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## Article

# Categories and Design Properties of Inherited Long-Lasting Products

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**Abstract:** As a counter-reaction to the increasing speed at which products are consumed, companies have embraced the idea of designing products that last longer. To understand characteristics of long-lasting products, this paper examines the product categories and design properties of products that are inherited, and thus have a prolonged product lifetime. Based on previous research, we propose a theoretical framework with product categories and design properties for inherited products. We then deploy this framework on an empirical dataset of 175 inherited products that are identified through participants' self-assessments. These are then analyzed in respect to 18 product categories and three overall groups of design properties: emotional properties (memories and brand), functional properties (functions), and aesthetic properties (colors and materials). Our study shows that the most inherited product categories are kitchenware (24%), furniture (21%), home decoration (14%) and jewelry (12%); it also shows that the reasons for keeping inherited products differ across product categories. However, inherited products commonly display honest and/or gracefully aging material, colors that reflect the material choice, single functions, and functional independency—that is, they do not rely on other products to function.

**Keywords:** inherited products; heirlooms; longevity; attachment; product lifetime; sustainability



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## 1. Introduction

Today, the lifetime of consumer products is in rapid decline [1–3]. We purchase, consume, and throw away products at an ever-increasing speed that is not sustainable and goes against the UN Sustainable Development Goal of ensuring sustainable consumption and production patterns (12th UN SDG) [4]. Moreover, the topic of sustainability and product lifetime has become increasingly popular, for example, reflected by the foundation of the Product Lifetimes and the Environment conference in 2015.

Although many scholars have worked with product lifetime and longevity, a recent review states that many questions remain unanswered regarding the discussion of how to design long-lasting products [1]. Further, several studies have researched consumer perception of longevity in specific product categories [5,6]. In this paper, we examine the product categories and characteristic design properties of inherited products. We aim to understand if there are distinct product categories and design properties of inherited products, and if so, what characterizes products that remain valuable over time and are ultimately passed on from one generation to another. Within this research, we define “inherited products” as products that have been owned and used by someone before they are passed on, for free, to a new owner (in most cases relatives). Further, we use “design properties” to refer to product characteristics that a product designer can consider when designing, for example, colors, material, etc.

The literature discussing inherited products is limited and, to our knowledge, predominantly focuses on studies on the sentimental value of products, e.g., [7–9]. The research, for example, includes studies on emotional attachment to family heirlooms [7]. However,

the current understanding of design properties for inherited products that go beyond the sentimental value is limited. We argue an understanding of design properties beyond emotional attachment will contribute to research on product longevity and be more operational in practice.

With this paper, we propose that the inheritance of products differ across product categories, and that the properties allowing products to survive more than one generation of owners has received limited research attention, and these may differ across product categories. To identify product categories and design properties, in order to build a theoretical framework, we turn to two streams of literature. First, the literature on product longevity and lifetime that, among other issues, deals with the product categories of long-lasting products. We argue that inherited products are long-lasting products. Second, we review the literature concerning design properties, beyond emotional attachment, relevant for products that are inherited and reused. We then propose a theoretical framework grounded in this literature with a set of categories and design properties for understanding and analyzing inherited products. The framework is then used to conduct a design analysis of 175 photos of inherited products selected and described by participants. This allows us to identify and further detail our understanding of categories and characteristic design properties of inherited products. Finally, the paper concludes with a discussion of the contribution of our study to the research on product longevity, lifetime, and inheritance and practical implications with an elaboration of product categories and design properties that may be key to designing products that last beyond one owner.

## 2. Theoretic Framework

Almost everyone owns products they have inherited. In this study, we aim to fill an important gap in the research on product lifetime and long-lasting products, as we seek to understand the design properties that characterize products that are long lasting in the sense that they are passed on from one generation to the next. As research on inherited products is scarce and mostly adopts the perspective of sentimental value and emotional properties [7,8], we draw on research on product longevity [1] and refurbished products [10], as we are interested in identifying relevant design properties that are distinct and common to products that have multiple owners over time.

