation.

Table 6.10. Participants of the second generative study.

	AGE	GENDER	SKILLS	OCCUPATION
G2-P1	60	Female	Artistic skills, craft skills	Art teacher
G2-P2	60	Male	Repairing skills, technical skills	Retired tourism professional

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6.6.2. Duration and the Setting of the Follow-up Study

Although I gained quick responses from the participants in the design workshop, the duration for personalization was not sufficient, and a longer duration was needed for an in-depth exploration of the participants' personalization process. Thus, I decided to give the participants enough time for thinking and reflecting on their personalization process, and conducted a longer study which lasted for one week, between May 24, 2015 and May 31, 2015.

It was observed in the design workshop that, the participants who personalized the generative toolkits around a table might have been affected by each other. I changed the setting of the generative sessions to avoid this problem, and the participants personalized the second generative toolkit at their homes using the available materials.

6.6.3. Data Collection

In the follow-up study, I collected both verbal and visual data as in the design workshop. However, I changed the data collection procedure in this phase, since the questionnaires I used in the design workshop did not provide in-depth data. To this end, I collected the verbal data through diaries and the semi-structured interviews I carried out in the specific phases of the generative session. I collected the visual data through the generative toolkits and through the photographs taken by the participants during their personalization process.

Generative Toolkit. The generative toolkit provided to each participant consisted of the half-way design with two covers that can be personalized, the electrical parts, which are the light bulbs, cables and plugs connected to each other, and the metal rings that can be used to pass the materials through the holes easily, if needed. I did not provide any material to integrate with the half-way design to not to limit the participants' creativity, and due to the fact that some of the materials I provided in the workshop misled the participants and resulted in unexpected ways of personalization as explained in Section 6.3 of this chapter.

Photographs of the Personalization Process. As another way of collecting visual data, I asked the participants to take the photographs of their personalization process whenever they make an intervention to the toolkit and send them to me via an online app prior to the interviews to understand the phases of their personalization process thoroughly.

Diaries. To collect verbal data, I provided each participant with a diary (Appendix G) including tables to note the important issues by date during their personalization process. The issues included the materials they used and their purposes of use, the problems that they encountered during the personalization process, and the context and purpose of use they defined for their lighting.

Semi-Structured Interviews. I planned to conduct three semi-structured interviews with each participant to collect in-depth data regarding their personalization processes, and their thoughts about the personalized toolkit. The interviews were planned to be carried out in the second, fourth and the last day of the one-week study.

The interview questions, which are provided in Appendix F, explored the phases of the participants' personalization process, the materials used by the participants and their purposes of use, the problems encountered by the participants in the personalization and the use phase (if they used it), the duration of personalization for each shading, and the participants' evaluations about the personalized toolkits.

Data Collection Procedure Followed in the Follow-up Study. At the first day of the study, I gave the toolkits to the participants with an explanatory sheet including information about the generative toolkit, the process that the participants will be involved and what is expected from them (Appendix E). I provided this explanatory sheet to the participants and explained the generative toolkit and the process verbally, since the participants of the design workshop could not understand the personalization task fully.

A consent form was read and signed by each participant (Appendix D). The participants were asked to personalize the half-way design during one week, and they were allowed to make any interventions on it. I also asked them to fill out the diaries, take the photographs of their personalization process whenever they make an intervention, and send them to me via an online app.

During this one-week study, I conducted two interviews with Participant 1 (P1) in the second and the last day of the study, and three interviews with P2 in the second, fourth and the last day of the study, to fully understand their personalization process. The reason why I conducted two interviews with P1 is that, she completed the first shading in the second day of the study, and she started to personalize the other shading in the sixth day of the study. I conducted three interviews with P2, since he personalized the toolkit throughout the week. During these interviews, I took notes on the interview schedule and audio recording was used.

6.6.4. Data Analysis

The verbal and visual data were analyzed holistically through content analysis. Although I was going to analyze the verbal data obtained through the diaries and the semi-structured interviews together, I could only analyze the results of the interviews, since the participants did not fill out the diaries. Regarding this problem, P1 stated that, she forgot to fill out the diary, and P2 indicated that, he enjoyed the personalization process but filling out the diary was an extra and difficult task for him. This problem can be age-related, and the diaries can be designed in a way that they minimize the effort required from such participants for using them, considering issues such as readability and clarity. While analyzing the interviews, I associated the visual data with the verbal data. The interviews were analyzed through inductive coding. In addition, I analyzed the participants' personalization process based on the dimensions of personalization important for sustainability, and thus the coding approach was deductive.

To analyze the interview results, firstly I verbatim-transcribed the data in MS Word, and then coded the first participant's responses through inductive coding. Then I transferred the initial set of codes and categories, and the relevant quotes of the participant for each category emerged in this analysis to an MS Excel sheet. Then I coded the second participant's responses based on these emerging categories. The initial set of categories fully fit to the second set of data and no other categories emerged. After identifying the initial categories, I grouped some of the them and developed the final themes. Figure 6.17 displays a section of the Excel sheet used in the analysis of the interviews.

	Quote	Code	Category	Theme
P1-S1	*I used the jute cord, since its color fit the color of the cardboard.*	Material color fitting to personal taste	Personal taste	Design considerations
	I like the naturalness of the jute cord.	Material fitting to personal taste	Personal taste	Design considerations
	I used the colorful felts to add some movement.	Shading design fitting to personal taste	Personal taste	Design considerations
	After I made a few circles, I turned on the light to check whether they look good when the light is on.	Lighting quality of the personalized shading	Lighting quality	Design considerations
	If I could find a crochet hook at home, it would be easier to pass the ropes through the holes.	Difficulty in using the design details		Problems
	It is visually beautiful.	Product's fit to person	Product-related benefits	Benefits
	I could see what I can and this made me happy.	Creative fulfillment, hedonic benefits	Process-related benefits	Benefits

Figure 6.17. A section of the semi-structured interviews analysis sheet.

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While analyzing the participants' personalization processes based on the dimensions of personalization important for sustainability, firstly I developed an Excel sheet using the dimensions as the main categories for analysis (Figure 6.18). Then, I analyzed the participants' personalization process for each shading based on these categories.

Participant/ Shading	Personalized Generative Toolkit	Method of Personalization	Skills	Effort	Nature of Intervention	Flexibility	Production Scales	PLS phase
P1-S1		Integrating parts/materials with the product	Craft skills, hand skills	Mental & Physical	Aesthetic & Functional	Once	Mass+mass	Design
P1-S2		Integrating parts/materials with the product	Hand skills, artistic skills	Mental & Physical	Aesthetic & Functional		Mass+mass	
P2-S1		Integrating parts/materials with the product	Hand skills, technical skills	Mental & Physical	Aesthetic & Functional	Once	Mass+mass	Design
P2-S2		Integrating parts/materials with the product	Hand skills	Mental & Physical	Aesthetic & Functional		Mass+mass	

Figure 6.18. Analysis of the toolkits based on personalization dimensions.

6.7. Findings of the Follow-up Study

In the follow-up study, both participants personalized both of the shadings, although it was optional (Figures 6.19 and 6.20). P1 completed the first shading in two days, and the second one in an hour, in the sixth day of the one-week study. P2 completed the first shading in five days and the second one in half an hour, in the sixth day of the generative study.

Figure 6.19. Generative toolkit personalized by Participant 1.

Figure 6.20. Generative toolkit personalized by Participant 2.

6.7.1. Findings of the Semi-Structured Interviews

The analysis of the interviews revealed three main themes which are the *design considerations*, *problems*, and *benefits of personalization*. Table 6.11 displays the themes, categories and codes emerged from the interview study.

Table 6.11. Categories emerged from the semi-structured interviews.

Theme	Category	Code
Design considerations	Personal taste	Materials fitting to personal taste, shading design fitting to personal taste
	Lighting quality	Lighting quality of the material, lighting quality of the personalized shading
	Context of use	
	Availability of the materials	
Problems	Problems about the design details	- Difficulty in using the design details - Weakness of the cardboard material
Benefits of personalization	Product-related benefits	- Product's fit to person, self-expressiveness
	Process-related benefits	- Creative fulfillment, hedonic benefits

6.7.1.1. Design Considerations

The study revealed that, the participants personalized the generative toolkits based on their *personal taste*, *lighting quality*, *context of use*, and *availability of the materials*.

The study showed that, the participants selected *materials* and designed *shadings* that fit to their *personal taste*. While selecting the materials, both participants considered the color harmony between the materials they used and the cardboard material, or the color balance between the materials they used based on their personal taste. Table 6.12 displays the personalized toolkits and the materials that the participants used in the personalization process. For instance, P1 used jute cord in the first shading, since she liked the naturalness of the material and she thought that its color fit the color of the cardboard. Similarly, P2 used blue strings since he thought that its color fit the color of the cardboard. Moreover, P1 stated that, she did not prefer to use the metal rings I provided, since their colors did not fit the cardboard. P2 also did not use the metal rings, since he did not use the holes for personalization.

In addition, the participants' personal taste affected the overall design of their shadings. For instance, P1 stated that, she did not like the monotonous design of the second shading she personalized, so she added felt human figures to bring some movement into her design, and P2 indicated that, the holes seemed ugly, so he filled them with a blue string (Figure 21).

Table 6.12. Personalized toolkits and the materials used.

P1-S1	P1-S2	P2-S1	P2-S2
Jute cord, felt, adhesive	Wadding, felt, adhesive	Aluminum foil, package, metal pipe, mica, base of a juicer, gasket, on-off button, wall plug, screw, rope, adhesive	Baking paper, adhesive

Figure 6.21. Felt figures and blue string on the toolkits.

Another design consideration of the participants was the *lighting quality*, which affected their material selection and the way they personalized the shadings. For instance, P1 selected wadding and colorful felt sheets as shading materials, since she considered that they would look good when the light is on.

P2 used aluminum foil to cover the inner surfaces of the cardboard body to reflect the light out more, whereas he used a sheet of baking paper in the second shading to obtain a more diffused lighting effect (Figure 6.22).

Apart from the material selection, the participants considered the lighting effect of their design on the shadings. For instance, P1 stated that, she checked whether her design looked good when the light is on, to achieve a good lighting effect. Similarly, P2 thought about cutting out star-shaped pieces from the baking paper to create reflections in the form of stars.

Figure 6.22. Aluminum foil and baking paper used on the toolkit.

Context of use was another design consideration for P2. He indicated that, he personalized the toolkit considering that, he could use it both on a table as a table lamp and on the ground as a mood lighting through changing the shadings.

Last but not least, the participants selected the materials they used based on their availability. Both participants preferred to use the materials they had readily available at home, although they mentioned other materials which could also be used, but they did not have such as mica, frosted glass and Teflon.

6.7.1.2. Problems

Each participant mentioned one problem they encountered in the personalization process. These are the difficulty in using the design details (P1) and the weakness of the cardboard material (P2). P1 stated that, if she had a crochet hook, it would be easier to pass the ropes through the holes. P2 indicated that, the cardboard material of the toolkit was not durable and more durable materials could be used such as wood.

6.7.1.3. Benefits of Personalization

While evaluating the personalized toolkits, the participants mentioned some benefits they obtained, which were parallel with the benefits of personalization I identified in the preliminary study phase 1. The participants mentioned both product-related and process-related benefits. The *product-related benefits* mentioned by the participants were *product's fit to person* and *self-expressiveness*. P1 and P2 stated that, the personalized toolkits fit to themselves aesthetically and functionally, respectively. For self-expressiveness, P1 indicated that, the colors she used reflected her personality.

The *process-related benefits* mentioned by the participants were *creative fulfillment* and *hedonic benefits*. P1 stated that, she could see what she could achieve through the personalization process. This reflects her creative fulfillment she experienced through the process. In addition both participants indicated that, they like making things and they enjoyed the process. P1 added that, the process made her happy. These were the hedonic benefits identified in the study.

6.7.2. Analysis of the Results based on the Dimensions of Personalization

Table 6.13 displays the results of the analysis of the personalized toolkits based on the dimensions of personalization important for sustainability in relation to the considerations I defined previously in the design phase. Some of the dimensions, which cannot be changed during the personalization process (goal of personalization and the role of the manufacturer, designer and the people) are not included in the table.

However, I compared the dimensions actively involved and which can be changed in the personalization process.

Table 6.13. Analysis of the personalized toolkits based on the dimensions of personalization important for sustainability.

	Before the personalization process	After the personalization process
Method of personalization	Integrating a part/material with the product	Integrating a part/material with the product
PLS phase	Design and use	Design
Required skills	Hand skills, craft skills, technical skills	Hand skills, craft skills, technical skills
Effort	Mental and physical effort	Mental and physical effort
Nature of intervention	Aesthetic and functional	Aesthetic and functional
Flexibility	More than once	Once
Production scales	Mass produced parts can be integrated with parts produced in mass/batch/one-off production scales.	Mass produced parts were integrated with mass-produced parts.

I had defined the personalization method as integrating a part/material with the product at the beginning. The parts to be integrated could be reused or repurposed parts. The personalized toolkits showed that, both participants integrated parts and some of these parts were repurposed, such as packaging and the base of the juicer. However, P2's way of integration of the juicer base on the toolkit was unexpected and he added additional design details on the cardboard box to achieve this.

In the design phase, I had defined the product life span phase in which the toolkit could be personalized as design and use phase. I predicted that, people could change the design of the covers based on their changing needs in the use phase. Examining the personalized toolkits, it appeared that, the participants personalized the toolkits in the design phase through permanent interventions using adhesives. This prevented the personalization of the toolkit in the use phase and affected the flexibility of personalization, which was predicted as more than once. This problem resulted from the design of the details and the materials the participants used, which were considered in the subsequent phases (Chapter 7 and 8).

Only P1 used the design details as expected while personalizing the first shading. However, she needed to stick the jute cord using adhesive, since there were not any details for knotting (Figure 6.23). In addition, the participants preferred to use sheet materials for most of the shadings (Figure 6.24), and there were not design details enabling the attachment of sheet materials. For this reason, they needed to stick those materials with adhesives, which affected the flexibility of personalization and the life span phase in which the product personalized.

Figure 6.23. Integration of the jute cord using adhesive.

Figure 6.24. Sheet materials attached using adhesive.

The skill levels defined in the design phase were parallel with the skill levels of the participants. The participants did not experience any difficulties while working with the materials, and during the personalization process, they used hand skills such as cutting materials, craft skills such as matting technique, and technical skills such as joining a metal pipe, a juicer base and on-off button together.

The participants spent both mental and physical effort during their personalization process. They spent mental effort to select the right materials, to achieve a good lighting quality and visual balance, and to fit the personalized lighting to the context of use. In addition, P1 continued to spend mental effort after she finished the personalization of the two shadings. She stated that, if more shadings were available, she could use detachable photographs instead of the felt human figures in the second shading or she could use paper instead of the wadding and the felt sheets. The participants also spent physical effort while personalizing the toolkit. Compared to the sample in the design workshop, the participants in the follow-up study had higher level of skills. As discussed in Chapter 4, Section 4.4.3.4, people who have craft skills and who are interested in DIY may have more motivation for spending physical effort. The results of the follow-up study support this proposition, since the participants were willing to spend more physical effort compared to the group in the design workshop.

As expected, the participants made both aesthetic and functional interventions on the toolkit. P1 mostly made aesthetic interventions, however, they were also made for a functional purpose, which was shading the light bulb. P2 also made both aesthetic and functional interventions. However, his interventions were mostly functional, such as attaching a leg on the toolkit and using aluminum foil for reflecting the light and heat inside the box. This may imply that, people who have craft skills tend to make aesthetic interventions, whereas people with technical skills tend to make functional interventions. This insight was considered in the subsequent phases of the study.

As predicted in the design phase, the participants integrated the mass-produced cardboard box with the mass-produced parts, and the resulting toolkits were objects in one-off production scale.

6.8. Discussion

The findings of the design workshop and the follow-up study revealed that, some of the themes were common for both of the studies. These are some of the design considerations of the participants and the benefits of personalization. The design considerations common for both studies include *personal taste*, *context of use* and the *lighting quality of the personalized toolkit*. Although not all of the participants considered these in their personalization process, these themes emerged in both of the studies. In addition, the results of the both studies revealed that, the personalization process ended up with *product* and *process-related benefits* for the participants. This supports the findings of the preliminary study phase 1 regarding the benefits of personalization discussed in Chapter 4 Section 4.4.2.2.

Considering the skill levels, problems, methods of personalization and the interventions of the participants of the two studies, an initial proposition about the relationship between the skill levels of people and the methods of personalization that can be provided by the designers can be discussed. For instance, based on the problems and the methods of personalization emerged from the design workshop, it can be proposed that, people with lower skill levels may be provided with various templates for facilitating the personalization process more effectively (e.g. templates for cutting materials). In addition, based on the participants' nature of interventions in the follow-up study, it can be proposed that, people who have craft skills may be provided with toolkits that enable aesthetic variety, whereas people with technical skills may be provided with toolkits that enable structural variety through personalization. Moreover, people with craft and technical skills may be more willing to spend physical effort during the personalization process. These propositions need further exploration.

In the follow-up study, I tried to solve the problems regarding the design details and the research methodology emerged from the design workshop. In the following section, the implications of the changes I made in the design of the toolkit and the research methodology are discussed and the issues to be improved are identified.

Reflections on the Design of the Generative Toolkits

Based on the findings of the design workshop, in the follow-up study, I improved the understandability of the design details through separating the parts to be personalized and I used new cardboard instead of a re-used one. The replacement of the re-used material with the new one enabled the participants to focus on the parts to be personalized, and none of the participants tried to cover the outer surfaces of the toolkit in the follow-up study. However, I identified the following problems regarding the design details and design of the toolkits, which need further consideration and improvements:

- Need for design details which do not require the use of adhesives in the personalization process,
- Need for more flexible design details for integrating different types of materials,
- Need for a toolkit design enabling structural variety besides the aesthetic variety,
- Need for design scenarios for a purposeful personalization process.

Firstly, the use of adhesives prevents the toolkit to be personalized more than once, which is undesirable from the sustainability viewpoint. In the follow-up study, P1 used adhesive, since there was not a design detail for knotting or fixing the jute cord at the end of the weaving process. In addition, P2 used sheet materials for shading, and thus, he had to use adhesive to place them. To this end, the design details need to be improved in a way that they allow the integration of various materials without the use of adhesives. In addition, the design details I developed only allowed the use of string-like materials.

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For this reason, more flexible details, enabling the use of various materials are needed. Moreover, I eliminated the metal rings, since none of the participants used them in their personalization process indicating that, they did not need them.

Another design consideration emerged from the follow-up study is that, the toolkit only allowed aesthetic variety, while it can also provide structural variety. For instance, P2 tried to increase the height of the light through integrating a leg under the toolkit. This implies that, the toolkit can be designed to be adapted to various lighting needs of people and people could also make structural interventions. To this end, I decided to develop a more flexible toolkit which could provide structural variety.

Finally, I realized that, the participants of the design workshop and the follow-up study personalized the toolkits in an improvised way, without a purpose. I gave them a personalization task, and they completed this task using the skills they had. Although I defined goals of personalization for the toolkits based on the goals of personalization emerged from the two phases of the preliminary study (e.g. improving aesthetic qualities, meeting a need with an available product), these goals appeared to be too general and my focus was on developing design details that enable personalization. To this end, the participant's needs and characteristics remained in the background and the features of the toolkits might not reflect the tastes and needs of the participants. For instance, a cardboard lighting may not be so appealing for participants who have craft or technical skills or for people who are at their 60s. For this reason, I defined a more focused design problem, which questioned the contexts that required personalization of a lighting product, and the people for whom these contexts may be relevant. To answer this question, I revisited the goals of personalization mentioned by people in the online questionnaire, since understanding what type of people had what type of personalization goals, and developing personas based on this question might provide clues for developing different strategies for design for personalization with a focus on people's needs. To this end, I developed personas and design scenarios based on people's goals of personalization, which guided the design process in the subsequent phases. The details of the personas and design scenarios are explained in Chapter 7.

Reflections on the Research Methodology

After the design workshop, I made changes in the research design of the follow-up study such as extending the duration of the study, using semi-structured interviews and diaries instead of questionnaires, changing the setting as participants' homes, not providing additional materials for personalization, and providing an explanatory sheet to the participants. While some of these changes positively affected the research process, some of them still need to be improved.

Extending the duration of the study provided the participants enough time for thinking and reflecting about the toolkit, and their personalization process. However, this duration was not sufficient for exploring the use phase of the personalized toolkits. To this end, longer duration is needed to explore both personalization and use phases of the toolkits.

In the follow-up study, I changed the data-collection method as diaries and semi-structured interviews. Although semi-structured interviews provided in-depth data, the diaries were not effective in data collection, since they were not filled out by the participants. One reason of this may be the design of the diaries, which may not be appealing to the participants. Thus, I improved the design of the diaries in the subsequent phases.

Since I conducted the generative sessions individually, at the homes of the participants, the participants were not influenced by each other as happened in the design workshop, which improved the originality of the personalized toolkits.

In the follow-up study, I did not provide any materials for personalization to the participants. This enabled me to see the types of materials the participants could use in the personalization process and the problems about the design details. In addition, the participants' creativity was not limited by the materials I provided.

Finally, providing an introductory page which explained the study's aim and the content enabled the participants to understand the personalization task more easily, and both of the them shaded the bulb, although they did not use the design details as expected. These insights and findings helped me improve the generative toolkit and the research process to gain further feedback from the participants.

CHAPTER 7

GENERATIVE RESEARCH PHASE 2

The insights I gained through the previous phases of the study indicated the necessity of identifying the contexts which may require the personalization of a lighting, and the relationships between the characteristics of people and their personalization goals to develop personas and design scenarios for the generative toolkits. To this end, in this phase of the study, firstly I developed five personas and design scenarios based on the findings of the preliminary study phase 1 and 2. Then, through analyzing these scenarios based on the sustainability considerations and the limitations of the doctoral study, I eliminated some of them, and reduced the number of the scenarios and personas into two. After that, I conducted another online questionnaire with the people represented in the first persona to further explore their needs, materials and methods they use in the personalization process, and their skill levels. Based on the findings of this survey and the previous phases, I developed a generative toolkit for the first design scenario, and conducted a generative study with the people represented in the first persona.

7.1. Development of the Personas and the Design Scenarios

I analyzed people's goals of personalization and the related product examples gathered through the preliminary study phase 1 and 2 based on the product life span phase that the products are personalized to generate personas and design scenarios. Based on this analysis I developed the map displayed in Figure 7.1. In this figure, personalization examples are displayed with the corresponding goals of personalization and the product life span phase during which the products are personalized. This map enabled me to see that certain groups of people have similar goals for personalization.

DESIGN

Improving aesthetic qualities

Attaching new knobs to a half-way furniture

Self-expression

Attaching new knobs to a half-way furniture

USE

Improving aesthetic qualities

Changing knobs of the furniture (to fit it to the room)

Attaching stickers on an automobile, motorcycle

Painting phone cover using erasable pen

Spray painting and decorating a refrigerator

Cherishing memories

Sticking a sticker reflecting old memories

Spray painting and decorating a refrigerator

Having a unique product

Attaching stickers on a motorcycle

Sticking a sticker reflecting old memories

Combining a pouffe with old leather parts

Process Enjoyment

Using eggcup as a teapot lid temporarily

Combining a pouffe with old leather parts

Improving Functionality

Changing internal and external parts (wheels,plugs, etc.) of an automobile

POST-USE

Repurposing

1. Meeting a need with an available product /Cost Constraints
2. Saving a product because of its aesthetic qualities
3. Process enjoyment
4. Saving a product due to environmental concerns
5. Having a unique product
6. Improving aesthetic qualities
7. Cherishing memories
8. Learning a new craft skill

TV as a table | A sock as an elbow pad | Cardboard box as TV table | Old sock as lavender pouch | Old T-shirt as a scarf | Glass package as a vase | Old coffee cup and plate for making a lighting

Strechfilm roll as a decorative object | Yogurt package as a flower pot | Cardboard package for storage | Decoupage and decoration on a glass jar | Old shirt pattern on a blanket | Pouffe out of plastic bottles | Moulding lace

Re-using

1. Having a unique product
2. Improving aesthetic qualities
3. Improving aesthetic qualities/matching the product with the environment
4. Learning a new craft skill
5. Process enjoyment
6. Saving a product due to its aesthetic qualities

Reusing old scarf through applying wet felt | Reusing old jean shorts through attaching lace parts | Camouflaging a stain on a T-shirt with spray paint | Surface treatment on a coffee table to match its colors with the room | Reusing glasss packages

Repair (to make the product usable again

1. Meeting a need with an available product /Cost Constraints
2. Process enjoyment
3. Improving functionality
4. Improving aesthetic qualities

Repairing a bicycle grip using tape | Repairing the shading of a lighting using a scarf | Repairing the flower pot through painting

Figure 7.1. People's goals of personalization by product life span phase.

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After developing the map in Figure 7.1, I developed five design scenarios corresponding to the personalization goals, since the goals provided by the participants reflected their needs for personalization. In addition, I generated personas representing the participants in these scenarios, which are explained in the following section.

7.1.1. Scenario 1: Affordability

In the online questionnaire, some of the participants indicated that, they *repurposed* their products, which completed their initial use phase to avoid buying a new product which would be costly. This personalization goal was mentioned for the cases such as using a TV as a table, using a sock as an elbow pad, using a cardboard box as a TV table, using an old sock as a lavender pouch, and repairing a bicycle grip with tape. All of the participants who personalized their products for this goal are young people, who are newly graduated or undergraduate level university students. They have a lower-middle or low level of income and they rent and share a house with their friends or they live alone in a house they rent. Considering these findings, the first scenario focuses on a low-cost lighting design exploration for this group of people, which can be personalized with the use of the repurposed materials, which are in the post-use phase.

7.1.2. Scenario 2: Evolving aesthetic qualities

The second scenario focuses on personalization for *improving aesthetic qualities* of a product to fit it to the environment during design and use phase. The origin of this scenario is the personalization practices emerged from the online questionnaire, during which people needed to improve the aesthetic qualities of their products to fit it to their room or their new furniture. For instance, one participant applied decoupage and wearing techniques to her coffee table to match it with her new furniture. Another participant changed the knobs of her dresser to match them with her room. For this scenario, I defined the characteristics of the potential participants as female participants who have middle-high income and who frequently change the decoration

of their homes. Based on this scenario, a lighting design exploration, which enables people to match it with the changing environment or furniture can be developed.

7.1.3. Scenario 3: Cherishing memories

The third scenario has an emphasis on *cherishing memories*. This scenario originated from the personalized product examples, which have parts that are meaningful and valuable to their user. For instance, one participant applied the needlework part of a shirt on a new blanket due to its meaning to her. Another participant, who is emotionally attached to the color and the fabric of her T-shirt converted it to a neck collar, since she could not wear it anymore. Considering these, I developed the third scenario for a lighting design exploration, which can be personalized according to changing needs during design and use phase, while cherishing the memories associated with it. For this scenario, a lighting design exploration can be developed for children, which can be adapted to their changing needs as they grow up, while keeping the childhood memories on it. Thus, the persona can be the children of a family, who are at different ages, and their parents can also be involved in the personalization process.

7.1.4. Scenario 4: Practicing a craft skill

The fourth scenario derives from the personalization examples which are created to learn and *practice a craft skill*. For instance, in the online questionnaire, one participant reused an old scarf to practice the wet felt technique. Another participant used the plastic bottles to learn to make a pouf out of them, which she had learned from her friend. The same participant also molded a lace, converted it to a three dimensional object and used it as a wall decoration. She stated that, she wanted to try this technique when she saw a similar one in a friend's house. Considering these findings, I developed the fourth scenario, during which people can personalize a lighting design exploration, which enable them to try, learn and practice a craft skill.

Potential participants for this scenario can be people who attend a specific craft course, who are interested in Do It Yourself, who follow DIY websites, blogs, etc. to develop their skills and who have self-made objects in their homes.

7.1.5. Scenario 5: Repairing

The fifth scenario focuses on *repairing*. This scenario derives from the personalization example of a participant in the online questionnaire, who had her lamp repaired through adding a scarf as a shading, which was torn. She indicated that, she was interested in the activities such as repairing and DIY. In addition, the male participant in the follow-up study explained in Chapter 6, was also interested in repairing and DIY. Moreover, there are online communities (e.g. www.ifixit.com) who are interested in repairing and helping each other. Considering these people and examples provided in the online questionnaire, I developed the fifth scenario, during which people improve the functionality and aesthetic qualities of a lighting design exploration, which has a lacking functional part and needs to be completed to make the lighting usable. The persona for this scenario focuses on male participants who are interested in repair and have technical knowledge, who have repairing tools and repaired products at home, and collect or keep waste materials/product parts to be used later.

7.1.6. The Analysis of the Scenarios based on the Sustainability and Research Considerations

After developing the five scenarios for contextualizing the cases in the online questionnaire, I analyzed them in terms of their implications for sustainability and their suitability for the doctoral study. Based on these considerations, I eliminated some of them, or integrated the themes explored in the eliminated scenarios into the remaining scenarios.

I eliminated the second scenario, which focuses on the personalization of a lighting product through improving its aesthetic qualities to adapt it to the changing environment in the use phase, since changing an environment frequently requires frequent consumption of products, which contradicts with the sustainability considerations. To this end, I preferred to integrate the goal of *improving aesthetic qualities of a product* into other scenarios, since a product may be personalized to achieve more than one goal. I also eliminated the third scenario focusing on cherishing the memories of children as they grow up, since conducting generative sessions with children or the parents together with their children may take a longer time, which may not be feasible for the doctoral study. Moreover, designing for children brings along additional design research considerations besides the design considerations focusing on personalization. To this end, I integrated the goal of *cherishing memories* into the remaining scenarios. Finally, I decided to address the *repairing* scenario (Scenario 5) through developing toolkits which provide ease of repair and ease of replacement of the product parts due to the time constraints of the doctoral study.

7.2. Online Questionnaire 2

In the second online questionnaire, I explored the products personalized in the post-use phase by Persona 1, who are university students or new graduates sharing the same home or living alone. Since the first scenario focused on personalization in the post-use phase, I explored the post-use personalization examples provided by Persona 1 to understand the types of materials they used in the post-use phase, their methods and goals of personalization, the skills they use, and their interventions. In addition, this study helped me to recruit participants for the generative study conducted in this phase.

In this study, the research question investigated in the first online questionnaire was explored specific to the Persona 1. Thus, the research question was:

- How does the product personalization process take place in daily life for Persona 1?

7.2.1. Data Collection

The second online questionnaire was prepared on Google Forms, and shared on Facebook on February 5, 2016. The questionnaire included the same questions with the first online questionnaire that was carried out in the preliminary study phase 2. However, I limited the age range, since I expected responses from young people. At the beginning of the study I explained the aim of the study, the target people who are invited to the questionnaire, post-use product personalization, and I gave information on the confidentiality of the study and contact information. The questionnaire consisted of nine questions including three questions on personal information, three questions on post-use product personalization, two questions requesting their participation in the further studies, and one question requesting the photographs of their personalized products. The scope of the questions is given below, and the questionnaire is provided in Appendix H.

1. Age range
2. Gender
3. City of residence
4. Product categories that are personalized (check boxes)
   - Furniture
   - Lighting
   - Small home appliances
   - Packaging
   - Personal accessories
   - Transportation vehicles
   - Electronic products
   - Clothing
   - Home accessories
   - Sports equipment
   - White goods
   - Other

5. Methods, product parts and materials used during personalization of each product (open-ended question)

6. Reasons for personalization for each product (open-ended question)

7. Permission for their participation in the further studies (Yes or No)

8. E-mail address of the participant

9. Request for the photographs of their personalized products

7.2.2. Sampling

The sampling procedure was *theoretical sampling* (Glaser & Strauss, 1967), since the sample was determined based on the insights gained through the previous phases of the study. At the beginning of the questionnaire I clearly stated that, only the participation of the people who are newly graduated or the university students sharing a home with their friends or living alone was required.

7.2.3. Data Analysis

I analyzed the results of the online questionnaire through deductive content analysis, based on the themes and categories emerged from the previous online questionnaire, which are also the dimensions of personalization. The themes, categories and sub-categories used for the analysis are given in Table 7.1 below. The category of *the product life span phase that the product is personalized* is removed from the analysis categories, since I explored only the products personalized in the post-use phase. Although I used a deductive approach, I also looked for the new sub-categories during the analysis process. I analyzed only the responses of the participants who sent the photographs of their personalized products, since it was difficult to understand the personalization process without the photographs.

Table 7.1. Themes and categories used for the analysis.

Product	Personalized product category	
Person	Goal of personalization (function and aesthetic-related)	Increasing product's fit to person, meeting a need with an available product, saving a product due to its aesthetic qualities
	Goal of personalization (personal)	Process enjoyment, saving a product due to environmental concerns, saving a product due to its sentimental value, having a unique product, learning a craft skill, cherishing memories
Personalization process	Method of personalization	Integrating a part/material with the product, changing the product's context of use, surface treatment, changing the form of the product, and reusing the product
	Skills used in the personalization process	No specific skill, hand skills, craft skills, and technical skills
	Effort spent in the personalization process	Mental effort and physical effort
	Nature of intervention	Aesthetic and functional

To analyze the participants' responses, firstly I prepared an Excel sheet including each category and inserted the participants' original responses regarding the relevant category. Then, I analyzed each personalized product and the response based on each category. Figure 7.2 displays a section of the Excel sheet prepared for the analysis. Then, I combined the analysis results of the first online questionnaire with the analysis of the second one. While integrating the results of the first online questionnaire, I selected only the analysis results of the participants who are between the ages of 21-25 and 26-30, and the analysis of the products personalized by this group of people in the post-use phase. While exploring the relationships between the categories and the sub-categories, I looked at the frequency of emergence of each sub-category of a category for the sub-categories of the other category.

Age Range	Product category	Product	Method of Personalization (Quote)	Method of Personalization (Sub-category)	Method of Personalization (Category)	Skills	Effort	Nature of Intervention
16-20	Packaging	Plastic icecream packages	I cleaned the food packages and used them for food storage.	Reusing without intervention	Reusing	No skill	Mental	Functional
	Clothing	Old jeans	I cut my jeans, which were tight, and changed their design.	Changing the form of the product	Reusing	No skill	Mental & Physical	Aesthetic & Functional
	Packaging	Glass jars	I cleaned the food packages and used them for food storage.	Reusing without intervention	Reusing	No skill	Mental	Functional

Figure 7.2. A section of the online questionnaire analysis sheet.

7.2.4. Results of the Online Questionnaire 2

The results of the study involve the responses of the participants who filled out the online questionnaire between the dates of February 5, 2016 and March 6, 2016. 13 people (11 female and two male) participated in the second online questionnaire. However, the responses of six participants (four female and two male) were taken into account in the analysis, since they sent the photographs of their personalized products. The total number of the personalized products provided in the second online questionnaire is 16. In addition, I integrated the findings of the first online questionnaire including the responses of the participants who met the age range and post-use personalization criterion. Thus, with a focus on a specific age range and post-use personalization, I analyzed 25 products personalized by 11 participants in this study. Table 7.2 displays the themes, categories and sub-categories emerged in the second online questionnaire.

Table 7.2. Themes and categories emerged from the online questionnaire.

Product	Personalized product category	Packaging, clothing, home accessories, furniture, electronics
Person	Goal of personalization (function and aesthetic-related)	Increasing product's fit to person, meeting a need with an available product, saving a product due to its aesthetic qualities
	Goal of personalization (personal)	Process enjoyment, having a unique product
Personalization process	Method of personalization	REPURPOSING Integrating a part/material with the product, repurposing without intervention, changing the form of the product, and surface treatment. RE-USE Re-using with a minimal intervention, integrating a part/material with the product, surface treatment, and changing the form of the product.
	Skills used in the personalization process	No specific skill, hand skills, craft skills, and technical skills
	Effort spent in the personalization process	Mental effort or mental and physical effort
	Nature of intervention	Aesthetic and/or functional

7.2.4.1. Personalized Product Categories

The results of the study indicate that, the participants mostly personalize packaging products (11 products). These include plastic (five products), glass (three products), cardboard (two products), and wooden packages (one product). It is followed by clothing (six products), and then comes home accessories, furniture, electronics and other product category including wooden pallets. No example was obtained regarding the lighting, small home appliances, personal accessories, vehicles, sports equipment, and white goods. Figure 7.3 displays the number of the personalized products by product categories.
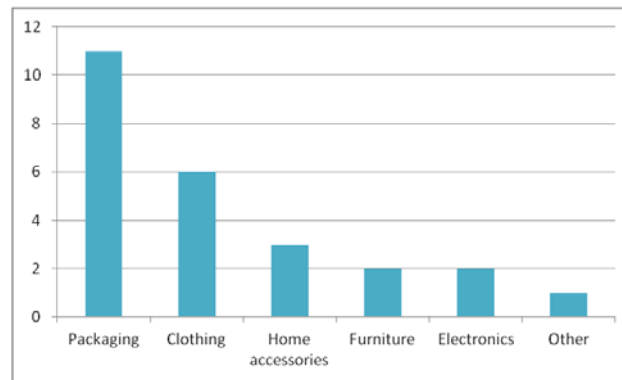
Figure 7.3. Products personalized by Persona 1 by product category.

7.2.4.2. Goal of Personalization

The participants specified function and aesthetic-related and personal goals of personalization as in the previous studies. The results reveal that, *meeting a need with an available product*, which is a function and aesthetic-related goal, is the major goal of personalization among the sample (13 products). The other product related goals include, *increasing product's fit to person* (eight products), which aim to improve the aesthetic and/or functional qualities of the product, and *saving a product with aesthetic value* (one product). Personal goals mentioned by the sample includes *process enjoyment* (four products) and *having a unique product* (two products).

Based on these findings it can be concluded that, this group of people personalize their products mostly to meet their practical needs using available products/parts, and to increase their product's fit to themselves.

7.2.4.3. Method of Personalization

The results of the study indicate that, the products in the post-use phase were personalized in two main ways, which are *repurposing* and *reusing*. In addition, there are some specific methods used for both of them (Table 7.3). *Repurposing* methods include *integrating a part/material with the product* (five products), *repurposing without intervention* (four products), *changing the form of the product* (two products), and *surface treatment* (two products). *Re-use* methods include *re-using with a minimal intervention* (five products), *integrating a part/material with the product* (three products), *surface treatment* (three products) and *changing the form of the product* (one product). Some of the products were personalized through the use of more than one method. Figure 7.4 displays some of the products personalized through repurposing methods and Figure 7.5 displays some of the re-used product examples.

Table 7.3. Methods of personalization used by the participants.

	Repurposing	**Reusing**
Integrating a part/material with the product	5 products	3 products
Repurposing without intervention	4 products	-
Changing the form of the product	2 products	1 product
Surface treatment	2 products	3 products
Reusing with a minimal intervention	-	5 products

Figure 7.4. Repurposed products (left to right): Plastic crate used as a printer stand (repurposing without intervention), bra cut and covered to be used as a bikini (changing the form of a product and integrating a part/material with the product), ice-cream packages covered with old socks to be used as pencil holders (integrating a part/material with the product), and wooden crate painted and used for storing books (surface treatment).

Figure 7.5. Re-used products (left to right): Ice-cream packages used for food storage (re-using with a minimal intervention), painted old coffee table (surface treatment), illuminated old table clock (integrating a part/material with the product), and old jeans ripped to be worn easily (changing the form of the product).