### 2.1. Product Categories

Research shows that attitudes towards products in general differ depending on product categories [7,11]. Mugge et al. [10], for example, finds the potential risk of obsolescence is higher in what they refer to as dynamic products such as computers, smartphones, etc. due to the high level of technology. Whereas static products such as kettle, iron, etc., do not become obsolete easily. In line with this, we suggest that this may also be the case for inherited products, and that some product categories may be more suitable or likely to be inherited than others.

Prior studies also show that consumers' requirements for purchasing refurbishing products differ depending on the product categories. Further, these relates to different reasons for either rejecting or accepting a pre-owned refurbished product [10]:

1. Financial: The financial benefit; the price gap between buying a new and a refurbished product must be significant;
2. Functional properties: "What you see is what you get"; must be easy to validate the functionality, must be easy to repair;
3. Aesthetic properties: "Hidden products," such as a drill or iron, can be accepted even with visual damage, whereas "visible" products or products used to express an identity, such as watches, sunglasses, or wallets, must look new;
4. Warranty: A warranty makes people more willing to buy refurbished;
5. Contamination: Some products are perceived as more "contaminated" by the previous user; this is often the case for food-related products;

6. Personalization: Personalized products, such as prescription glasses, are less likely to be bought refurbished; products worn close to the body are similar.

Even though previous studies show that consumers have an interest in purchasing long-lasting products [12,13], the reasons for acquiring and keeping a product has received limited attention in the literature [6,10]. Therefore, we examine which product categories are inherited and whether differences in design properties exist across these.

To our knowledge, product categories relating to inherited products have only been briefly explored, cf. [7]. Therefore, to understand whether there are some product categories that are more likely to be inherited than others, we first identify relevant product categories. Building on the United Nations Statistics Division classification of product consumption categories [4] (also used in a published study by [6]), we construct a comprehensive list of eighteen product categories, including:

1. Bicycles
2. Cars
3. Clothing
4. Electronic goods
5. Floor coverings
6. Footwear
7. Furniture
8. Household textiles
9. Jewelry, clocks, and watches
10. Kitchenware
11. Large kitchen appliances
12. Musical instruments
13. Power tools for the home and garden
14. Small household appliances
15. Small tools and fittings
16. Space heating and cooling products
17. Sports equipment
18. Toys and games

Prior studies show consumers' requirements and attitudes towards products differ depending on these product categories. Gnanapragasam et al. [6], for example, finds a difference in purchasing factors across these. E.g., in product categories such as clothing, floor coverings, household textiles, jewelry, clocks and watches and kitchenware, the appearance was extremely important. In contrast, the longevity shows to be extremely important in product categories such as cars, electronic goods, floor coverings, furniture, large kitchen appliances, power tools for the home and garden and space heating and cooling products [6]. As differing purchasing factors are important depending on products categories, in line with this we also suggest that different design properties are relevant in determining whether products are suitable for inheritance.

## 2.2. Product Properties

### 2.2.1. Emotional Properties

In the following, we delve into the literature on emotional properties to understand the sentimental values, explaining why we keep things, or what product categories we tend to keep more than others. Emotional properties, according to prior research, is the most significant reason for keeping products. The concept has received considerable research attention under concepts such as *product relation*, *consumer-product attachment*, *emotional attachment*, or *product attachment* [7–9,14]. While recent studies agree on the importance of emotional attachment, they differ in the number of underlying categories. Moreover, many of these studies focus on the time perspective concerning the owner's change in attachment over time [8].

Page [7] investigated what kinds of products people feel different kinds of attachment to. In his study, 36 participants each brought three products (in physical form, photos

and in some cases detailed descriptions) to which they felt attached. This was followed by interviews on how the owners' attachment affects their attitude toward replacing the products. The study showed that memories are the strongest kind of attachment, making the owners the least positive toward replacing their belongings. As it is difficult to define the product categories to which people become emotionally attached, and which have received limited attention in the current literature [2], we strive to understand the characteristics of product categories of inherited products.