The analysis of the results of the online questionnaire revealed two prominent issues regarding the participants' methods of personalization and the materials they used in the personalization process. Firstly, the participants between the ages of 16-25 made simple interventions to the products (e.g. reusing or repurposing a product with a minimal intervention) while those between the ages of 26-30 made interventions that required the use of higher level skills such as craft and technical skills. Secondly, except for their old products, the participants mostly personalized products that they obtained without any cost such as packages and wooden pallets. In addition, the participants mostly personalized products made of textile materials such as socks, T-shirts, jeans, etc.

The analysis of the relationship between some of the goals and methods of personalization revealed similar results as in the first online questionnaire. For instance, when the goal is to meet a need with an available product, the participants mostly re-used or repurposed their products with minimal interventions. When the goal is to improve the aesthetic qualities of the product, the method can be integrating a part/material with the product and/or surface treatment, whereas when the goal is to improve functionality, the method of integrating a part/material with the product and changing the form of the product are mainly used. It is difficult to discuss the relationship between the other goals and methods of personalization, since there is no prominent method of personalization used by the participants for the other personalization goals.

The analysis of the methods of personalization by product categories reveals similar results with the first online questionnaire. For instance, changing the form of the product is only used to personalize the clothing products. As found in the first questionnaire, integrating a part/material with a product can be applied to most of the product categories such as clothing, packaging, home accessories and electronics. Repurposing and reusing a product with a minimal intervention appeared as the main methods of personalization for the packaging category. Finally, surface treatment is mostly used on wooden products in various product categories such as furniture and packaging.

7.2.4.4. Skills

The study revealed that, the participants personalized their products using *no specific skills* (15 products), *craft skills* (seven products), *hand skills* (four products), and *technical skills* (two products). The participants mostly did not use a specific skill, while repurposing or re-using their products without any interventions (Figure 7.6). The hand skills used by the participants involve cutting materials in specific dimensions and creating a pattern with spray painting (Figure 7.7).

The craft skills were used by three participants, who are between the ages of 25-30, and the skills include sewing, wood painting, and glass painting (Figure 7.8). Technical skills were used by two participants for two products, and these include integrating electrical parts with a table clock to create an illuminated clock and making a lamp made of an old coffee cup and plate through joining metal parts with ceramic ones (Figure 7.9). Based on the findings, it can be concluded that, product personalization process which does not require the use of a specific skill may be more appropriate for this age group, since more than half of the products personalized without the use of a specific skill.

Figure 7.6. Reused or repurposed products with the use of no specific skill (left to right): Reusing a plastic package as coffeee container, reused old jeans through ripping them, reusing glass jars as food containers, repurposing crates to use them as table legs, repurposing cans to use them as pencil holders, and reusing a plastic crate as printer stand.
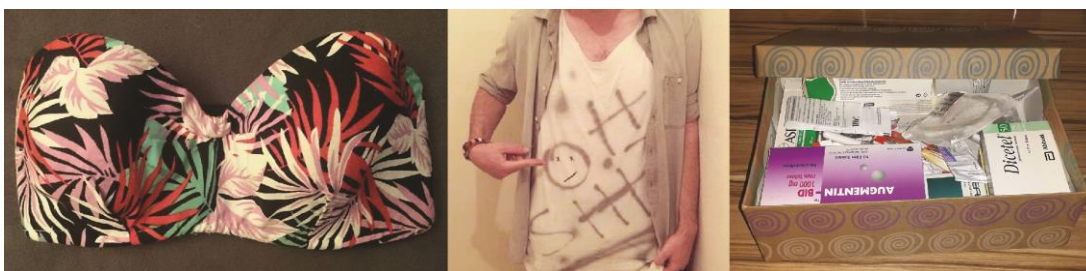
Figure 7.7. Products personalized using hand skills (left to right): Cutting fabric to cover a bra, spray painting a t-shirt, and covering a cardboard box.

Figure 7.8. Products personalized using craft skills (left to right): Sewing fabric on a bra, painting a wooden crate and a coffee table with wood paint, and cutting and sewing a T-shirt to make a neck warmer.

Figure 7.9. Products personalized using technical skills (left to right): Clock illuminated with LEDs, coffee cup and plate combined with brass pipes to make a lamp.

I also analyzed the personalization methods based on the skills used by the participants as in Table 7.4. According to this table, integrating a part with a product may require a high skill level (e.g. sewing fabric on a bra, making decoupage on a jar), while the same method can be used without the use of a specific skill (e.g. covering ice cream pacakages with cut socks) or with the use of hand skills (e.g. cutting paper in specific size to cover a cardboard box) within this group of participants. Thus, as found in the first online questionnaire, this method of personalization can be used by people who have different skill levels in different ways, which can be considered when designing for personalization. Repurposing and reusing a product with a minimal intervention naturally does not require the use of a specific skill (e.g. reusing ice-cream packages to store food). Surface treatment on the other hand, mostly requires a high skill level, since it requires knowledge and experience in materials and paint types.

Changing the form of the product is used by people with low skill level (e.g. cutting old jeans-low level), and medium skill level (e.g. cutting a fabric in the form of a bikini).

Table 7.4. Methods of personalization by the skill levels.

Method of Personalization	Skill Level Low	Skill Level Medium	Skill Level High
Integrating a part/material with a product	3 products	2 products	6 products
Repurposing with a minimal intervention	4 products	-	-
Re-using with a minimal intervention	5 products	-	-
Changing the form of the product	3 products	1 product	-
Surface treatment	-	1 product	4 products

7.2.4.5. Effort

All of the personalized products required mental effort, since the participants personalized them for specific purposes. Some of the examples required only mental effort (nine products), such as the products repurposed or reused with a minimal intervention. For the remaining personalized products, the participants spent both mental and physical effort (16 products). However, as appeared in the results of the first online questionnaire, the participants who used craft and technical skills, spent a higher level of physical effort compared to the ones who used hand skills.

7.2.4.6. Nature of Intervention

While personalizing their products, the participants made aesthetic (four products), functional (10 products), and both aesthetic and functional interventions (11 products) to the products. These results indicate that, functional interventions with or without aesthetic interventions are prominent among the sample. This finding is expected, since the participants' major goal of personalization was to meet a functional need through product personalization. Figure 7.10 displays the nature of intervention by product categories. All of the packaging products were personalized either through functional interventions or both aesthetic and functional interventions, since they were repurposed and their functions were changed, or reused to extend their functionality.

On the other hand, clothing products were personalized either through aesthetic or aesthetic and functional interventions. In addition, electronic products are mainly personalized through functional interventions, whereas furniture products are mainly personalized through aesthetic interventions. The results regarding the packaging, clothing and furniture are consistent with the results of the first online questionnaire.
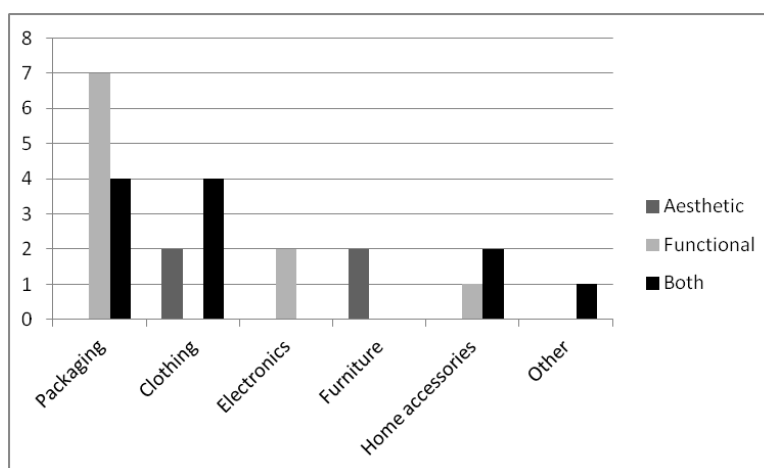
Figure 7.10. Nature of intervention by product category.

The analysis of the relationship between the goal of personalization and the nature of intervention revealed that, the goal of improving aesthetic/functional qualities naturally results in aesthetic/functional interventions. When the goal is to meet a need with an available product, the participants mostly make functional interventions. These results conform with the results of the first online questionnaire. In addition, it was found that, the goal of process enjoyment mostly resulted in both aesthetic and functional interventions, although more examples are needed for such an interpretation, and the nature of intervention may vary by the product category that is personalized. However, the participants in this study, who personalized their products, since they enjoy the process, used more advanced skills such as craft skills and technical skills.

The analysis of the relationship between the skill levels and the nature of intervention revealed that, the interventions which did not require the use of a specific skill are mostly functional (e.g. using a crate as a printer stand or re-using plastic ice-cream packages for food storage), whereas interventions which required the use of craft skills are mostly aesthetic (e.g. sewing fabric on a bra to make a bikini, painting a coffee table). These results were also found in the first online questionnaire, and it is difficult to identify the relationship between the other skill levels and the nature of intervention based on the available input received from this part of the study.

7.2.5. Reflections

The results of this study showed that, the participants mostly personalized packaging and clothing products in their personalization process. Packaging was also found to be the most commonly personalized product category in the first online questionnaire. The participants mostly personalized products that they obtained without any cost such as packages and wooden pallets besides their old products. In terms of the materials, the participants mostly personalized products made of textile materials such as socks, T-shirts, jeans, etc. Thus, the product types and the materials included in these product categories can be used for personalizing the generative toolkit to be developed for this group of people.

The prominent goal of the participants in product personalization are meeting a need (which is mostly functional) with an available product and increasing product's fit to person aesthetically and/or functionally. These goals also appeared as the most common goals of personalization in the first online questionnaire. Considering these goals, the generative toolkit to be developed may enable this group of people to meet their lighting needs with the use of available products/parts and which can be fit to their personal taste through aesthetic and/or functional interventions.

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The two common methods of personalization appeared as repurposing or reusing with minimal interventions to the products and integrating a part/material with the product. Considering this finding, integrating a part/material with the product can be the main method of personalization for the generative toolkit to be designed for this group of people.

Two tendencies emerged in terms of the skill levels used by the participants. Those between the ages of 16-25 made simple interventions to the products without the use of any specific skills, whereas those between the ages of 26-30 mostly made interventions that required the use of higher level skills such as craft and technical skills. Thus, it would be better to focus on one of these groups in the generative session. However, in total, more than half of the products personalized without the use of a specific skill and thus, it would be better to develop a generative toolkit that does not require high-level skills.

Moreover, I decided to develop a generative toolkit which can be personalized both aesthetically and functionally, since functional interventions are more common than the aesthetic ones and the participants' two major goals of personalization can be addressed in this way.

7.3. Development of the Generative Toolkit for the Persona and Scenario 1

The first design scenario focuses on product personalization in the post-use phase due to cost constraints, and the persona addressed involves people who are university students or newly graduated people with low level of income, and who shares a home with their friends. The main design considerations required by this design scenario are:

- Use of the materials in the post-use phase, and
- Developing an affordable design exploration.

I also considered the findings of the second online questionnaire during the design process. These are:

- The main personalization goals of the participants in the second online questionnaire (meeting a need with an available product and increasing product's fit to person),

- The main methods of personalization used by the participants in the second online questionnaire (integrating a part/material with a product),

- Use of low-level skills,

- Enabling aesthetic and functional interventions to meet the goals of the persona.

Finally, the results of the generative sessions conducted previously in the follow-up study brought along certain design considerations as follows:

- Understandability and clarity of the design details,

- Need for design details which do not require the use of adhesives,

- Need for design details for integrating different types of materials,

- Need for the exploration of the structural variety besides the aesthetic variety for functional purposes.

Firstly, the generative toolkit to be developed needs to involve the use of materials in the post-use phase. Secondly, the generative toolkit needs to be low-cost. Considering the materials that can be used for the structure, I preferred to use cardboard material, since it was cheap, easily accessible, and may provide flexible design solutions. In addition, I explored the possibilities of the cardboard material further, since I also used it in the previous phases. I decided to use the materials in the post-use phase as shading materials.

The design exploration could meet the lighting needs of the persona with the use of available products/parts. To this end, I considered the lighting needs of the persona. For instance, different lighting needs in the same room for different activities may be a concern for a student living with his/her friends. A lighting design exploration, which can be used in different ways, such as, as a table lamp and floor lamp for mood lighting, may meet the various lighting needs of this group of people. This could be achieved through providing structural variety to address different contexts of use, and aesthetic variety to address different lighting needs. Providing structural variety was an important consideration, since most of the products were personalized through functional or aesthetic and functional interventions.

In the second online questionnaire, one of the main methods of personalization used by the participants appeared to be integrating a part/material with a product. Thus, I decided to develop a design exploration that can be personalized through this method, which was also the method of personalization I used in the previous generative toolkits. In addition, the participants mainly used low-level skills and made simple interventions, which was another important design consideration for the generative toolkit to be developed.

The results of the follow-up study showed that, separating the parts to be personalized increased the understandability of the personalization process. However, the participants tried to integrate different materials such as strings and sheet materials, and the design details only allowed the use of string-like materials. Considering this, I decided to provide variety in the design details, which could allow the use of different materials to be integrated through them. In this way, I could also prevent the use of adhesives in the personalization process, which adversely affected the flexibility of personalization in the previous phases, since the design details for integrating different materials would be specific to different types of materials.

Considering all these criteria, I started to explore the possibilities through mock-ups. Improving the generative toolkit I developed in the previous phases further, firstly, I tried to increase the number of surfaces that could be personalized to enable the aesthetic variety. To do this, I started with a polyhedron structure, the surfaces of which could be personalized through the use of materials with different shading qualities, and which can be placed in various ways to meet different lighting needs. However, this structure did not provide structural variety. To achieve this, I started to explore triangular surfaces, which can be connected in different directions. However, the light bulb needs to be placed on a surface, and for this reason, I created a base for placing the light bulb, and separated the surfaces that would be personalized. Figure 7.11 displays these explorations.

Figure 7.11. Exploration of the aesthetic and structural variety.

To combine the surfaces, firstly I used snap fasteners. However, they deformed the cardboard and loosened easily. So, I looked for another alternative for combining surfaces, and I decided to use binding screws. These screws could be used both to bring the triangular surfaces together and to attach shading materials on the triangular surfaces (Figure 7.12).

Figure 7.12. Connection details (left to right): Binding screws used to combine the surfaces of the structure, and felt, fabric and wadding attached on the triangular surfaces using the binding screws.

I realized that, combining too many triangular surfaces would be time consuming and might require too much physical and mental effort. Thus, I decided to use a rhombic surface, which is the combination of two triangles, and I also reduced the number of edges of the base, which was hexagonal initially, and created a square base. (Figure 7.13).

Figure 7.13. Lighting structure with square base and rhombic shading surfaces.

To attach different types of materials, I initially created three types of shadings:

- The first one was for attaching sheet materials using the binding screws.

- The second one was striped to insert triangular surfaces between the stripes without the use of screws or which can be used without inserting materials.
- The third one was with holes on each edge of the triangle for attaching string-like materials (Figure 7.14).
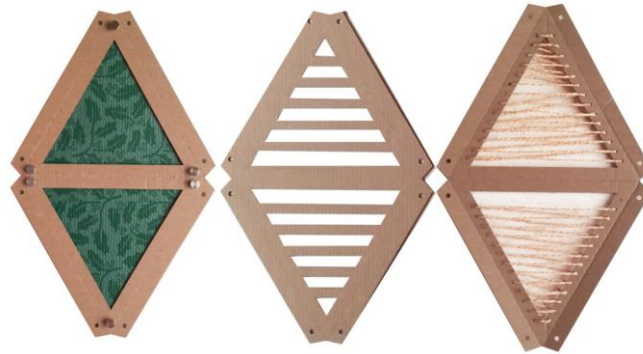
Figure 7.14. Initial shading alternatives for the lighting.

To attach the sheet materials, which are in the post-use phase, a triangular template with three holes on each corner could be provided, and people could cut the materials and open holes on them using this template. Through folding the rhombic surfaces in different directions and combining them with other rhombic surfaces using the binding screws, one could create different structures. Figure 7.15 displays the initial generative toolkit, which was changed later, and Figure 7.16 displays the alternatives that could be created with it.

Figure 7.15. Initial generative toolkit.

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Figure 7.16. Structure and shading possibilities with the initial generative toolkit.

Although, the generative toolkit I developed provided a flexible structure, it was still time consuming to build it. In addition, exploring the variations required too much mental effort, and the use of the binding screws to attach the sheet shading materials also required too much physical effort. To solve this problem, I tried to combine the rhombic shadings in various ways (Figure 7.17), and in the end, I combined four rhombic shadings to create a shading unit (Figure 7.18).
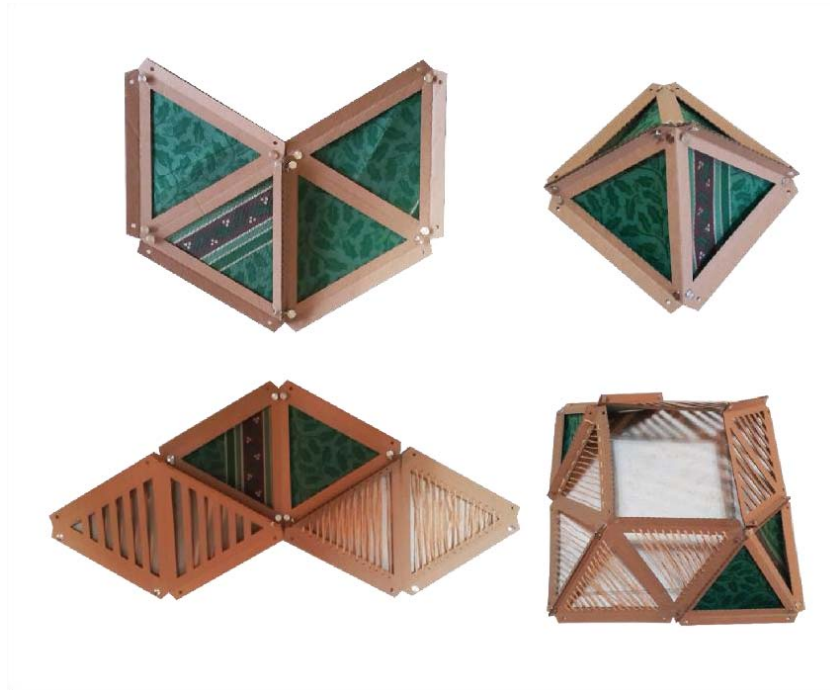
Figure 7.17. Exploration of the ways of combining the shadings.
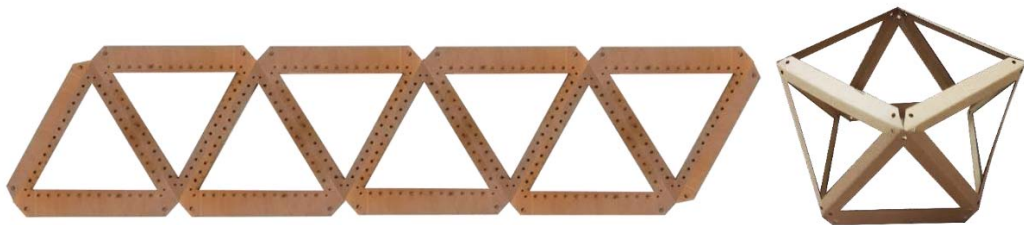
Figure 7.18. Final shading form (left to right): The final shading unit made of four rhombic surfaces; The 3D form obtained through folding the shading unit.

I also eliminated the use of the binding screws used for attaching the sheet materials on the shading surfaces, and created slots to insert sheet materials. I created a cardboard template to cut the sheet materials, which will be inserted into the slots (Figure 7.19). In addition, I eliminated the striped shading, since it also enabled the use of the sheet materials, which might not be necessary. Finally, I opened bigger holes on the shading unit for inserting string-like materials, and created smaller holes for knotting. In addition, I created a triangular cardboard template with holes to enable

people to explore the shading variations using string-like materials, before transferring their design into the shading unit (Figure 7.20).

Figure 7.19. Cardboard template and fabric inserted into the slot details.
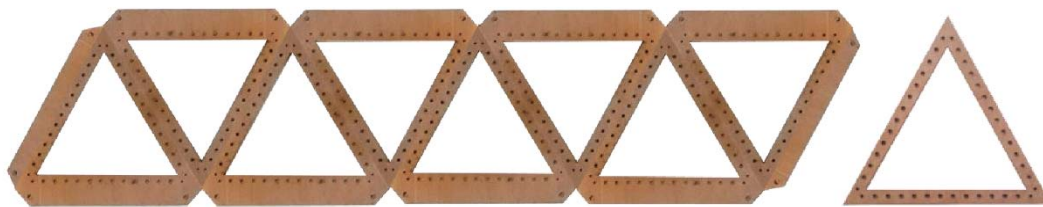
Figure 7.20. Shading B (left to right): Refined shading unit for attaching string-like materials; Cardboard template with holes.

The finalized toolkit is displayed in Figure 7.21. The toolkit consists of two different types of shading units (Shading A with slots and Shading B with the holes), two cardboard templates for cutting sheet materials and exploring the variations of shading that can be created using the string-like materials. In addition, it involves one base for inserting the light bulb and holding the shading units, electrical parts (cable, socket and plug connected to each other), and the binding screws for combining the shadings with the base and with each other.

Shading A

Shading B

Base | Electrical parts and the connection screws | Templates for using Shading A and B
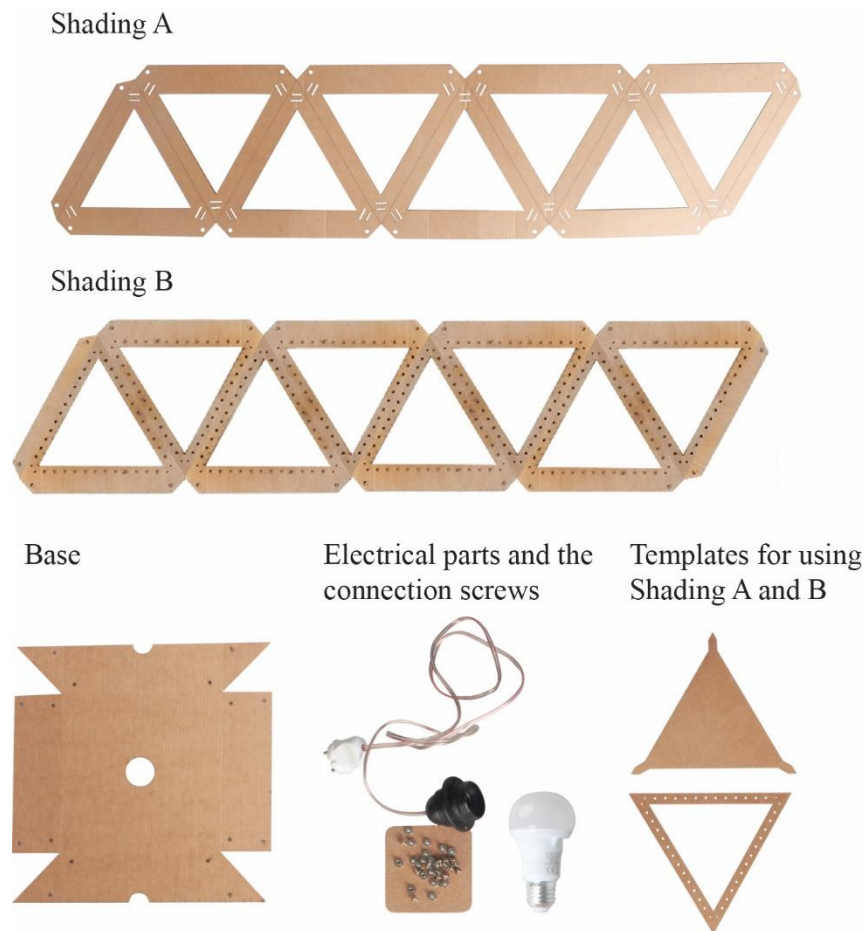
Figure 7.21. The finalized generative toolkit.

The finalized generative toolkit can initially be obtained as a half-way design kit by the people, since they need to obtain the binding screws and the electrical parts with the cardboard parts. In addition, the open-source data of the cardboard parts can be provided by the designer, so that people can obtain the kit, and they can produce as many shadings as they like depending on their lighting needs or they can have it produced by a local manufacturer. Using personally available materials in the post-use phase, people can personalize the toolkit in the design phase, and they can change the shadings and the structure depending on their needs in the use phase. Table 7.5 displays the evaluation of the generative toolkit in terms of the dimensions of personalization important for sustainability.

Table 7.5. The evaluation of the design exploration in terms of the dimensions of personalization important for sustainability.

Goal of personalization	Meeting a need with an available product, increasing a product's fit to person (through improving aesthetic and functional qualities)
Method of personalization	Integrating a part/material with the product
PLS phase	Design and use (using materials in the post-use phase)
Required skills	Hand skills, no specific skill
Effort	Mental and physical effort
Nature of intervention	Aesthetic and functional
Flexibility	More than once
Production scales	Mass produced parts can be integrated with mass/craft/batch produced parts
Role of manufacturer	Producing the cardboard toolkit through laser cutting
Role of designer	Providing a half-way design that can be completed by the people
Role of people	Building the structure, completing the lighting design using personally available materials in the post-use phase, and (if they want) downloading the open-source data and have the cardboard shading units produced by a local manufacturer or produce that themselves.

7.4. Generative Study 3: Design Workshop and the Individual Generative Sessions

In this phase, I conducted a design workshop and follow-up individual generative sessions with six participants. The purpose of the design workshop was to introduce the generative toolkit and the research process to the participants, explain how to build and personalize the toolkit, and find the potential participants for the individual generative sessions, which were conducted after the design workshop. The aim of the individual generative sessions was to gain feedback about the participants' personalization processes, and the use of the improved design details enabling personalization. To prevent the participants from influencing each other's personalization process, personalization phase was planned as an individual activity. The design workshop was held on December 22, 2016, in Yaşar University, and the individual generative sessions were carried out between December 22 and 26, 2016 in the participants' homes.

7.4.1. Sampling

The sampling approach was *theoretical sampling*, since I selected the participants based on the personas I developed in the study. Since this study focused on university students and newly graduated people who had limited income, and who shared a home with their friends, I needed to find participants fitting this profile. Considering the required skill levels of the participants, I decided to conduct the generative sessions with the university students, and due to ease of accessibility I conducted the workshop with the students of the Yaşar University. I announced the design workshop with a poster (Appendix I) on December 20, 2016 on Facebook pages of various departments of Yaşar University, and an e-mail requesting the announcement of the workshop to all of the departments of the university was sent to the academic mail list of the university. In the poster, I provided my e-mail address for application, and I sent an application form prepared on Google Forms to those who wanted to participate in the workshop (Appendix J) in order to give information about the workshop, confirm their participation, make sure they fit to the target persona, and obtain their contact information.

Although I invited 12 participants from any department, who shared a home with their friends, six students participated in the study. Three of these participants had also participated in the online surveys that conducted previously. Table 7.6 displays the information about the participants. I intended to involve the students from different departments in the generative study; however, five industrial design students and one interior design student participated in the study. I also conducted the individual generative sessions with these six participants.

Table 7.6. Information about the participants of the design workshop.

	DEPARTMENT	EDUCATION LEVEL	GENDER
DW-P1	Industrial Design	2nd Year	Female
DW-P2	Industrial Design	2nd Year	Male
DW-P3	Industrial Design	2nd Year	Female
DW-P4	Industrial Design	2nd Year	Male
DW-P5	Industrial Design	3rd Year	Male
DW-P6	Interior Architecture	3rd Year	Female

7.4.2. Duration and the Setting

The generative study was carried out in two phases and it lasted one week. The first phase was the design workshop, which was held on December 22, 2016 and lasted half a day between 14:00 and 17:00, during which students became familiarized with the generative toolkit and the personalization process. The second phase involved the personalization of the toolkit by the participants at their homes, and lasted one week, between the dates of December 22-29, 2016.

The design workshop was carried out in one of the design studios of Industrial Design Department at Yaşar University. The students were all familiar with the workshop environment, since they took courses in the class. For the six participants, two tables were used and chairs were distributed equally around the tables, to provide enough space for each participant. The generative toolkits and the additional materials and tools required for the personalization process were placed in the middle of the tables. The workshop setting is displayed in Figure 7.22. In the individual generative session, each participant personalized the generative toolkit at his/her home, and after the personalization process, I conducted individual interviews with the participants in my office at Yaşar University.

Figure 7.22. Setting of the design workshop.

7.4.3. Data Collection

Verbal and visual data were collected through different means during the workshop and the individual generative sessions. In the design workshop, I collected verbal data through a printed questionnaire. In addition, I took notes about my observations and comments of the participants during the workshop. I collected visual data through the photographs and videos of the workshop process during which the generative toolkits were partly built and personalized by the participants. The whole workshop process was recorded with a video camera placed against the tables. In addition, a student helped me to take the photographs of the process, and we collected visual data with two digital cameras.

In the individual generative sessions, I collected verbal data through the diaries the participants filled out during their personalization process and the semi-structured interviews I conducted with the participants at the end of the process. I collected visual data through the generative toolkits personalized by the participants, and the photographs the participants took and sent to me during the personalization process.

Printed questionnaire. At the end of the design workshop, I gave a printed questionnaire (Appendix L) to the participants, asking their view on the workshop environment, workshop process, the generative toolkits and its personalization process to identify the problems, which I could resolve to improve the research design and the design of the toolkit in the future generative studies. After the students filled out the questionnaire, I carried out a brief focus group session to get the details of the students' answers.

Generative toolkit. Each participant was provided with a cardboard base, electrical parts such as one lampholder connected to a cable and a plug, one LED light bulb, 24 pairs of binding screws and two shadings, one with slots and one with holes and two templates (Figure 7.21). I limited the number of the shadings with two, to simply receive the opinions of the students about the design details of the two different shadings.

Besides the generative toolkit, I provided materials and tools for personalization (Figure 7.23). These included three types of fabric, various magazines, wool and jute ropes and tools such as scissors, pencils and rulers. Students were also asked to bring the materials such as old notebook pages, newspaper, magazines, old T-shirts and other materials that reflected themselves, which they collected or kept at home due to their emotional value or which were the waste materials they had at home.

Figure 7.23. Additional materials provided in the design workshop.

Diaries. To collect information about the participants' personalization process during the individual generative sessions, I gave them printed diaries (Appendix M). Since the participants did not fill out the diaries in the follow-up study, I improved the design of the diaries to make them more appealing for the participants. The diaries involved one page explaining the parts of the generative toolkit, and how to build and personalize it, seven pages (one page for each day of the study) including questions about the details of the participants' personalization and usage process, one sample page displaying how to fill the diary, and one page asking for the participants' suggestions on the generative toolkit and the research process. In addition, I added my contact information on the back cover of the diary. Figure 7.24 displays a page of the diary filled out by one of the participants.

Figure 7.24. A diary page filled by a participant.

Semi-structured interviews. At the end of the participants' one-week personalization process, I conducted semi-structured interviews with each participant to get the details of their personalization process. I collected the diaries the day before the interviews to have an idea about the personalization process of each participant, and prepare additional questions for clarifying the points that were not clear in the diaries, if any.

The interview questions (Appendix N), explored the following issues, and I asked additional questions, when I wanted to clarify the responses of the participants:

- phases of the personalization process of the participants,
- duration of the personalization process,
- the materials/parts used in the process and the reasons of their material selection,
- problems encountered by the participants during the personalization process,
- participants' evaluations about the two different design details and the personalized generative toolkit,
- participants' suggestions about the toolkit and the research process
- participants' evaluations about the usage of the toolkit.

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Data collection procedure. At the beginning of the design workshop, each participant was given a consent from (Appendix K) explaining the aim of the study and the research process, and the participants signed the forms. The workshop was conducted in four phases as explained below.

*1. Introduction phase***:** This phase lasted about half an hour. In this phase, firstly I introduced myself and explained the aim of the study and my expectations from the students. Then, I explained the concept of personalization, the parts of the lighting design exploration, and how to build and personalize it. Information about all the building and personalization process was also provided in the diaries, and I gave the diaries to the students in this stage.

2. Personalization phase: This phase lasted about an hour. During this phase, students freely explored the generative toolkit, and started to personalize the shadings using the materials I provided. No intervention was made to the participants during this phase.

3. Building the structure: In the third phase, which lasted about an hour, I explained how to build the base and the whole lighting structure. Using the binding screws and folding the shadings, students tried to combine the parts of the lighting and built up the 3d form.

4. Evaluation phase: In the final phase of the workshop, which lasted half an hour, I handed out the evaluative printed questionnaire to the students. They filled out it and then, with a quick focus group session, I asked the same questions to the students and obtained detailed answers from them.

At the end of the workshop, I gave the generative toolkits to the participants, and they continued to personalize the toolkits at their homes, using their own materials. I also provided the diaries, and asked them to note each intervention they made on the diary, and take the photographs of their interventions and send these to me before the semi-structured interviews.

Finally, we scheduled appointments for the semi-structured interviews with each participant. After one week, I conducted semi-structured interviews lasting about 20 minutes with each participant on their personalization process.

7.4.4. Data Analysis

The focus of the data analysis was to extract knowledge for improving the design details for enabling personalization and improving the research design. The verbal data collected through the questionnaires, diaries, and the interviews, and the visual data collected through the photographs and videos of the workshop, personalized generative toolkits, and the photographs of the personalized toolkits taken by the participants were analyzed through content analysis.

To analyze the workshop process, firstly I watched the videos of the workshop and took observational notes. Then, together with the observational notes I took during the workshop, I transferred these into an Excel sheet, associating them with the relevant participant and the photograph of the action. Then I interpreted each observation, and coded my interpretations with an inductive coding approach. After this process, I formed the categories and themes. An example of this analysis process is given in Figure 7.25.

Participant	Photograph	Observation	Interpretations	Code	Category	Theme
P1		The participant had difficulty in turning the screws, while connecting the shading with the base.	Screw detail may be reconsidered.	Difficulty in turning the screws	Ease of building the toolkit	Problems about the design details

Figure 7.25. Analysis of the observational data.

In the analysis of the questionnaires, I focused on the problems about the workshop process, design details and the personalization process. For this reason, I only coded the problems mentioned by the participants with a deductive coding approach.

I analyzed the diaries and the semi-structured interviews together, since they completed each other. To analyze the interview responses, firstly I verbatim-transcribed the data in MS Word, and then transferred the sentences or paragraphs to be coded into MS Excel for each participant. After this, I coded each coding unit with an inductive coding approach, and then grouping these codes, I generated the categories (Figure 7.26). After the analysis of each interview, I reviewed the diary of the relevant participant to investigate whether additional issues were mentioned by the participant or not. The emerging issues in the diaries were also transferred into Excel and coded in the same way.

Participant	Quote	Code	Category
P1	I did not change some of the materials I used in the workshop.	Use of workshop materials	Methodological problems
	Firstly I left a triangle blank to obtain more light, than I covered it, since the amount of light disturbed my eye.	Lighting quality	Design considerations
	I changed the place of the white string to fit it to the fabrics I used in the bottom shading.	Color harmony between the materials used for both shading	Design considerations

Figure 7.26. A section of the interview and diary analysis sheet.

After all the interviews and diaries were analyzed, I combined all of the categories emerged from the observations, questionnaires, interviews and diaries in an Excel sheet, categorized each coding unit and the code under the relevant category, and developed the final themes. Analyzing, compiling and cross-checking many layers of data enabled me to validate my analysis and interpretations.

I also analyzed each personalized design proposition based on the dimensions of personalization important for sustainability, with a deductive coding approach, to explore their implications for design for sustainability (Figure 7.27).

P	Personalized toolkit	Goal of Personalization	Method of Personalization	Skills	Effort	Nature of Intervention	PLS Phase	Flexibility	Production Scales
P2		Meeting a need with an available product, increasing product's fit to person, **self-expression**	Integrating a part/material with the product	Hand skills	Mental & Physical	Aesthetic & Functional	Design & Use	More than once	Mass+mass

Figure 7.27. Analysis of the toolkits based on the personalization dimensions.

7.4.5. Findings of the Design Workshop and the Individual Generative Sessions with Persona 1

During this one-week study, the participants partly built and personalized the toolkit in the design workshop, and completed their personalization process at their homes. It was observed that, all of the participants used the personalized toolkit as a lighting, as they were personalizing them, even when their personalization process did not end. Thus, they provided comments regarding the use phase of the toolkit as well. The personalized toolkits and the materials the participants used are displayed in Table 7.7.

Table 7.7. *Toolkits personalized by Persona 1*

Participant 1		Materials used
		Workshop materials (i.e. magazine paper and fabric), nylon bag, waste strings
Participant 2		
		Waste fast food packages in the post-use phase

Table 7.7 (continued). Toolkits personalized by Persona 1

Participant 3	
	Magazine paper, childhood pillow case, waste strings, personally meaningful decorative object
Participant 4	**Materials used**
	Workshop materials (i.e. magazine paper and fabric), old T-shirt, waste strings
Participant 5	
	Old childhood pillow case, waste strings
Participant 6	
	Workshop materials (fabric), waste strings and fabrics

The analysis results of the design workshop and the individual generative sessions were grouped under four themes, which are *the design details*, *participants' design considerations*, *benefits of personalization,* and *methodological problems*. *Design details* involve the participants' evaluations about the design details. *Participants' design considerations* refer to the criteria that the participants considered while personalizing the toolkits. *Benefits of personalization* refer to the benefits that the participants mentioned when evaluating the personalized toolkit and their personalization process. *Methodological problems* refer to the problems about the research design. Table 7.8 displays the themes and the relevant categories, sub-categories and the codes emerged from the data analysis.

Table 7.8. Themes and categories emerged from the data analysis.

Theme	Category	Sub-category	Code
Design details	Problems	Difficulty in personalization	Similarity of the both sides of the shadings, smallness of the holes, difficulty in attaching/detaching the screws, difficulty in changing the shading materials in the use phase, impracticality of the knot holes, effort required for Shading B, inadaptability of the design details to different materials, difference between the ways of personalization between the shadings
		Difficulty in building the toolkit	Difficulty in attaching/detaching the screws, looseness of the screws, clarity of the building up process
		Aesthetic problems	Disharmony between the shading forms, deformation of the cardboard, visibility of the shading material
		Lighting quality	Uncovered top surface, smallness of the holes, physical effort required to adjust the lighting amount
	Suggestions	Ease of personalization	Larger holes in shading B, replacing of the screw detail
		Aesthetic problems	Form harmony in shadings
		Lighting quality	Cover for the top part
		Ease of building the toolkit	Replacing of the screw detail
	Positive Attributes	-	Ease of building the toolkit, shading variety, form of the toolkit, structural variety, adaptability in the use phase, ease of personalization
	Preferences	-	Shading A, higher length

Theme	Category	Sub-category	Code
Participants' design considerations	Shading materials	-	Personal taste, self-expressiveness of the materials, lighting quality of the materials, availability of the materials
	-	-	Context of use
	-	-	Uniqueness
Benefits of Personalization	Product-related benefits	-	Product's fit to person, self-expressiveness, hedonic benefits
	Process-related benefits	-	Hedonic benefits
Methodological problems	-	-	Use of workshop materials, low level of sample-shading design relationship, duration
		Diaries	Place of the sample page, understandability of the photo icons in the diary

7.4.5.1. Design Details

The participants' personalization experiences revealed issues regarding the design details of the generative toolkit, which were grouped under the theme of *design details*. The categories emerged under this theme was *problems*, *suggestions*, *positive attributes* and *preferences*.

Problems

The problems encountered by the participants during the personalization process were grouped under four sub-categories, which are *difficulty in personalization*, *difficulty in building the toolkit*, *aesthetic-related issues*, and the *lighting quality*.

Difficulty in personalization. Difficulty in personalization resulted from the characteristics of some of the design details, which are the *shadings* and the *screw detail* used for connecting the cardboard parts. Table 7.9 displays the characteristics of the design details resulted in difficulty in personalization.

Table 7.9. Design details of the shadings resulted in difficulty in personalization.

Shadings			Screw detail
Both shadings	**Shading A**	**Shading B**	
Similarity of the both sides of the shadings	Inadaptability of the design details to different materials	Smallness of the holes	Difficulty in attaching/detaching the screws
Difference between the ways of personalization between the shadings	Difficulty in changing the shading materials in the use phase	Impracticality of the knot holes	Difficulty in changing the shading materials in the use phase
		Effort required to personalize the Shading B	

Some of the difficulties in personalization resulting from the shadings were related to both shadings, whereas some of them were specific to Shading A or Shading B. The difficulties in personalization resulted from the design of the both of the shadings included the *difference between the way of personalization between the shadings*, and the *similarity of the both sides of the shadings.* Regarding the difference between the way of personalization between the shadings, one participant stated that, while it is easier to personalize the shading A when it is unfolded, it was easier to personalize the shading B when it was folded. This difference may result in confusion in the personalization process, and this can be considered as an important design consideration when designing products that enable personalization, which include form variety in terms of the parts to be personalized. Secondly, the *similarity of the surfaces of the both sides of the shadings* was observed to be a problem during the design workshop, since one of the participants had inserted the materials to the shading A from different sides, while she needed to insert the shading materials from the same side. To prevent this, the sides of the shadings on which the materials will be inserted could be defined in a more understandable way through surface treatment or the shadings could be designed to be personalized through the use of either surfaces.

Difficulties in personalization resulted from the design of the Shading A include the *inadaptability of the design details to different materials* and *the difficulty in changing the shading materials in the use phase.*

Three participants mentioned problems about the inadaptability of the design detail of the Shading A to different materials. Two participants stated that, thicker fabrics stayed fixed, but the magazine paper or thinner fabrics remained loose on the shading (Figure 7.28).

Figure 7.28. Magazine paper remained loose on the shading A.

Another participant tried to use tickets, but he could not, since he needed to cut the tickets. The experiences of these participants reveal that, design details need to be adaptable for a range of material thicknesses, although it is impossible to provide this flexibility for every material thickness. In addition, triangular form might have been problematic for the participant who did not want to cut his tickets for the shading A. Moreover, one participant stated that, she had difficulty in changing the shading materials on the shading A during the use phase after she constructed the 3D form, since it was easier to personalize the shading, when it was unfolded, and unfolding the shading A required the unfolding of the shading B, since she used both of the shadings. This problem indicated that, an easier way of changing the materials during the use phase needs to be provided.

For shading B, the participants mentioned problems regarding the *smallness of the holes*, *impracticality of the knot holes*, and *effort required to personalize it*. The most prominent problem about the shading B was about the smallness of the holes.

Five of the six participants evaluated the holes as small, and they indicated that, this limited their material selection, and made the personalization process difficult. In addition, four participants stated that, the knot holes were impractical, since their knots did not coincide with the knot holes, and it was difficult to tie a knot. Two participants stated that, too much effort required to personalize the shading B. Considering these findings, it can be concluded that, the shading B was not appropriate for this group of participants, since it required too much physical and mental effort for them.

Regarding the screw detail, five of the six participants indicated that, they had difficulty in attaching/removing the connection screws. This resulted in difficulty in building process for these participants, and difficulty in changing the shading materials in the use phase for two participants. Considering these responses, it would be better to use a connection detail that makes the building process and changing the materials in the use phase easier.

Difficulty in building the toolkit. The difficulties in building the toolkit resulted from the *screw detail* and the *building process which looked complicated to the participants*, when they first experienced the toolkit. Three participants were found to have difficulty in using the screws while connecting the parts. Another problem stated by one participant about the screw detail was that, the screws loosely held the cardboard material. Considering these responses, connection details that are easier to use need to be incorporated, and the use of a thicker cardboard may solve the latter problem.

Two participants stated that, without the instructions in the diary, it would be difficult to understand the building process, but once they learned, the building process looked fairly easy to them. This implies that, either self-explanatory building of the parts, which is preferable, or explanatory instructions need to be provided for products which have to be built up.

Aesthetic related issues. The aesthetic related issues mentioned by three participants include the *disharmony between the shading forms*, *deformation of the cardboard*, and the *visibility of the shading material*. One participant stated that, the shading forms were not in harmony with each other. In fact, this may not be a problem, since the two different shadings were provided for gaining feedback about two different design details enabling personalization. Nevertheless, the harmony between the shading forms emerged as a design consideration in the study. In addition, one participant stated that, she had difficulty in passing strings through the holes of the shading B, since the cardboard material was deformed eventually. A thicker cardboard could solve this problem. Finally, one participant indicated that, he wanted to see the material he personalized more, since it was his contribution to the product, so the visibility of the shading material emerged as a design consideration for this participant.

Problems about the lighting quality. The participants mentioned some design details which affected the lighting quality. These include the *uncovered top surface*, the *smallness of the holes of the shading B,* and the *physical effort required to adjust the lighting amount by the shading B*. Three participants indicated that, the light came out of the top surface, which remained open disturbed them. To prevent this, two of them tried to attach an extra material to cover the top surface (Figure 7.29). I realized that, when only one shading was used, this disturbance existed. For this reason, the toolkit can be improved through enabling the covering of the top surface.

Figure 7.29. Top surfaces of the toolkit covered by the participants.

Another problem stated by one participant was the smallness of the holes of the shading B, which did not shade the light properly. The participant indicated that, if the holes were larger, he could use thicker ropes, which could shade the light better. Finally, one participant indicated that, it was more difficult to adjust the lighting amount of the shading B, compared to shading A, since she needed to weave the strings more to achieve a better lighting quality, which required a high amount of physical effort.

Suggestions

The participants made some suggestions regarding the design details which addressed the *difficulties in personalization*, *difficulties in building the toolkit*, *lighting quality*, and the *aesthetic problems*. The suggestions of the participants for the *difficulties in personalization* include, the use of larger holes in Shading B (two participants) and replacing the screw detail with a more practical connection detail to make the personalization process easier (one participant). Two participants made suggestions regarding the *difficulties in building the toolkit*, stating that, the screw details need to be replaced to make the building process easier and more practical. Two participants suggested that, the top part could also be coverable to achieve a better *lighting quality*. Finally, as an *aesthetic related issue*, one participant commented that, the two shadings did not match with each other, and he proposed a third shading design, which was composed of the combination of the two shadings.

Positive Attributes

The positive attributes of the toolkit mentioned by the participants include the *ease of personalization (Shading A)*, *adaptability in the use phase*, *variety (structural and shading variety)*, *form of the toolkit*, and *ease of building the toolkit*. Three participants stated that, attaching materials to the shading A was easy.

Two participants evaluated the *adaptability of the toolkit in the use phase* as a positive attribute. They stated that, the variations were endless, and they could make various interventions on the toolkit. One participant stated that, height adjustability (*structural variety*) for using the toolkit in different contexts was a positive attribute, and one participant mentioned the *shading variety* as a positive attribute for the same reason. In addition, the form of the toolkit (one participant) and the ease of building it (one participant) were found to be positive attributes.

Preferences

The participants mentioned about their preferences during the interviews, and all of the participants stated that they would prefer to use shading A, and they would prefer to use three or four shadings (Shading A) during the use phase. The reasons why the participants prefer shading A include the lighting quality it provides (for five participants) and ease of personalization (for two participants). For the lighting quality of the shading A, the participants indicated that it gave a soft light, they could adjust the light amount with it, and it was more functional. The reason why the participants prefer to use more shadings on top of each other (higher) was that, they could obtain a better lighting quality in this way.

7.4.5.2. Participants' Design Considerations

The participants took certain design considerations into account during their personalization process. The factors affected their material selection include their *personal tastes*, *self-expressiveness of the materials*, *lighting quality of the materials*, *availability of the materials*, and *personal meaning of the materials*.

Some of the participants indicated that, they selected materials that fit to their *personal taste*. More specifically, they selected materials, colors of which fit to their personal taste (two participants), which they considered in harmony with each other (four participants) and in harmony with the cardboard material (four participants).

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Self-expressiveness was another important design consideration for the participants' material selection. Four of the six participants stated that, they would like to use the materials that reflected themselves more, instead of the materials in the post-use phase. For instance, P2, who used the waste food packages, indicated that he would prefer to use the logos of his team or cartoon characters, which would reflect him more. P3 stated that, she liked fashion, and she attached the fashion magazine pages, which involved the products she liked. P4 also indicated that, he would prefer to print out different images that would reflect himself and express his tastes more. P5 also stated that, the use of the materials in the post-use phase limited his personalization process. These findings reveal that, self-expression may be an important consideration for this group of people, and since the materials in the post-use phase may not have self-expressive qualities, the emotional bond between the person and the product may be weak.

Similarly, personal meaning of the materials affected the material selection of three participants. One participant used a part of his old T-shirt, with which the participant had memories. Two participants used parts of their old pillow cases which they had been using since their childhoods, and one of them also integrated a decorative object on the shading B, which was personally meaningful for her (Figure 7.30). As mentioned before, one of the participants stated that, he would prefer to use more personally meaningful parts instead of the fast food packages. In these cases, the goal of cherishing memories may also exist, besides meeting a need with an available product. Considering the self-expressiveness and personal meaning of the materials that the participants looked for in the personalization process, for this toolkit, it might have been better to use the post-use materials for the structure, and enable the participants to integrate more self-expressive and personally meaningful materials to the shadings. However, when people buy new materials or print out images that express themselves for personalization, they would be consuming materials, which may result in negative implications for sustainability.

Figure 7.30. The use of personally meaningful objects on the toolkit.

Lighting quality was another design consideration that four participants considered when selecting the shading materials. These participants stated that, they turned-on the light to make sure the material provided a good shading, and if not, they replaced the materials.

Four participants stated that, they used the materials due to their *availability* at their homes. These materials included plastic bags, fast food packages, fabrics, and strings.

Besides the design considerations regarding the shading materials, two participants considered the *context of use,* and one participant considered *uniqueness* during their personalization process. In terms of *context of use*, one participant stated that, she used one shading or both shadings depending on the context of use, such as on a table or on the floor. One participant also stated that, he personalized the shading B, so that he could hang it on the ceiling. For *uniqueness*, one participant stated that, he personalized the shadings partly to make it look more *unique*.

7.4.5.3. Benefits of Personalization

The participants mentioned product and process related benefits of personalization during the interviews. *Product-related benefits* include *product's fit to person*, *self-expressiveness*, and *hedonic benefits*. It also emerged that, the participants obtained *hedonic benefits* from the personalization process as a *process-related benefit*.

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Some of the participants mentioned *product's fit* to themselves was increased after the personalization process. One participant stated that, she loved the personalized toolkit, since it fit to her room. Another two participants mentioned that, they were content with the photos and fabrics they used on the toolkit. Two participants indicated that, the personalized toolkit reflected their lifestyle and themselves. To this end, *self-expressiveness* of the personalized product emerged as a product-related benefit of personalization. In addition, one participant stated that, she felt happy, to see her meaningful object on the lighting, which is a hedonic benefit obtained from the personalized product.

Some of the participants also mentioned *hedonic benefits* obtained from the personalization process such as, the enjoyment, relaxation, and excitement they felt during the personalization process. These benefits are in parallel with the benefits emerged in the previous studies.

7.4.5.4. Methodological Problems

The methodological problems identified in this study include *the use of workshop materials in the individual generative sessions*, *low level of sample and shading design relationship*, *duration of the study*, and *problems about the diaries*.

Although I asked the participants to personalize the toolkit at their home, using the materials that were in the post-use phase, and which reflected themselves, three participants used some of the materials I provided in the design workshop. Since the participants started to personalize the toolkit during the design workshop, some of the materials remained on the toolkit, when they brought them home. Thus, starting the personalization process might have limited the creativity of the participants and their personalization process. For this reason, it might be more effective to introduce the toolkit in the design workshop, without asking the participants to personalize it. This also prevents the participants from being affected from each other during their personalization process.

Another methodological problem appeared as the low relationship between the sample and the design of the shading B. One participant commented that, he had no strings at his home, and another participant stated that, the students may rarely have strings available at home. Thus the material requirement for personalization of the shading B might not fit to the sample. In addition, weaving strings to create a shading was observed to require a certain level of physical and mental effort that the participants did not want to spend. For this reason, I concluded that, the shading B did not fit the skill level, motivation and characteristics of the participants.

Two participants commented on the *duration* of the study, stating that if the duration of the individual generative sessions was longer, they could explore more different ideas with the shadings.

Finally, two problems were identified regarding the *design of the diaries*, which are *placing of the sample page* and the *understandability of the photo icons in the diary*. One participant stated that, he saw the sample page which explained how to fill out the diaries, after filling out his diary. This problem resulted from the placing of the sample page in the diary, which was before the last page. Thus, I decided to place it before the daily diary pages for the subsequent study. In addition, the same participant indicated that, he could not understand the meaning of the photo icons. To increase their understandability, I made them bigger in the last phase of the study.

7.4.5.5. Analysis of the Personalized Toolkits based on the Dimensions of Personalization

Table 7.10 displays the analysis of the personalized toolkits based on the *dimensions of personalization* important for sustainability. The role of the manufacturer, designer, and the user were not included in the table, since they were not changed during the personalization process.

The participants personalized the toolkits as predicted, and in conformity with the dimensional characteristics defined in the design phase. In addition, new dimensional characteristics emerged from the interviews conducted with the participants, which were written in bold in the right column.

Table 7.10. The evaluation of the design exploration in terms of the dimensions of personalization important for sustainability.

Dimension	Defined in the Design Phase	Emerged from the personalization process
Goal of personalization	Meeting a need with an available product, increasing a product's fit to person (through improving aesthetic and functional qualities)	Meeting a need with an available product, increasing a product's fit to person (through improving aesthetic and functional qualities), **self-expression, cherishing memories**
Method of personalization	Integrating a part/material with the product	Integrating a part/material with the product, **surface treatment**
PLS phase	Design and use (using materials in the post-use phase)	Design and use (using materials in the post-use phase)
Required skills	Hand skills, no specific skill	Hand skills
Effort	Mental and physical effort	Mental and physical effort
Nature of intervention	Aesthetic and functional	Aesthetic and functional
Flexibility	More than once	More than once
Production scales	Mass produced parts can be integrated with mass/craft/batch produced parts	Mass produced parts can be integrated with mass/craft/batch produced parts

The goal of personalization was defined as *meeting a need with an available product*, and *increasing a product's fit to person* (through improving its aesthetic and functional qualities) in the design phase based on the findings of the online questionnaire conducted with the participants. Besides these goals, *self-expression* and *cherishing memories* emerged as the personalization goals of the participants in the study. Some of the participants personalized the toolkit to demonstrate their lifestyle and interests or they stated that they would like to express themselves using more self-expressive materials. For instance, P1, who had an interest in fashion, used pages of fashion magazines, and P2 used fast food packages which reflected his lifestyle. In addition, some of the participants used product parts that had personal meaning and memories.

For instance, two participants used the parts of their childhood pillow cases, and one participant attached a decorative object which was meaningful to her due to the memories she had with it. To this end, the goals of personalization co-existed as found in the previous studies, and different personalization goals can be considered together when designing for product personalization. As discussed in the findings of the study, four participants stated that they would like to use more self-expressive materials in the personalization process. To this end, emotional connection between the product and the person may be stronger, when the goals of *self-expression* and *cherishing memories* were met through the use of personally meaningful parts compared to the use of materials in the post-use phase which addressed the goal of *meeting a need with an available product.*

The method of personalization was defined as integrating a part/material with the product. All of the participants used this method in their personalization process. In addition, P4 and P5 stated that, they could paint the cardboard. The use of materials which can be painted easily can facilitate self-expression and increase the fit between the product and the personal tastes, and this may positively affect the person-product relationship.

The other dimensional characteristics remained the same during the participants' personalization process. They made non-permanent interventions, and the product life span phase during which the toolkit can be personalized remained the same (design and use phase). To this end, the toolkit remained flexible to be personalized more than once, which is preferable from the sustainability viewpoint. In addition, the participants used hand skills to personalize the toolkit, and made aesthetic and functional interventions on the toolkit such as integrating shading materials to improve its aesthetic quality and functionality, or changing and adjusting the structure depending on their needs.

During the personalization process, the participants spent both mental and physical effort. They spent mental effort while considering the lighting quality or self-expressiveness of the shading materials, harmony between the materials, etc. In addition, the participants continued to produce ideas on the materials that can be integrated on the toolkit after the personalization process. In other words, they continued to spend mental effort after the personalization process ended, since the toolkit could be personalized in the use phase more than once. To this end, the investment of mental effort during and after the personalization process due to the flexibility provided for personalization can keep people's interest in the toolkit alive, and this may further increase the bond between the person and the product. The participants also spent physical effort while constructing and personalizing the toolkit. As discussed earlier, the investment of mental and physical effort is important for a stronger person-product relationship, and this can prolong the product lifetime. In terms of the production scales, the participants integrated the mass produced cardboard parts with mass produced parts such as fabrics, paper, and strings at the post-use phase, and created a lighting in one-off production scale. Since the cardboard parts can be locally produced in the number people want to use, this reduces the excessive use of resources.

7.5. Discussion

In the previous phases, the following design considerations had emerged regarding design for personalization in line with sustainability principles:

- Understandability of the design details,
- Need for design details which do not require the use of adhesives,
- Need for design details for integrating different types of materials,
- Need for the exploration of the structural variety besides the aesthetic variety,
- Need for design scenarios for a purposeful personalization process.

Except for providing design details for integrating different types of materials, other design considerations were found to be met in this study. The participants could understand the design details and the personalization task, they did not use adhesives to attach the materials, structural variety was provided to a certain extent besides aesthetic variety, and the toolkits were developed based on the design scenarios, which contextualized the cases in which people might need to personalize a product.

Based on the problems identified in this study and the suggestions of the participants regarding the design details, new design considerations were developed. These design considerations were taken into account in the subsequent phase of the study, and included the following:

Design Consideration for Ease of Personalization

- Consistency in the ways of personalization of different parts, when variety is provided,
- Defining the side of the surfaces on which the interventions could be made,
- Design details adaptable for a range of material thicknesses,
- Ease of changing the materials in the use phase,
- Suitability of the form for integrating materials in different forms (e.g. square form instead of triangular one to attach tickets without cutting them),
- The use of more practical connection details to improve the ease of changing of the materials in the use phase.

Design Considerations for Ease of Building the Toolkit

- The use of more practical connection details to improve the ease of building the structure,
- Self-explanatory construction of the structure or providing explanatory instructions for building the toolkit.

Design Considerations for Aesthetic Qualities

- Harmony between the forms of the parts to be personalized,
- Visibility of the materials used for personalization.

Design Considerations for Lighting Quality

- More homogeneous shading quality (e.g. covering the top surface which emit too much light),
- Ease of adjustment of the lighting amount.

Some of the design considerations that the participants took into account during their personalization process were similar to those found in the previous studies. These considerations include *personal taste*, *context of use*, and *lighting quality of the materials*. Besides these, the participants considered *self-expressiveness of the materials*, *availability of the materials*, *personal meaning of the materials, and uniqueness of their design* during their personalization process.

The design considerations mentioned above were taken into account in the subsequent study, and the design details were improved accordingly. In addition to these, insights were gained regarding improving person-product relationship, considering the characteristics of the sample. It was found in the study that, the participants preferred to make simple interventions which did not require too much physical effort, and they looked for practicality and variety. For this reason, they mentioned the *ease of personalization of the Shading A*, *adaptability of the toolkit in the use phase*, and *structural and shading variety* as positive attributes. In addition, they preferred shading A compared to the shading B, due to its lighting quality and ease of personalization. Based on the participants' evaluations, I concluded that, shading B was not appropriate for this sample, since it required too much physical and mental effort, it required the use of strings, which may not be found in the students' houses, and the problems were identified regarding its ease of personalization and lighting quality.

Another finding about the characteristics of the sample was that, *self-expression* and *personal meaning* were important motives in their personalization process. Although the participants' main goals of personalization appeared as meeting a need with an available product and increasing product's fit to person in the online questionnaire, *self-expression* and *cherishing memories* were found to be important personalization goals for this group of people. The participants wanted to use shading materials that had personal meaning for them. For this reason, the use of materials in the post-use phase, which did not have self-expressive qualities, for the shadings may not be preferable for the sample. The conflict between the participants' goals of personalization emerged in the online questionnaire and in the generative sessions might result from two reasons. Firstly, the participants might not be aware of their need for self-expression, or it might be a latent need, which they did not mention in the online questionnaire. Secondly, the product examples provided by the participants in the online questionnaire were not designed for personalization. When the participants encountered a product that can be personalized, other needs such as self-expression and cherishing memories might have emerged. Considering this, while designing for personalization, it would be better to use the materials in the post-use phase for the parts that will not be personalized, such as the structure. In relation to this, some of the participants stated that, they would buy new materials or print out images which expressed themselves to integrate into the toolkit. This may result in negative implications for sustainability, since frequent changes made by the participants may increase resource consumption which was not an intended result for this scenario. Addressing people's personal personalization goals (e.g. process enjoyment, having a unique skill, cherishing memories, etc.) and enabling them to integrate more meaningful parts with the half-way products, which can express themselves more can prevent this problem, since the personal value of such parts may postpone the replacement of them.

As found in the previous studies, the personalization process provided the participants with product-related benefits including product's fit to person, self-expressiveness of the lighting, and product and process related hedonic benefits.

Finally, the study revealed that, the participants continued to produce ideas on the potential materials that could be used on the toolkit. In other words, they continued to spend mental effort after the personalization process, besides the effort they spent during the personalization process. To this end, the investment of mental effort during and after the personalization process due to the *flexibility* provided for personalization can keep people's interest in the toolkit alive, and this may further increase the bond between the person and the product.

Methodological problems were also identified in the study, which include *the use of workshop materials in the individual generative sessions*, *low level of sample-shading design relationship*, *duration of the study*, and *problems about the diaries.* Although I specified that, the participants needed to personalize the toolkit using their own materials, some of them used the materials they attached during the design workshop also in the generative sessions. This implies that, to not to limit the creativity of the participants, it would be better to introduce the toolkit and the process in the design workshop, and let the participants personalize the toolkit at their homes. It was also found in the study that, shading B was not suitable for the sample, since it required too much physical effort, and weaving strings in different ways might require the use of craft skills and patience. In addition, some of the participants stated that, one-week personalization process was short, and they needed extra time for more exploration. Finally, the participants mentioned problems about the design of the diaries, such as wrong placement of the sample page and difficulty in understanding the icons. In the subsequent phase, these issues were also considered while improving the research design, and no workshop was conducted, generative toolkit was designed considering the participants' tendency to spend mental and physical effort, duration of personalization was extended, and diaries were refined based on the feedbacks of the participants in this study.

I had planned to conduct this study with 12 university students, who studied in different departments. However, all of the participants applied for the workshop was either industrial or interior design students. This was both a limitation and an advantage for the study. It was a limitation, since I could not gain feedback from people who did not have design background, and it was an advantage, since the participants knew how to analyze an object, usability, and how to work with cardboard material, they provided in-depth information, and they could be critical about the toolkit. Another limitation of the study was that, the use phase of the personalized toolkits could not be explored further due to the time constraints of the doctoral study. Although the participants both personalized and used the toolkits, longer duration is needed to explore its use phase in-depth.

CHAPTER 8

GENERATIVE RESEARCH PHASE 3

In the last phase of the study, I developed a generative toolkit for the second scenario focusing on using and practicing a craft skill through product personalization, and conducted individual generative sessions with six participants. While the *affordability* scenario (Chapter 7) addressed localization in terms of the use of the locally available materials in the post-use phase, the *practicing a craft skill* scenario described in this chapter focused on the use of the local skills in product personalization. In this chapter, I explained the selection process of the craft skill to be integrated into the personalization process, the development process of the generative toolkit, the design and the results of the individual generative sessions, and the conclusions I drew regarding design for product personalization, and its implications for sustainability.

8.1. Selecting the Craft Skill

To explore and select the local skills that could be used in the personalization process, I visited the year-end exhibitions of two public education centers in İzmir. I visited Narlıdere Public Education Center year-end exhibition on May, 20 2017, and Balçova Public Education Center on May, 16 2017. I selected these two public education centers due to their ease of accessibility for the recruitment of potential participants for facilitating the generative sessions. I photographed the products in the exhibition and categorized the craft skills taught in these public education centers under four groups, which are the craft skills based on:

- surface decoration,
- attaching materials on a surface,
- joining materials,
- creating surfaces and 3D forms using raw materials.

The craft skills which are based on *surface decoration* include the painting of the materials such as wood, clay, fabric, porcelain, silver, stone, straw, copper, mica, and glass using various techniques. These skills involve *marbling*, *çini making*, *fabric painting*, va*rious wood painting techniques* such as wood aging, masking, stencil, decoupage, etc., and *various painting techniques on the other materials*. Among these handicrafts, wood painting techniques are the most diverse. In these public education centers, marbling is mostly applied on ceramic and fabric surfaces. In fabric painting various types of fabrics can be used, whereas in çini making clay is used as the surface material. Figure 8.1 displays the craft skills which are based on painting surfaces.

Figure 8.1. The craft skills based on painting surfaces (the first row, left to right): marbling on fabric and ceramic, fabric painting; (the second row, left to right): çini making, wood painting.

The craft skills applied through *attaching materials on a surface* include embroidery techniques, wet felt, mosaic, and needle lace. The embroidery techniques are the most diverse, and they involve techniques such as cross stitch, wire embroidery, traditional Turkish embroidery techniques (*hesap işi*), ribbon embroidery, etc. In addition, all these techniques are applied through stitching various materials on various types of fabrics through the use of an embroidery frame, which can be in different sizes (Figure 8.2). In wet felt technique, raw felt is used, and raw felt pieces are either bonded with each other through the use of soapy water and then applied on various surfaces through sewing or gluing, or they are directly bonded with a fabric surface, such as on clothing.

In mosaic technique, small stone or glass pieces are glued on various surfaces, and in needle lace, laces made through the use of a needle are applied on various fabrics. Figure 8.3 displays the craft works created through the use of wet felt, mosaic and needle lace techniques.

Figure 8.2. Various embroidery techniques applied on fabric.

Figure 8.3. Wet felt, needle lace, and mosaic techniques applied on objects.

The craft skills which are based on joining readily available materials include patchwork and felt accessory making. In patchwork, fabric parts are cut and joined together through sewing, and in felt accessory making, felt parts are cut and joined together through sewing or gluing. Figure 8.4 displays the products created through these crafts.

Figure 8.4. The craft skills based on joining parts together (left to right): Patchwork, felt home accessories.

Figure 8.5. The craft skills based on creating surfaces and 3D forms using raw materials

Lastly, some of the craft skills are based on creating surfaces and 3D forms using raw materials, which are rug weaving, ceramic, needle lacing, and tragacanth doll making (Figure 8.5). In rug weaving, yarns are woven on a loom, and the trainees in the public education centers mostly create furniture upholstery, bags, and rugs made of these woven yarns. In the ceramic course, clay is formed and the 3D forms are decorated through dyeing. Needle lacing can also be performed to create surfaces to be used in jewellery, without integrating the laces into another material. In tragacanth doll making, wire, cotton, oninonskin paper, and gum tragacanth are used, and doll parts are created through wrapping cotton around wires using gum tragacanth. Then, these are joined together and dyed.

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To select the craft skill to be used in the personalization process of a lighting, I analyzed the craft skills mentioned above based on the following criteria:

- Light transmittance of the materials used in the craft skill,
- Variety in the techniques used for the craft skill,
- Ease of changeability of the parts that are produced through the use of the craft skill in the use phase,
- Convenience of the craft skill for creating three dimensional forms,
- Environmental impact of the materials used in the craft skill,
- Duration required for creating parts with the use of a craft skill,
- Ease of accessibility to the participants who know a certain craft skill.

Since the design exploration would be a lighting design, the light transmittance of the materials used in the craft skill was important. Considering this criterion, I eliminated rug weaving, wet felt, mosaic, ceramic and çini making, since the products created through these craft skills would not emit the light efficiently. The crafts using fabrics such as marbling, fabric painting, patchwork, and the embroidery techniques were more suitable to be used in the lighting design due to the light transmittence of the fabric material.

The variety of the techniques used in the craft skill is another important consideration when selecting the craft skill, since it brings aesthetic diversity for the parts to be personalized. In addition, I preferred to select a craft skill involving various techniques instead of selecting one specific skill to increase the possibility of finding people who know one of the variations of that skill. In terms of variety, the most diverse techniques are the wood painting techniques and the embroidery techniques. There are many sub-techniques of them, which can be applied through various tools and materials.

When the skills are evaluated in terms of the ease of changeability of the personalized parts in the use phase, embroidered parts seemed to be easier to replace compared to

the painted wooden parts in terms of cost and accessibility. It is also difficult to replace a ceramic part in the use phase, and creating details to integrate ceramic parts may not be feasible, since these parts could shrink, when they are kiln-dried. Thus, wood painting and ceramic skills seemed inconvenient for the design exploration in terms of the product parts' changability in the use phase.

In terms of the convenience of the craft skill for creating three dimensional forms, skills using soft materials such as fabric and felt seemed more convenient. To this end, embroidery techniques, fabric painting, marbling, wet felt, and patchwork seemed to provide more flexibility for creating 3D forms. Synthetic felt is used in the felt accessories course, and considering the environmental impact of the material, this skill was also eliminated.

The duration required by the craft skill to complete a part was another important criterion, since the participants need to complete a half-way design exploration within a limited period of time. For this reason, crafts such as ceramic, tragacanth doll making, needle lacing, rug weaving, and mosaic seemed inconvenient in terms of this criterion. The embroidery techniques might require less time, since they could be applied using frames in various sizes.

The assessment of the craft skills based on the criteria mentioned above revealed that, the embroidery techniques were the most convenient craft skill for the study, due to their variety, ease of changability of the parts produced through the use of these techniques, the duration they required, the light transmittence and naturalness of the materials used in these techniques, and the flexibility of the fabric material for creating 3D forms.

8.2. Development of the Generative Toolkit for the Persona and Scenario 2

While developing the toolkit, I considered the design criteria that I generated at the end of the previous study (Chapter 7, Section 7.5) regarding ease of personalization, ease of building the toolkit, aesthetic considerations, and design considerations for the

lighting quality. In addition, I needed to develop the generative toolkit considering the skill level and design interventions of the participants, and their potential for spending mental and physical effort. People who engage in the embroidery techniques have high-level skills, and they might be more willing to spend mental and physical effort during the personalization process compared to the participants of the previous study. To this end, they may not prefer a too simplistic way of personalization, and they would like to reflect their skills fully on the toolkit. In addition, the participants would make mainly aesthetic interventions, since the products exhibited in the year end exhibition were mainly focusing on decorating various materials or products, and aesthetic considerations appear to be their priority since they would like to fully demonstrate their skills. Thus, the generative toolkit needed to enable aesthetic interventions rather than functional ones.

Considering the criteria mentioned above, in the design process of the generative toolkit, firstly I focused on the possible ways of making embroidery on a surface and the ways of stretching a fabric and transforming it into a three dimensional form. I explored these ideas through sketches (Figure 8.6).
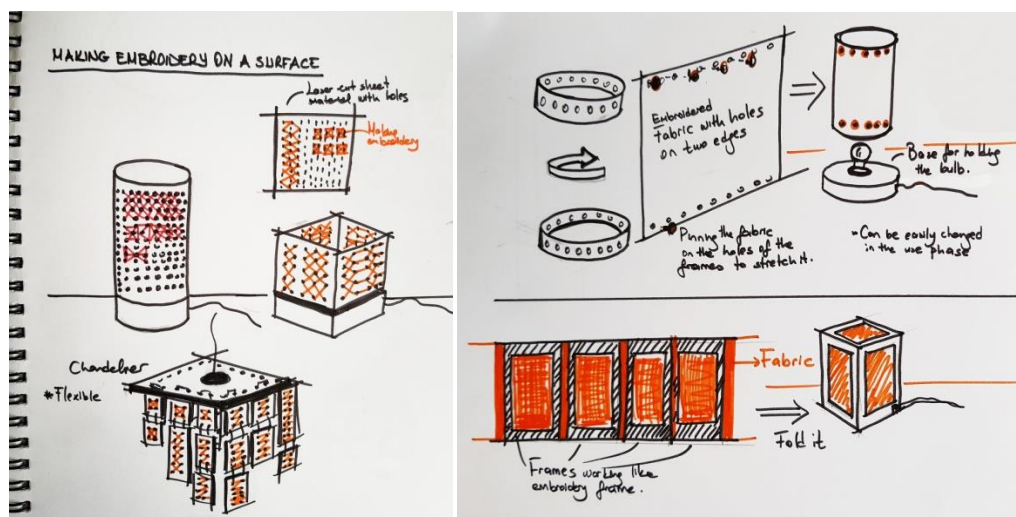
Figure 8.6. Exploration of the initial ideas through sketches.

The people who make embroidery use an embroidery frame to stretch the fabric. I decided to use this principle in the design, since it was a more familiar way of stretching the fabric for these people. Based on this idea, I considered to usage of frames on a continuous fabric, which can be placed on the fabric using a template. Through stretching the fabric with the use of the frames, making embroidery on them and then folding them, a 3D form could be created. However, this process involved too many steps, and it may not meet the criteria of ease of building the structure and ease of personalization. Thus I decided to use single pieces of fabric for each frame and connecting these frames to create the 3D form. In addition, these frames could enable people to make embroidery directly with them, instead of using an embroidery frame and then transferring it into the generative toolkit. Finally, this 3D form also needed a surface to hold the light bulb, so I combined the frames with a base holding the light bulb, and I developed the final generative toolkit (Figure 8.7). To build up the structure with the frames, I developed slots on the base. Thus, each part can be inserted into the slots designed for them. Lastly, I prefered to use wood material for the frames, since the material needed to be rigid for making embroidery, and the cardboard material that I used in the previous studies might look homemade and might not be suitable for the participants' tastes.
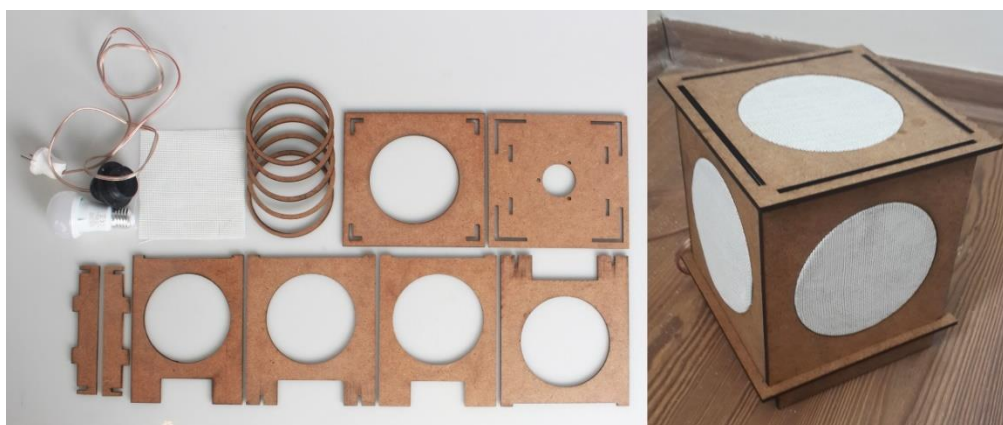
Figure 8.7. Finalized generative toolkit.

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The finalized generative toolkit was produced through laser cutting 4 mm MDF parts and it involves five surfaces with circular holes, five rings with which the fabric can be stretched on the surfaces with holes, one base, and two leg pieces to increase the height of the toolkit from the ground to provide space for the electrical parts such as the bulb socket and the cable.

The generative toolkit can be obtained as a half-way design kit by people. In addition, the open-source data of the MDF parts can be provided by the designer so that, people can have it produced by a local manufacturer and possibly in different sizes as well. In the personalization process, people can either stretch their fabric on their own frames and then place the embroidered fabric on the toolkit or they can use the frames of the toolkit to make embroidery. Then, inserting the five embroidered surface into the slots, they can build the lighting. People can change the shadings in the use phase through replacing the fabrics stretched on the surfaces. Table 8.1 displays the evaluation of the generative toolkit in terms of the dimensions of personalization important for sustainability.

Table 8.1. *The evaluation of the generative toolkit based on the dimensions of personalization.*

Goal of personalization	Using a craft skill
Method of personalization	Integrating a part/material with the product
PLS phase	Design and use phases
Required skills	Craft skills
Effort	Mental and physical effort
Nature of intervention	Aesthetic
Flexibility	More than once
Production scales	Parts produced in one-off scale can be integrated with mass produced toolkit parts, the toolkit can be produced at the batch production scale
Role of manufacturer	Producing the toolkit through laser cutting
Role of designer	Providing a half-way design that can be completed by the people, producing the half-way design
Role of people	Building the structure, completing the lighting design using craft skills, and (if they want) downloading the open-source data and have the MDF parts produced by a local manufacturer.

As defined earlier in the design scenarios (Chapter 7, Section 7.1), the second scenario focuses on product personalization through the use of a craft skill. In the personalization process, people can integrate the parts they embroidered with the frames I provide. The toolkit can be personalized in the design and use phases, and more than once, since the personalized parts can be attached and detached. The toolkit is designed for people who have embrodiery making skills, and the nature of intervention is mainly aesthetic. In the personalization process of the toolkit, parts produced in the one-off scale through the use of embroidery skills are integrated with mass produced MDF parts and electrical parts. The toolkit can also be produced locally at the batch production scale. The half-way toolkit can be produced by the designer, manufacturer or the person. In addition, designer provides the half-way design. The person who acquires it can personalize the parts of the half-way design and build it.

8.3. Generative Study 4: Individual Generative Sessions

In this phase, I conducted individual generative sessions with six participants who had embroidery making skills. In this generative phase, the participants personalized the toolkits, then I conducted follow-up interviews and think-aloud studies with each participant. The purpose of the individual generative sessions was to explore the participants' personalization processes, and the use of the design details enabling personalization to gain insight on design for personalization and its implications for sustainability. Since the participants were influenced by the workshop materials in the previous study, this time I did not arrange a design workshop, and conducted the generative sessions individually at the homes of the participants.

8.3.1. Sampling

I selected the participants with *theoretical sampling* approach, based on the personas addressed in the scenarios I developed in the study (Chapter 7, Section 7.1). To find the participants, I followed a snow-ball sampling strategy, and asked people whether they knew people who had embroidery skills or attending to an embroidery course in the public education centers. I found one of the participants, during my visit to the year end exhibition of the public education centers, and one of the participants had participated in the follow-up study conducted in the generative research phase 1 (Chapter 6, Section 6.5). Six female participants were recruited for the generative study. Table 8.2 displays the information about the participants.

Table 8.2. Information about the participants of the fourth generative study.

	Age	Participant's craft skills	Duration of experience with the craft skill
GS4-P1	58	Cross-stitch	30 years
GS4-P2	57	Wire embroidery, traditional embroidery techniques	23 years
GS4-P3	67	Cross-stitch, aluminum relief & ink	Since childhood (cross-stitch), 10 years (aluminum relief & ink)
GS4-P4	63	Basic embroidery techniques	30 years
GS4-P5	59	Cross stitch, fabric painting	30 years (cross stitch), 15 years (fabric painting)
GS4-P6	54	Wire embroidery	10 years

8.3.2. Duration and Setting

Based on the feedback of the participants in the previous study, I decided to extend the duration of the personalization process in this generative study, and thus, I asked the participants to personalize the toolkits in two weeks. However, the generative research phase was completed at different times for each participant. The whole generative study, including the follow-up interviews and the think aloud studies, was carried out between August 2-22, 2017. Table 8.3 displays the duration of each phase

of the study conducted with each participant, and includes the dates of the personalization phase, semi-structured interviews and the think-aloud studies.