Emotional properties shaped by memories strengthens the product-relation [15]; nevertheless, the user must also be satisfied with the product's functionality, in order for it to be pleasurable [16]. Page's study [7] also revealed that across the 108 products, there were five different factors influencing the consumer-product attachment: memories, pleasure, appearance, usability, and reliability. However, as product attachment due to pleasure, appearance, usability, and reliability relates to the functional and aesthetic properties of products, we argue that they may be more operational and more elaborately described if investigated as a separate objectively described parameter. Moreover, the importance of these properties differs according to product categories. For example, watches reoccur due to their high aesthetic or sentimental value (e.g., as a family heirloom), whereas brand-new, high-tech electronic products appear frequently, explained by their tremendous functionality or visual appeal.

In relation to identifying design properties for product inheritance, we suggest that memories are not the core parameter to design for. Emotional attachment to a product often relies on a memory of a place, an event, a holiday, or the previous owner of the product [7]. Thus, the lifetime of such a product has more to do with the emotions a memory evokes than to the physical product and its durability. Therefore, emotional properties are not exclusively for product designers to control [2]. However, the branding of a products may also build emotional attachment [17,18].

Studies show brands to be influencing the product attachment as well, and that consumers can feel attached to a brand itself [17,18]. Brand value is intangible; however, Thomsen et al. [18] argues that just as people can be attached to a person and hence be willing to sacrifice something for that person, consumers can also feel attached to a brand, and thus sacrifice money on, e.g., limited edition products. Every product has a brand, but only some are receiving the emotional attachment [18]. Thus, we argue that besides the intangible value of a memory related to a product, some inherited products may also be kept due to brand value, rather than tangible qualities.

In the following, we complement and combine this research with the literature on non-sentimental (aesthetic and functional) design properties of pre-used, refurbished, second-hand, and long-lasting products.

Notably, when we refer to emotional properties, we only refer to the memory attachment and brand value of inherited products.

### 2.2.2. Functional Properties

Functional properties, are the properties related to the use of products, reflecting reliability, functionality, and performance. According to Jordan [16], products can have functional properties that fulfil specific need—that typically means they would have been bought anyway if they had not been inherited. Hence, this refers to products providing functionality, which is difficult to substitute with another type of product. Products may also be appreciated because of their functional properties, the smooth interaction they provide, or parts that fit perfectly together, and hence are satisfying to use. Prior research shows that people tend to feel badly about discarding functional products and replacing a product can be easier if the “old” product can be passed on to someone else [19]. This indicates that products providing reliable functionality may appear often among inherited products.

Studies [20,21] argued that products with a “simplistic design” retain their functional property over time, and hence postpone product obsolescence. As the same may apply to simplistic functions as well, we argue that studying the functional complexity of inherited

products can provide insight into how and which functional properties can extend the lifetime of a product. Functional properties may thus be related to how the complexity of a product's functionality affects its lifetime.

### 2.2.3. Aesthetic Properties

Aesthetic properties encompass the visual appearance of products. Prior research shows that the material choice is an important design parameter to consider for preventing product obsolescence [22]. The choice of materials influences how people perceive a product [23,24]. For example, people dislike products made of plastic, due to the environmental impact. Nevertheless, some products are “allowed” to be made of plastic if they have a hygienic purpose, such as food containers [16]. Gracefully aged materials are sometimes referred to as “materials with patina”; however, patina is not a quality reflecting a material's durability or resilience, but rather a social agreement on how the aging of materials is perceived [25,26]. Bridgens and Lilley [27] clarified the overall difference between what they called “natural materials” and “invented materials” (see Table 1) and how the aging of these materials is perceived.