Table 8.3. Duration of the generative study by participant.

	Personalization Phase	**Semi-Structured Interviews**	**Think-Aloud Protocol**
GS4-P1	04.08.2017-13.08.2017 (10 days)	14.08.2017	14.08.2017
GS4-P2	02.08.2017-05.08.2017 (4 days)	09.08.2017	22.08.2017
GS4-P3	10.08.2017-16.08.2017 (7 days)	22.08.2017	22.08.2017
GS4-P4	07.08.2017 - 17.08.2017 (11 days)	22.08.2017	22.08.2017
GS4-P5	05.08.2017-16.08.2017 (12 days)	19.08.2017	19.08.2017
GS4-P6	03.08.2017- 06.08.2017 (4 days)	11.08.2017	22.08.2017

The participants personalized the generative toolkits at their homes, using their own materials, and the interviews and the think aloud studies were also carried out at the participants' homes.

8.3.3. Data Collection

During this phase of the study, I collected verbal data through the diaries that the participants filled out during their personalization process, and through the semi-structured interviews and the think-aloud protocols that I conducted at the end of the participants' personalization process. I collected visual data through the personalized generative toolkits, photographs taken by the participants during their personalization process, and through the video recordings of the think-aloud sessions.

Generative Toolkit. I provided each participant with one generative toolkit, including the MDF parts in disassembled form, electrical parts (plug, cable and a lamp holder connected to each other), one LED bulb, and ten sheets of etamine fabric for personalization (two sheets for each surface of the toolkit) cut according to the dimensions of the blank surfaces of the toolkit. In addition, I provided a 70x100 cardboard which could be used as a background for the photographs that the participants would take. Apart from the etamine fabric, I did not provide any material

to be used in the personalization process to not to limit the participants' material selection.

I provided etamine to the participants to enable them to start the personalization process as soon as they obtained the generative toolkit, since they might not have fabric for embroidery available at their homes at the time they were given the toolkit.

Diaries. As in the previous study, the participants documented their personalization process using the diaries I provided to them in this generative study (Appendix P). Based on the feedback I gained in the previous study, I improved the design of the diaries through placing the sample page before the diary pages to be filled out by the participants. In addition, I clarified the photograph icons in the diary. Figure 8.8 displays a page filled out by a participant.
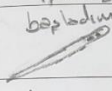
Figure 8.8. A diary page filled out by a participant.

Semi-structured Interviews. After each participant's personalization process ended, I conducted semi-structured interviews with them to understand their personalization process in detail. The interviews were audio-recorded and lasted about 30 minutes.

Before each interview, I collected the diaries to identify the unclear issues written on the diaries and to prepare additional questions for these issues.

The interview questions are given in Appendix Q, and covered the following subjects:
- the phases of the participants' personalization process and their durations,
- the craft skills they used, the reasons of craft selection, and the potential craft skills that could be integrated in the toolkit
- the materials used in the personalization process, the reasons of material selection, the potential materials that could be used in the personalization process,
- the reasons of the participants' interventions,
- the participants' evaluations and suggestions about the personalization process,
- the participants' evaluations and suggestions about the toolkit,
- usage process of the toolkit,
- the participants' evaluations about the research methodology,
- the participants' consents about a potential exhibition for exhibiting the personalized toolkits.

Think-Aloud Protocol. The think-aloud protocols were carried out after each semi-structured interview and lasted approximately 15 minutes. These aimed to explore how the participants' used the details of the generative tooolkit enabling personalization, how they could change the materials after the initial personalization process, and validate the responses the participants provided in the interviews and the diaries. In the think-aloud sessions, the participants were asked to perform certain actions including dissassembling all of the parts of the toolkit, replacing the materials placed on the surfaces of the toolkit with an alternative material they tried before or attaching the same materials (if no alternative material is available), and re-assembling the parts of the toolkit (Figure 8.9). During the participants were performing these actions, I also asked questions about the specific task they were doing, and their evaluations about the design details. Video recording was used to document this phase. The think-aloud protocol followed in the study is given in Appendix R.

Figure 8.9. Snapshots of the think-aloud protocol.

Data Collection Procedure. At the beginning of the study, the participants signed a consent form (Appendix O), which was explaining the aim of the study and the research process. Then I provided one generative toolkit and one diary to each participant. Although instructions on how to build and personalize the toolkit were provided in the diaries, I showed the participants how to build the toolkit to ensure that, they would not have difficulty in building the 3D structure. I also verbally explained the research procedure to them, and asked them to personalize the toolkit using the craft skills they had, and document their personalization process on the diaries and through taking photographs. During the study, the participants sent the photographs of their personalization process to me via an online app. At the end of the personalization process of each participant, I took the diaries back, and scheduled the follow-up interviews and the think-aloud protocols.

8.3.4. Data Analysis

The focus of the data analysis was to refine the conclusions drawn from the previous studies regarding design for personalization and its implications for design for sustainability. The verbal data collected through the diaries, semi-structured interviews, and the think-aloud protocols were analyzed through content analysis in combination with the visual data collected through the photographs taken by the participants, personalized generative toolkits, and the video recordings of the think-aloud studies.

I analyzed the data gathered through the semi-structured interviews, diaries and the think aloud protocol together, since they complemented each other. Firstly, I verbatim transcribed the interview and diary responses in MS Word, and then transferred the participants' quotes to be coded into MS Excel for each participant. After this, I coded each coding unit using an inductive coding approach (Figure 8.10).

Participant	Quote	Code
GS4-P1	I had difficulty in selecting the patterns. The dimensions of the patterns that I found did not fit the object. I made a rose, but it was too small, so I had to change it.	Difficulty in finding a pattern in the right size
	I could not make the embroidery in the middle of the circular surface.	Difficulty in adjusting the place of the pattern
	I made all of them through cross-stitching.	Cross-stitch

Figure 8.10. Coding of the interview and diary responses on MS Excel.

Then, using the video recordings of the think-aloud session, I verbatim transcribed the participants' responses and I took observational notes. I also transferred the data to be coded into MS Excel for each participant, and coded the data with an inductive approach (Figure 8.11) During this process, I also considered the codes, categories, and themes emerged in the previous study as a guide for my analysis. Lastly, I combined all the data using a separate Excel sheet and generated the sub-categories, categories, and the themes (Figure 8.12).

Think-aloud/Observations		
Participant	Observation	Code
GS4-P6	The participant easily attached the fabric on the frame.	Ease of attaching the fabric on the frame
	The participant had difficulty in placing the upper part.	Difficulty in placing the upper part

Figure 8.11. Coding of the observational data on MS Excel.

Interviews, Diaries, Think-aloud - Combined				
P	Quote/Observation	Code	Sub-category	Category	Theme
GS4-P3	Attaching & detaching the parts are practical.	Ease of assembling the toolkit	Ease of assembly /disassembly	Positive attributes	Design details
	I used etamine and crossstitch yarn.	Etamin & crossstitch yarn		Materials (used)	Personalization Process
	I had these yarns at home, so I used them.	Availability of the material	Reason of material selection	Participants' design considerations	Personalization Process
	The participant had difficulty in detaching the painted parts.	Difficulty in attaching/detaching parts due to surface treatment	Difficulty in disassembly	Problems	Design details

Figure 8.12. Development of the categories and themes using the combined data.

Besides the analysis explained above, I analyzed the personalized toolkits based on the dimensions of personalization as in Figure 8.13, to evaluate their implications for sustainability.

P	Personalized toolkit	Goal of Personalization	Method of Personalization	Skills	Effort	Nature of Intervention	PLS Phase	Flexibility	Production Scales
P1		Using a craft skill	Integrating a part/material with the product	Craft skills	Mental & Physical	Aesthetic	Design & Use	More than once	Mass+one-off
P2		Using a craft skill	Integrating a part/material with the product	Craft skills, hand skills	Mental & Physical	Aesthetic	Design & Use	More than once	Mass+one-off
P3		Using a craft skill	Integrating a part/material with the product, surface treatment	Craft skills	Mental & Physical	Aesthetic	Design & Use	More than once	Mass+one-off
P4		Using a craft skill	Integrating a part/material with the product	Craft skills, hand skills	Mental & Physical	Aesthetic	Design & Use	More than once	Mass+one-off
P5		Using a craft skill	Integrating a part/material with the product, surface treatment	Craft skills, hand skills	Mental & Physical	Aesthetic	Design	Once	Mass+one-off
P6		Using a craft skill	Integrating a part/material with the product	Craft skills	Mental & Physical	Aesthetic	Design & Use	More than once	Mass+one-off

Figure 8.13. Analysis of the toolkits based on the personalization dimensions.

8.4. Findings of the Individual Generative Sessions with Persona 2

During the study, the participants personalized the generative toolkits at their homes, completing the process in different durations, as given in Section 8.3.2 of this chapter. The personalized toolkits and the craft skills the participants used are displayed in Table 8.4.

The results of the data analysis were grouped under four themes, which are *the personalization process*, *design details*, *benefits of personalization,* and *methodological problems*. The theme of the *personalization process* involves the *craft skills* and *materials* used by the participants, and the *design considerations* taken into account while selecting these. *The design details* involve the *problems* the participants faced during the personalization process, the *positive attributes* of the toolkit according to the participants, and the participants' *suggestions* about the design details. *Benefits of personalization* refer to the benefits that the participants mentioned when evaluating the personalized toolkit and their personalization process. Finally, *methodological problems* refer to the problems about the research design mentioned by the participants. Table 8.5 displays the themes and the relevant categories, sub-categories and the codes emerged from the data analysis.

Table 8.4. Toolkits personalized by Persona 2.

Participant 1	Skills used
	Cross-stitch
Participant 2	
	Traditional Turkish wire embroidery techniques
Participant 3	
	Cross-stitch, wood painting, aluminum relief, aging aluminum with ink
Participant 4	
	Basic embroidery techniques
Participant 5	
	Cross-stitch, sewing (beads), fabric painting, spray painting
Participant 6	
	Wire embroidery

Table 8.5. Themes and categories emerged from the data analysis.

Theme	Category	Sub-category	Code
Personalization process	Actions		Pattern research, creating patterns by drawing, transferring the pattern on the fabric, checking the lighting effect, exploration with different fabrics/techniques
	Involvement of others		Exchanging ideas, surface treatment, building the toolkit
	Skills	Skills used	Cross stitch, wire embroidery, wood painting, aluminum relief, aging with ink, basic embroidery techniques, sewing, fabric painting, spray painting
		Potential skills	Ribbon embroidery, sewing materials, lacework, wood aging, weaving, mosaic
	Materials	Materials used	Fabrics, threads, beads, paints, aluminum sheet
		Potential materials	Ribbons, wooden sticks, leaves, paper, beads, toys
	Participants' design considerations	Criteria for craft selection	Fabric-craft relationship, availability of the material, lighting effect of the craft, filling the empty areas, process enjoyment
		Criteria for material selection	Lighting effect of the material, availability of the material, craft-thread relationship, harmony between the materials, durability, practicality, authenticity
		Criteria for pattern selection	Experience with the pattern, personal taste, frame size, variety on the toolkit's surfaces, adaptability to context of use, meaning of the pattern
Design details	Problems	Difficulty in personalization	Difficulty in using the frame detail, difficulty in detaching the parts due to surface treatment
		Difficulty in building the toolkit	Top frame, need to fix the cable
		Aesthetic-related Issues	Color of the lighted frame, form of the toolkit
	Suggestions	Size	Bigger size
		Electrical parts	Cable, light bulb, on-off button,
		Details for personalization	Surface with holes
		Connection details	Locking the surfaces with each other, longer connection detail for the upper part
	Positive attributes	Ease of personalization	Using the frame detail for embroidery, ease of attaching the fabric on the frame, quick feedback
		Ease of assembly/ disassembly	Interlocking connection details, dimensional differences between the parts, clarity in the direction of the assembly
		Overall design	Adaptability, lighting quality, uniqueness, aesthetic appearance, ease of cleaning, material, enabling self-expression

Benefits of personalization	Product-related benefits		Product's fit to person, self-expressiveness
	Process-related benefits		Hedonic benefits, creative fulfillment, emotional connection
Methodological issues	Problems		Short duration
	Suggestions		Longer duration, diary question for planning of the process

8.4.1. Personalization Process

During their personalization process, the participants followed certain steps and performed *actions* that are common among all of the participants. In addition, *other people involved* in some of the participants' personalization process in certain steps. While personalizing the toolkit, the participants used specific skills, materials, and patterns for specific reasons, which are explained under the categories of *skills*, *materials*, and the *participants' design considerations*.

8.4.1.1. Actions

Before beginning the personalization of the toolkit, all of the participants carried out pattern research on internet and from books and some of the participants created their own patterns by drawing on paper, and some used the available patterns (Figure 8.14). Then, some of the participants transferred these patterns on the fabric by drawing or tacking (Figure 8.15), and some of them directly embroidered the patterns and personalized the toolkits using different skills (Figure 8.16). While personalizing the toolkits, three of the participants used the object's frame for embroidery, and three participants used their own embroidery frame, and then attached the fabric on the toolkit's surfaces.

All of the participants checked the lighting effect of their personalized parts, through turning on the light and attaching the personalized part on the base. In some cases, the participants needed to change their pattern design, and created another pattern to embroider. For instance, P1 changed her pattern design twice, since the string connnections appeared to be not pleasantly looking for her when the light was on and the pattern she embroidered looked too small on the etamin.

Figure 8.14. The use of the patterns found online and from books.

Figure 8.15. Transfer of the patterns on the fabric through drawing and tacking.

Figure 8.16. Direct transfer of the pattern through embroidery.

8.4.1.2. Involvement of Others

People who live with the participants are involved in some of the personalization phases of three participants. This took place as exchanging ideas, applying the surface treatment, and building the toolkit. Two participants asked the others' opinion on pattern selection, and surface treatment method to be applied on the surfaces of the toolkit. Two participants got help from the family members in performing the surface treatment. P3 got help from her husband in the initial building of the toolkit, and he was also involved in pattern selection, the selection of the surface treatment method, and performing the part of the surface treatment. For this reason, I also conducted interview with him.

8.4.1.3. Skills

Three participants (P1, P3, P5) made cross-stitch on the etamin surfaces. Two participants (P2, P6) used the wire embroidery technique, and P4 used basic embroidery techniques in her personalization process. In addition, P5 painted the etamin fabric and sewed beads on it. Two participants (P3 and P5) also personalized the toolkit's wooden surfaces. P3 used wood painting, aluminum relief, and aging the relief with ink, whereas P5 painted the surfaces with spray paint. The surfaces personalized by each participant is displayed in Figure 8.17.

The participants also mentioned other skills that could be potentially used in the personalization process. These include, ribbon embroidery, lacework, and weaving (basic weaving, macrome) on the frames, and wood aging and mosaic on the wooden parts. Except from the weaving, the other skills can be used in the personalization of the toolkit. However, for weaving, additional design details are needed on the frame parts, such as holes to pass the threads through.

Figure 8.17. Toolkit surfaces personalized by the participants.

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8.4.1.4. Materials

The participants used various fabrics, threads, and additional materials in their personalization process. While five participants used the etamin fabric I provided to them at the beginning of the study, P2 used a hand woven fabric and P4 attached old embroidered fabrics on the toolkit for exploration. For embroidering, some of the participants (P1, P3, P4, P5) used cross-stitch threads, whereas P2 and P6 used wire. P2 also used silvery threads in her embroidery and P4 used floss threads on one of the surfaces. Additionally, P5 sewed plastic beads on etamin and used fabric paint on it. For the wooden surfaces, P3 used wood paint, aluminum sheet and ink, whereas P5 used spray paint.

For the other materials that can be used on the object, the participants suggested the use of ribbons, paper and glass beads, and for the wooden surfaces, they suggested attaching materials such as wooden sticks, dried leaves, mosaic and toys (to be used in baby room).

8.4.1.5. Participants' Design Considerations

The participants took certain design considerations into account when selecting the skills, materials, and the patterns they used. In addition, the suggestions they made about the potential materials and techniques that could be used revealed their design considerations in the personalization process.

Criteria for Craft Selection

The participants used and suggested certain craft techniques based on the criteria including *fabric-craft relationship*, *availability of the material, lighting effect of the craft, filling the empty areas,* and *process enjoyment*. P1, P3, and P5 indicated that, they applied cross-stitch, since it was more suitable for the etamin fabric. P1 and P4 preferred to use techniques that can be applied on etamin, since it was the only available fabric at their homes.

P3 and P5, who suggested the use of painted wax paper, macrome and ribbon embroidery as the craft techniques and materials that can be potentially used, stated that, they suggested these crafts due to their potential lighting effect. In addition, one participant stated that, after making the cross-stitching, she applied fabric painting and sewed beads on the empty areas around the embroidered pattern, since the personalized areas looked empty. P1 indicated that, she made cross-stitch, since she enjoyed the process of cross-stitching.

Criteria for Material Selection

The participants' criteria for material selection include, the *lighting effect of the material*, *availability of the material, craft-thread relationship, harmony between the materials, color harmony, durability of the material, authenticity of the material,* and *practicality of applying the material*.

Four participants stated that, they selected the materials considering their *lighting effect*. P2 used silvery threads and wire, P4 used bright threads and fabrics embroidered with these threads, P5 used beads, and P6 used wire, since the lighting effect of these materials would be better.

Availability of the material is also another important criterion that affected the four participants' material selection. P1, P3, and P4 used threads due to their availability, and P6 used etamin for the same reason.

Three participants (P1, P2, P5) indicated that, they used the specific threads and wire, since they were *suitable for the craft technique* they used. For instance, P1 stated that, the threads she used were suitable for cross-stitching, and if she had applied Turkish embroidery, she would have selected another type of thread.

Harmony between the materials was another material selection criterion for three participants (P2, P4, P6). P2 and P6 stated that, they preferred to use wire, since both the material of the toolkit and the wire looked natural. P2 indicated that, she used the wire material, since its color was in harmony with the color of the toolkit's material. P4 noted that, selection of a thread in harmony with the fabric type is important.

Besides these, P2 selected wire material since it would be more *durable* against deformation due to the light, and she used the hand woven fabric due to its *authenticity* and appropriateness to the traditional application of the wire embroidery technique. In addition, P3 used threads, colors of which were in *harmony* with the patterns she embroidered, and P5 used spray paint due to its *practicality* compared to the wood paint.

Criteria for Pattern Selection

Participants' pattern selection criteria include *experience with the pattern, personal taste, frame size, variety on toolkit's surfaces, adaptability to the context of use, and meaning of the pattern.*

Three participants stated that, they embroidered the patterns, since they were experienced in making them. Three participants selected the patterns, since they loved how they looked, based on their personal taste. Frame size defined three participants' pattern selection, and they embroidered patterns that fit the toolkit's frame. Two participants indicated that, they embroidered different patterns on different surfaces of the toolkit, since they wanted to see variety on the lighting. In relation to that, one of them stated that, she seeked variety to adapt the personalized object to the different contexts of use, considering color harmony with the objects in the environment. Finally, one of the participants (P3) selected the evel eye bead pattern due to its cultural meaning associated with protection from evilness, since she wanted to give the personalized object to her son.

8.4.2. Design Details

This theme involves three categories, which are the *problems* that the participants faced during the personalization process due to design details, their *suggestions* about these problems, and the *positive attributes* of the toolkit and its details that are evaluated by the participants.

8.4.2.1. Problems

The participants encountered certain problems in the personalization process, which are classified under *difficulty in personalization*, *difficulty in building the toolkit*, and *aesthetic-related issues*.

Difficulty in personalization

The participants mentioned difficulties they faced during their personalization process, which are classified as *difficulty in using the frame detail* and *difficulty in detaching the parts due to surface treatment*.

The problems regarding the frame detail involve, *looseness of the frames*, *difficulty in finding a pattern in the right size*, *need for a reference to center the fabric*, *need for a template to cut fabric*, *low thickness of the frames*, and *smallness of the frames*.

Three participants (P2, P4, P6) mentioned the *looseness of the frames* as a problem about the frame detail. Two participants (P2 and P4), who tried to use fabrics other than the etamin I gave to them, indicated that, the frames held the certain fabrics loosely. One of them surrounded the frame with another fabric to solve this problem. In addition, P6 stated that, the etamin got loose during the embroidery process, since she used wire, which was a rigid material, and thus she used her own frame for embroidery. The participants' solutions are displayed in Figure 8.18.

The adaptability of the frame detail to different material thicknesses is an important design consideration for personalization to enable people to use the materials that are available to them, and those they like for expressing their personal tastes and skills. To this end, this problem can be solved either through increasing the diameter of the frame to hold the fabrics more firmly than the one I used in the study, or through providing various frame sizes for the materials that would potentially be used.

Figure 8.18. The participants' solutions for the looseness of the frame.

Two participants (P1 and P5), who applied cross-stitching, stated that, they had *difficulty in finding a pattern in the right size* for the frame. One of them changed the embroidery that she initialy applied on the etamin, and the other used other techniques (sewing beads and fabric painting) to fill the empty areas on the etamin (Figure 8.19). Patterns in the right size can be easily selected through putting the frames on the patterns, when the pattern is selected from a book. However, when the participants use the patterns on the internet or create their own patterns, it may be difficult to adjust the pattern size, as in these cases. To solve this problem, a paper template representing the holes on the etamin could be given to the participants, on which they could draw the pattern they adapted from the digital sources.

Figure 8.19. Difficulty in adjusting the pattern size.

In the think-aloud sessions, two participants (P1 and P6) indicated that, they needed a *reference to center the fabric* on the frame. This issue could be solved through engraving guidelines on the frames which correspond to the four corners of the fabric.

It was observed in the think-aloud sessions that, P2, who used fabrics other than the etamin I gave her, cut the fabrics bigger than they should be, which created a problem in building the toolkit (Figure 8.20). Although the participants could use the etamin I provided as a *reference for cutting other fabrics*, this problem could be solved through providing a cardboard template for cutting fabrics.

Figure 8.20. Difficulty in building the toolkit due to fabrics cut large.

P2, who used her own frame for emboridery, stated that, the *thickness of the frame* is not sufficient to stretch the fabric, which could be solved through the use of a thicker material. P2 also indicated that, she preferred to use a big frame to use both of her hands to sew the patterns. Since the frame size was small, it required holding it with one hand, and making the embroidery with the other.

One participant (P5), who spray painted the MDF surfaces, had *difficulty in detaching the parts* in the think-aloud sessions, which makes the adaptation of the toolkit in the use phase difficult. This problem implies that, for products to be personalized, detailed information on the possible surface treatment methods could be given to people, to prevent the product's loss of flexibility for personalization in the use phase.

Difficulty in building the toolkit

Although all of the participants found easy to build the toolkit, they mentioned two problems about this process. One of the problems was related to the *top frame*, which was considered difficult to place by all of the participants. When the participants tried to attach the top frame, the side frames moved. For this reason, the side surfaces need to be interlocked firmly. In addition, during the think-aloud session, P2 stated that, if there was a *detail to fix the cable*, it would be easier to build the toolkit. Since the cable moved as the participant was building the toolkit, she had difficulty in placing the parts.

Aesthetic-related Issues

Two participants mentioned problems regarding the aesthetic qualities of the toolkit. P2 stated that, she painted the frame white, since she did not like the brown color of the frame, when she turned the light on. P5 commented on the form of the toolkit, indicating that, she found the cubic form ordinary. In fact, I kept the form simple to make the participants concentrate on the details for personalization and avoid the loss of time due to building a more complicated form. However, stuctural variety can be

provided based on applying the same or similar principles for attaching and detaching the components, considering the suggestions of the participants.

8.4.2.2. Suggestions

The participants' suggestions regarding the generative toolkit were classified under four categories, which are the *size of the toolkit*, *electrical parts*, *details for personalization*, and *connection details*.

Four participants stated that, the size of the toolkit was small, and they would prefer it bigger. The reasons for preferring the toolkit to be bigger include increased lighting amount (three participants), the visibility of the personalized parts (three participants), and ease of building (one participant).

The participants' suggestions about the electrical parts include suggestions about the *cable*, *light bulb*, and attaching an *on-off button*. The suggestions about the cable include, the use of a transperant cable for aesthetic concerns (one participant), the use of longer cable (one participant) or using no cable (one participant) to adapt the lighting to different contexts of use, and a fixing detail for the cable for ease of building the toolkit (one participant). In addition, four participants suggested the use of a light bulb which provided a softer light to achieve a better lighting quality (three participants), and for the durability of the wire material used for the embroidery (one participant). Finally, two participants suggested attaching an on-off button to easily turn on and off the light.

One participant (P5) suggested design details for enabling the use of craft skills other than embroidery. She suggested using a surface with small holes on it, on which glass beads could be attached to achieve light reflection with the beads. She also suggested the use of holes around the circular blank parts of the MDF surfaces through which threads and beads could be passed, and crafts like macrome could be applied.

Finally, two participants made suggestions about the connection details of the toolkit. Both of them suggested locking the side surfaces to each other before placing the upper part for ease of building. One of them also suggested longer connection details at the top for attaching the upper part.

8.4.2.3. Positive Attributes

The participants also found some of the attributes of the toolkit favourable, which are classified under three categories as *ease of personalization*, *ease of assembly/ disassembly*, and *overall design*.

Some of the participants mentioned that, the frame detail provided the ease of personalization in three aspects. Four participants (P1, P3, P4, P6) indicated that, *attaching the fabrics on the frames* was easy. In addition, three participants (P1, P3, P5), who used the toolkit's frame for embroidery stated that, *using the object's frame for applying the embroidery* was effective, practical and easy, which made the personalization process easier. Finally, P6 indicated that, the toolkit provided *quick feedback* about how the personalized parts look when the light was turned on, since attaching the parts and checking the lighting effect was simple.

Some of the attributes of the toolkit which were found positive by the participants were related to the *ease of assembly and disassembly of the toolkit*. All of the participants stated that, assembling and disassembling the toolkit was easy. More specifically, three participants indicated that, the *interlocking connection details* were practical, and made the building process easy. In addition, one participant stated that, the dimensional differences between the side surfaces helped her to build the toolkit easily. One participant noted that, the *direction of assembly was clear* due to the extensions of the side surfaces placed on the bottom edges.

The participants also found some of the general characteristics of the toolkit design positive, which were related to the toolkit's *adaptability*, *lighting quality*, *uniqueness*, *aesthetic appearance*, *ease of cleaning*, *material*, and its potential for *enabling self-expression*.

In terms of adaptability, two participants stated that, the toolkit's *adaptability in the use phase* was a favorable attribute. One of them also noted that, the toolkit was *adaptable to different tastes and skills*, and people who did not have embroidery skills could also personalize the toolkit. Another positive comment was about the lighting quality of the toolkit. It was a positive feature for one participant that, the kit gave off light from five surfaces. In addition, P3 found the toolkit unique and aesthetically appealing, P5 found it easy to clean, and P6 evaluated its potential for self-expression, and its material's natural and safe look as positive attributes.

8.4.3. Benefits of Personalization

The participants mentioned some *product-related* and *process-related benefits* of personalization. *Product-related benefits* include the *product's fit to person* and its *self-expressiveness*. All of the participants stated that, they were quite content with the toolkit's appearance after the personalization process. In addition, two participants indicated that, the personalized toolkits reflected themselves and had self-expressive value.

The *process-related benefits* mentioned by the participants include *hedonic benefits*, *creative fulfillment*, and *emotional connection* with the personalized toolkit. Five participants stated that, the personalization process was enjoyable, which was a *hedonic benefit*. In addition, five participants made comments about the *creative fulfillment* they felt after the personalization process. For instance, some of them were proud of the product they personalized, and some of them expressed their creative fulfillment regarding the joy of producing something new. The participants' comments regarding their creative fulfillment are as follows:

P1: "I want to place this lighting in my living room, where everyone can see it. Because I made it."

P2: "Since I made this, it looks more beautiful to me."

P3: "I would put this lighting on a table in my living room. I would show it to my guests and tell its story. I would not use it in my bedroom, because I want it to be visible to everyone."

P4: "I discovered my own capabilities and saw what I could make. The joy of making something is invaluable."

P6: "Producing something new is very enjoyable. I would proudly show this to everyone."

Two participants also expressed their *emotional connection* with the personalized toolkit, which was also a *process-related benefit*. The comment of P3 indicates that, she considers the personalization process as a valuable and meaningful memory. The participants made the following comments:

P2: "Since this product is hand-made and I spent effort to make it, it has a special place for me."

P3: "This product is both yours and mine. It has a memory. If you gave me a golden lamp, I would still prefer to use this one, because this is our work."

8.4.4. Methodological Issues

Three participants stated that, the duration of the study, which lasted two weeks, could be longer, since they wanted to make some explorations with the toolkit. One participant also indicated that, she could plan her personalization process better, if there was a question like "what do you plan to do tomorrow?" in the diaries. Since these issues were revealed during the interviews, and the personalization process ended at that time, I could not provide extra time to the participants for exploration.

8.5. Analysis of the Personalized Toolkits based on the Dimensions of Personalization

Table 8.6 displays the analysis of the personalized toolkits based on the *dimensions of personalization* important for sustainability. The role of the manufacturer, designer, and the user in this table were not included in the table, since they did not change in the personalization process. The participants personalized the toolkits as predicted, and defined in the design phase. In addition, a few new dimensional characteristics emerged from the follow-up studies conducted with the participants, which were written in bold in the right column.

Table 8.6. The evaluation of the generative toolkit in terms of the dimensions of personalization important for sustainability.

Dimension	Defined in the Design Phase	Emerged from the personalization process
Goal of personalization	Using a craft skill	Using a craft skill
Method of personalization	Integrating a part/material with the product	Integrating a part/material with the product, **surface treatment**
PLS phase	Design and use phases	Design and use phases
Required skills	Craft skills	Craft skills and **hand skills**
Effort	Mental and physical effort	Mental and physical effort
Nature of intervention	Aesthetic	Aesthetic
Flexibility	More than once	More than once
Production scales	Mass produced parts can be integrated with parts produced in one-off scale	Mass produced parts can be integrated with parts produced in one-off scale

As defined in the design phase, the goal of personalization was mainly using and practicing a craft skill, which was achieved by all of the participants in the generative sessions.

The method of personalization was defined as integrating a part/material with the product in the design phase. Besides integrating parts with the toolkit through creating embroidered surfaces, some of the participants applied surface treatment on the wooden parts.

As discussed earlier, the application of paints on the surfaces reduced the the toolkit's adaptability to changing needs and tastes in the use phase, since the participants had difficulty in detaching the parts after surface treatment. From the sustainability viewpoint, the adaptation of products to changing needs and tastes has potential in prolonging product lifetime. To this end, to keep a product's flexibility of personalization in the use phase, instructions may be provided on the applicable personalization methods.

In the design phase, product lifespan phase in which the product can be personalized was defined as design and use phases. Except for the personalized toolkit of P5, the others can still be personalized in the use phase. Since P5 applied spray paint on the wooden surfaces, she had difficulty in detaching the parts of the toolkit. Similarly, flexibility of personalization which was defined in the design phase as more than once, the toolkits, except for the personalized toolkit of P5, can be personalized more than once, which is a positive attribute from the sustainability viewpoint.

In the study, the participants used various craft skills. In addition, some of the participants used hand skills such as cutting fabrics in certain dimensions and spray painting. Although some of the craft skills used by the participants are not only locally applied (e.g. cross-stitching, wire embroidery), the craft skills used by P2, such as traditional Turkish embroidery techniques, were specific to this geography. The use of local skills in personalization can facilitate the development of products that respond better to local needs and tastes. Besides, the use of local skills can make economic and social contributions for the people who have these skills.

The participants spent both mental and physical effort during their personalization process. They invested mental effort during their pattern search, and fabric, craft and material selection. For some participants, these phases lasted longer than the embroidery making process.

The participants also continued to generate ideas about the potential techniques that they could use in the future, after their personalization process ended. Since the toolkit could be adapted and changed also in the use phase and more than once (flexibility of personalization), the participants continued to spend mental effort after their personalization process. As discussed in Chapter 7, people's interest in the toolkit can last longer through the investment of mental effort during and after the personalization process due to the flexibility provided for personalization, and this may further increase the bond between the person and the product. In some phases, the participants invested both mental and physical effort, such as while creating and drawing a pattern on a notebook, applying the embroidery, and painting the fabric. In addition, the participants spent physical effort while attaching the personalized parts on the frames, checking their lighting effect, and building the toolkit. The investment of mental and physical effort during the personalization process strengthens the emotional bond between the person and the product, which positively affects product lifespan. To this end, the toolkit has the potential to achieve this.

The nature of intervention was defined in the design phase as mainly aesthetic. In the study, the participants made aesthetic interventions using their craft skills. Finally, for the production scales involved, it was revealed that, the participants integrated the mass produced parts of the toolkit with parts produced in one-off scale, obtaining a product produced in on-off production scale.

8.6. Discussion

This study revealed that, most of the design considerations developed in the previous studies were met by the generative toolkit. These design considerations include, the understandability of the design details through defining the surfaces on which the interventions could be made, design details not requiring the use of adhesives, ease of changing the materials in the use phase, the use of more practical connection details for ease of personalization in the use phase and building the toolkit, self-explanatory construction of the toolkit, more homogenious shading quality, and ease of adjustment of the lighting amount. On the other hand, some of the design considerations were not met by the toolkit, which are design details adaptable for a range of material thicknesses and visibility of the materials used for personalization. To this end, based on the problems, suggestions and positive attributes of the toolkit mentioned by the participants, the prominent design considerations for personalization emerged in this study are as follows:

Design Considerations for Ease of Personalization

- Familiarity of the method of personalization
- Providing templates (for cutting materials, drawing patterns, etc.)
- Guides for the correct placement of the materials
- Information on the surface treatment methods that could be applied
- Quick feedback for checking the personalized part's lighting effect

Design Considerations for Adaptability

- Variety in the parts to be personalized for adaptability to different craft skills
- Adaptability to different material thicknesses
- Adaptability to different contexts of use through structural variety for various lighting needs

Design Considerations for Ease of Building the Toolkit

- Size of the toolkit for ease of building the toolkit
- The use of more practical connection details to improve the ease of building the structure
- Affordances and constraints provided for building the structure

Design Considerations for Aesthetic Qualities

- Size of the toolkit for the visibility of the personalized parts

Design considerations for ease of personalization

Familiarity of the method of personalization, which is the adaptation of the embroidery frame to the personalization process, helped the participants to easily understand how to personalize the toolkit. Although the participants were highly skillful at the craft techniques, the study revealed that, they might still need *templates* (for cutting materials, drawing patterns, etc.) to ease the personalization process. In addition, for the parts to be attached, *guides for the correct placement of the materials* may be helpful. As discussed in the previous section, the use of paints on the wooden surfaces which caused difficulty in detaching the parts, made the personalization of the toolkit in the use phase difficult. Since the flexibility dimension of personalization is important in terms of meeting the changing needs and tastes of people regarding a product, *information on the surface treatment methods that could be applied* may be provided. Finally, *quick feedback* provided by the toolkit through easy attachment and detachment of the parts, enabled the participants to see the lighting effect of the parts they personalized immediately. This reduced the errors and problems that might occur in the personalization process, and increased the likelihood of the personalized toolkit's fit to the participants' personal taste.

Design considerations for adaptability

Based on the suggestions of the participants regarding the potential craft skills that could be used to personalize the toolkit, it would be better to provide *variety in the surfaces* which can be adapted to various craft skills. For instance, to enable the use of skills such as macrome and weaving, holes could be provided around the apertures on the surfaces, without changing the structure.

Adaptability to different material thicknesses is one of the design considerations, which could not be met in this study. Two participants tried to attach different fabrics, and the frames remained loose. Since this problem affects the adaptability of the toolkit to personal needs, tastes, and skills, it needs to be considered in the design of the products that enable personalization through attaching parts. The participants wanted to use the personalized toolkits in different places, such as on the floor in the living room, as a bedside lamp, etc., each requiring different lighting amounts. However, the size of the tookit was suitable for its use as a bedside lamp. To this end, *structural variety* can be provided through the application of similar details that enable the people to adapt the toolkit to different contexts of use and different lighting needs.

Design Considerations for Ease of Building the Toolkit

Product size was mentioned as an important product attribute by one participant for easy building of the toolkit. Thus, the size of the object to be personalized need to be considered for its adaptation to different contexts of use, visibility of the personalized parts and ease of building. Finally, the use of interlocking *connection details, which do not require the use of screws* helped the participants to easily construct the toolkit. In addition, the *affordances and constraints* provided by the toolkit parts, such as the slots and extensions on the parts and differences between the dimensions of the edges of the rectangular surfaces, enabled the participants to understand the building process of the toolkit intuitively.

Design Considerations for Aesthetic Qualities

Size of the toolkit was mentioned as important for two participants also in terms of the visibility of the personalized parts. This consideration had also emerged in the study explained in Chapter 7. The participants wanted to make the personalized object visible to others, which may help them to express themselves to others, to make them feel proud of their skills and feel unique.

Some of the design considerations of the participants were common with those of the participants of the previous study. These are *personal taste*, *lighting quality*, *context of use* and *availability of the materials*. The generative toolkit's potential for adaptability to different tastes and contexts of use is a positive feature in terms of the sustainability considerations. As the toolkit facilitates this adaptability, it provides the benefit of product's fit to person, which can positively affect the person-product relationship. This is an important issue for prolonged product lifespans. In addition, all of the participants used the materials available at their homes, and most of the materials are natural materials (threads, natural fabrics), which are preferred conditions for sustainability.

Besides these, some of the design considerations of the participants are found to be based on their know-how. These include, fabric-craft relationship, craft-thread relationship, harmony between the materials, durability, practicality and authenticity of the material, and their experience with the patterns. This implies that, the participants could integrate their knowledge with the generative toolkit, which is a condition that the mass produced products cannot meet. In addition, some of the design considerations of the participants directly determined by the generative toolkit. For instance, the participants selected the patterns based on the frame size, and since the toolkit was a lighting design, lighting effect of the crafts and materials were considered as specific to that product category.

Benefits of Personalization

As in the previous generative studies, the participants mentioned the benefits of personalization in this study. These are *product-related benefits* including *product's fit to person* and *self-expressiveness* of the personalized product, and the *process-related benefits* including *hedonic benefits*, *creative fulfillment*, and *emotional connection with the personalized product*.

Compared to the previous study discussed in Chapter 7, and based on the participants' evaluations about the personalized toolkits, it can be inferred that, the emotional connection of the participants with the generative toolkit tended to be stronger in this study. This can be resulted from the personally meaningful nature of the personalized parts, and the participants' enjoyment from the process. Since the participants of the previous study personalized the generative toolkit using the materials in the post-use phase, they did not mention benefits regarding their emotional connection with the personalized toolkit.

In the study, the participants personalized the toolkits as predicted, and in accordance with the goal and method of personalization defined in the design phase. The method of personalization and the nature of intervention that the toolkit enabled were defined considering the relationship between these dimensions and the goals of personalization discussed in Chapter 5.

Since aesthetic interventions are more prominent in the products produced through the use of the craft skills, in this study, the generative toolkit was designed to enable aesthetic interventions, and the functional and structural interventions were limited to make the participants focus on the personalization task. The results of the study showed that, the participants found the toolkit easy to build, they cared about the visibility of the personalized parts, and they preferred the toolkit bigger. This showed that, aesthetic attributes of the toolkit and their visibility were important for this group of people.

Method and Flexibility of Personalization
As discussed in Chapter 4, the method of personalization can affect the flexibility of personalization. As an example of this, the participant who spray painted the toolkit reduced the toolkit's flexibility of personalization in this study. Despite this, the other participants could personalize the toolkit in a way that it could be flexibly personalized more than once. This is an important design consideration for sustainability in terms of meeting the changing needs of people in the use phase.

Mental and Physical Effort

Compared to the participants of the previous study, the participants of this study spent much more mental and physical effort during the personalization process. This verifies the conclusion drawn in Chapter 4 and also proposed by Mugge et al. (2009), regarding the relationship between the people's skill levels and their tendencies to invest mental and physical effort in the personalization process. More specifically, the study revealed that, people who have craft skills tend to spend a higher level of mental and physical effort during the personalization process. Moreover, as seen in the previous generative study (Chapter 7), the participants of this study also continued to generate ideas on how else the toolkit could be personalized. In other words, as the toolkit could be personalized more than once, the participants kept spending mental effort even after the personalization process. As discussed earlier, mental effort invested during and after the personalization process can keep a person being interested in the product, and this may strengthen the person-product relationship.

Skills

The study revealed that, some of the skills used for personalization are local skills (traditional Turkish embroidery using wires), while some of them are the skills that are universally applied (e.g. cross-stitching). The use of local skills positively contribute to the social and economic dimensions of sustainability, and it was found that the toolkit had the potential to facilitate this. One of the participants cut readily embroidered fabrics and attached them on the toolkit. In addition, the participants suggested that craft techiques such as fabric painting and lacing could also be used to personalize the toolkit. This implies that, although the study was conducted with people who had high-level skills, people who have low-level skills can personalize the toolkit through cutting fabrics and attaching them on the toolkit, or people who have skills other than embroidering can also personalize the toolkit.

The two-week period given to the participants enabled me to explore their personalization process but the use phase of the toolkits could not be explored. Thus, longer duration is needed to explore the use phase of the toolkit in-depth.

8.7. Comparison of the Results of the Affordability and Practicing a Craft Skill Scenario

In this section, the prominent differences and similarities between the results of the last two generative studies which focused on the affordability (Chapter 7-Section 7.4.6) and practicing a craft skill scenario (Chapter 8-Section 8.4) are discussed.

In terms of the goals of personalization, the affordability scenario addressed the goal of meeting a need with the post-use materials available, which is a function and aesthetic-related goal, whereas the other study focused on the goal of practicing a craft skill, which is a personal goal. At the end of the former study, participants' design considerations and responses revealed that, they wanted to attach more self-expressive and personally meaningful materials on the toolkit, and some of them looked for uniqueness in the personalized toolkit, all of which were personal goals. As these participants could not meet their personalization goal through the toolkit, none of them mentioned the emotional bonding between the product and themselves. On the other hand, in the latter generative study, a better fit between the participants and the defined personalization goal existed. As the responses of these participants revealed, an emotional connection between them and the personalized toolkit existed, since the toolkit met their personalization goals. These results can imply that, targeting people's personal goals rather than the function and aesthetic-related goals can result in a stronger person-product relationship.

In the former study, the participants were university students sharing a home with their friends, whereas in the latter scenario, women who have embroidery skills were recruited for the generative study. These two groups of people are quite different from each other in terms of their skills and their potential in investing effort in the personalization process. In the former study, the participants had difficulty in personalization of the Shading B, which required too much mental and physical effort. For this reason, they preferred the other shading, which was easier to personalize for them. In the latter study, a better match between the people's skills and the personalization method was achieved. Since the personalization method was familiar

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to them, they could easily personalize the toolkits. This implies that, the methods of personalization need to be defined based on people's skill levels and the amount of effort they could spend. The study showed that, the participants of the former study look for practicality and structural variety in the personalization process, and they tend to spend lower level of mental and physical effort compared to the participants of the latter study.

As for the design considerations for personalization, design details adaptable to a range of material thicknesses could not be met in both of the studies. On the other hand, most of the problems regarding the difficulty in personalization and in building the toolkit emerged from the former study were solved in the latter study, with the elimination of the screw detail. This implies that, more practical connection details are needed to reduce the required physical effort in the personalization process. The participants in both study suggested increasing the visibility of the personalized parts. This issue is related with the participants' self-expression need and designing for such personal needs can result in stronger person-product relationship.

CHAPTER 9

CONCLUSION

This thesis explores the ways of enabling product personalization through design with a focus on sustainability. Product personalization is defined as *a process during which a product's aesthetic and/or functional attributes are defined, adapted or modified by its user during design, use and/or post-use stages of the product life span, to increase product's personal relevance to its user, and during this process, user is involved as co-designer and co-maker of the product*. Product personalization is a process, which has the potential of prolonging product lifetimes through strengthening person-product relationship. As this relationship gets stronger, the person attached to the product may show behaviours such as caring for, maintaining and repairing the product (Schifferstein & Zwartkruis-Pelgrim, 2008; Mugge et al., 2005), which may postpone product replacement. Thus, product personalization has potentials for sustainable consumption. Besides addressing sustainable consumption, in the study, product personalization was discussed together with localization through taking design considerations for sustainability into account such as the use of local materials, production techniques, and skills. In the study, the ways of enabling product personalization in line with the sustainability principles are explored with a focus on lighting product category. The research questions of the study are as follows:

1. How does the product personalization process take place in daily life?
2. What are the dimensions of product personalization?
3. How can product personalization be facilitated through design with a focus on sustainability?

      3.1 How can personalization of lighting products be facilitated through design with a focus on sustainability?

3.2 What are the implications of personalization of lighting products for sustainability?

3.3 What are the opportunities and limitations for incorporating product personalization into design process for sustainability?

4. What would be the means of incorporating product personalization into design research for people's empowerment?

In this chapter, the answers to these questions are revealed, the main contributions of the study to the existing literature are explained, and the limitations of the study and the directions for the future studies are discussed.

9.1. Research Question 1 and 2: Product Personalization Process and Its Dimensions

The first two research questions explore the product personalization process and its dimensions, since it is important to identify the factors involved in the personalization process, before designing for personalization. To understand how product personalization process progresses in daily life with the products not designed for personalization, I conducted exploratory studies with people who would personalize their products. These studies include, the semi-structured interviews (Chapter 4) and the online questionnaires (Chapters 5 and 7). The semi-structured interviews I conducted in the preliminary study phase 1 with two people who personalize their products, provided me with an in-depth understanding on people's needs regarding product personalization, the factors involved in the personalization process, and the effects of the personalization process. In addition, the dimensions of product personalization found in the literature were extended through this study. Then, increasing the number of the personalized product examples through the online questionnaire (Chapter 5), I diversified the sub-dimensions of each dimension (Table 9.2). The online questionnaire I conducted in Chapter 7 for exploring the personalization process of Persona 1 also helped me verify and expand these sub-dimensions.

Table 9.1 presents the dimensions of personalization emerged from the preliminary study phase 1 and the literature review with their definitions. Apart from the dimension of *flexibility*, all the other dimensions emerged from the preliminary study phase 1. The reason why *flexibility* did not emerge in that study was that, I conducted the interviews through investigating the products mostly mass-produced and not designed for personalization in the use phase more than once. Table 9.2 displays the dimensions and sub-dimensions of personalization emerged from the preliminary study phase 1 and the online questionnaires.

Table 9.1. Definitions of the dimensions of personalization.

Dimension	Definition
Goal of personalization	Why a person personalizes a product.
Method of personalization	How a person personalizes a product.
Nature of intervention	Type of intervention made on the product through the use of a method of personalization.
Skills	Skills a person uses in the personalization process.
Effort	Effort a person spends in the personalization process.
PLS phase	Product life span phase in which the product is personalized.
Flexibility	How many times a product can be personalized.
Benefits of personalization	The benefits a person obtains at the end of the personalization process, if the product is personalized as intended.

Table 9.2. Dimensions and sub-dimensions of personalization.

Dimension	Sub-dimension
Goal of personalization	**Functional and aesthetic-related goals:** - Increasing product's fit to person - improving aesthetic qualities - Saving a product due to its aesthetic qualities - Increasing product's fit to person - improving functionality - Meeting a need with an available product
	Personal (value and meaning-related) goals: - Saving a product (environmental concerns, sentimental value) - Self-expression - Cherishing memories - Process enjoyment - Having a unique product - Using/practicing a craft skill
Method of personalization	- Integrating a part/material with the product - Surface treatment - Changing the product's context of use - Changing the form of the product - Reusing a product
Nature of intervention	- Aesthetic - Functional
Skills	- No specific skill (Low-level) - Hand skills (Medium-level) - Craft skills (High-level) - Technical skills (High-level)
Effort	- Mental - Physical
PLS phase	- Design - Use - Post-use
Flexibility	- Once - More than once
Benefits of personalization	**Product-related benefits:** - Product's fit to person - Hedonic benefits - Perceived uniqueness - Self-expressiveness
	Process-related benefits: - Hedonic benefits - Creative fulfillment - Emotional connection with the product

The exploratory studies reveal that, *product personalization process* begins with people's *personalization goals,* which are people's needs to be met through personalization. These goals can be *functional and aesthetic-related goals* or *personal (value and meaning-related) goals,* and they can co-exist in the personalization process. In other words, a person may aim to achieve more than one goal through the personalization process. Based on these goals, people make *aesthetic and/or functional interventions* to products, using their *skills and knowledge*, using the *methods of personalization* that are the extensions of these skills and knowledge, and they spend *mental and physical effort* during this process. The product or the product parts to be personalized can be in the *design, use, or post-use phase*. If the personalization method allows, the product can be personalized more than once (*flexibility*) in the use phase, and the personalization process can be repeated, which is one of the design considerations important for sustainability. In addition, at the end of this process, people can obtain certain *benefits* resulting from the *personalized product* and the *personalization process*, if the product can be personalized as intended.

Based on the results of the preliminary study phase 1 (Chapter 4) and phase 2 (Chapter 5), I could also develop an inital framework for the relationships between the dimensions of personalization. Then, the results of the generative studies I carried out in Chapters 6, 7, and 8 enabled me to refine and verify the relationships between these dimensions during the personalization process. Figure 9.1 displays the dimensions of personalization, and their relationships with each other during the personalization process, which were developed through the whole research process. Further studies with more product examples would explore and expand these relationships and their potential implications for design and sustainability.

As discussed above, product personalization process begins with people's goals of personalization. These goals can determine the method of personalization. For instance, it was found in the online questionnaire that (Chapter 5-Section 5.4.3.1), people who wanted to improve the aesthetic qualities of their products used the methods of integrating a part with the product or surface treatment, whereas people who wanted to meet a need with an available product for functional reasons seemed to repurpose their products. In addition, some of the goals were found to be resulting in certain type of interventions. For instance, the online questionnaire revealed that (Chapter 5-Section 5.4.3.4), people who personalize their products for self-expression, mostly made aesthetic interventions on their products, which are visible to others. Moreover, people's skills can affect the nature of intervention they make, the methods of personalization they use, and the effort they spend in the personalization process. It was found in the preliminary study phase 1 (Chapter 4-Section 4.4.3.1) and phase 2 (Chapter 5-Section 5.4.3.2) that, surface treatment methods require mostly medium and high-level skills, whereas repurposing is mostly performed by the use of no specific skill or low-level skills. For the skill-intervention relationship, the preliminary study phase 1 (Chapter 4-Section 4.4.3.2) and phase 2 (Chapter 5-Section 5.4.3.4) revealed that, the use of craft skills mainly performed to make aesthetic interventions. This insight was considered while generating the toolkits for Persona 2 in Chapter 8. In the study, it was also found that (Chapter 4-Section 4.4.3.4, Chapter 5-Section 5.4.3.3), as the skill level required in the personalization process gets higher, (e.g. products personalized through craft and technical skills), the level of physical effort increases. This insight was supported by the generative study conducted in Chapter 8. The participants who used the embroidery skills invested considerable mental and physical effort to personalize the toolkits. The study also reveals that, the method of personalization can affect the flexibility of personalization. This is an insight emerged from the generative studies I conducted (Chapters 6 and 8). The parts glued on the toolkits (Chapter 6-Section 6.7.2) and the spray painting applied on a toolkit (Chapter 8- Section 8.5) reduced their flexibility of personalization.

For the method of personalization and the effort relationship, the online questionnaire revealed that (Chapter 5-Section 5.4.3.3), some methods of personalization such as repurposing or reusing a product with a minimal intervention requires very low physical effort. The product category can also determine the method of personalization. For instance, packaging products are mostly repurposed or reused, and the clothing category was mostly personalized through the method of changing the form of a product (Chapter 5-Section 5.4.3.1).
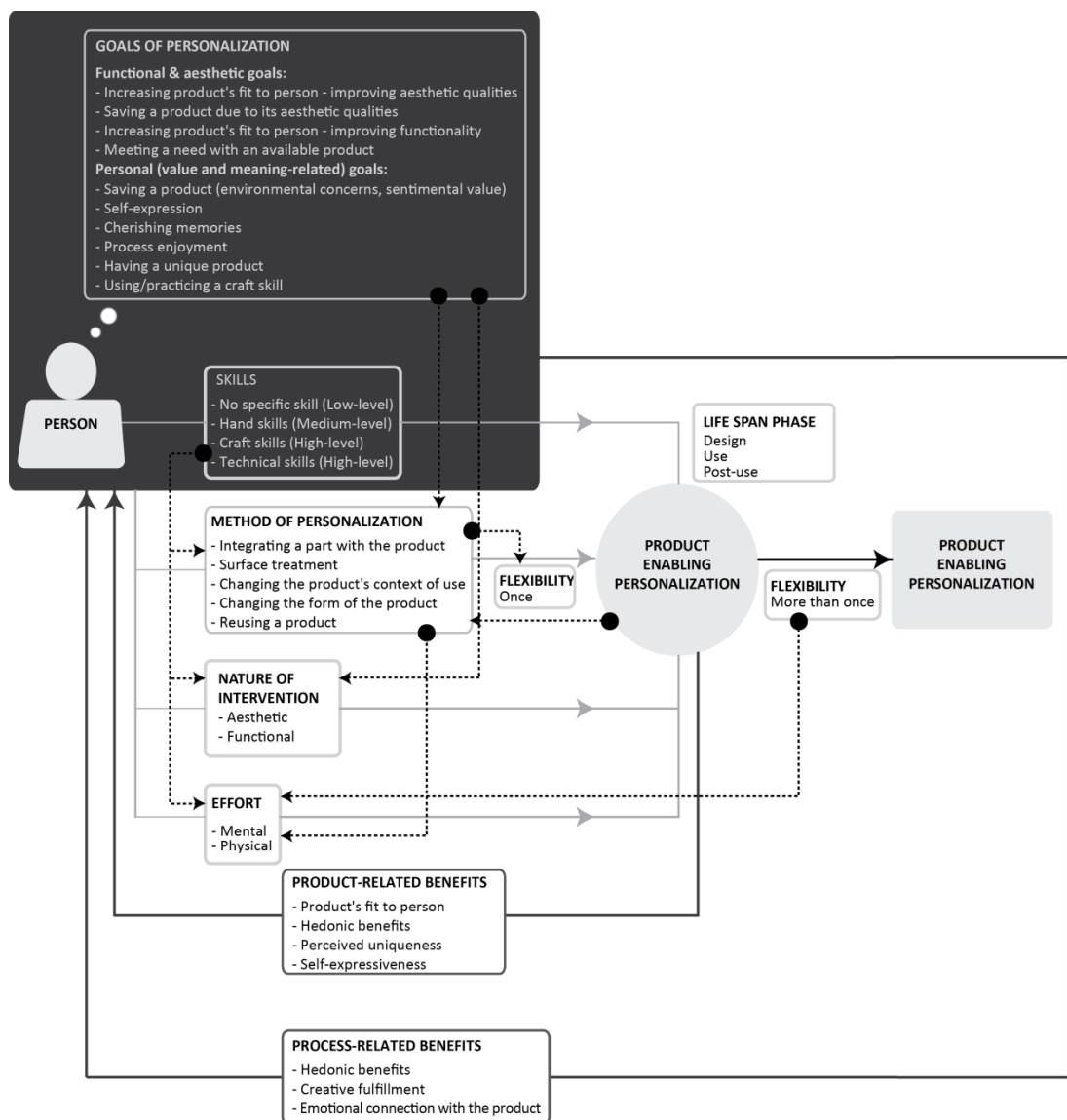
Figure 9.1. Personalization process and its dimensions.

Finally, the generative sessions conducted in the generative research phase 2 and 3 (Chapters 7 and 8) revealed that, the flexibility of personalization provided by the generative toolkits caused the participants to continue spending mental effort after finishing their personalization process.

9.2. Research Question 3: Facilitating Product Personalization Through Design with a Focus on Sustainability

Since product personalization was discussed to address sustainability in this study, understanding the relationships between the dimensions of personalization and the sustainability considerations is important. The sustainability considerations developed through the literature review are discussed in Chapter 2, Section 2.4. In Table 9.3, the dimensions of personalization are presented in relation to these sustainability considerations and discussed in the following section.

Table 9.3. The relationships between the personalization dimensions and sustainability considerations.

Dimensions of Personalization	Sustainability Considerations
Goal of personalization	Strengthening person-product relationship, adaptability to local and regional needs and tastes
Method of personalization	Strengthening person-product relationship Integrating different scales of design and production Use of local production techniques Use of locally available materials (natural, manufactured materials, re-used materials, etc.)
Nature of intervention	Adaptability to local and regional needs and tastes, strengthening person-product relationship
Skills	Enabling people to use their skills and knowledge in design, production, maintenance and repair, use of local skills, strengthening person-product relationship
Effort	Strengthening person-product relationship
PLS phase	Evolving, upgradable and adaptable products for changing needs, strengthening person-product relationship, effective use of resources
Flexibility	Evolving, upgradable and adaptable products for changing needs, strengthening person-product relationship
Benefits of personalization	Strengthening person-product relationship

Goal of personalization

Designing for people's personalization goals is important for sustainability, since products that can better meet the people's needs can be developed in this way, which may result in a stronger person-product relationship and thus, a longer product lifetime.

Some of the personal personalization goals found in the exploratory studies such as *process enjoyment*, *evoking memories* and *self-expression* are also addressed as the possible determinants of product attachment in the literature (Schifferstein & Zwartkruis-Pelgrim, 2008; Mugge et al. 2005). Another personal goal of personalization emerged from the study is *practicing a craft skill*. Designing for enabling the use of people's craft skills, which may vary depending on the geography, can result in products adaptable to various localities, and that respond to local needs and tastes, which is an important sustainability consideration addressed in the literature (Doğan & Walker, 2008).

Method of personalization

In the literature review, various practices and approaches providing various methods of personalization were revealed and discussed based on the personalization dimensions important for sustainability. From the sustainability viewpoint, people's active involvement in the design process is important, since when they are mentally and physically involved in this process, a stronger bond between the person and the product can be achieved (Mugge et al., 2009a). For this reason, I provided methods of personalization which make people active in the designing and making process of the generative toolkits. In addition, the production scales of the parts used in the method of personalization, and where these parts are produced are important considerations in terms of the environmental dimension of sustainability. To this end, personalization methods involving the use of locally available materials and parts (materials and parts that can be locally found, post-use materials, etc.), local production techniques, integration of local production techniques (batch production, one-off production of crafted parts) with mass production and skills can better meet the sustainability criteria.

Considering these in the study, I developed toolkits that can be locally produced, that can be personalized through the use of local skills and locally available parts, and integrated mass produced electrical parts with locally available or locally produced (craft parts in Chapter 8) parts.

Nature of intervention

Nature of intervention can be aesthetic and/or functional in the practices enabling product personalization and it is related with what a person wants to achieve through personalization, which is the goal of personalization. For the interventions that a person can make on the product, it is important that, the level of intervention a product can provide is high. As the level of design intervention increases, people can adapt the products based on their needs, changing tastes and preferences, which is important for prolonged product life spans.

Skills

The use of local skills in product personalization is important for sustainability, since the integration of these skills can contribute to both economic and social dimensions of sustainability as explained in the literature review. In addition, the use of personal skills and the uniqueness of the outcome may positively contribute the person-product relationship, while creating a feeling of accomplishment.

Effort

As discussed in the literature review, mental and physical effort invested in the personalization process can affect the bond between the person and the product. Mugge et al. (2009a) also indicate that the mental effort spent in the personalization process is more effective in strengthening person-product relationship due to the person's creative involvement in the process can result in more unique and self-expressive outcomes. These outcomes are defined in this study as benefits of personalization. However, when the effort required is more than necessary, these benefits may not arise. To this end, defining the required effort based on people's skill levels is an important design consideration for personalization.

Product Life Span Phase

From the sustainability viewpoint, personalization of the products in design phase and transformation of products in the use and or post-use phase, reusing product components, upgradability of product parts, etc. are important considerations in terms of longer product life spans and effective use of resources. When a product can be personalized in different phases of its life span (i.e. design, use and/or post-use phase), it can better meet the changing needs and tastes of its owner, which can result in a stronger person-product relationship. In addition, design approaches integrating the personalization of post-use product parts and materials can enable the effective use of resources. In this study, I aimed to develop generative toolkits that can be personalized both in design and use phases. In addition, in the generative research phase 1, I explored the personalization of a product in the post-use phase (cardboard shoe box) and in the generative research phase 2, I explored the personalization of a product through the use of post-use materials.

Flexibility

Flexibility dimension is related to the dimension of PLS phase, as it implies how many times a product can be personalized. As a product can be personalized more than once, it can be adapted to the changing needs and tastes of its owner, which can positively affect the person-product relationship and increase the product lifetime.

Benefits of personalization

When a product is personalized as intended by its owner, based on the defined personalization goal, certain benefits can arise. These are listed as product and process-related benefits of personalization in Table 53. The occurrence of these benefits depends on the degree of the fit between the person and the personalized product, and this can be determined by the fit between the goals and skills of the person and the effort and the nature of intervention required and the method of personalization provided by the product. As discussed in the goal of personalization section, some of these benefits (i.e. self-expression, creative fulfillment), are addressed as the determinants of product attachment in the literature (Schifferstein & Zwartkruis-

Pelgrim, 2008; Mugge et al. 2005). Thus, when product personalization process results in these benefits, the person-product relationship can be stronger.

In the study various design considerations for product personalization are revealed based on the results of the generative sessions. These design considerations emerged from the inductive analysis of the participants' personalization process and they were grouped based on the dimensions of personalization discussed in the previous section. Some of the design considerations were specific to the lighting product category. These were highlighted with grey. Table 9.4 displays the design considerations for personalization emerged from each generative study.

Table 9.4. Sustainable design considerations for personalization.

	Design Considerations	GS1	GS2	GS3	GS4
Goals of Personalization	Addressing people' personal goals of personalization			x	x
Method of Personalization	Defining methods providing flexibility of personalization			x	x
	Defining the method of personalization considering goals, skills, and effort required	x		x	
	Familiarity of the method of personalization to the target people				x
	Consistency in the methods of personalization of different parts			x	
	Providing guidance on the methods of personalization	x	x		
	Providing quick feedback for checking the personalized part's lighting effect				x
Nature of intervention	Defining the nature of intervention based on people's skills and goals of personalization		x		
Skills	Providing variety in the design details to enable the use of various skills				x
Effort	Providing flexibility of personalization for extended mental effort			x	x
	Defining the required effort based on people's skill and motivation levels	x		x	
	Providing templates (for cutting materials, drawing patterns, etc.)	x			x
	Guides for the correct placement of the materials			x	x
	Size of the toolkit for ease of building				x
	The use of practical connection details to improve the ease of building			x	x
	Affordances and constraints provided for ease of building				x
	Defining the parts to be personalized clearly for the understandability of the design details	x			
	Separating the electrical parts and the parts to be personalized for ease of personalization	x			
Flexibility and PLS phase	Providing guidance on the methods of personalization				x
	Adaptability to different types of materials			x	x
	Adaptability to different material forms			x	
	Adaptability to different contexts of use through structural variety for various lighting needs		x		x
	Ease of changing the materials in the use phase	x	x	x	
	Design details not requiring the use of adhesives in the personalization process	x	x		
	Ease of adjustment of the lighting amount for changing lighting needs.			x	
Benefits of Personalization	Visibility of the personalized parts to others			x	x

Design considerations related to the goals of personalization

Understanding people's goals of personalization is the first step in designing for personalization, since these goals reflect people's needs for personalization. When the product to be personalized cannot meet these needs, the person-product relationship cannot be strong. In the study, conducting semi-structured interviews and an online questionnaire, I explored people's goals of personalization. Although I defined the goals of personalization for the first and the second generative toolkit based on the goals of personalization emerged in the online questionnaire, the goals of personalization were not considered in relation to the participants' needs for personalization in these studies. After realizing this, I developed design scenarios and personas considering the findings of the online questionnaire, and I developed the third and fourth toolkit considering the participants' potential needs for personalization. Based on the results of the second online questionnaire (Chapter 7), I defined the goal of personalization for the third generative toolkit as meeting a need with an available product and increasing a product's fit to person (through improving aesthetic and functional qualities). Thus, in the generative research phase 2, I developed a toolkit that could be personalized through the use of post-use materials. However, at the end of the generative sessions, the participants' needs for self-expression and the use of personally meaningful parts emerged, which were not revealed in the online questionnaire. This study revealed that, the use of post-use materials for personalizing an object may not result in a strong person-product relationship, and the use of self-expressive and personally meaningful parts emerged as prominent design considerations in this study for the Persona 1, which involves the university students sharing a home with their friends. In the development of the last generative toolkit, the goal of personalization was defined as practicing a craft skill based on the second scenario, and I provided the participants with a tookit that could be personalized through the use of the craft skills they had. The participants' responses regarding the benefits of personalization implied that, they could reflect their skills through the personalized toolkits, and they mentioned the bond between themselves and the personalized toolkit as a process-related benefit (Chapter 8-Section 8.4.3).

The results of the generative research phase 2 and 3 imply that, *enabling people to achieve the personal goals of personalization* can be more effective in strenghtening person-product relationship than addressing function and aesthetic-related goals of personalization. Similarly, in these studies, some of the participants indicated that, they would prefer the toolkits to be bigger, to increase the visibility of their contributions to the toolkits and visibility of the personalized toolkits to others. This can also be explained through the participants' needs for self-expression, which is a personal goal.

Considering these findings, designers can explore and focus on *people's personal goals of personalization* when designing for personalization for a stronger person-product relationship. The relationship of goal of personalization dimension with the other dimensions discussed in Section 9.1 can also help designers to develop design strategies for personalization.

Design considerations related to methods of personalization
Firstly, when defining the *methods of personalization*, *flexibility of personalization* needs to be considered to enable people to personalize the product more than once in the use phase. This was achieved in the generative research phase 2 and 3 through providing design details that allow the temporary attachment of materials on the toolkits. In this way, the products become adaptable to people's changing needs, which can result in prolonged lifetimes and stronger person-product relationship. In addition, when defining the method of personalization, people's goals, their skill levels and the effort required by the method need to be considered. This design consideration emerged from the first three generative sessions. In the first design workshop and in the follow-up study, the fit between the people's skills and effort and the generative toolkits were low. In addition, the goals of personalization were vaguely defined. Moreover, in the third generative study, the participants had difficulty in personalizing one of the shadings, since it required too much physical effort for them.

The fit between the method of personalization and the participants' goals, skills, and effort were better achieved in the last generative study conducted with the participants who had craft skills. Thus, designers need to consider the relationships between these personalization dimensions, when defining the method of personalization through exploring their target group's skill levels, the potential level of effort they could spend and their goals of personalization.

Familiarity of the method of personalization to a person provides ease of personalization. In this way, the person do not invest too much mental and physical effort to understand how to personalize the product. In addition, this *familiarity can facilitate the person's creative involvement* in the personalization process through providing a feeling of control over the personalization task. Thus, more unique and self-expressive outcomes can be created, which can result in a stronger person-product relationship. This design consideration emerged from the final generative study, during which I used a detail derived from the embroidery frame that the participants use in their craft process. None of the participants had difficulty in using this detail and they could transfer their skills on the products.

In the generative research phase 2, I provided the participants with two types of shadings, which could be personalized through two types of materials (i.e. sheet materials and threads). Some of the participants indicated that, while it was easy to personalize Shading A when it was unfolded, it was easy to personalize the Shading B when folded. This problem complicates the personalization process, and requires the investment of mental and physical effort more than necessary, which may negatively affect the person-product relationship.

As people are more actively involved in the personalization process defined in this study, *guidance on the potential methods of personalization* that can be applied to the products is needed. This can be achieved through providing instructions on the personalization methods and self-explanatory design details.

In the first design workshop, I provided information on the method of personalization verbally and in the second one I provided these in written form. However, the participants tried to personalize the toolkits in their own way, since I did not give any instructions on what they should not do. Similarly, in the final generative study, one participant spray painted the toolkit, which reduced its flexibility of personalization, since she could not separate the parts again. Such unexpected applications can reduce the potential of the product for adaptability to changing needs and thus, a strong person-product relationship.

One of the *design considerations* for the personalization method, which is directly related to the *lighting product category* is, *providing quick feedback for checking the personalized part's lighting effect*. Since the personalized toolkits in the study were lighting design explorations, it was important to see the personalized parts' lighting effect during the personalization process. When the attachment of the shading part on the structure where the light bulb is placed is easy, it provides feedback on how the part being personalized will look like when it is finished. This can reduce the possibility of person's disappointment at the end of the process and increase the possibility of a better fit between the person and the product, which can result in a stronger person-product relationship.

Design considerations related to nature of intervention

As discussed previously, the nature of intervention can be aesthetic and/or functional, and when designing for personalization, the personalization goals of people need to be considered. The goal and the nature of intervention relationship emerged in the exploratory studies as mentioned in Section 9.1. This criterion also emerged as a design consideration in the follow-up study in the generative research phase 1. The participant who had technical and repair skills made functional interventions, although this was not enabled through the toolkit. *Considering people's personalization goals when defining nature of intervention* can result in better adaptation of products to personal needs, which can also increase the possibility of a strong person-product relationship.

Design considerations related to skills

As discussed earlier, *enabling the use of local skills* is important in terms of the social and economic dimensions of sustainability. In this study, this consideration was explored in the final generative study, during which the participants personalized the toolkits using embroidery skills. In this generative study, some of the participants mentioned additional craft skills that could be adapted to the toolkit such as fabric painting, lacing, macrome, etc., which can be enabled without additional changes or small changes in the toolkit. Since providing variety can increase the potential of enabling product personalization for people with various skill levels, variety in the parts to be personalized can be provided, if possible.

Design considerations related to effort

The investment of mental and physical effort, especially *mental effort*, in the personalization process strengthens the person-product relationship. One of the insights I gained through the last two generative sessions is that, if *flexibility of personalization* is provided through the product, *people continue to invest mental effort on the product after completing the personalization process*, thinking the other ways of personalization or other possible materials that could be integrated. Thus, flexibility of personalization can result in an extended mental effort on the product and keeps the people's interest in the product alive, which can strengthen the person-product relationship.

As discussed earlier, when *too much effort* is required to personalize a product, this may *negatively affect the person-product relationship*, and thus product lifetime, since the person can stop personalizing the product due to the difficulty of personalization. For instance, in the generative research phase 2, the participants, who were university students, found the Shading B difficult to personalize, since it required too much time and physical effort. To this end, it is important to define the required effort based on people's skills and motivation levels.

Some of the design considerations regarding effort are related to *ease of personalization* and *ease of building the structure*. For ease of personalization, people may need *templates for cutting materials, drawing patterns, etc*., as they are more actively involved in the personalization process. This necessity emerged from the first and the final generative sessions. In the design workshop, people had difficulty in cutting materials in certain dimensions. In the last generative study, although the participants had high-level skills, some of them cut the materials bigger than necessary, which made the building of the toolkit difficult. In addition, *guides* can be provided *for the correct placement of the materials for ease of personalization*. In the generative research phase 2, one of the participants had difficulty in determining the shading side on which the material would be attached, and in the final generative study, one of the participants suggested the use of guides for the proper placement of the fabrics on the frames. In addition, in the first design workshop, I provided the toolkit as a structure involving both the design details and the light bulb. The participants had difficulty in creating a shading in front of the light bulb, and could not understand the personalization task. To this end, *defining the parts to be personalized clearly* can increase the *understandability of the design details and the personalization task*. The participants of the first design workshop also had difficulty in personalizing the toolkits, since the light bulb was on the toolkit as they were personalizing it. For this reason, I separated the light bulb and the toolkit body in the subsequent phases, which improved the ease of personalization, and thus reduced the physical effort required. This is another design consideration specific to lighting product category.

Design considerations regarding the *ease of building* the toolkits emerged as providing a toolkit in *proper size for ease of building*, *the use of practical connection details*, and *providing affordances and constraints*. In the final generative study, one participants stated that, if the toolkit was bigger, it would be easier to build it.

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The use of practical connection details emerged as a design consideration in the generative research phase 2, during which most of the participants found the toolkit difficult to build using the screw details. To this end, I developed a toolkit which did not require the use of screws or other connection parts, and in the last generative session, the participants found the toolkit easy to build. Lastly, it was revealed through the interviews and the think-aloud study in the final generative study that, the connection details in the form of slots and the variations in the sizes of the parts helped the participants to easily build the toolkit structure. Thus, building the toolkit can be facilitated through affordances and constraints.

Design considerations related to flexibility and PLS phase

Flexibility of personalization and the personalization of a product in various phases of product life span phase is important sustainability considerations in terms of creating evolving, upgradable and adaptable products for changing needs, strengthening person-product relationship, and effective use of resources.

In the study, *providing guidance on the methods of personalization* emerged as a *design consideration for flexibility* in the last generative study. One of the participants spray painted the toolkit in that study, and this reduced the toolkit's flexibility of personalization, since the parts could not be separated again. To this end, designers need to provide guidance on the potential methods of personalization (e.g. surface treatment methods that can be used) to ensure the product's flexibility of personalization.

The two design considerations that could not be met in this thesis are the *adaptability of the design details for different types of material thicknesses and forms*. The participants have stated this issue as a problem in the generative research phase 2 and 3. In the generative research phase 2, the participants indicated that the design details enabled the use of materials only in specific thicknesses.

In the last study, one of the participants wanted to use a fabric other than the one I provided, and she needed to attach extra material on the frame to fix the fabric. Similarly, one of the participants of the generative research phase 2 stated that, he wanted to attach match tickets as the materials that reflected himself, but he needed to cut it to attach it to the triangular apertures.

To this end, it would be better to provide design details enabling the use of different material thicknesses and forms to increase the *adaptability of the products to people's changing needs in the use phase*, and also *enabling the use of various materials* to increase the possibility of *self-expression* through the personalization process.

Providing *design details that do not require the use of adhesives* in the personalization process is another consideration for the personalization of products for more than once, which emerged from the first and the second generative studies in the generative research phase 1. In these studies, the participants glued materials on the toolkits, since it was easier to do so. Thus, people can choose the easiest way for personalizing a product when self-explanatory design details and/or instructions are not provided or if the product to be personalized does not match with people's goals, skills and motivation.

For half-way design solutions, flexibility of personalization requires *ease of changing the materials in the use phase*. Since the participants of the first and the second generative studies glued materials on the toolkits, its flexibility of personalization was reduced. In the generative research phase 2, the participants indicated that, they had difficulty in changing the materials they attached, since they needed to remove the screws to do this. Considering these problems, I improved the design details for ease of changing the materials in the use phase, and the participants could easily change the materials in the personalization process, which was also observed in the think-aloud study.

In the study, two more design considerations regarding flexibility emerged, which are directly related with the lighting product category. These are the *adaptability of the product to different contexts of use through structural variety for various lighting needs* and *ease of adjustment of the lighting amount for changing lighting needs*. In the follow-up study in the generative research phase 1, one of the participants attached a leg to the cardboard toolkit to increase the height of the light bulb to fit it to his lighting needs.

However, the toolkit did not enable structural interventions. This implies that, structural variety can be provided for people's various lighting needs. In addition, in the last generative study, the participants wanted to use the personalized toolkits in different places, such as on the floor in the living room, as a bedside lamp, etc., each requiring different lighting amounts. However, the size of the tookit was suitable for its use as a bedside lamp. To this end, *structural variety* can be provided through the application of similar details that enable the people to adapt the toolkit to different contexts of use and different lighting needs. Lastly, in the generative research phase 2, the participants preferred Shading A over Shading B, since it was easier to adjust the lighting amount with it for various lighting needs. In this case, design details of Shading A allowed the *easy attachment and detachment of materials* and provided the *adaptability of the shading for various lighting needs* in the use phase.

Design considerations related to benefits of personalization

One design consideration emerged from the study regarding the benefits of personalization, which is the *visibility of the personalized parts to others*. In the generative research phase 2, one participant stated that, he would prefer a bigger shading, since he wanted to see his contribution to the product more. Similarly, in the last generative study, most of the participants preferred a bigger toolkit, and some of them indicated that, they would place the personalized toolkit in the most visible space of their homes, to make it visible to others. These responses are related to the benefits of personalization such as *self-expression* and *creative fulfillment*.

As the participants feel proud of the personalized toolkit, they feel creative fulfillment and they want to show their creativity to others. The visibility of the personalized parts to others can be more easily achieved through aesthetic interventions, and the size of the product can affect the visibility of the parts, as suggested by the participants. Considering the visibility of the personalized parts, designers can increase the possibility of emergence of personalization benefits discussed above.

The responses of the participants in the preliminary study phase 1 and the final generative study indicate that, product personalization results in an emotional bonding between the person and the product, if the *product is personalized as intended by the person*.

In the last generative study, one of the participants indicated that, the product she personalized had a memory and she would not replace it. In this case, the personalization process was conceived as a *valuable memory* and this creates a bond between the person and the product. As discussed previously, the emotional bonding between the person and the product depends on the *fit between the person's goals and skills*, and the other dimensionsal characteristics of the product to be personalized such as the method of personalization, nature of intervention and flexibility it offers. When a balance between these cannot be provided, this emotional bonding can be weak. It is also important to note that, besides lighting, the product personalization approach discussed in this study can be more applicable to product categories that are vulnerable to changes in fashion, such as personal accessories and clothing, and products such as furniture and accessories used in office and home environment, which are the spaces that people personalize more often.

9.3. Research Question 4: Incorporating Product Personalization into Design Research

In this thesis, I adopted the *research through design* (RTD) methodology (Frayling, 1993) to explore the ways of empowering people in the design process through product personalization and implications of this for sustainability. The reason why I adopted this methodology is that, most of the mass produced products are not designed for personalization and with a focus on sustainability. Thus, first of all, I needed to develop design explorations that enable personalization to explore their implications for sustainability. In addition, as discussed in Chapter 3, Section 3.2, RTD approach is suitable for exploring the preferred states and the potential futures.

In the use of RTD methodology in the literature, designer/researchers develop a theoretical background through literature review and exploratory studies, then generating design considerations through these studies, conceptual designs are developed. Through reflecting on the design process and the design outcome, they refine theory, and repeat this process. One of the main contributions of this thesis is *the integration of the generative research into the RTD process*. Since one of the purposes of the thesis was to understand the implications of product personalization for sustainability, it was necessary to explore people's interactions with the design explorations enabling personalization to understand their needs for personalization in-depth. In addition, the product personalization process defined in this study requires two partners, which are the designer and the person who will personalize the design exploration, by its nature. The generative studies were used in the study both to generate new theory through the personalization of the toolkits by people, and to evaluate and improve the design details I developed. This process is summarized in Figure 9.2.
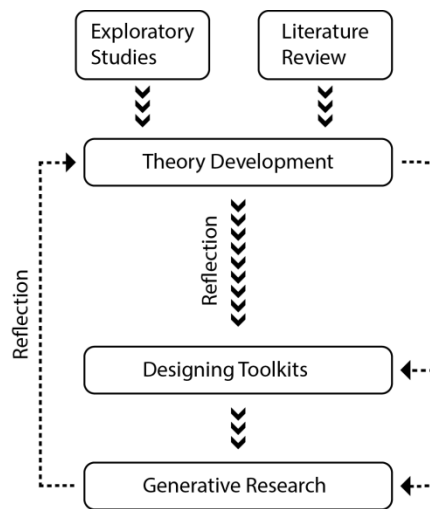
Figure 9.2. RTD process adopted in the thesis.