**Table 1.** Perceptions of aged natural and invented materials adapted from research of Bridgens and Lilley [27].

Material Category	Materials	Definition
Natural materials	Wood, paper, stone, leather	Natural materials are imperfect from the beginning. The naturally varied surfaces blur the line between looking brand new and looking aged, making changes in natural materials more acceptable.
Invented materials	Plastic	Invented materials are made perfect to begin with, and thus, the perception is often that they must remain perfect. Hence, aging occurs suddenly and is undesired when the surface gets its first scratches, fades, or cracks.

Aesthetic properties are not equally important across all product categories. For hedonic products (e.g., vase, watch), the aesthetic properties are crucial; hence, the materials should be durable and age gracefully, or it should be possible to re-surface them. Whereas high-involvement products (e.g., computers, smartphones) are financial investments and can be supported by high functional or aesthetical properties, they do not depend on it [10]. To our knowledge, there is a gap in the literature regarding the relation between aging of materials [22] and product categories [10] that might contribute knowledge of useful design properties for inherited products.

Besides the choice of material, also the colors, finish, and form play a role in users' attitudes toward a product [7]. Different colors can awaken associations and can sometimes have functional properties as well (e.g., neon orange for road workers); other times, the colors are just part of the aesthetics [16]. Page [7] found that a timeless design is very important regarding people's likelihood of keeping products. Further, Wallner et al. [20] and Lobos [21] underlined the importance of a simplistic design (only very few ornaments and decorations) in extending a product's lifetime, since no fast trends affect aesthetics. Jordan [16] (p. 69) defined a timeless design as an honest design without unnecessary details. Hence, the design emphasizes the functionality of the product, unlike, for example, Victorian products, which were dominated by a lot of decoration. An honest design is closely related to the finish. For instance, a car with a plastic dashboard and fabric seats is expected to be cheap, whereas leather seats and a wooden dashboard gives an expensive feeling. In addition, the finish plays a significant role for users, since people will be dissatisfied if a product claims to be something it is not. For instance, if a purportedly wooden surface gets a scratch and, suddenly, it is exposed that it is actually veneer, the surface was “dishonest”, and the owner will be disappointed [16].

To our knowledge, there is a literature gap in knowledge of how materials and colors influence the lifetimes of different product categories.

### 2.3. Analytical Framework

First, our review showed that design properties differ significantly across product categories. Second, the design properties could be divided into emotional properties, functional properties, and aesthetic properties of inherited products (see Table 2).

**Table 2.** Product properties found in the literature (based on [7,16,17,27]).

Product Properties	Type	Definitions
Emotional properties	Memories	The product is used as a way of exploring/stimulating memories of a person, an event, a trip, etc. [7]
	Brand	Brands can influence product attachment, and hence create intangible value of a product [17,18]
Aesthetic properties	Appearance	Color, form, finishes [16] and materials [27]
Functional properties	Usability, Reliability, Pleasure	Functionality/interaction/tactile feedback, requires only little maintenance, “easy ownership,” lasts for years. [7,16]

### 3. Methodology

The research design follows a research methodology similar to the methodology used by Page [7], where participants select products (in this case inherited products) by their own choice, followed by questions upon each selected product to find the reasoning for keeping each one of them. Hence, the patterns of properties making products last for more than one generation are detected. It is as the study by Page [7], designed as a self-assessment consisting of 175 photos of inherited products. Instead of 10 min interviews, as in Page [7], we instead ask participants to share reflective descriptions answering the self-assessment in Table 3.