Reflection is a crucial aspect of RTD process. While developing the toolkits and conducting the exploratory and generative studies, I documented my *reflections in action* (Schön, 1983) using a notebook and a sketchbook verbally and visually. In addition, after the exploratory and generative studies, I reflected on the theoretical insights on design for personalization and the research process, through taking notes, which enabled me to plan the subsequent phase and develop the subsequent generative toolkit. Content analysis of these notes helped me to understand the key issues that I needed to focus on for improving the research further.

In the thesis, the RTD process started with the literature review and the exploratory studies for theory development. The exploratory studies include the semi-structured interviews conducted in the preliminary study phase 1 (Chapter 4) and the online questionnaire (Chapter 5) conducted in the preliminary study phase 2, which aimed to explore people's personalization experiences with the mass-produced products. Based on these studies, I developed design criteria to develop the first generative toolkit. These criteria include the sustainability considerations and the dimensions of personalization important for sustainability revealed through the literature review, and the insights I gained through the two exploratory studies.

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Developing the first generative toolkit based on these criteria, I conducted the first generative study, which is the two-hour design workshop conducted in the maker fair with ten participants. These participants constituted a mixed group in terms of the skills they had. To collect data, I used the generative toolkits, which were half-way design explorations and printed questionnaires. Through reflecting on the results of this generative study, I developed additional design criteria for the development of the second generative toolkit. In addition, reflecting on the research methodology of the design workshop, I improved the design of the follow-up generative study, in terms of recruiting participants that have specific skills (theoretical sampling), increasing the duration, providing explanatory materials for the personalization process and the toolkit, and improving the data collection tools.

Then I developed the second generative toolkit and conducted a one-week follow-up study with two people who have repair and artistic skills. This time, the participants personalized the toolkits at their homes individually. Besides the generative toolkit, I provided the participants with an explanatory sheet describing the toolkit and the research process, and a printed table to document their personalization process. In addition, I asked the participants to send the photographs of their personalization process to me. During and at the end of the study, I visited the participants' homes, and conducted semi-structured interviews to explore their personalization process in-depth.

The follow-up study revealed additional design considerations important for personalization and sustainability, and for the design of the generative studies (i.e. the use of theoretical sampling, changing the usage purpose of the design workshop and personalization of the toolkits at the home environment, improving the design of the diaries).

At the end of this study, I realized the gap between the design features of the generative toolkits (e.g. materials, methods of personalization) and the participants' personalization needs and their skills, and the need of designing the toolkits based on people's personalization goals. Thus, I developed five design scenarios and personas (Chapter 7-Section 7.1) based on the people's personalization goals revealed in the online questionnaire (Chapter 5). Through analyzing these scenarios based on the sustainability considerations, I reduced the number of the scenarios to two. The two personas and scenarios developed in the study are as follows:

- *Affordability scenario*: A low-cost lighting design exploration for young people, who are newly graduated or undergraduate level university students, which can be personalized through the use of the post-use materials.
- *Practicing a craft skill scenario*: A lighting design exploration which can be personalized through the use of craft skills for people who attend a specific craft course, who are interested in Do It Yourself, who follow DIY websites, blogs, etc. to develop their skills.

In the next phase, I focused on developing a generative toolkit for the first design scenario and persona. Before the development of the toolkit, I conducted another online questionnaire (Chapter 7-Section 7.2), which was an exploratory study investigating the post-use personalization practices of Persona 1. The analysis of the personalized products emerged from this questionnaire based on the dimensions of personalization, enabled me to understand the sub-dimensions of personalization (e.g. integrating a part with the product as the method of personalization, the use of low-level skills, etc.) that I could focus on when developing the toolkit for this persona. Then, I developed the third generative toolkit based on the design criteria emerged from the previous generative studies, the second online questionnaire, and the criteria required by the first scenario.

After the development of the third generative toolkit, I carried out a three-hour design workshop to introduce the toolkit, and the research and personalization process to the participants, who were the university students appropriate for the affordability scenario. The workshop was video recorded, and at the end of the workshop I provided the participants with printed questionnaires to get their evaluations about the workshop process. In addition, to clarify the issues explored in the questionnaires, I conducted a focus-group session at the end of the workshop. Then the participants personalized the toolkits at their homes for a week. I collected data through diaires, and the participants sent the photographs of their personalization process to me. At the end of the study, I conducted semi-structured interviews with the participants to explore their personalization process in depth. The results of this study revealed more design considerations for personalization and sustainability, and for the research methodology (i.e. improvement of the diary design, the integration of the think-aloud protocol with the research process). Based on the insights I gained through this study, I developed the last generative toolkit for the second design scenario and persona, and planned the last generative session.

In the development of the fourth generative toolkit, I considered the design criteria emerged from the previous generative study regarding design for personalization and sustainability, requirements of the second design scenario (i.e. the use of craft skills in the personalization process), and the design considerations developed through the analysis of the personalization practices of the second persona based on the dimensions of personalization. In addition, I extended the duration of the generative study based on the insights I gained through the previous generative study. Developing the fourth toolkit, I conducted two-week individual generative sessions with six participants who had embroidery skills. The participants personalized the toolkits at their homes for two weeks. To collect data, I provided the participants with diaries, and asked them to send the photographs of their personalization process to me. At the end of the personalization process, I conducted follow-up interviews with the participants to explore their personalization process in-depth.

In this final generative session, I also carried out a think-aloud study to explore how the participants' used the design details enabling personalization, how they could change the materials in the use phase, and to validate the responses the participants provided in the interviews and the diaries. As discussed above, during the study, the design of the generative sessions also evolved besides the theory and the design explorations. Each cycle in the study (involving theory development, designing and the generative studies) informed the subsequent phase in terms of the development of design considerations for personalization, the toolkits and the design of the generative sessions. Table 9.5 presents a comparison of the four generative studies based on the methodological components.

Table 9.5. Comparison of the methodological components of the generative studies.

	Generative Research Phase 1		Generative Research Phase 2		Generative Research Phase 3
	GS1: Design workshop	**GS2: The follow-up study**	**GS3: Generative research for affordability scenario**		**GS4: Generative research for practicing a craft skill scenario**
Context	Group (design workshop)	Individual	Group (design workshop)	Individual	Individual
Duration	Two hours	One week	Three hours	One week	Two weeks
Sampling	Availability	Theoretical	Theoretical		Theoretical
Number of participants	Ten	Two	Six		Six
Skills of participants	Mixed skill levels	Repair and artistic skills	Design skills, hand skills		Craft skills
Data collection	- Generative tool (half-way design) - Printed questionnaire	- Generative tool (half-way design) - Diaries - Photo documenta-tion by participants - Semi-structured interviews	- Generative tool (half-way design) - Printed questionnaire - Focus-group session	- Generative tool (half-way design) - Diaries - Photo documentation by participants - Semi-structured interviews	- Generative tool (half-way design) - Diaries - Photo documentation by participants - Semi-structured interviews - Think-aloud protocol
Additional materials provided	Fabric, thread, tools, electrical parts	Only electrical parts	Fabric, paper, thread, tools, electrical parts	Only electrical parts	Etamin fabric, electrical parts

The details of methodology for each generative session were explained in Chapter 6-Section 6.2 and 6.6, Chapter 7-Section 7.4, and Chapter 8-Section 8.3. In the following sections, I reflected on the methodological components of the generative studies and revealed my insights for design research for product personalization.

Design workshops

Throughout the study, I conducted generative sessions in two different contexts, which are the design workshops conducted in a group setting, and the generative sessions conducted individually at home setting.

The purpose of the first design workshop was to explore the interactions of the participants with the generative toolkits which had one type of detail for personalization. While the use of the design workshops at the initial phases of my research enabled me to access a high number of people (ten participants) at the same time, and I could observe the people's interactions with the toolkits and obtain feedback from them in a short time, one of the limitations of workshops in terms of design research for personalization is that, the participants were influenced by each other while personalizing the toolkits. Thus, the outcomes did not reflect completely their personal needs and preferences. I also realized in this design workshop that, since the personalization process requires the investment of mental and physical effort, it would be better to provide more time for personalization to the participants. At the end of the personalization of the toolkits in a few hours, people may get exhausted and unwilling to explain their process and reflections in the design workshops. For this reason, I integrated individual generative sessions into my research process in the subsequent phases and extended the duration of the generative studies. The second design workshop (Chapter 7, Section 7.4) was arranged as an introduction of a longer individual generative study, and it aimed to introduce the research process and the toolkit to the participants, which would be personalized by them at their homes individually for one week after the workshop.

Another *limitation of design workshops* is related to the tools and materials provided for personalization. In the workshops, I needed to provide sample materials that could be attached on the toolkits and tools for cutting and attaching materials to enable the participants experiment on how to use the design details for personalization since the sessions took place in a classroom setting, and the toolkit was a half-way design. These materials may limit the creative involvement of the participants in the personalization process. For instance, at the end of the third generative study (generative research phase 2), which started with a design workshop and continued individually, I realized that, some of the participants had used the workshop materials, instead of using their own materials, and most of them had used materials similar to those I provided to them in the workshop.

Based on my insights on these two design workshops, I suggest that, *design researchers can use design workshops at the initial phases of the design research for personalization, to gain quick feedback on various design details enabling personalization or to introduce the toolkits and the research process basically, which will progress individually at the later stages without giving clues about the ways that the toolkits can be personalized.*

For *data collection*, in the first design workshop, I used the generative toolkits and provided printed questionnaires to enable the participants to define a context and purpose of use for the lighting design explorations to be personalized at the beginning, and reflect on their personalization process at the end of the session. In this workshop, I found that, the use of questionnaire on its own to collect data about the participants' personalization process and their opininons about the personalized toolkits was not sufficient, and these issues needed to be explored further. Thus, in the second design workshop, I conducted a quick focus-group session to clarify the participants' responses besides using the toolkits and printed questionnaires, and extended the study with individual sessions which were further explored through other data collection methods such as interviews and think-aloud protocols. Based on my experience, *the use of questionnaires can be supported with focus-group sessions to obtain quick*

feedback about the participants' interactions with the toolkits and the design of the workshops, which have limited duration, without exhausting the participants.

It is also important to note that, *the way of recruiting participants* for the design workshops may bring along some limitations for the research process. For instance, the first design workshop was arranged as part of a maker fair, the participants applied the workshop by using an application form, and thus, I did not have the opportunity to select the participants and conducted the study with a mixed group in terms of the skill levels. This issue enabled me to understand that, I needed to recruit the participants more selectively, since this created an ambiguity in terms of the design of the toolkit and the research design (tools, explanations required for the sample).

For this reason, my sampling strategy has been *theoretical sampling* (Glaser & Strauss, 1967) in the subsequent phases, and I selected the participants based on the skills they had, and for the last two generative sessions, based on the design scenarios and personas I developed. In the second design workshop, I wanted to recruit 12 participants representing the Persona 1. I announced the workshop through digital and printed posters in Yaşar University, and called for university students from any department (to form a heterogeneus group in terms of skill levels), who shared a home with their friends. However, six students studying in design disciplines (i.e. industrial and interior design) applied for the workshop. The number of the participants has been sufficient for gaining insights into their personalization process. However, the participants' skill levels were similar and higher compared to the students studying in departments other than the design departments. Thus, when recruiting participants for design workshops with the purpose of design research for product personalization, it would be better to *recruit the participants based on specific requirements, rather than recruiting participants who respond to the workshop announcement*.

Individual generative sessions

The personalization of the toolkits individually, in a personal environment is important to obtain outcomes wich are truly personal, since personalization process, as its name implies, needs to be a personal experience. In this study, I conducted three individual generative sessions (Chapter 6-Section 6.6, Chapter 7-Section 7.4, and Chapter 8-Section 8.3) during which the participants personalized the toolkits and documented their personalization process. The first two individual generative sessions lasted one-week, and the last one lasted two-weeks. The reason why I extended the duration for one more week in the last generative study was that, the participants personalized the toolkits using the craft skills they had, which required more mental and physical effort compared to the other generative studies. *While the personalization process in the design phase were fully explored in these studies, longer duration is needed to fully explore the use phase of these toolkits.*

In these phases, besides the ease of personalization of the toolkits, the *easy and proper documentation of the personalization process by the participants* are important to reveal their reflections in the process and their latent needs. In addition, since these sessions were conducted at the homes of the participants without the researcher's involvement, it is of great importance that, the participants fully document their personalization process. As indicated in Chapter 3, Section 3.3.2, the explanations of the participants, which may reveal their thoughts, aspirations and priorities create the real value of the generative research rather than the solutions generated. For documentation of the participants' personalization process in these three individual generative sessions, I provided diaries and asked the participants to send the photographs of their personalization process to me via an online app whenever they made an intervention. Based on my experiences in this study, I can conclude that, *if designed well, the diaries used in the individual generative sessions can be quite helpful to understand the participants' personalization experience, and to enable the participants to make reflection in action* (Schön, 1983). During the study, the design of these diaries also evolved.

In the follow-up study, I provided the participants with a table including particular aspects about the personalization process to fill out, which were not properly used by the participants. For this reason, I improved the design of the diaries in the second and third individual generative studies. These diaries included open-ended questions exploring their personalization process, sample pages to help the participants in filling out the diaries, and information about the toolkits and the personalization process. These two diaries were filled out by the participants as expected. In addition, photo documentation of the personalization process by the participants and collecting these via an online app enabled me to practically collect data and support and verify the responses on the diaries with the photographs provided by the participants.

Besides the documentation of the personalization process by the participants, I also conducted *semi-structured interviews* with the participants in specific phases of the individual generative sessions. In the follow-up study conducted in the generative research phase 1, I conducted semi-structured interviews during and after the participants' personalization process. Through visiting the participants at their homes, I explored their personalization experience documented through diaries and photographs in-depth. *Since the diaries can only provide short answers and requesting detailed answers through the diaries can be exhausting for the participants, conducting interviews and in-depth exploration of the process were necessary.* In the second and third generative sessions conducted in the generative research phase 2 and 3, these interviews were conducted at the end of the generative sessions, after obtaining the participants' diaries. Lastly, I carried out a *think-aloud study* in the last individual generative session to explore how the participants' used the design details enabling personalization, how they could change the materials in the use phase, and to *validate the responses the participants provided in the interviews and the diaries*. This think-aloud study helped me to observe how the participants interacted with the generative toolkits in the personalization process, in which I could not be involved.

Generative Toolkits

As discussed in the literature review, there are various ways of enabling personalization such as designing a finished product as a design template, designing a product with two life spans and leaving a space for people's intervention in the post-use phase of the product, developing a half-way design or enabling people to combine the old products with new product parts/products/surface treatments. As I focused on half-way design in this study, the toolkits needed to be completed by people. This affected the design of the generative sessions and the design features of the toolkits. For instance, if I provided the participants with one design template of a finished product as an open source design data, they might also need to produce the product and could adapt it individually at their homes, then this process could be explored. Thus, *the methodoloy used in this study was developed to enable product personalization through half-way design, and for other ways of enabling personalization, the research methodology can be different*.

The integration of generative research to RTD process to enable product personalization through *half-way design* (Fuad-Luke, 2009) brought forward the challenge and the necessity of the development of design explorations which both represent the theoretical ideas behind the design process and which can be usable for the participants and production of these explorations by the researcher. Thus, I developed design explorations with which people could interact and use. This issue was a necessary limitation for my design process, during which I had to take additional design considerations into account such as usability and safety. In addition, *the production of the toolkits was a highly demanding process, requiring lots of planning, working on details, material selection, affordability, etc*.

Roles of the researcher

Another affect of the integration of the generative research into the RTD process is that, I took on different roles throughout the research process. I was a *designer/researcher* while conducting the exploratory studies and designing the toolkits based on the theoretical knowledge, while in the generative research phases, I also took on the role of the *facilitator* of the personalization process of the participants. This necessitated providing the right tools for the participants' creative involvement in both the personalization process, and more importantly, in expressing themselves. To this end, various data collection tools were used specific to the research contexts such as developing separate data collection tools for the design workshops and the individual generative sessions. At the end of the research process, *I collected many layers of data through the use of various data collection techniques for triangulation and to increase the credibility of my research*.

Exploratory studies

Last but not least, the exploratory studies I conducted at the beginning of my study, which include the semi-structured interviews and the online questionnaires enabled me to understand the people's needs regarding personalization, their skills, and the methods they can use to personalize their products.

While, the semi-structured interviews provided an in-depth understanding on people's personalization process, the online questionnaires enabled me to see the variations between the products personalized by people. Although these questionnaires did not provide in-depth data about the peoples' personalization process, they have been very helpful for developing design scenarios and personas (Chapter 7, Section 7.1) for the last two phases the my study. As the study reveals, *when designing for personalization, different design strategies are needed to address people's various skill and motivation levels and their goals for personalization. For this reason, exploratory research needs to be included at the beginning of the design research for product personalization.*

The understanding of the dimensions of personalization and the interactions between them are important since, when designing for personalization, firstly designers can explore the product examples personalized by the target group, and through analyzing the product examples based on the personalization dimensions, they can determine the potential methods of personalization, the required skills, type of intervention and effort for personalization, life span phase of the product to be personalized that are suitable for that group of people. S*electing the sub-dimensions of each personalization dimension that best fit the target group, and considering the relationships between these dimensions*, they can develop design strategies for personalization that would better meet the personalization needs of people.

Grounded theory

The characteristics of *grounded theory* framework I adopted in this study are *theoretical sampling* (Glaser & Strauss, 1967), simultaneous progression of data collection and data analysis, open coding of the data, and cross-comparison of the cases involving generative research. Through the simultaneous progression of data collection and analysis, the data collection and analysis of each phase determined the planning of the next phase.

Theoretical sampling was used as a tool to identify the design considerations to be addressed in each study through comparing the results of a study with the previous one, and to select the participants based on the theoretical constructs developed through the exploratory studies. For instance, the design considerations for personalization generated at the end of each generative session were explored in the next phase, and by drawing on the comparisons among the results and the considerations set at the beginning, I determined the design considerations of the subsequent study. In addition, I selected the participants of the last three generative sessions through theoretical sampling, based on the theoretical constructs emerged from the previous studies (the exploratory studies) such as their skills and the design scenarios and personas. The cross-case comparison I carried out in Chapter 8, Section 8.7 enabled me to identify the prominent differences and similarities between the cases and the reasons behind them.

9.4. Positioning the Study and Further Studies

Product personalization is addressed in several studies as a design strategy for strengthening person-product relationship to create competitive advantage (Mugge et al., 2009a; Mugge et al., 2009b) and to prolong product lifetimes (Fuad-Luke, 2010; van Nes, 2010; Mugge et al., 2005). How product personalization results in product attachment was explored through the studies of Mugge et al. (2009a) and Mugge et al. (2005). The study of Mugge et al. (2009b) reveals the dimensions of personalization and the authors discuss specific personalization strategies for targeting specific consumers. However, sustainability is not the focus of this study.

One of the main contributions of this study to the literature on product personalization is that, *the dimensions of product personalization were extended through exploratory studies and reconsidering these dimensions within the context of sustainability through addressing localization with personalization, design considerations for personalization that are important for sustainability were generated.* In addition, specific relationships between these dimensions were defined to guide the design process for product personalization.

Product personalization through half-way design is also addressed in the literature as a way of extending product lifetimes in various studies (Power & Bernabei, 2017; Power & Bernabei, 2013; Niinimaki & Hassi, 2011; Fuad-Luke, 2009) and in some of the studies (Power & Bernabei, 2017; Power & Bernabei, 2013) mass-produced half-way lighting products are developed through RTD approach considering some of the personalization dimensions such as effort and enabling the use of various skills such as embroidery skills, weaving and basic hand skills. In these studies, the authors rename the half-way design approach as *user completion.* In addition, the authors conduct design workshops and user questionnaires to gain feedback on the personalized half-way products. The necessity of instructions on the personalization process and skill level-toolkit relationships are revealed through these workshops.

However, these two studies focus on how to develop half-way products and the implications of half-way design for sustainability were not explored in these studies. In addition, some of the dimensions of personalization important for sustainability such as flexibility of personalization, personalized part's life span phase and people's goals of personalization are not integrated systematically into the design process.

To this end, this study is *one of the first explorations in understanding the implications of half-way design for sustainability through the development of generative toolkits considering the personalization dimensions important for sustainability, and the personalization of these toolkits in generative studies, during which people's personalization experiences were explored in-depth through various methods such as design workshops, diaries, interviews and think-aloud protocols. The results of these generative studies revealed various design considerations for personalization that are important for sustainability*, and the development of these design considerations in relation to dimensions of personalization is another contribution of the study to the literature on product personalization

Although there are RTD studies with a focus on sustainability in the literature (Walker, 2011 and 2006; Marchand, 2008; Doğan, 2007), the interaction between the RTD outcomes in the form of design explorations and people are not explored in these studies. In this sense, *the study also contributes to the literature in terms of integration of generative research into the RTD methodology for sustainability, and it is one of the first studies on the incorporation of product personalization with design research systematically*. The opportunities and limitations of integrating generative research into RTD methodology for exploring product personalization can help design researchers in exploring the implications of product personalization for sustainability or exploring other research subjects.

In this thesis, the personalization process of the toolkits could be explored only in the design phase within the time limitations of the doctoral study. Further studies exploring the use phase of the personalized design explorations for a longer period can reveal additional design considerations for personalization and the implications of product personalization for sustainability. In addition, the personas and design scenarios were developed based on the product examples provided by the participants in the online questionnaires. Thus, further research on the people's personalization goals, and the methods and skills they use in the personalization process with other participants may reveal additional design scenarios, personas and sub-dimensions of personalization. In addition, one way of enabling product personalization, which is half-way design, and its implications were explored in this study. Further research studies can focus on understanding the implications of other product personalization strategies for sustainability. Finally, in the study, the implications of product personalization was explored through the lighting product category. Exploring the implications of product personalization for the other product categories through adapting the methodology of this study can reveal additional considerations of design for personalization important for sustainability.

REFERENCES

Adidas. (n.d.). Customize. Retrieved on 7.8.2018, from https://www.adidas.com/us/customize

Archer, B. (1995). The nature of research. *Co-Design*, *January 1995*, 6-13.

Ayres, L. (2008). Semi-structured interview. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 810-811). California: SAGE Publications, Inc.

Badurdeen, F., & Liyanage, J. P. (2011). Sustainable value co-creation through mass customisation: a framework. *International Journal of Sustainable Manufacturing 2*(2-3), 180-203. doi:10.1504/IJSM.2011.042151

Bakırlıoğlu, Y. (2017). *Open design for sustainability: An exploration on practices shaped around small kitchen appliances* (Ph.D. Dissertation). Faculty of Architecture, METU, Ankara.

Benyus, J. M. (1997). *Biomimicry: Innovation inspired by nature*. New York: William Morrow.

Bernabei, R., & Power, J. (2013). Designing together: End-user collaboration in designing a personalised product. *Proceedings of the Crafting the Future, 10th European Academy of Design Conference, Sweden*, 1–12.

Bernabei, R., & Power, J. (2017). Personalization from a design practice perspective. *Proceedings of the PLATE 2017 Conference, Delft, Netherlands*, 37-40.

Bhamra, T., Lilley, D., & Tang, T. (2011). Design for sustainable behaviour: Using products to change consumer behaviour. *The Design Journal*, *14*(4), 427-445. doi:10.2752/175630611X13091688930453

Blecker, T., & Abdelkafi, N. (2006). Mass customization: state-of-the-art and challenges. In T. Belcker, & G. Friedrich (Eds.), *Mass customization: challenges and solutions* (pp. 1-25). Boston, MA : Springer Science+Business Media, Inc.

Blom, J. (2000). Personalization: a taxonomy. *Proceedings of CHI'00 Extended Abstracts on Human Factors in Computing Systems* (pp. 313-314). doi:10.1145/633292.633483

Brown, B., Buchanan, R., DiSalvo, C., Doordan, D., Lee, K., Margolin, V., & Mazé, R. (2017). Introduction [Special Section]. *Design Issues*, *33*(3), 1-2.

Bunnell, K., & Marshall, J. (2009). Developments in post industrial manufacturing systems and the implications for craft and sustainability. *Proceedings of the Making Futures Conference*, *Plymouth, UK*, *1*. ISSN 2042-1664 105

Burns, B. (2010). Re-evaluating obsolescence and planning for it. In: T. Cooper (Ed.), *Longer lasting products: Alternatives to the throwaway society* (pp. 39-60). Farnham, Burlington: Gower.

Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*, *47*, 118-163. doi:10.1016/j.destud.2016.09.002

Chapman, J. (2005). *Emotionally durable design: Objects, experiences, and empathy.* London: Earthscan.

Chapman, J. (2010). Subject/object relationships and emotionally durable design. In: T. Cooper (Ed.), *Longer Lasting Products: Alternatives to the throwaway society* (pp. 61-76). Farnham, Burlington: Gower.

Cho, J. Y., & Lee, E. (2014). Reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. *The Qualitative Report*, *19*(32), 1-20. Retrieved from https://nsuworks.nova.edu/tqr/vol19/iss32/2

Coletti, P., & Aichner, T. (2011). *Mass customization: An exploration of European characteristics*. Berlin, Heidelberg: Springer.

Cook, K. E. (2008). In-Depth Interview. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 422-423). California: SAGE Publications, Inc.

Cooper, T. (2000). Product development implications of sustainable consumption. *The Design Journal, 3*(2), 46-57.

Cooper, T. (2005). Slower consumption reflections on product life spans and the "throwaway society". *Journal of Industrial Ecology*, *9*(1-2), 51-67.

Coşkun, A. (2010). *Post-use design thinking for product design process and sustainability: A study on an educational project in glass packaging* (Master's thesis). Retrieved from METU Library Catalog.

(Accession No. metu.b1387949)

Coşkun, A., & Doğan, Ç. (2010a). Post-use design thinking. Presenting insights into a design research for sustainability. *Proceedings of Sustainability in Design: NOW! Challenges and Opportunities for Design Research, Education and Practice in the XXI Century, Bangalore, India*, 368-381.

Coşkun, A., & Doğan, Ç. (2010b). Post-use design thinking for sustainability: A research on an educational project in industrial design. *Proceedings of Sustainable Innovation 2010 Conference, Rotterdam, The Netherlands,* 40-46.

Da Silveira, G., Borenstein, D., & Fogliatto, F. S. (2001). Mass customization: Literature review and research directions. *International Journal of Production Economics*, *72*(1), 1-13.

Dalsgaard, P., & Halskov, K. (2012). Reflective design documentation. *Proceedings of the Designing Interactive Systems Conference, UK*, 428-437. doi:10.1145/2317956.2318020

Designboom. (2012). prodUSER by Tristan Kopp at İstanbul Design Biennial. Retrieved on 7.8.2018, from https://www.designboom.com/design/istanbul-design-biennial-produser-by-tristan-kopp/

Desmet, P., Overbeeke, K., & Tax, S. (2001). Designing products with added emotional value: Development and appllcation of an approach for research through design. *The Design Journal*, *4*(1), 32-47.

Dezeen. (2012). Stratigraphic Manufactury by Unfold. Retrieved on 31.05.2014, from https://www.dezeen.com/2012/10/17/stratigraphic-manufactury-3d-printing-by-unfold/

Doğan, Ç. (2007). *Product design for sustainability - Integrated scales of design and production* (Unpublished doctoral dissertation). University of Calgary: Alberta.

Doğan, Ç., & Walker, S. (2008). Localisation and the design and production of sustainable products. *International Journal of Product Development*, *6*(3-4), 276-290. doi:10.1504/IJPD.2008.020396

Don, A., & Petrick, J. (2003). User requirements. In B. Laurel (Ed.), *Design research: Methods and perspectives* (p. 22). Cambridge, Mass. : MIT Press.

Drizo A., & Pegna, J. (2006). Environmental impacts of rapid prototyping: an overview of research to date. *Rapid Prototyping Journal. 12*(2), 64-71. doi:10.1108/13552540610652393

Droog. (2000). Do hit chair - hit by van der Poll. Retrieved on 28.10.2013, from http://www.droog.com/webshop/product/do-hit-chair-hit-van-der-poll

Droog. (n.d.). Do scratch auction. Retrieved on 7.8.2018, from http://www.droog.com/project/do-scratch-auction

Droog. (n.d.). Do add 'short-leg' & 'extended seat' by Jurgen Bey. Retrieved on 28.10.2013, from http://www.droog.com/project/do-add-short-leg-extended-seat-jurgen-bey

Durrant, A. C., Vines, J., Wallace, J., & Yee, J. S. (2017). Research through design: Twenty-first century makers and materialities. *Design Issues, 33*(3), 3-10. doi:10.1162/DESI_a_00447

Findeli, A., Brouillet, D., Martin, S., Moineau, C., & Tarrago, R. (2008, May).

Research through design and transdisciplinarity: A tentative contribution to the methodology of design research. *FOCUSED - Current Design Research Projects and Methods*. Symposium conducted at the meeting of the Swiss Design Network*,* Mount Gurten, Berne, Switzerland.

Fox, S. (2001). Managing product personalisation. *Engineering Management Journal*, *11*(4), 174-180. doi:10.1049/em:20010406

Forlizzi, J., Zimmerman, J., & Stolterman, E. (2009). From design research to theory: Evidence of a maturing field. *Proceedings of International Association of Societies of Design Research Conference, Seoul, Korea,* 2889-2898.

Frayling, C. (1993). Research in art and design [Monograph]. *Royal College of Art Research Papers*, *1*(1)*,* 1-5. London: Royal College of Art.

Frens, J. W. (2007). Research through design: a camera case study. In R. Michel (Ed.), *Design research now: essays and selected projects* (pp. 135-156). Basel: Birkhäuser. doi:10.1007/978-3-7643-8472-2_9

Fuad-Luke, A. (2009). *Design activism: Beautiful strangeness for a sustainable world*. London: Earthscan.

Fuad-Luke, A. (2010). Adjusting our metabolism: Slowness and nourishing rituals of delay in anticipation of a post-consumer age. In: T. Cooper (Ed.), *Longer lasting products: Alternatives to the throwaway society* (pp. 133-155). Farnham, Burlington: Gower.

Gaver, W. (2012). What should we expect from research through design?. *Proceedings of the 30th ACM Conference on Human Factors in Computing Systems, CHI 2012, Texas, USA,* 937-946. doi:10.1145/2207676.2208538

Gilmore, J. H. , & Pine, B. J. (1997). The four faces of mass customization. *Harvard Business Review*, *75*(1), 91-101.

Given, L. M., & Saumure, K. (2008). Trustworthiness. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 895-896). California: SAGE Publications, Inc.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory; Strategies for Qualitative Research*. Chicago: Aldine Publishing Company.

Godin, D., & Zahedi, M. (2014). Aspects of research through design. *Proceedings of DRS 2014: Design's Big Debates*, Umeå, Sweden *1*, 1667-1680.

Hanington, B. (2003). Methods in the making: A perspective on the state of human research in design. *Design Issues, 19*(4), 9-18.

Hanington, B. (2007). *Generative Research in Design Education*. International Association of Societies of Design Research Conference, November 12-15, the Hong Kong Polytechnic University, Hong Kong, China.

Hanington, B. M, & Martin, B. (2012). *Universal methods of design*. Beverley, Mass: Rockport Publishers.

Hsieh, H-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277-1288.

doi:10.1177/1049732305276687

IISD (n.d.). *The Imperative of Sustainable Production And Consumption*. Retrieved May 12, 2016, from http://enb.iisd.org/consume/oslo004.html

Inequality. (2017). *Global Inequality*. Retrieved April 18, 2018, from https://inequality.org/facts/global-inequality/

Instructables. (n.d.). The Cardboard Computer. Retrieved on 28.10.2013, from https://www.instructables.com/id/The-Cardboard-Computer/

Instructables. (n.d.). Electric Trike on the Cheap. Retrieved on 28.10.2013, from https://www.instructables.com/id/Electric-Trike-on-the-cheap/

Ireland, C. (2003). Qualitative methods: From boring to brilliant. In B. Laurel (Ed.), *Design research: Methods and perspectives* (p. 22). Cambridge, Mass. : MIT Press.

Jensen, D. (2008). Credibility. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 138-139). California: SAGE Publications, Inc.

Jensen, D. (2008). Dependability. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 208-209). California: SAGE Publications, Inc.

Jensen, D. (2008). Transferability. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, p. 886). California: SAGE Publications, Inc.

Jonas W. (2015). Research through design is more than just a new form of disseminating design outcomes. *Constructivist Foundations, 11*(1), 32-36. Retrieved from http://constructivist.info/11/1/032

Julien, H. (2008). Content analysis. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 120-121). California: SAGE Publications, Inc.

Julien, H. (2008). Survey research. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 846-848). California: SAGE Publications, Inc.

Kelliher, A., & Byrne, D. (2015). Research through Design, Documentation, Annotation, and Curation. *Proceedings of the 21st International Symposium on Electronic Art*, *Vancouver, Canada*.

Krippendorff, K. (2004). *Content analysis: An introduction to its methodology*. California: Sage Publications, Inc.

Levitt, M., & Richards, S. (2010). Leveraging user expertise through participatory design: Beyond observation. *Innovation*, *29* (1), 24-27.

Manzini, E. (2007). Design research for sustainable social innovation. In R. Michel (Ed.), *Design Research Now: Essays and selected projects*. Basel, Switzerland: Birkhäuser.

Manzini, E., & Jegou, F. (2003). *Sustainable everyday: Scenarios of urban life*. Milan: Edizioni Ambiente.

Marchand, A. (2008). *Responsible consumption and design for sustainability* (Unpublished doctoral dissertation). University of Calgary: Alberta.

Marchand, A., & Walker, S. (2007). *Connecting through time: Old objects, new contexts, and design-centered research for sustainability*. Retrieved December, 18, 2012, from http://www.idsa.org/sites/default/files/Marchand-Walker-Connecting_Through_Time.pdf

McDonough, W., & Braungart, M. (2002*). Cradle to cradle: Remaking the way we make things.* New York: North Point Press.

McKay, A. (2007). Affective communication: Towards the personalisation of a museum exhibition. *CoDesign*, *3*(1), 163-173.

McKechnie, L. E. F. (2008). Observational research. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Vols. 1-2, pp. 573-575). California: SAGE Publications, Inc.

Merle, A., Chandon, J-L., & Roux, E. (2008). Understanding the perceived value of mass customization: the distinction between product value and experiential value of co-design. *Recherche et Applications en Marketing (English Edition)*, *23*(3), 27-50.

Morelli, N. (2007). Social innovation and new industrial contexts: Can designers "industrialize" socially responsible solutions?. *Design Issues 23*(4), 3-21.

Mugge, R., Schoormans. J. P. L., & Schifferstein, H. N. J. (2005). Design strategies to postpone consumers' product replacement: The value of a strong person-product relationship. *The Design Journal*, *8*(2), 38-48. doi:10.2752/146069205789331637

Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2009a). Emotional bonding with personalised products. *Journal of Engineering Design*, *20*(5), 467-476. doi:10.1080/09544820802698550

Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2009b). Incorporating consumers in the design of their own products. The dimensions of product personalisation. *CoDesign*, *5*(2), 79-97.

Nervous System. (2007). Radiolaria App. Retrieved on 22.10.2013, from

https://n-e-r-v-o-u-s.com/projects/tags/algorithm/albums/radiolaria-app/

Niinimäki, K., & Hassi, L. (2011). Emerging design strategies in sustainable production and consumption of textiles and clothing. *Journal of Cleaner Production*, *19*(16), 1876-1883. doi:10.1016/j.jclepro.2011.04.020

Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things*. New York: Basic Books.

OpenStructures. (2012). TransparentKettle. Retrieved on 28.10.2013, from http://beta.openstructures.net/pages/14/structures/26

OpenStructures. (2012). ToyBox. Retrieved on 24.05.2015, from http://beta.openstructures.net/pages/14/structures/29

365

Ozan, E., & Doğan, Ç. (2014). Kişiselleştirme yoluyla kullanıcıları tasarım sürecinde etkin kılan yöntem ve yaklaşımların sürdürülebilirlik için ürün tasarımı açısından değerlendirilmesi. In P. Kaygan, & H. Kaygan (Eds.), *Eğitim, Araştırma, Meslek ve Sosyal Sorumluluk* [*Education, Research, Practice and Social Responsibility*], *UTAK 2014 Conference* (pp. 157-172). Ankara: METU Faculty of Architecture Press.

Packard, V. (1960). *The waste makers.* New York: D. McKay Co.

Page, N., & Czuba, C. E. (1999). Empowerment: What is it?. *Journal of Extension*, *37*(5), 1-5. Retrieved from https://joe.org/joe/1999october/comm1.php.

Papanek,V. (1971). *Design for the real world: Human ecology and social change*. New York: Pantheon Books.

Pedgley, O. (2007). Capturing and analysing own design activity. *Design Studies*, *28*(5), 463-483. doi:10.1016/j.destud.2007.02.004

Phellas, C. N., Bloch, A., & Seale, C. (2012). Structured methods: interviews, questionnaires and observation. In C. Seale (Ed.), *Researching society and culture* (pp.181-205). Thousand Oaks, CA: Sage Publications Ltd.

Read, H. (1948). *Education through art*. Oxford, England: Pantheon.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2): 155-169.

Robson, C. (2002). *Real world research: a resource for social scientists and practitioner-researchers*. Oxford: Blackwell Publishers.

Rossman, G. B., & Rallis, S. F. (2003). *Learning in the field: An introduction to qualitative research*. Thousand Oaks, California: Sage Publications.

Sadan, E. (2004). *Empowerment and community planning: Theory and practice of people-focused social solutions.* Retrieved from http://www.mpow.org/.

Sanders, E. B. -N. (2008). An evolving map of design practice and design research. *Interactions*, *15*(6), 13-17. doi:10.1145/1409040.1409043

Sanders, E. B. -N., Brandt, E., & Binder, T. (2010). A Framework for organizing the tools and techniques of participatory design. *Proceedings of the 11th Conference on Participatory Design, New York, USA*, 195-198. doi:10.1145/1900441.1900476

Sanders, E. B. -N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5-18. doi:10.1080/15710880701875068

Sanders, E. B. -N., & William, C. T. (2001). Harnessing people's creativity: Ideation and expression through visual communication. In J. Langford; D. McDonagh (Eds.), *Focus groups: Supporting effective product development* (pp: 137-148). London: Taylor and Francis.

Schifferstein, H. N. J., & Zwartkruis-Pelgrim, E. P. H. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design*, *2*(3), 1-13.

Schön, D. (1983). *The Reflective Practitioner: How professionals think in action.* London: Maurice Temple Smith.

Schreier, M. (2006). The value increment of mass-customized products: An empirical assessment. *Journal of Consumer Behaviour*, *5*(4), 317-327.

Sel, S. K. (2013). *Industrial design and mass customization of electronic goods*. (Doctoral Dissertation). Retrieved from METU Library Catalog. (Accession No. metu.b1796299)

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education For Information*, *22*(2), 63-75. doi:10.3233/EFI-2004-22201

Sleesvijk Visser, F., Stappers, P.J., Van der Lugt, R., & Sanders, E.B.-N. (2005). Contextmapping: Experiences from practice. *CoDesign,1*(2), 119-149. doi:10.1080/15710880500135987

Stewart, S. (2014). Design research. In D. Coghlan, & M. Brydon-Miller (Eds.), *The SAGE encyclopedia of action research* (pp. 245-247). London: SAGE Publications, Inc.

Sustainabledevelopment.un.org. (n.d.). Conferences: Sustainable Development Knowledge Platform. Retrieved on 17.11.2018, from https://sustainabledevelopment.un.org/conferences

Taylor, S. J., Bogdan, R., & DeVault, M. L. (2016). *Introduction to qualitative research methods: A guidebook and resource*. New Jersey: John Wiley & Sons, Inc.

Tooze, J. Baurley, S. Phillips, R., Smith, P. Foote, E. & Silve, S. (2014). Open Design: Contributions, Solutions, Processes and Projects. *The Design Journal*, *17*(4), (538 – 559).

Turhan, S. (2013). Experience reflection modelling (ERM) as a generative research method and student engagement in product design at undergraduate level (Ph.D. Dissertation). Faculty of Architecture, METU, Ankara.

United Nations. (2002). *Johannesburg declaration on sustainable development*. Retrieved from http://www.un-documents.net/johannesburg-declaration.pdf

United Nations. (2012). *The 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP)*. Retrieved from https://sustainabledevelopment.un.org/content/documents/1444HLPF_10YFP 2.pdf

UNEP. (2015). *UNEP 2015 Annual Report.* Retrieved from https://www.unenvironment.org/annualreport/2015/en/sustainable-development-goals.html

Warth, L., & Koparanova, M. (2012). *Empowering women for sustainable development* (UNECE discussion paper). Retrieved from https://sustainabledevelopment.un.org/content/documents/549ece4.pdf

van Nes, N. (2010). Understanding replacement behaviour and exploring design solutions. In: T. Cooper (Ed.), *Longer Lasting Products: Alternatives to the throwaway society* (pp. 107-131). Farnham, Burlington: Gower.

van Nes, N., & Cramer, J. (2005). Influencing product lifetime through product design. *Business Strategy and the Environment*, *14*(5), 286–299.

doi:10.1002/bse.491

Verbeek, P., & Kockelkoren, P. (1998). The things that matter. *Design Issues*, *14*(3), 28-42.

Walker, S. (2006). *Sustainable by Design: Explorations in theory and practice*. London: Earthscan.

Walker, S. (2011). *The spirit of design: Objects, environment and meaning*. Washington, DC: Earthscan.

Walker, S., Dogan, Ç., & Marchand, A. (2009). Research through design – The development of sustainable material cultures. *Proceedings of the 8th European Academy of Design Conference*, *Scotland, UK*, 482-486.

Wells, P. (2013). Diversity, scale and sustainability in human systems: Towards a research agenda. *Journal of Cleaner Production*, *47*, 232-235.

doi:10.1016/j.jclepro.2012.06.011

Williams, C. C. (2004). A lifestyle choice? Evaluating the motives of do-it-yourself (DIY) consumers. *International Journal of Retail & Distribution Management*, *32*(5), 270-278.

Wolf, M., & McQuitty, S. (2013). Circumventing traditional markets: An empirical study of the marketplace motivations and outcomes of consumers' do-it-yourself behaviors. *The Journal of Marketing Theory and Practice*, *21*(2), 195-210. doi:10.2753/MTP1069-6679210205

Wolf, M., & McQuitty, S. (2011). Understanding the do-it-yourself consumer: DIY motivations and outcomes. *Academy of Marketing Science Review.1*(3-4), 154–170.

World Commission on Environment and Development. (1987). *Our common future*. Oxford, New York: Oxford University Press.

Zimmerman, J., Stolterman, E., & Forlizzi, J. (2010). An analysis and critique of Research through design: Towards a formalization of a research approach. *Proceedings of the 8th ACM Conference on Designing Interactive Systems*, *Denmark*, 310-319. doi:10.1145/1858171.1858228

A. Interview Schedule Used in the Preliminary Study Phase 1

A1: Turkish

Tarih: Görüşülen kişi:

Giriş

Doktora çalışmam kapsamında, kullanıcıların kişiselleştirdiği ürünler ve kişiselleştirme yolları ile ilgili bir araştırma yapıyorum. Araştırmanın bulguları sürdürülebilirlik için tasarım yöntemleri geliştirmekte önem taşıyor. Bu nedenle siz kullanıcıların kişiselleştirdiği ürünlerin fotoğraflarına ve bu fotoğraflar üzerinden sizlerle görüşmeye yapmaya ihtiyacım var. Sağlayacağınız örnekler ve vereceğiniz bilgiler çalışmam için büyük önem taşımaktadır. Verdiğiniz bilgiler tamamen gizli tutulacak ve herhangi bir belgede isminiz kullanılmayacaktır.

Kişiselleştirme Hakkında Ön Bilgi

Kişiselleştirmeyi; kendi bilgi ve deneyiminizi kullanarak bir ürünün dış görünüşünde, kullanımında veya iç aksamında, ürüne yeni bir kullanım kazandırmak, ürünün işlevini, estetik özelliklerini iyileştirmek, kendinizi ifade etmek ve/veya kendinize özgü ihtiyaçlarınızı karşılamak amacıyla yaptığınız herhangi bir değişiklik olarak düşünebilirsiniz. Örneğin, eski ve yeni ürün parçalarını bir araya getirerek yeni bir ürün yaratmak ya da eskimiş bir ürünü yeni bir amaçla kullanmak, ya da estetik ve/veya işlevsel müdahalelerle bir ürünü değiştirmek kişiselleştirme yöntemlerine örnek verilebilir.

• Kişiselleştirdiğiniz ürünlerin fotoğraflarını bana bir hafta içinde gönderebilir misiniz?
• (Evet ise) Fotoğrafları gönderdikten sonra, kişiselleştirdiğiniz ürünler üzerinde konuşmak için yaklaşık bir saat ayırabilir misiniz?
• (Evet ise) Görüşme için uygun olduğunuz tarihleri belirtir misiniz?
• Sormak istediğiniz bir soru var mı?

Kişiselleştirme Öncesi Ürün Özellikleri
1. Ürünü satın mı aldınız, kendiniz mi yaptınız?
2. (Satın aldıysanız) ne zaman satın aldınız? (Kendiniz yaptıysanız) ne zaman yaptınız?
3. Ürünün kişiselleştirmeden önceki özellikleri hakkında bilgi verir misiniz?
(Üretim yöntemi, estetik ve işlevsel özellikler, malzeme, vb.)

Kişiselleştirme Süreci

1. Ürünü nasıl kişiselleştirdiniz?

2. Ürünü ne zaman kişiselleştirdiniz?

3.Ürünü kişiselleştirme nedenlerinizden bahseder misiniz?

4. Ürünün eski halini düşündüğünüzde, kişiselleştirmenizde kolaylık sağlayan özellikleri neler oldu?

5. Kişiselleştirdiğiniz ürünü estetik açıdan nasıl değerlendiriyorsunuz?

6. Kişiselleştirdiğiniz ürünü işlevsel açıdan nasıl değerlendiriyorsunuz?

7.(Varsa) Ürünü kişiselleştirmenizin sağladığı avantaj/dezavantajları açıklar mısınız?

8. Kişiselleştirdiğiniz bu ürün sizin için neler ifade ediyor?

9. Ürüne daha fazla nasıl müdahale etmek isterdiniz?

A2: English

Date: **Interviewee:**
Introduction
Within the scope of my PhD study, I conduct a research on everyday products that are personalized by users and the ways of personalization. The findings of this resarch is important for developing products in line with sustainability considerations. For this reason, I need the photographs of the products that you personalize, and need to conduct interviews regarding these products. The products and the information you will provide, are of great importance for my study. The information you provide is completely confidential and your name will not be used in any document.

Background Information on Product Personalization
You can consider personalization as any modification you make on a product's aesthetic and functional attributes or usage to assign a new usage to the product, improve the aesthetic and functional qualities of the product, express yourself and/or meet your own needs using your own knowledge and experience. For instance, creating a new product through combining old and new product parts, or repurposing an old product, or changing a product through aesthetic (visual) or functional interventions can be the examples of product personalization.

- Could you send me the photographs of the product(s) that you personalized in a week?
- (If yes) After sending the photographs, could you have about an hour for talking on the products that you personalized?
- (If yes) Could you specify the dates you will be available?
- Do you have any questions?

Product Features Before Personalization
1. Did you purchase the product or did you make it?
2. (If purchased) When did you purchase it? (If made it) When did you make it?
3. Could you give information about the attributes of the product before personalization?
(Production method, aesthetic appearance, functionality, material, etc.)

Personalization Process
1. How did you personalize the product?
2. When did you personalize the product?
3. Could you give information about your reasons/goals for personalizing this product?
4. Considering the old version of the product, which product attributes enabled you to personalize it?
5. How do you evaluate the personalized version of the product aesthetically?
6. How do you evaluate the personalized version of the product functionally?
7. If any, could you give information about the advantages/disadvantages of personalizing this product?
8. What does the personalized product mean in your life?
9. How would you like to personalize this product further?

B. Online Questionnaire 1

B1: Turkish

Değerli Katılımcı;

Bu çalışma Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümü'nde devam etmekte olan doktora tezi kapsamında yapılmaktadır. **Anketin amacı, katılımcılar tarafından kişiselleştirilmiş ürünler üzerinden bir değerlendirme yapmak olup, sizden istenen, araştırmaya katılarak görüşlerinizi iletmeniz ve kişiselleştirmiş olduğunuz ürünleriniz varsa, fotoğraflarını ezgozan@gmail.com adresine göndermenizdir.**

Kişiselleştirme, bir ürünün parça veya parçalarının estetik ve/veya fonksiyonel özelliklerinin, tasarım, kullanım ve kullanım sonrası aşamalarda kullanıcısı tarafından tanımlandığı, uyarlandığı veya değiştirildiği bir süreçtir. Örneğin, bir ürünü bu ürüne ait olmayan parçalarla bir araya getirdiğiniz, kullanım ömrü tamamlanmış bir ürüne farklı ya da benzer bir kullanım kazandırdığınız, eski ve yeni ürün parçalarını bir araya getirdiğiniz, kullanım sırasında veya kullanım sonrasında estetik (görsel) ve/veya fonksiyonel (işlevsel) özelliklerini değiştirdiğiniz ürünler kişiselleştirilmiş ürünler olabilir.

Bu çalışmadan elde edilen veriler yalnızca bilimsel amaçlarla, tasarım sürecinde, tez araştırmalarında, bilimsel yayınlarda ve sunuşlarda kullanılacaktır. Katılımcıların kimlik bilgileri saklı tutulacaktır. Anketin tamamlanma süresi yaklaşık 10 dakikadır. Ankete katılmanız yasal haklarınızdan vazgeçtiğiniz anlamına gelmemektedir; ayrıca öğrencinin, ilgili kişi ve kurumların yasal ve mesleki sorumlulukları devam etmektedir. Çalışmaya katılım gönüllülük esasına dayanır. Araştırma, katılımcılar açısından herhangi bir risk taşımamaktadır. İstediğiniz zaman gerekçe belirtmeksizin yanıtlama işlemini sonlandırabilirsiniz.

Yukarıdaki tanım ve örneklere uyan kişiselleştirilmiş ürünleriniz varsa ankete geçebilir, kişiselleştirilmiş ürünleriniz yoksa anketten çıkabilirsiniz.
Araştırmaya katkıda bulunduğunuz için teşekkür ederim.
Ezgi Ozan
ODTÜ-Endüstri Ürünleri Tasarımı Bölümü
Doktora Öğrencisi
E-mail: ezgozan@gmail.com
Tel: 0232 411 51 62

1. Yaş aralığınız

☐ 21 - 25
☐ 26 - 30
☐ 31 - 35
☐ 36 - 40
☐ 41 - 45
☐ 46 - 50
☐ 51 ve üzeri

2. Cinsiyetiniz

☐ Kadın
☐ Erkek

3. Yaşadığınız şehir

4. Lütfen kişiselleştirdiğiniz ürün kategorisini işaretleyiniz. Birden fazla ürün için birden fazla kategoriyi işaretleyebilirsiniz.

☐ Mobilya
☐ Aydınlatma
☐ Küçük ev aletleri
☐ Ambalaj
☐ Kişisel aksesuarlar
☐ Ulaşım araçları
☐ Elektronik ürünler
☐ Giyim
☐ Ev aksesuarları
☐ Spor ekipmanları
☐ Beyaz eşya
☐ Diğer:

5. Ürün ya da ürünlerinizi kişiselleştirmede nasıl bir yol izlediniz? Ürünlerin her biri için lütfen belirtiniz. (Kullandığınız parçalar, malzemeler, yöntemler, vb.)

6. Kişiselleştirdiğiniz ürün/ürünler için kişiselleştirme nedenlerinizi ürünlerin her biri için lütfen belirtiniz.

7. Paylaştığınız ürünlerle ilgili daha fazla bilgi edinmek amacıyla yürütülecek olan çalışmanın 2. aşamasına katılmak ister misiniz?

☐ Evet ☐ Hayır

8. Elektronik posta adresiniz
(Araştırmanın 2. aşamasında size ulaşabilmek için gereklidir.)

9. Lütfen kişiselleştirdiğiniz ürünün/ürünlerin fotoğraflarını ezgozan@gmail.com adresine gönderir misiniz?

B2: English

Dear Participant;
This study is carried out within the scope of an ongoing doctoral thesis in Middle East Technical University, Department of Industrial Design. **The purpose of the questionnaire is to make an assessment of the products personalized by the participants, and you are requested to participate in the study, express your opinions, and send the photographs of the products you personalized to ezgozan@gmail.com, if you have any.**

Product personalization is a process during which the aesthetic and functional attributes of a product's part(s) are defined, adapted or modified by its user during design, use and/or post-use stages of the product life span. For instance, a product, which you combined with the parts that does not belong to that product, or a product, which you reused or repurposed in the post-use phase, or a product changed through aesthetic (visual) and/or functional interventions during use or post-use phase can be the examples of personalized products.

The data acquired through this study will only be used for scientific purposes in the design process, thesis research, scientific publications and presentations. The identity of the participants will be kept confidential. Filling out the questionnaire takes approximately 10 minutes. You do not waive your legal rights by participating in the study; or release the researcher and/or involved institution(s) from their legal and professional responsibilities. Participation in the study is voluntary. The study does not have any risks for the participants. You are free to withdraw from the study at any time, without any justification.

If you have personalized products that match the definitions and examples above, you can fill out the questionnaire, and if you do not have personalized products, you can leave this page.

Thank you for your contribution.
Ezgi Ozan
METU-Department of Industrial Design
PhD Student
E-mail: ezgozan @gmail.com
Tel: 0232 411 51 62

1. Age range
- ☐   21 - 25
- ☐   26 - 30
- ☐   31 - 35
- ☐   36 - 40
- ☐   41 - 45
- ☐   46 - 50
- ☐   51 and over

2. Gender
- ☐   Female
- ☐   Male

3. The city of residence

4. Please mark the product category/categories you personalized.
You can mark more than one category for more than one product.
- ☐   Furniture
- ☐   Lighting
- ☐   Small home appliance
- ☐   Packaging
- ☐   Personal accessory
- ☐   Vehicle
- ☐   Electronic product
- ☐   Clothing
- ☐   Home accessory
- ☐   Sports equipment
- ☐   White good
- ☐   Other:

5. How did you personalize your product(s)?
Please answer the question for each product you personalized.
(The parts, materials, methods you used, etc.)

6. Please explain your reasons of personalization for each product you personalized.

7. Would you like to participate in the second phase of the study that will be conducted to learn more about the products you share?
- ☐   Yes
- ☐   No
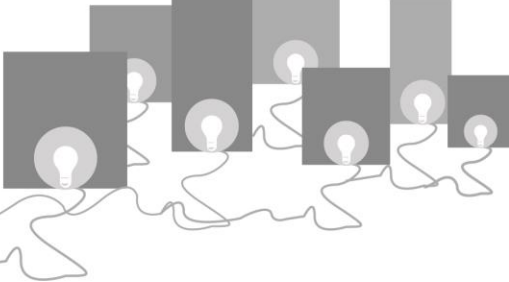
8. Your e-mail address
(Required to get in contact with you in the second phase of the study.)

9. Could you please send the photographs of your personalized product(s) to ezgozan@gmail.com?

C. Questionnaire Used in the Design Workshop 1

C1: Turkish

KUTUDAN AYDINLATMAYA TASARIM ATÖLYESİ

Ad Soyad:

Yaş:

E-posta adresi:

Kişiselleştireceğiniz aydınlatmayı nerede kullanırdınız?

....

Kişiselleştireceğiniz aydınlatmayı ne amaçla kullanırdınız?

....

Yukarıda belirlediğiniz kullanım yeri ve amacını ve kendi beğeni ve tercihlerinizi hangi özelliklerle kişiselleştirdiğiniz ürüne yansıttınız?

....

....

Kişiselleştirdiğiniz aydınlatma hakkında ne düşünüyorsunuz?

....

....

Aydınlatmayı kişiselleştirirken yaşadığınız problemler olduysa lütfen belirtiniz.

....

....

C2: English

FROM BOX TO LIGHTING
DESIGN WORKSHOP

Name Surname:

Age:

E-mail address:

Where would you use the lighting that you will personalize?

. . . .

For what purpose would you use the lighting that you will personalize?

. . . .

Which product qualities reflect the place and purpose of use that you defined
above and your taste and preferences?

. . . .

. . . .

What do you think about the lighting that you personalized?

. . . .

. . . .

Please specify if you have experienced any problems while personalizing the
lighting.

. . . .

. . . .

D. Consent Form Used in the Follow-Up Study

D1: Turkish

Orta Doğu Teknik Üniversitesi (ODTÜ)
Mimarlık Fakültesi Endüstri Ürünleri Tasarımı Bölümü

Kişiselleştirme Yoluyla Kullanıcıların Ürün Tasarım Sürecinde Etkin Kılınmasının Sürdürülebilirlik için Tasarıma Etkileri
Yaratıcı Tasarım Araştırması   Mayıs 2015

Bu araştırma, ODTÜ Endüstri Ürünleri Tasarımı Bölümü doktora öğrencisi Ezgi Ozan'ın doktora tez çalışması kapsamında yapılmaktadır. **Araştırmanın amacı, katılımcıların, kendilerine yarı tamamlanmış olarak verilen bir aydınlatma elemanını tamamlamaları yoluyla, geliştirilen ürünün kişiselleştirme ve sürdürülebilirlik açısından yansımalarını araştırmaktır.**

Araştırma sırasında elde edilen veriler yalnızca bilimsel amaçlarla, tasarım sürecinde, tez çalışmasında, bilimsel yayınlarda ve sunuşlarda kullanılacaktır. Katılımcıların kimlik bilgileri saklı tutulacaktır. **Araştırma 1 hafta sürecek ve araştırmanın başında, ortasında ve sonunda katılımcılarla yaklaşık yarım saat sürecek görüşmeler yapılacaktır.** Konuşulanları ve süreci daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için, süreç içinde yapılacak görüşmeler kaydedilecektir. Görüşme sırasında fotoğraf makinesi, video ve ses kayıt cihazı kullanılacaktır.

Bu formu imzalayarak yapılacak araştırma konusunda size verilen bilgiyi anladığınızı ve görüşme yapılmasını onayladığınızı belirtmiş oluyorsunuz. Formu imzalamış olmanız yasal haklarınızdan vazgeçtiğiniz anlamına gelmemektedir; ayrıca araştırmacının, öğrencilerin, ilgili kişi ve kurumların yasal ve mesleki sorumlulukları devam etmektedir. Çalışmaya katılım gönüllülük esasına dayanır. Araştırma, katılımcılar açısından herhangi bir risk taşımamaktadır. Görüşme sürecinin başlangıcında veya herhangi bir aşamasında açıklama yapılmasını veya bilgi verilmesini isteyebilirsiniz. İstediğiniz zaman gerekçe belirtmeksizin görüşmenin durdurulmasını talep edebilirsiniz. Araştırmaya katkıda bulunduğunuz için teşekkür ederiz.

Katılımcının adı soyadı   İmza   Tarih

Araştırmacının adı soyadı   İmza   Tarih

Araştırmacı İletişim Bilgileri
Tel: 0535 781 94 42
ezgozan@gmail.com

Bu formun bir kopyası katılımcıya verilmelidir.

D2: English

Middle East Technical University (METU)
Faculty of Architecture Department of Industrial Design

People's Empowerment in the Design Process Through Product Personalization for Design for Sustainability
Generative Study   May 2015

This research is carried out within the scope of the doctoral thesis of Ezgi Ozan, who is a PhD student of METU Department of Industrial Design. **The aim of the study is to investigate the implications of the lighting product, which was given to the participants as semi-finished, in terms of personalization and sustainability through its completion by the participants.**

The information collected during the research will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes. The identity of the participants shall be reserved. **The study will last for one week, and at the beginning, in the middle, and at the end of the study, interviews will be conducted with the participants, which will last approximately half an hour.** To be able to recall and review the process later, interviews conducted in the process will be recorded. Camera and voice recorder will be used during the interviews.

By signing this form, you will be agreed that, you understand the information provided to you about the research, and that you accept your participation in the interviews. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

Participant's Name   Signature   Date

Researcher's Name   Signature   Date

Researcher's Contact Information
Tel: 0535 781 94 42
ezgozan@gmail.com

A copy of this form must be given to the participant.

E. Explanatory Sheet Used in the Follow-Up Study

E1: Turkish

Kişiselleştirme Yoluyla Kullanıcıların Ürün Tasarım Sürecinde Etkin Kılınmasının Sürdürülebilirlik için Tasarıma Etkileri - Yaratıcı Tasarım Araştırması

AÇIKLAMALAR

Size verilen yarı tamamlanmış aydınlatma ürün önerisi, gövde parçasına yerleştirilmiş bir LED ampul ve kullanıcısının değişen ihtiyaç ve tercihlerine göre ışık kaynağının önünü kapatarak, kişiselleştirmesine olanak tanıyan iki karton kapaktan (gölgelik) oluşmaktadır. Gölgeliklerden birini ışık kaynağı önünde kullanırken, diğerini kutunun arkasına takarak muhafaza edebilirsiniz.

ARAŞTIRMADA SİZDEN İSTENEN:

1. Aydınlatma önerisinin gölgeliklerini oluşturan kapakları, **üstlerindeki delikler, evinizde bulunan malzemeler ve (isterseniz) size verilen bağlantı halkalarını** kullanarak kendi tercih ve beğenilerinize göre tasarlamanız ve kendi gölgeliklerinizi yaratarak ürünü tamamlamanız,

2. Ürünü, bir hafta boyunca, kendi belirlediğiniz ortamlarda ve belirlediğiniz farklı ya da benzer kullanım amaçlarıyla, **gölgeliklerini değiştirerek kullanmanız,**

3. Gölgelikleri oluştururken ve ürünü kullanırken ya**şadığınız problemleri size verilen forma kaydetmeniz,**

4. Gölgeliğinizi tasarlama ve kullanım aşamalarınızın **fotoğraflarını çekmenizdir.**

Araştırma boyunca, 26, 28 ve 30 Mayıs tarihlerinde, size uygun olan saatlerde, tasarlama ve kullanım sürecinizi anlamak ve ürünle ilgili düşüncelerinizi almak amacıyla, maksimum yarım saat sürecek üç görüşme yapılacaktır.

Araştırmaya katıldığınız için teşekkür ederim.

Ezgi OZAN

E2: English

EXPLANATIONS

The half-way lighting product proposition given to you consists of a LED bulb placed inside the body and two cardboard covers (shadings), which enable the user to personalize it through covering the front of the light source according to the person's changing needs and preferences. While using one of the shadings in front of the light source, you can store the other through placing it at the back of the box.

IN THIS STUDY, YOU ARE ASKED TO:

1. Design the covers **using the holes on them, the materials you have at home and (optionally) the connection rings** given to you based on your preferences and taste, and complete the lighting through creating your own shadings,

2. Use the product for one week, in the contexts and for different or similar purposes you defined, **by changing its shadings,**

3. **Record the problems you experienced** while completing the shadings and using the product on the form given to you,

4. **Take the photographs** of your personalization and use processes.

During the study, three interviews lasting maximum half an hour will be conducted with you to understand your personalization process and take your opinions about the product. These interviews will be carried out on May 26, 28 and 30, at times when you are available.

Thank you for contributing to the study.

Ezgi OZAN

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F. Interview Schedule Used in the Follow-up Study

F1: Turkish

Tarih: **Görüşülen kişi:**

GÖRÜŞME KILAVUZU
Bu görüşmeyi, kişiselleştirme ve kullanım sürecinizi ve ürünle ilgili deneyimlerinizi daha detaylı öğrenmek için gerçekleştireceğim. Konuştuklarımızı daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için görüşmemizi kaydedeceğim. Görüşme yaklaşık yarım saat sürecek. Kimliğinizle ilgili bilgiler saklı tutulacak.

Görüşmeye başlamadan önce sormak istediğiniz herhangi bir şey var mı?

A.	Kişiselleştirme süreci

1. Kişiselleştirme sürecinizde hangi malzemeleri kullandınız?
2. Malzeme seçimlerinizin nedenlerini açıklar mısınız?
3. Kişiselleştirme sürecinizde ürünle birlikte size verilen halka parçaları kullandınız mı? Evet/Hayır ise neden?
4. Kişiselleştirme sürecinizde yaşadığınız sorunlar olduysa bunları açıklayabilir misiniz?
5. İki gölgeliği de kişiselleştirdiniz mi?

B.	Sonuç ürün

6. Kişiselleştirdiğiniz ürün hakkında ne düşünüyorsunuz?

C.	Kullanım süreci

7. Ürünü kullandınız mı?
8. (Evet ise) Ürünü nerede, ne amaçla kullandınız? Nedenlerini açıklar mısınız?
9. Ürünü kullanırken yaşadığınız sorunlar olduysa bunları açıklayabilir misiniz?

D.	Katılımcının çektiği fotoğraflarla ilgili sorular

F2: English

Date: **Participant:**

INTERVIEW SCHEDULE
I am conducting this interview to learn more about your personalization and usage process, and your experience with the product in more detail. I will record our interview to be able to remember and review what we talked about later. The interview will take about half an hour. Information about your identity will be kept confidential. Is there anything you want to ask before the interview?

A. Personalization process

1. Could you explain how did you personalize each shading?
2. Which materials did you use in your personalization process?
3. Could you explain the reasons behind your material selection process?
4. Did you use the ring-like parts that were given to you with the product in your personalization process? If yes/no, why?
5. If you experienced any problems in your personalization process, could you explain these?

B. Personalized toolkit

6. How would you evaluate the product that you personalized?

C. Usage phase

7. Did you use the product?
8. (If yes) Where and for what purpose did you use the product? Could you explain your reasons for these?
9. If you experienced any problems in your usage process, could you explain these?

D. Questions about the photographs taken by the participant

G. Diary Used in the Follow-up Study

G1: Turkish

Katılımcı- 1 - Gölgelik 1

Tarih	Kullanılan malzemeler/ parçalar	Malzemenin/ Parçanın kullanım nedeni	Süreçte yaşanan sorunlar	(Kullandıysanız) Kullanım yeri	(Kullandıysanız) Kullanım amacı
25 Mayıs					
26 Mayıs					
27 Mayıs					
28 Mayıs					
29 Mayıs					
30 Mayıs					
31 Mayıs					

G2: English

Participant- 1 - Shading 1

Date	Materials/ parts used	Reason of use of the material / part	Problems encountered during the process	(If you used the product) Place of use	(If you used the product) Purpose of use
May 25					
May 26					
May 27					
May 28					
May 29					
May 30					
May 31					

H. Online Questionnaire 2

H1: Turkish

Değerli Katılımcı;
Bu çalışma Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümü'nde devam etmekte olan doktora tezi kapsamında yapılmaktadır. **Anketin amacı, ortak bir evi paylaşan ya da kendi başına yaşayan öğrenci veya yeni mezun kişilerin, kullanım ömrünü tamamlamış ürün veya ürün parçalarını aynı ya da farklı bir amaçla yeniden kullanarak oluşturduğu ürünler hakkında bir değerlendirme yapmaktır. Bu tür ürünleriniz varsa, fotoğraflarını ezgozan@gmail.com adresine göndermeniz bu çalışmaya katkı sağlayacaktır.**

Bu araştırma yalnızca kullanım ömrünü tamamlamış ürünlerde gerçekleştirilen kişiselleştirme örneklerini incelemektedir. Örneğin, kullanım ömrü tamamlanmış bir ürüne farklı ya da benzer bir kullanım kazandırdığınız, eski ve yeni ürün parçalarını bir araya getirdiğiniz, kullanım sonrasında estetik (görsel) ve/veya fonksiyonel (işlevsel) özelliklerini değiştirdiğiniz ürünler kullanım sonrasında kişiselleştirilmiş ürünlere örnek olabilir.

Bu çalışmadan elde edilen veriler yalnızca bilimsel amaçlarla, tasarım sürecinde, tez araştırmalarında, bilimsel yayınlarda ve sunuşlarda kullanılacaktır. Katılımcıların kimlik bilgileri saklı tutulacaktır. Anketin tamamlanma süresi yaklaşık 10 dakikadır. Ankete katılmanız yasal haklarınızdan vazgeçtiğiniz anlamına gelmemektedir; ayrıca öğrencinin, ilgili kişi ve kurumların yasal ve mesleki sorumlulukları devam etmektedir. Çalışmaya katılım gönüllülük esasına dayanır. Araştırma, katılımcılar açısından herhangi bir risk taşımamaktadır. İstediğiniz zaman gerekçe belirtmeksizin yanıtlama işlemini sonlandırabilirsiniz.

Yukarıdaki tanım ve örneklere uyan, ilk kullanımı sonrasında kişiselleştirdiğiniz ürünleriniz varsa ve araştırmada hedef alınan kullanıcı grubuna dahilseniz ankete geçebilirsiniz.

Araştırmaya katkıda bulunduğunuz için teşekkür ederim.

Ezgi Ozan
ODTÜ-Endüstri Ürünleri Tasarımı Bölümü, Doktora öğrencisi
E-posta: ezgozan@gmail.com
Tel: 0232 411 51 62

1. Yaş aralığı

☐   16 - 20
☐   21 - 25
☐   25 ve üzeri

2. Cinsiyet

☐   Kadın
☐   Erkek

3. Yaşadığınız şehir

4. Lütfen kişiselleştirdiğiniz ürün kategorisini işaretleyiniz.
Birden fazla ürün için birden fazla kategoriyi işaretleyebilirsiniz.

☐   Mobilya
☐   Aydınlatma
☐   Küçük ev aletleri
☐   Ambalaj
☐   Kişisel aksesuarlar
☐   Ulaşım araçları
☐   Elektronik ürünler
☐   Giyim
☐   Ev aksesuarları
☐   Spor ekipmanları
☐   Beyaz eşya
☐   Diğer:

5. Ürün ya da ürünlerinizi ilk kullanımları sonrasında kişiselleştirirken nasıl bir yol izlediniz? Ürünlerin her biri için lütfen belirtiniz.
(Kullandığınız parçalar, malzemeler, yöntemler, vb.)

6. İlk kullanımı sonrasında kişiselleştirdiğiniz ürün/ürünler için kişiselleştirme nedenlerinizi ürünlerin her biri için lütfen belirtiniz.

7. Bu araştırma sonrasında, kişiselleştirilebilen bir ürün geliştirmek amacıyla yürütülecek olan çalışmaya katılmak ister misiniz?

☐   Evet
☐   Hayır

8. Elektronik posta adresiniz
(Araştırmanın bir sonraki aşamasında size ulaşabilmek için gereklidir.)

9. Lütfen kullanım sonrasında kişiselleştirdiğiniz ürünün/ürünlerin fotoğraflarını ezgozan@gmail.com adresine gönderir misiniz?

H2: English

Dear Participant;
This study is carried out within the scope of an ongoing doctoral thesis in Middle East Technical University, Department of Industrial Design. **The purpose of the questionnaire is to make an assessment of the products which were created through the use of the products or product parts that completed their lifespan for a similar or different purpose by the students or newly graduated people who share a home with friends or live alone. If you have such products, and if you could send the photographs of them to ezgozan@gmail.com, you would contribute to this study.**

This research only examines the personalization of the products which completed their lifespan. For instance, products gained a similar or different usage after completing their lifespan, products created through the integration of old and new product parts, products which you modified their aesthetic (visual) and/or functional qualities in the post-use phase may be the examples of products personalized in the post-use phase.

The data acquired through this study will only be used for scientific purposes in the design process, thesis research, scientific publications and presentations. The identity of the participants will be kept confidential. Filling out the questionnaire takes approximately 10 minutes. You do not waive your legal rights by participating in the study; or release the researcher and/or involved institution(s) from their legal and professional responsibilities. Participation in the study is voluntary. The study does not have any risks for the participants. You are free to withdraw from the study at any time, without any justification.

If you have personalized products in the post-use phase that match the definitions and examples above, and if you are involved in the user group targeted in this study, you can fill out the questionnaire.

Thank you for your contribution.

Ezgi Ozan
METU-Department of Industrial Design, PhD Student
E-mail: ezgozan @gmail.com
Tel: 0232 411 51 62

1. Age range
☐   16 - 20
☐   21 - 25
☐   25 and over

2. Gender
☐   Female
☐   Male

3. The city of residence

4. Please mark the product category/categories you personalized.
You can mark more than one category for more than one product.
☐   Furniture
☐   Lighting
☐   Small home appliance
☐   Packaging
☐   Personal accessory
☐   Vehicle
☐   Electronic product
☐   Clothing
☐   Home accessory
☐   Sports equipment
☐   White good
☐   Other:

5. How did you personalize your product(s) in the post-use phase?
Please answer the question for each product you personalized.
(The parts, materials, methods you used, etc.)

6. Please explain your reasons of personalization for each product you personalized in the post-use phase.

7. Would you like to participate in the second phase of the study that will be conducted to develop a new product that can be personalized?
☐   Yes
☐   No

8. Your e-mail address
(Required to get in contact with you in the second phase of the study.)

9. Could you please send the photographs of the products you personalized in the post-use phase to ezgozan@gmail.com?

İ. Poster of the Design Workshop 2

I1: Turkish

TASARIM ÇALIŞTAYI:
KİŞİSELLEŞTİRİLEBİLİR AYDINLATMA

22 Aralık 2016
Yer: C-108
14:00 - 17:00

Katılım12 kişiyle sınırlıdır.
Başvuru ve kayıt: ezgi.ozan@yasar.edu.tr

Öğrenci evinde yaşıyorsan, **çalıştaya davetlisin.**

DESIGN WORKSHOP:
PERSONALIZABLE LIGHTING

December, 22 2016
Place: C-108
14:00 - 17:00

Participation is limited to 12 people.
Application and registration:ezgi.ozan@yasar.edu.tr

If you live in a student house, you are invited to the workshop.

J. Design Workshop Application Form

J1: Turkish

Kişiselleştirilebilir Aydınlatma Tasarım Çalıştayı Başvuru Formu Bilgilendirme Notu

Bu çalıştayda sizden istenen, **size verilen yarı tamamlanmış aydınlatma ürününü, el becerilerinizi ve kağıt, kumaş ve ip türevi malzemeleri kullanarak tamamlamanızdır (kişiselleştirmenizdir). Çalıştayın amacı ürün ve kişiselleştirme sürecinizle ilgili sizin değerlendirmelerinizi almaktır.**

Çalıştay süreci 1 hafta devam edecektir. Çalıştayın ilk günü, size verilecek aydınlatma ürününü kurmanız ve sınıf ortamında yürütücü tarafından sağlanan malzemelerle kişiselleştirmeniz istenecektir. Ayrıca, evinizde atık durumda bulunan ya da özellikle biriktirdiğiniz, kişisel değeri olan/olmayan karton, kağıt, kumaş ve ip türevi malzemeleri de çalıştaya getirebilirsiniz. Daha sonra, aydınlatma ürünü size 1 hafta süreyle verilecek ve ürünü kendi malzemelerinizle, kendi ihtiyaçlarınız doğrultusunda evinizde kişiselleştirmeniz, size verilen günlüklere kişiselleştirme sürecinizle ilgili notlar almanız ve sürecinizi fotoğraflamanız istenecektir. Bir hafta sonra kişiselleştirdiğiniz ürünleri getirmeniz istenecek ve süreçle ilgili değerlendirmelerinizi almak için sizinle yaklaşık 15 dakika süren bir görüşme yapılacaktır. Kişiselleştirdiğiniz ürünün, eş-tasarımcı olan sizin isminizle birlikte (izniniz dahilinde) araştırma sürecinin sonunda sergilenmesi planlanmakta olup, sergi hakkında size yürütücü tarafından bilgi verilecektir.

Yürütücü: Ezgi OZAN   E-posta:ezgi.ozan@yasar.edu.tr Tel: 0232 570 87 54

Çalıştaya katılmak istiyorum.   ☐

Yaşar Üniversitesi'nde öğrenciyim.   ☐ Evet   ☐ Hayır

Öğrenci evinde yaşıyorum.   ☐ Evet   ☐ Hayır

Katılımcı ad, soyad   :
Katılımcının okuduğu bölüm   :
Katılımcı e-posta adresi   :
Katılımcı telefon numarası   :

J2: English

Personalizable Lighting Design Workshop Application Form
Information about the Workshop

In this workshop, you are requested to **complete (personalize) a half-way lighting product given to you, using your hand skills and materials like paper, fabric and strings. The aim of the workshop is to get your evaluations about the product and your personalization process.**

The workshop process will last for one week. On the first day of the workshop, you will be requested to set up the lighting product to be given to you, and to personalize it using the materials provided by the facilitator in the classroom environment. You can also bring materials to the workshop such as cardboard, paper, fabric, and strings that you have in your home, and which are in the condition of waste or which you keep purposefully due to their personal value or other reasons. After the half-day workshop, the lighting will be given to you for a week, and you will be requested to personalize it at your home, using your own materials to meet your needs, take notes on the diaries that will be given to you about your personalization process, and photograph your process. After one week, you will be asked to bring back the product that you personalized, and an 15-minute interview will be conducted with you to get your evaluations about the process. The product that you personalized is planned to be exhibited at the end of the research process with your name as the co-designer (within your permission), and you will be informed about the exhibition by the facilitator.

Facilitator: Ezgi OZAN   E-mail: ezgi.ozan@yasar.edu.tr   Tel: 0232 570 87 54

I want to participate in the workshop. ☐

I am a student in Yaşar University. ☐ Yes   ☐ No

I live in a student house. ☐ Yes   ☐ No

Participant's name and surname   :
Participant's department   :
Participant's e-mail address   :
Participant's telephone no   :

K. Consent Form Used in the Generative Research Phase 2

K1: Turkish

Yaşar Üniversitesi - Sanat ve Tasarım Fakültesi - Endüstriyel Tasarım Bölümü
Tasarım Çalıştayı: Kişiselleştirilebilir Aydınlatma
Tasarım Çalıştayı için Katılımcı İzin Formu

Değerli Katılımcı;

Bu çalıştayda sizden istenen, **size verilen yarı tamamlanmış aydınlatma ürününü, el becerilerinizi ve kağıt, kumaş ve ip türevi malzemeleri kullanarak tamamlamanız ve kişiselleştirmenizdir. Çalıştayın amacı ürün ve kişiselleştirme sürecinizle ilgili sizin değerlendirmelerinizi almaktır.**

Bu çalıştay, Yaşar Üniversitesi Endüstriyel Tasarım Bölümü Öğretim Görevlisi Ezgi OZAN'ın Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümü'nde devam etmekte olan doktora tezi kapsamında yapılmaktadır. Çalıştay sırasında elde edilen bilgiler yalnızca bilimsel amaçlarla, tasarım sürecinde, doktora tez çalışmasında, bilimsel yayınlarda ve sunuşlarda kullanılacaktır. Katılımcıların kimlik bilgileri saklı tutulacaktır.