**Table 3.** Self-assessment—questions for reflective descriptions.

#	Question of Self-Assessment	Reasoning
1	Insert photo of inherited product	Visual identification of color, material, state, and type and possibly brand of the object. Helps to identify, e.g., similarities in color or material. Further, photos allow the participants to choose any inherited product regardless the size of it.
2	What did you inherit?	Open question calling for a description of the object. Participants might show a picture of unknown products; hence, an explanation is needed.
3	From whom did you inherit it?	To understand the potential sentimental value, and possibly indicate whether the object was passed through several generations.
4	Why do you still have the product?	The open-ended question allows the participant to provide qualitative insights in various reasons for keeping the object. This variety provides foundation for forming categories of product attachment without any bias.
5	What do you like about the product?	Open-ended question that provides qualitative insights into various reasons for keeping a product that goes beyond potential sentimental value.
6	What do you dislike about the product?	Open-ended question that provides qualitative insights into the balance between likes and dislikes of an object.
7	Has the product ever been repaired (and if so, how?)	If an object has been repaired, it may indicate strong attachments and possible also durability/repairability. This question provides information on the ratio of repaired products among inherited ones. Hence, gives insight on whether the inherited products lasts because they are significantly durable or because they are maintained and taken care of.

The participants within this research were identified using two strategies, availability (university students,  $n = 34$ ) and through reference—one participant asking another to partake. The participants were sampled to be regular users. Each participant was asked to

select one or more products they had inherited, take photos of them, and write descriptions. The participants ranged in age from young people in their twenties to people in their sixties, and included both males and females. Geographically, the sample was limited to participants from all over Denmark. The self-assessment was a template containing the following questions:

Once the self-assessments had been filled out, they were uploaded digitally. Thus, the research approach provides qualitative insights into specific cases alongside the quantitative amount of data providing general insights and patterns among inherited products.

### Analysis

To prepare for analyzing inherited products, the theoretical framework was tested in a smaller setting. Initially, using the properties found in the literature, 35 inherited products were analyzed. To investigate whether the right and relevant product categories and design properties had been identified, the results were discussed with the product owners. The test confirmed the theoretical framework to be useful in understanding the product categories and design properties of inherited products, but it also revealed that a previous theoretic framework with product categories from Mugge et al. [10] needed to be revised, and these were later replaced by an exhaustive list of product categories by united nations [4] and Gnanapragasam [6].

First, each product was categorized in respect to the characteristics of Table 4.

**Table 4.** Characterization framework.

#	Categories	Characteristics
1	Product category	Bicycles; Cars; Clothing; Electronic goods; Floor coverings; Footwear; Furniture; Household textiles; Jewelry, clocks and watches; Kitchen ware; Large kitchen appliances; Musical instruments; Power tools for the home and garden; Small household appliances; Small tools and fittings; Space heating and cooling products; Sports equipment; Toys and games
2	Specific product	E.g., bowl
3	Material, primary and secondary	Natural materials: Wood; Stone; Paper; Leather Invented materials: Plastic Other materials: Metal; Porcelain; Glass; Ceramics; Fabric; Crystal/gemstone; Pearl; Wool; Bone; Silk
4	Main color	Brown; White / transparent; Grey/Silver; Gold(en); Black; Blue; Red/pink; Green; Yellow; Multi
5	Product properties	Emotional property; Functional property; Aesthetic property
6	Repair	Repaired + how; Not repaired
7	No. of functions	Single function; More functions


The analysis began with filtering for overall things, such as product categories and reasoning for keeping the products, and then progressed to finding patterns in the relationships between two or more qualities.

To avoid biases, the product properties are characterized in respect to keywords occurring in the self-assessment (see keywords in Table 5), e.g., sample #10 (Tables 6 and 7) contains the words ‘*tradition*’ and ‘*easy to use*’, and is thus characterized as being kept due to emotional and functional qualities.

**Table 5.** Keywords for properties.

#	Properties	Keywords
1	Emotional	Memories, traditions, histories, mentioning of brand, mentioning of specific people/events/locations
2	Functional	Great function, easy use, easy to clean, reliability
3	Aesthetic	Like material, like color, like design, fits other products

**Table 6.** Example of self-assessment, sample #10.

#	Question of Self-Assessment	Answer
1	Insert photo of inherited product	
2	What did you inherit?	“A cookie press”
3	From whom did you inherit it?	“My mother”
4	Why do you still have the product?	“It’s the best tool for making Danish cookies. We use it 2–3 times a year. Especially around Christmas. The tool is a part of a tradition”
5	What do you like about the product?	“It is easy to use—you cannot really do anything wrong with it. It is very useful for its purpose and makes some nice looking Danish cookies”
6	What do you dislike about the product?	“It is hard to clean, and demands you to be very thorough. It takes some time”
7	Has the product ever been repaired (and if so, how?)	“The handle has been broken off, but is soldered on again”