Çalıştay süreci 1 hafta devam edecektir. Çalıştayın ilk günü, size verilecek aydınlatma ürününü kurmanız ve çalıştay için hazırlanan yerde, yürütücü tarafından sağlanan malzemelerle kişiselleştirmeniz istenecektir. Ayrıca, evinizde atık olarak bulunan ya da özellikle biriktirdiğiniz, kişisel değeri olan/olmayan karton, kağıt, kumaş ve ip türevi malzemeleri de çalıştaya getirebilirsiniz. Daha sonra, aydınlatma ürünü size 1 hafta süreyle verilecek ve ürünü kendi malzemelerinizle, kendi ihtiyaçlarınız doğrultusunda evinizde kişiselleştirmeniz, size verilen günlüklere kişiselleştirme sürecinizle ilgili notlar almanız ve sürecinizi fotoğraflamanız istenecektir. Bir hafta sonra kişiselleştirdiğiniz ürünleri getirmeniz istenecek ve süreçle ilgili değerlendirmelerinizi almak için sizinle 15-20 dakika süren bir görüşme yapılacaktır. Kişiselleştirdiğiniz ürünün, eş-tasarımcı olarak sizin isminizle ve izniniz dahilinde araştırma sürecinin sonunda sergilenmesi planlanmakta olup, sergi hakkında size yürütücü tarafından ayrıca bilgi verilecektir. Konuşulanları ve süreci daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için, süreç içinde yapılacak görüşmeler kaydedilecektir. Görüşme sırasında fotoğraf makinesi, video ve ses kayıt cihazı kullanılacaktır.

Bu formu imzalayarak yapılacak araştırma konusunda size verilen bilgiyi anladığınızı, çalıştaya katılımınızı, ürünü eksiksiz ve çalışır durumda teslim aldığınızı ve çalıştay sonunda geri getireceğinizi onayladığınızı belirtmiş oluyorsunuz. Araştırma, katılımcılar açısından herhangi bir risk taşımamaktadır. Kullanım hatalarından doğacak sorunlardan kullanıcı sorumlu olup, araştırmacılar, Yaşar Üniversitesi ve Orta Doğu Teknik Üniversitesi bu konuda sorumluluk kabul etmemektedir. Formu imzalamış olmanız yasal haklarınızdan vazgeçtiğiniz anlamına gelmemektedir; ayrıca araştırmacının, öğrencilerin, ilgili kişi ve kurumların yasal ve mesleki sorumlulukları devam etmektedir. Çalışmaya katılım gönüllülük esasına dayanır. Görüşme sürecinin başlangıcında veya herhangi bir aşamasında açıklama yapılmasını veya bilgi verilmesini isteyebilirsiniz. İstediğiniz zaman gerekçe belirtmeksizin çalışmanın durdurulmasını talep edebilirsiniz. Araştırmaya katkıda bulunduğunuz için teşekkür ederim.

Katılımcının adı soyadı	İmza	Tarih
Araştırmacının adı soyadı	İmza	Tarih

Araştırmacı: Ezgi Ozan	**Tez Danışmanı:** Doç. Dr. Çağla Doğan
E-posta: ezgi.ozan@yasar.edu.tr	**E-posta:** dcagla@metu.edu.tr
Tel: 0232 570 87 54	**Tel:** 0312 210 22 14

Bu formun bir kopyası katılımcıya verilmelidir.

K2: English

Yaşar University – Faculty of Art and Design – Department of Industrial Design
Design Workshop: Personalizable Lighting
Consent Form for the Design Workshop

Dear Participant;

In this workshop, you are asked to **complete and personalize the semi-finished lighting product given to you, by using your hand skills and materials such as paper, fabric and rope. The aim of the workshop is to take your assessments about the product and your personalization process.**

This workshop is organized within the context of the doctoral thesis of Ezgi Ozan, which is ongoing in the Middle East Technical University. The information obtained during the workshop will be used in the design process, in doctoral dissertation, in scientific publications and presentations only for scientific purposes. The identity of the participants shall be reserved.

The workshop process will last one week. On the first day of the workshop, you will be asked to build the lighting product, and personalize it with the materials provided by the researcher in the classroom prepared for the workshop. You can also bring cardboard, paper, fabric and rope derivative materials that are found as waste in your home, or that you have accumulated on purpose, or with or without personal value with you. Then, the lighting product will be given to you for one week, and you will be asked to personalize the product with your own materials in your home according to your needs, to take notes on the diaries about your personalization process and to photograph your process. After one week, you will be asked to bring the product you personalized, and a 15-20 minute interview will be conducted with you to take your assessment about the process. The product you personalized will be exhibited in a possible exhibition with your consent and your name as the co-designer, and you will be informed about the exhibition. After the exhibition, the product will belong to you. To be able to recall and review the process later, interviews conducted in the process will be recorded. Camera and voice recorder will be used during the interviews.

By signing this form, you will be agreed that, you understand the information provided to you about the research, your participation in the research, that you you have received the product in a complete and working condition, and you will bring it back at the end of the workshop. The research does not have any risks for the participants. The participant is responsible for the problems that may arise from misuse, and the researchers, Yaşar University and Middle East Technical University are not responsible for these. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

Participant's Name   **Signature**   **Date**

Researcher's Name   **Signature**   **Date**

Researcher: Ezgi Ozan **E-mail:** ezgi.ozan@yasar.edu.tr **Tel:** 0232 570 87 54	**Thesis Supervisor:** Assoc. Prof. Dr. Çağla Doğan **E-mail:** dcagla@metu.edu.tr **Tel:** 0312 210 22 14

A copy of this form must be given to the participant.

L. Questionnaire Used in the Generative Research Phase 2

L1: Turkish

Yaşar Üniversitesi Sanat ve Tasarım Fakültesi - Endüstriyel Tasarım Bölümü Tasarım Çalıştayı: Kişiselleştirilebilir Aydınlatma

Çalıştay Değerlendirme Anketi

1. Çalıştay ortamı hakkındaki görüşleriniz

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………......………………………………………

2. Çalıştay süreci ile ilgili görüşleriniz

…………………………………………………………………………………………
…………………………………………………………………......………………………
…………………………………………………………………………………………
…………………………………………………......………………………………………

3. Aydınlatmanın tasarımı ve kişiselleştirme süreciyle ilgili görüşleriniz

…………………………………………………………………………………………
…………………………………………………………………......………………………
…………………………………………………………………………………………
…………………………………………………......………………………………………

Çalıştaya katıldığınız için teşekkür ederim.

Öğr. Gör. Ezgi OZAN

Yaşar Üniversitesi /Sanat ve Tasarım Fakültesi / Endüstriyel Tasarım Bölümü

L2: English

**Yaşar University Faculty of Art and Design - Department of Industrial Design
Design Workshop: Personalizable Lighting**

Workshop Evaluation Questionnaire

1. Your views about the workshop environment.
………………………………………………………………………………………
………………………………………………………………………………………
………………………………………………………………………………………
………………………………......………………………………………………………

2. Your views about the workshop process.
………………………………………………………………………………………
……………………………………………………………......………………………………
………………………………………………………………………………………
………………………………......………………………………………………………

3. Your views about the lighting design and the personalization process.
………………………………………………………………………………………
……………………………………………………………......………………………………
………………………………………………………………………………………
………………………………......………………………………………………………

Thank you for participating in the workshop.

Lecturer Ezgi OZAN
Yaşar University / Faculty of Art and Design / Department of Industrial Design

M. Diary Used in the Generative Research Phase 2

KİŞİSELLEŞTİRİLEBİLİR AYDINLATMA
DİSİPLİNLERARASI TASARIM ÇALIŞTAYI
KATILIMCI GÜNLÜĞÜ | Katılımcı:

AÇIKLAMALAR

Taban   Gölgelik 1   Bağlantı Vidası (24 adet)   LED ampul, kablo, fiş, duy

Gölgelik 2

Şablon 1   Şablon 2

Kağıt, kumaş gibi   İp türevi malzemelerle
malzemeleri kesmek için   deneme yapmak için

Aydınlatmanın Yapılışı ve Kişiselleştirilmesi

1 Malzemeleri bul.

Kendini yansıtan, evinde atık durumunda bulunan ya da özellikle biriktirdiğin, değerlendirmek istediğin, kağıt, kumaş, ip türevi malzemeleri topla.

2 Gölgeliklerini tamamla.

Şablonları kullanarak seni yansıtan gölgelikler yarat.

3 Tabanı oluştur.

Tabanı katla, bağlantı parçaları ile kulakçıklardan sabitle, tabanını oluştur. Duyu tabana yerleştir. Ampulu duya tak.

4 Parçaları bir araya getir.

Gölgeliklerini 3 boyutlu hale getir ve tüm parçaları birbirine bağlantı parçalarıyla sabitle.

1. GÜN - CUMA

Bugün ne yaptım?					
Kullandığım malzemeler/ parçalar					
Neden bu malzemeyi kullandım?					
Deneyimler (olumlu, olumsuz, nötr)					

Ürünü kullandım ☐	**Nerede kullandım?**	....
	Ne amaçla kullandım?	....

Örnek günlük sayfası

Bugün ne yaptım?	Tabanı oluşturdum.	İpli gölgeliği oluşturmaya başladım.	Taban ve iplerle oluşturduğum gölgeliği birleştirdim.		
Kullandığım malzemeler/ parçalar	Karton tabanı ve bağlantı parçalarını kullandım.	Rafya	Taban, gölgelik, bağlantı parçaları		
Neden bu malzemeyi kullandım?	—	Elimde bu malzeme vardı. Renkleri hoşuma gitti. ...	—		
Deneyimler (olumlu, olumsuz, nötr)	Karton malzeme kolay katlanabiliyor. Deliklerden bağlantı parçalarını geçirmekte zorlandım. ...	Önce delikli şablonla denemeler yaptım. Rafyayı küçük delikten geçirmekte zorlandım. Tamamladığım gölgelik güzel bir aydınlatma etkisi yaratacak gibi görünüyor. Denemek için sabırsızlanıyorum.	....		

Ürünü kullandım ✔	**Nerede kullandım?**	Odamda yere koydum.
	Ne amaçla kullandım?	Dinlenirken daha loş bir ortam sağlamak amacıyla kullandım.

404

ÖNERİLERİM

Ürünü iyileştirmeye yönelik önerilerim *(Örn. birleştirme detayları, malzeme, strüktür (yapıyı oluşturma), kişiselleştirme yöntemleri vb. ile ilgili öneriler)*

....
....
....
....
....
....

Süreçle ilgili diğer önerilerim *(Örn. günlüğün tasarımı, süreçle ilgili geri bildirim verme, vb.)*

....
....
....
....
....
....
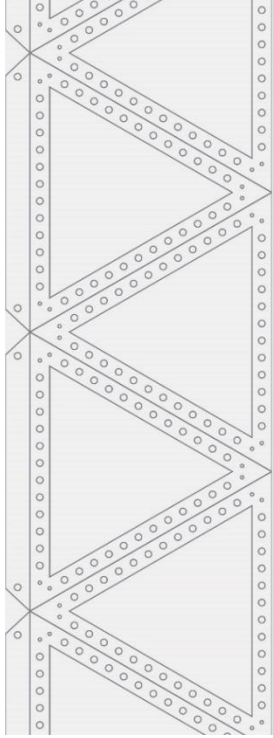
Çalıştay Yürütücüsü İletişim Bilgileri

Öğr. Gör. Ezgi OZAN

ezgi.ozan@yasar.edu.tr

Tel: 0535 781 94 42

N. Interview Schedule Used in the Generative Research Phase 2

N1: Turkish

Orta Doğu Teknik Üniversitesi
Mimarlık Fakültesi Endüstri Ürünleri Tasarımı Bölümü
Araştırma Konusu: Kişiselleştirme yoluyla kullanıcıların ürün tasarım sürecinde etkin kılınmasının sürdürülebilirlik için tasarıma etkileri

_____
Katılımcı: **Tarih:**

GÖRÜŞME KILAVUZU
Öncelikle aydınlatma önerisini kişiselleştirdiğiniz ve sürecinizi günlük ve fotoğraflarla aktardığınız için teşekkür ederim. Bu görüşmeyi, kişiselleştirme sürecinizi ve ürünle ilgili deneyimlerinizi daha detaylı öğrenmek için gerçekleştireceğim. Konuştuklarımızı daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için görüşmemizi kaydedeceğim. Görüşme yaklaşık yarım saat sürecek. Kimliğinizle ilgili bilgiler saklı tutulacak. Görüşmeye başlamadan önce sormak istediğiniz herhangi bir şey var mı?

A. Kişiselleştirme süreci

1. Bir haftalık süreçte, üründe hangi değişiklikleri yaptığınızı açıklar mısınız?
2. Üründe yaptığınız değişikliklerin nedenlerini açıklar mısınız?
3. Kişiselleştirme sürecinizde hangi malzemeleri/ürün parçalarını kullandınız?
4. Malzeme/ürün parçası seçimlerinizin nedenlerini açıklar mısınız?
5. Ürünü kişiselleştirirken herhangi bir problemle karşılaştıysanız, bunları açıklar mısınız?
6. (Günlükler üzerinden) Kişiselleştirme sürecinizde her bir müdahale yaklaşık ne kadar sürdü?

B. Sonuç ürün ve öneriler
7. İki gölgeliğin tasarım detaylarını nasıl değerlendirirsiniz? (kişiselleştirme kolaylığı, ışıkla ilişkisi, vb.)
8. Aydınlatmanın tasarımıyla ilgili önerileriniz varsa bunları açıklar mısınız?
9. Kişiselleştirdiğiniz aydınlatma hakkında ne düşünüyorsunuz?

C. Kullanım süreci
10. (Ürünü kullandıysanız) Nerede kullandınız?
11. Kullanım sürecinde herhangi bir problemle karşılaştıysanız, bunları açıklar mısınız?
12. Ürünü günlük hayatınızda kullanmak ister misiniz? Nedenlerinizi açıklar mısınız?

D. Katılımcının çektiği fotoğraflarla ilgili sorular

E. Araştırma süreci

13. Araştırma sürecini nasıl değerlendirirsiniz? (günlüklerin tasarımı, süreçle ilgili geri bildirim verme, vb.)

14. Araştırma süreciyle ilgili önerileriniz varsa, bunları açıklar mısınız?

N2: English

Middle East Technical University
Faculty of Architecture Department of Industrial Design
Research Subject: People's empowerment in the design process through product personalization for design for sustainability

_____
Participant: **Date:**

INTERVIEW SCHEDULE
First of all, thank you for personalizing the lighting proposition and for documenting your process with the diaries and photos. I will conduct this interview to learn more about your personalization process and your experiences regarding the product. I will record our interview to be able to remember and review what we talked about later. The interview will take about half an hour. Information about your identity will be kept confidential.

Is there anything you want to ask before beginning the interview?

A. Personalization Process
1. Could you explain, what kind of changes did you make on the product during one week?
2. Could you explain your reasons for the changes you have made on the product?
3. Which materials/product parts did you use during your personalization process?
4. Could you explain the reasons for your material/product part choices?
5. If you encountered any problems while personalizing the product, could you explain these?
6. (Reviewing the diaries) In your personalization process, how long did each intervention take?

B. Personalized toolkit and the suggestions
7. How would you evaluate the design details of the two shadings?
   (In terms of ease of personalization, lighting effect, etc.)
8. If you have any suggestions for the lighting design, could you explain them?
9. What do you think about the lighting that you have personalized?

C. Usage phase
10. (If you used the product) Where did you use the product?
11. If you encountered any problems while using the product, could you explain them?
12. Would you like to use the product in your daily life? Could you explain your reasons?

D. Questions about the photographs taken by the participant

E.   Research process

13. How would you evaluate the research process? (design of the diaries, giving feedback about the process, etc.)

14. If you have any suggestions regarding the research procedure, could you explain these?

O. Consent Form Used in the Generative Research Phase 3

O1: Turkish

Orta Doğu Teknik Üniversitesi (ODTÜ)
Mimarlık Fakültesi Endüstri Ürünleri Tasarımı Bölümü
Araştırma Konusu: Kişiselleştirme Yoluyla Kullanıcıların Ürün Tasarım Sürecinde Etkin Kılınmasının Sürdürülebilirlik için Tasarıma Etkileri

Yaratıcı Tasarım Araştırması - Katılımcı İzin Formu   Ağustos 2017

Değerli Katılımcı;
Bu çalışmada sizden istenen, **size verilen yarı tamamlanmış aydınlatma ürününü sahip olduğunuz el sanatı becerilerini kullanarak tamamlamanızdır (kişiselleştirmenizdir). Çalışmanın amacı ürün ve kişiselleştirme sürecinizle ilgili değerlendirmelerinizi almaktır.**

Araştırma sırasında elde edilen bilgiler yalnızca bilimsel amaçlarla, tasarım sürecinde, tez çalışmasında, bilimsel yayınlarda ve sunuşlarda kullanılacaktır. Katılımcıların kimlik bilgileri saklı tutulacaktır. **Araştırma iki hafta sürecek olup, ilk gün, size bir aydınlatma ürünü ile birlikte, bu ürün ve araştırma süreci hakkında bilgi verilecektir. Katılımcıların kişiselleştirme sürecinin yeterince belgelenemediği durumlarda, araştırmacının katılımcıları evlerinde ziyaret etmesi gerekebilir. Süreç sonunda, kişiselleştirdiğiniz ürün, izniniz dahilinde, eş-tasarımcı olan sizin de adınız verilerek olası bir sergide sergilenecek ve sergi hakkında size bilgi verilecektir. Sergiden sonra ürün size ait olacaktır.** Konuşulanları ve süreci daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için, süreç içinde yapılacak görüşmeler kaydedilecektir. Görüşme sırasında fotoğraf makinesi, video ve ses kayıt cihazı kullanılacaktır.

Bu formu imzalayarak yapılacak araştırma konusunda size verilen bilgiyi anladığınızı, çalışmaya katılımınızı, ürünü eksiksiz ve çalışır durumda teslim aldığınızı onayladığınızı belirtmiş oluyorsunuz. Araştırma, katılımcılar açısından herhangi bir risk taşımamaktadır. Formu imzalamış olmanız yasal haklarınızdan vazgeçtiğiniz anlamına gelmemektedir; ayrıca araştırmacının, öğrencilerin, ilgili kişi ve kurumların yasal ve mesleki sorumlulukları devam etmektedir. Bununla birlikte, bir eğitim projesi kapsamında paylaşılan tasarım önerisinin kullanım sürecinde oluşan sorunlar katılımcılara aittir. Çalışmaya katılım gönüllülük esasına dayanır. Görüşme sürecinin başlangıcında veya herhangi bir aşamasında açıklama yapılmasını veya bilgi verilmesini isteyebilirsiniz. İstediğiniz zaman gerekçe belirtmeksizin çalışmanın durdurulmasını talep edebilirsiniz. Araştırmaya katkıda bulunduğunuz için teşekkür ederim.

Katılımcının adı soyadı   **İmza**   **Tarih**

Araştırmacının adı soyadı   **İmza**   **Tarih**

Araştırmacı: Öğr. Gör. Ezgi OZAN
ODTÜ Endüstri Ürünleri Tasarımı Bölümü, Doktora öğrencisi
ezgi.ozan@yasar.edu.tr
Tel: 0535 781 94 42

Tez Yöneticisi: Doç. Dr. Çağla DOĞAN
ODTÜ Endüstri Ürünleri Tasarımı Bölümü
dcagla@metu.edu.tr

O2: English

Middle East Technical University (METU)
Faculty of Architecture Department of Industrial Design
Research Subject: People's empowerment in the design process through product personalization for design for sustainability

Generative Research – Consent Form   August 2017

Dear Participant;
In this study, you are asked to **complete (personalize) the semi-finished lighting product that you have received, using your own craft skills. The purpose of the study is to take your evaluations about the product and your personalization process.**

The information collected during the research will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes. The identity of the participants shall be reserved. **The study will last for two weeks, and on the first day, you will be given a lighting product and informed about the product and the research process. In cases where the participants' personalization process cannot be sufficiently documented, the researcher may need to visit the participants at home. At the end of the process, the product you personalized will be exhibited in a possible exhibition with your consent and your name as the co-designer, and you will be informed about the exhibition. After the exhibition, the product will belong to you.** To be able to recall and review the process later, interviews conducted in the process will be recorded. Camera and voice recorder will be used during the interviews.

By signing this form, you will be agreed that, you understand the information provided to you about the research, your participation in the research, and that you you have received the product in a complete and working condition. The research does not have any risks for the participants. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. However, the responsibility of the problems that arise during the usage of the design proposal, which is shared within the scope of an educational project, belong to the participants. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

Participant's Name   **Signature**   **Date**

Researcher's Name   **Signature**   **Date**

Researcher: Ezgi OZAN
METU Department of Industrial Design, Ph.D. Candidate
ezgi.ozan@yasar.edu.tr
Tel: 0535 781 94 42

Thesis Supervisor: Assoc. Prof. Dr. Çağla DOĞAN
METU Department of Industrial Design
dcagla@metu.edu.tr

P.   Diary Used in the Generative Research Phase 3

KİŞİSELLEŞTİRİLEBİLİR AYDINLATMA

KATILIMCI GÜNLÜĞÜ

Katılımcı:

AÇIKLAMALAR

1. Aydınlatma ve Kişiselleştirme Süreci

El becerilerinizi kullanarak kişiselleştirebileceğiniz **5 yüzey, takılıp çıkarılabilmekte** ve **her bir yüzey** kumaşı gerebildiğiniz **kasnak görevi görebilmektedir.**

Aydınlatma yüzeylerini nasıl kişiselleştireceğim?

- Size verilen etamin kumaşları, kasnak detayıyla yüzeylere gerip çalışabilir,
- Daha önce yapmış olduğunuz çalışmaları ürünün farklı yüzeylerine yerleştirebilir,
- Başka bir kumaş türü tercih edip, o kumaşla çalışma yapabilir,
- İsterseniz ahşap yüzeye de müdahale edebilirsiniz.

Araştırmada sizden istenen, aydınlatma önerisini sizi, beğenilerinizi, el becerilerinizi yansıtacak şekilde kişiselleştirmenizdir. Bir başka deyişle, ürünün eş-tasarımcısı olarak, aydınlatmayı size ait hale getirmeniz beklenmektedir.

2. Kişiselleştirme Sürecinin Belgelenmesi

Kişiselleştirme sürecinizi belgelemeniz için, size bu günlük ve fotoğraf çekiminde kullanmanız için 1 fon kartonu verilmiştir. Günlüğü nasıl dolduracağınız, örnek günlük sayfasında gösterilmiştir. Günlükte, yaptığınız müdahaleleri ilgili satırlara kısaca not almanız ve müdahalede bulunduğunuz günün tarihini atmanız istenmektedir. Dilerseniz telefonunuza ses kaydı yaparak daha ayrıntılı bilgi verebilirsiniz. Sürecinizi fotoğraflarken, her aşamada birkaç fotoğraf çekmenizi ve bunlardan birini fon kartonunun önünde çekmenizi rica ederim.

Neleri fotoğraflayacağım?

- Ürünü kişiselleştirirken yaptığınız müdahaleleri
- Karşılaştığınız problemleri
- (Ürünü kullanırsanız) Kullanım sürecini, kullanım yerini
- Yaptığınız denemeleri
- Değişiklik yaptığınız tüm aşamaları

Fotoğraf kalitesini görmem ve sürecinizi evinizde fotoğraflamama gerek olup olmadığını anlayabilmem için, **ilk çektiğiniz fotoğrafı, arka kapakta yer alan e-posta adresine ya da telefon numarasına Whatsapp üzerinden göndermenizi rica ederim.**

AÇIKLAMALAR

3. Aydınlatmanın Kişiselleştirilmesi ve Kurulumu

A) Kumaşlarınızı kasnak detaylı yüzeylere gerin. El becerilerinizi kullanarak, gerdiğiniz kumaşı aydınlatmanızın gölgeliklerini oluşturmak üzere kişiselleştirin. Önceden yaptığınız bir çalışmayı da yüzeylere takabilirsiniz.

C) Kişiselleştirilmiş aydınlatma yüzeylerinizi önce tabana yerleştirin. En son, tavan yüzeyini takın.
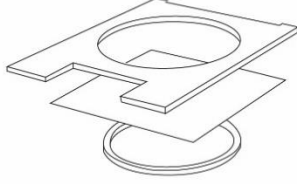
B) Ayakları taban yüzeyine yerleştirin. Ampul ve duyu takın.

ÖRNEK GÜNLÜK SAYFASI

	📷✓	📷✓	📷✓	📷☐	📷☐
Bugün ne yaptım?	Aydınlatmanın bir yüzeyine kumaş gerdim.	Kanaviçeyle çalışacağım deseni belirledim. Kumaşın üzerine deseni çizdim.	Kanaviçeyle yüzeyde deseni oluşturdum.		
Kullandığım malzemeler/ parçalar	Etamin	Kurşun kalem, etamin	Kanaviçe ipi, iğne, etamin		
Neden bu malzemeyi/ parçayı kullandım?	Kanaviçe çalışması için uygun olduğu için.	—	—		
Deneyimler (olumlu, olumsuz, nötr)	Kumaşı kasnak yerine aydınlatmanın üzerine gerebilmek pratik oldu.	....	....		

Ürünü kullandım ☐	**Nerede kullandım?**	Salonda sehpanın üzerinde kullandım.
	Ne amaçla kullandım?	Dinlenirken daha loş bir ortam sağlamak amacıyla kullandım.

1. GÜN (Tarih: ....)

	📷☐	📷☐	📷☐	📷☐	📷☐
Bugün ne yaptım?					
Kullandığım malzemeler/ parçalar					
Neden bu malzemeyi/ parçayı kullandım?					
Deneyimler (olumlu, olumsuz, nötr)					

Ürünü kullandım ☐	**Nerede kullandım?**	....
	Ne amaçla kullandım?	....

ÖNERİLERİM

Ürünün tasarımıyla ilgili önerilerim (Birleşme detayları, malzeme, vb. ile ilgili öneriler)

....

....

....

....

Kişiselleştirme süreciyle ilgili önerilerim (Birleşme detayları, malzeme, vb. ile ilgili öneriler)

....

....

....

....

Araştırma süreciyle ilgili önerilerim (Araştırmanın süresi, günlüğün tasarımı, verilen bilgiler vb. ile ilgili öneriler)

....

....

....

....

Araştırmacı İletişim Bilgileri

Öğr. Gör. Ezgi OZAN
ezgi.ozan@yasar.edu.tr
Tel: 0535 781 94 42

Q. Interview Schedule Used in the Generative Research Phase 3

Q1: Turkish

Orta Doğu Teknik Üniversitesi
Mimarlık Fakültesi Endüstri Ürünleri Tasarımı Bölümü
Araştırma Konusu: Kişiselleştirme yoluyla kullanıcıların ürün tasarım sürecinde etkin kılınmasının sürdürülebilirlik için tasarıma etkileri

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Katılımcı: **Tarih:**

GÖRÜŞME KILAVUZU
Öncelikle aydınlatma önerisini kişiselleştirdiğiniz ve sürecinizi günlük ve fotoğraflarla aktardığınız için teşekkür ederim. Bu görüşmeyi, kişiselleştirme sürecinizi ve ürünle ilgili deneyimlerinizi daha detaylı öğrenmek için gerçekleştireceğim. Konuştuklarımızı daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için görüşmemizi kaydedeceğim. Görüşme yaklaşık yarım saat sürecek. Kimliğinizle ilgili bilgiler saklı tutulacak. Görüşmeye başlamadan önce sormak istediğiniz herhangi bir şey var mı?

A. Kişiselleştirme süreci
1. Ürünü kişiselleştirme süreciniz nasıl ilerledi?
      1.1 Bu süreçte hangi el becerilerini kullandınız?
      1.2 Ürünü kişiselleştirirken başka ne tür el becerileri kullanılabilirdi? Neden?
      1.3 Ürünü kişiselleştirirken hangi malzemeleri kullandınız?
      1.4 Malzeme seçimlerinizin nedenini açıklar mısınız?
      1.5 Ürünü kişiselleştirirken başka ne tür malzemeler kullanılabilirdi? Neden?
      1.6. Kişiselleştirme sürecinizde ön denemeler yaptınız mı? Yaptıysanız açıklar mısınız?
      1.7 Kişiselleştirme sürecine başkaları da katıldı mı? Evet ise, hangi açılardan sürecinizi etkiledi(ler)? (Fikir verme, yapım süreci, …)
      1.8 Üründe yaptığınız değişikliklerin nedenlerini açıklar mısınız?
      1.9 Kişiselleştirme sürecini nasıl değerlendirirsiniz? Olumlu, olumsuz yönler…
      1.10 Kişiselleştirme süreciyle ilgili önerileriniz varsa açıklar mısınız?
      1.11 (Günlükler üzerinden) Kişiselleştirme sürecinizde, yaptığınız her bir müdahale yaklaşık ne kadar sürdü?

B. Sonuç ürün ve öneriler

2. Kişiselleştirdiğiniz ürünü nasıl değerlendirirsiniz?

Olumlu, olumsuz yönler.

3. Kişiselleşitrdiğiniz parçaları aydınlatma kalitesi açısından nasıl değerlendirirsiniz?

4. Ürünün tasarımı ile ilgili önerileriniz varsa açıklar mısınız?

C. Kullanım süreci

5. (Ürünü kullandıysanız) ne zaman kullanmaya başladınız?

6. (Ürünü kullandıysanız) Ürünü nerelerde kullandınız?

7. Ürünün kullanım aşamasını nasıl değerlendirisiniz?
   Olumlu, olumsuz yönleri…

8. Kullanım süreciyle ilgili önerileriniz neler?

9. Ürünü kullanmaya başladıktan sonra değişiklikler yaptınız mı? Yaptıysanız bunlar neler?

10. Ürünü kullanmaya devam etmek ister miydiniz? Evet/Hayır ise nedenlerini açıklar mısınız?

D. Katılımcının çektiği fotoğraflarla ilgili sorular

E. Araştırma süreci

11. Çalışmanın ilk günü ürün ve araştırma süreci hakkında size verilen bilgileri nasıl değerlendirirsiniz?

12. Günlüklerde yer alan açıklamaları nasıl değerlendirirsiniz? Önerileriniz varsa açıklar mısınız?

13. Araştırma süreciyle ilgili önerileriniz varsa belirtir misiniz? (Günlük doldurma, fotoğraflama, vb. süreçler)

14. Kişiselleştirme sürecinizin ve sonuçlarının olası bir sergide paylaşılmasını ister misiniz? Evet/Hayır ise nedenlerini açıklar mısınız?

Q2: English

Middle East Technical University
Faculty of Architecture Department of Industrial Design
Research Subject: People's empowerment in the design process through product personalization for design for sustainability

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Participant: **Date:**

INTERVIEW SCHEDULE
First of all, thank you for personalizing the lighting proposition and for documenting your process with the diaries and photos. I will conduct this interview to learn more about your personalization process and your experiences regarding the product. I will record our interview to be able to remember and review what we talked about later. The interview will take about half an hour. Information about your identity will be kept confidential.

Is there anything you want to ask before beginning the interview?

A. Personalization Process
1. How did your personalization process progress?
    1.1 Which skills did you use in your personalization process?
    1.2 Which skills could be used when personalizing the product other than the one(s) you used? Why?
    1.3 Which materials did you use to personalize the product?
    1.4 Could you explain the reasons behind your material selection process?
    1.5 Which materials could be used when personalizing the product other than the one(s) you used? Why?
    1.6. If you made any preliminary work during your personalization process, could you explain these?
    1.7 Did anyone else participated in the personalization process? If yes, in what ways did (s)he affect your process? (Idea exchange, building process, etc.)
    1.8 Could you explain the reasons of the changes you made on the product?
    1.9 How would you evaluate the personalization process? (Positive, negative aspects)
    1.10 If you have any suggestions regarding the personalization process, could you explain these?
    1.11 (Reviewing the diaries) In your personalization process, how long did each intervention take?

B. Personalized toolkit and the suggestions

2. How would you evaluate the product that you personalized? (Positive, negative aspects)
3. How would you evaluate the parts that you personalized in terms of lighting quality?
4. If you have any suggestions about the design of the product, could you explain these?

C. Usage phase

5. (If you used the product) When did you start using the product?
6. Where did you use the product?
7. How do you evaluate the usage of the product? (Positive, negative aspects)
8. What are your suggestions on the usage process?
9. Did you make any changes after you started using the product? If so, what are these?
10. Would you like to continue using the product? If yes/no, can you explain your reasons?

D. Questions about the photographs taken by the participant

E. Research process

11. How would you evaluate the information given to you about the product and research process on the first day of the study?
12. How would you evaluate the descriptions in the diaries? Could you explain if you have any suggestions?
13. Could you explain if you have any suggestions regarding the research process? (Procedures such as filling out the diaries, taking the photographs)
14. Would you like to share your personalization process and the product you personalized in a possible exhibition? If yes/no, could you explain your reasons?

R. Think-Aloud Protocol Used in the Generative Research Phase 3

R1: Turkish

Orta Doğu Teknik Üniversitesi
Mimarlık Fakültesi Endüstri Ürünleri Tasarımı Bölümü
Araştırma Konusu: Kişiselleştirme yoluyla kullanıcıların ürün tasarım sürecinde etkin kılınmasının sürdürülebilirlik için tasarıma etkileri

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Katılımcı: **Tarih:**

SESLİ DÜŞÜNME PROTOKOLÜ
Bu oturumu, kişiselleştirme sürecinizde gerçekleştirdiğiniz aşamaları gözlemleyebilmek ve ürün ve kişiselleştirme deneyiminizi daha iyi anlayabilmek için gerçekleştireceğim. Görüşme sürecinde sizden bazı eylemleri gerçekleştirmenizi isteyeceğim. Bu süreçte, sesli bir şekilde yaptığınız eylemlerden, nedenlerinden, olumlu ve olumsuz deneyimlerinizden bahsetmenizi rica ediyorum. Araştırma sürecini daha sonra tam olarak hatırlayabilmek ve gözden geçirebilmek için görüşmemizi video kamera ile kaydedeceğim. Süreç yaklaşık yarım saat sürecek. Kimliğinizle ilgili bilgiler saklı tutulacak.

Görüşmeye başlamadan önce sormak istediğiniz herhangi bir şey var mı?

Eylem 1 – Ürünü parçalarına ayırma
Lütfen ürünü parçalarına ayırır mısınız?
1. Ürünü parçalarına ayırırken yaşadığınız problemler olduysa açıklar mısınız?

Eylem 2 - Kişiselleştirilmiş yüzeyleri değiştirme
1. Kişiselleştirme sürecinizde ön denemeler yaptınız mı? (Evet ise) bu parçaları kullanıp kullanmayacağınıza nasıl karar verdiniz?
2. Deneme yaptığınız yüzeylerde hangi el becerilerini kullandınız?
3. Deneme yaptığınız yüzeylerdeki malzeme seçimlerinizin nedenini açıklar mısınız?

Eylem 2a - Daha önceden deneme olarak yapılan kişiselleştirilmiş parçalarla var olan parçaları değiştirme (Deneme yapıldıysa)
Lütfen, daha önceden deneyip de üründe kullanmadığınız parçalarla şu an üründe bulunan parçaları değiştirir misiniz?

Eylem 2b - Kişiselleştirilmiş parçaları çıkarıp tekrar takma (Deneme yapılmadıysa)
Lütfen kişiselleştirdiğiniz yüzeyleri aydınlatmadan çıkarıp tekrar kurabilir misiniz?

4. Kişiselleştirme sürecinizde yüzeyleri yerleştirirken karşılaştığınız sorunlar olduysa açıklar mısınız?

5. Aydınlatmadaki yüzeyleri değiştirmenizi sağlayan detaylarla ilgili önerileriniz varsa açıklar mısınız?

Eylem 3 - Aydınlatma parçalarını yeniden bir araya getirme
Lütfen ürünün parçalarını tekrar bir araya getirebilir misiniz?

1. Aydınlatma parçalarını bir araya getirmenizi sağlayan tasarım detaylarını nasıl değerlendirirsiniz?
2. Birleştirme detaylarıyla ilgili önerileriniz neler?
3. Parçaları bir araya getirirken karşılaştığınız problemler olduysa açıklar mısınız?
4. Aydınlatmayı nerelerde kullanmayı tercih edersiniz? Neden?
5. Aydınlatmayı başka şekilde kullanmak ister misiniz? Neden?

R2: English

Middle East Technical University
Faculty of Architecture Department of Industrial Design
Research Subject: People's empowerment in the design process through product personalization for design for sustainability

_____

Participant: **Date:**

THINK-ALOUD PROTOCOL
I am conducting this session to observe the tasks you performed in your personalization process, and to better understand your product and personalization experience. I am going to ask you to perform some tasks in this session. During this process, I would ask you to talk about your actions, reasons of your actions, and positive and negative experiences. I will record the interview with a video camera to be able to remember and review the research process later. The process will take about half an hour. Information about your identity will be kept confidential.

Is there anything you want to ask before the interview?

Task 1 – Disassembling the product
Could you disassemble the product?
1. If you experienced any problems while disassembling the product, could you explain these?

Task 2 – Changing the personalized surfaces
1. Did you make any preliminary work in your personalization process? (If yes) how did you decide whether to use these parts?
2. Which skills did you use in your preliminary work?
3. Could you explain the reasons of your material choices of your preliminary work?

Task 2a – Replacing the existing parts with the previously personalized parts (If preliminary work was done)
Could you replace the parts that are on the product with the parts you tried before and did not use in the product?

Task 2b – Removing and re-attaching the personalized parts (If no preliminary work was done)
Could you please remove the personalized surfaces and attach them again?

4. If you experienced any problems while placing the surfaces in your personalization process, could you explain these?
5. If you have any suggestions about the details that enable you to change the surfaces of the lighting, could you explain these?

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Task 3 – Re-assembling the toolkit parts
Could you please re-assemble the product parts?

1. How would you evaluate the design details that enable you to connect the product parts?
2. What are your suggestions about the connection details?
3. If you experienced any problems while connecting the product parts, could you explain these?
4. Where would you prefer to use the lighting? Why?
5. Would you like to use the lighting in another way? Why?

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

Degree	Institution	Year of Graduation
MS	METU Industrial Design	2008
BS	METU Industrial Design	2005
High School	Selma Yiğitalp High School, İzmir	1999

WORK EXPERIENCE

Year	Place	Enrollment
2014-Present	Yaşar University	Lecturer
2014	Atılım University	Lecturer
2013	Atılım University	Research Assistant

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS

1. Ozan Avcı, E., Doğan Ç. (2018). "Birlikte Tasarım Sürecine Yerel Bir Yaklaşım: Nakış Becerilerini Etkin Kılan ve Kişiselleştirme Sürecine Olanak Veren Aydınlatma Tasarımı". UTAK 2018 Proceedings; September 12-14, 2018, METU, Ankara, 29-44.

2. Ozan, E., Doğan Ç. (2017). "Exploration of the Ways of Empowering People in the Design Process through Product Personalization". Proceedings of PLATE 2017 Conference; November 8-10, 2018, Delft, Netherlands, 334-339.

3. Ozan, E., Doğan Ç. (2014). "Kişiselleştirme Yoluyla Kullanıcıları Tasarım Sürecinde Etkin Kılan Yöntem ve Yaklaşımların Sürdürülebilirlik için Ürün Tasarımı Açısından Değerlendirilmesi". Proceedings of UTAK 2014 Conference; September 10-12, 2014, METU, Ankara, 157-172.