**Table 7.** Example of coding, sample #10.

#	Categories	Characteristics
1	Product category	Kitchen supply
2	Specific product	Cookie press
3	Material, primary and secondary	Primary: Other materials: Metal Secondary: Natural materials: Wood
4	Main color	Grey/Silver
5	Product qualities	Emotional property + Functional property
6	Repair	Repaired: soldered
7	No. of functions	More functions

The following (Tables 6 and 7) shows an example of how a sample is handed in as self-assessment, and further how it is characterized in the following analysis.

## 4. Results

### 4.1. Inherited Product Categories

To create an overview of the inherited products, they have been sorted with use of the list of product categories by united nations [4] and Gnanapragasam [6], as shown in Table 8.

**Table 8.** Product categories based on [4,6], percentages, number of products and design properties.

Product Categories [4,6]	Percentages	Total Number	Emotional Properties	Functional Properties	Aesthetic Properties
Bicycles	-	0	-	-	-
Cars	-	0	-	-	-
Clothing	1%	2	2	0	2
Electronic goods	4%	8	5	7	6
Floor coverings	0%	1	1	0	0
Footwear	-	0	-	-	-
Furniture	1%	36	26	25	26
Household textiles	1%	1	0	1	0
Jewelry, clocks and watches	12%	21	19	6	18
Kitchenware	24%	42	33	35	29
Large kitchen appliances	-	0	-	-	-
Musical instruments	2%	4	3	0	2
Power tools for the home and garden	1%	1	1	1	0
Small household appliances	3%	5	1	5	1
Small tools and fittings	4%	7	5	3	4
Space heating and cooling products	-	0	-	-	-
Sports equipment	-	0	-	-	-
Toys and games	3%	6	6	4	1
Home decorations (category inductively emerged from data)	14%	24	24	8	18
Hobbies (category inductively emerged from data)	10%	17	13	6	10

Please note, some products reoccur in the three rightmost columns, since a product characterized with both functional and aesthetic properties will add +1 to each of these columns. Hence, the total number might be lower than the three rightmost columns added.

This research shows a great number of inherited kitchenware products, some of which are not easy to clean, such as old wooden coffee mills. This indicates that concerns about product contamination, found in previous studies [10], do not apply to the same extent to products previously owned by a family member or other well-known people. Likewise, this research implies that concerns about product contamination are also not a problem regarding inherited products worn closely to the body.

#### 4.2. Emotional Properties

This research shows that for the majority of inherited products, memories are only one part of the explanation for why the products are kept for more than one generation. Only 23 products have been kept exclusively due to sentimental value (often, memories of the previous owner), and in 35 cases, the products have been kept due to reasons other than the emotional properties. Hence, in 116 out of 175 cases, the products have other properties besides being inherited from a loved one, and thereby provide a way of revisiting memories of that person.

Twenty-three products are kept exclusively due to emotional properties, but not every product category has some of these products. Following are the product categories of which we found the product was kept exclusively due to emotional properties, and the following percentages refer to the proportion of the specific product category kept due to emotional

properties; floor coverings (100%), musical instruments (50%), toys (33%), hobbies (29%), home decoration (25%).

Products kept solely due to emotional properties have the largest variation in product categories, yet almost every one of them has something in common: except for three pieces of furniture and a guitar, the products are small and therefore easy to store.

#### 4.3. Functional Properties

More than three quarters of the products kept exclusively due to their functional properties are kitchenware and tools. Further, only 6% of the 175 inherited products are multifunctional.

Sixteen products are kept exclusively due to functional properties, but not every product category has some of these products. Following are the product categories of which we found the product was kept exclusively due to functional properties, and the following percentages refer to the proportion of the specific product category kept due to functional properties; small household appliances (60%), kitchenware (14%), small tools and fittings (29%). Products kept only due to their functional properties are often specialized, meaning that they have core functions they perform well, making minor dislike of the products less important to the user.

Only 17 inherited products are electrical, and besides the printer, all the electrical products are (what Mugge et al. [10] refers to as) static products. E.g., lamps and drills are inherited products, where the function hardly ever becomes obsolete; the products do not rely on other products to fully function, and the evolution of these products hardly outcompetes the old ones. Likewise, the non-electrical products kept due to their functionality also have the qualities of being static products. They provide functions that remain working and useful, e.g., plates, wrenches, books, and tables. Thus, inheriting static products will offer a financial (and possibly environmental) benefit. Furthermore, many of the products kept only due to their functional properties are low-involvement products kept because “it works” [sample #19] and “I got it for free” [sample #87]. Hence, in general, the owners do not care much about the aesthetics of these products as long as they remain functional.

Regarding the complexity of functions, 94.3% of the inherited products was found to be single-functional (as having only one function) and 5.7% was found to be multifunctional.

#### 4.4. Aesthetic Properties

Products kept only due to their aesthetic properties comprise the smallest group and constitute only 4% of the total number of inherited products. Product categories kept due to only aesthetic properties (6 products): hobbies (12 %), and jewelry (10%). Like the products with only emotional value, these products are relatively small, except for a piano (hobbies) and a sofa set (furniture). The sofa set is only used as a spare set for when many guests arrive, indicating that the owners have plenty of space to store things.

##### 4.4.1. Colors

To gain an overview of the colors observed, each product is characterized by its main color. Hence, white porcelain with decorations in another color is characterized as “white,” transparent products with colored decorations are characterized with the color, furniture (with or without upholstery) is characterized by the color of its frame. Products with many different equal colors are characterized as “multi”.

Main colors observed are: Brown (37%), White/transparent (18%), Gray/silver (11%), Gold/golden (9%), Black (7%), Multi (7%), Blue (5%), Pink/red (2%), Green (2%), Yellow (2%). Brown is the most frequently occurring color among the inherited products.

##### 4.4.2. Materials

The primary and secondary materials are selected depending on how large the visible areas of the materials are; therefore, screws, joints, foam inside a cushion, internal parts, etc.

are excluded. Consequently, upholstered wooden chairs are characterized as “wood” and “fabric,” and a porcelain figure containing only one material as “porcelain” and “none”.

As Table 9 shows, this study found a number of other materials besides the natural and invented ones. The three most dominating primary materials are found to be wood (33%), metal (27%) and plastic (10%). Regarding the secondary materials, the most frequently occurring materials were metal (15%), fabric (7%) and, wood (5%), plastic (5%), glass (5%).

**Table 9.** Materials of the observed inherited products.

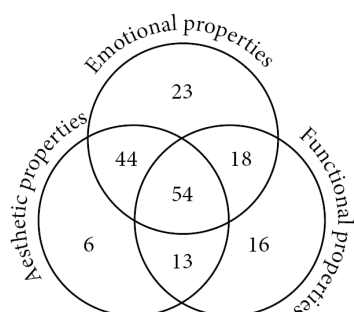
Material Category	Primary Materials	Secondary Materials
Natural materials [27]	Wood (33%)	Wood (5%)
	Leather (2%)	Leather (2%)
	Stone (2%)	Paper (2%)
	Paper (2%)	Stone (1%)
Invented materials [27]	Plastic (10%)	Plastic (5%)
Other materials	Metal (27%)	Metal (15%)
	Porcelain (9%)	Fabric (7%)
	Glass (6%)	Glass (5%)
	Ceramics (5%)	Crystal/gemstone (2%)
	Fabric (2%)	Pearl (1%)
	Crystal/gemstone (1%)	Silk (1%)
	Pearl (1%)	
	Wool (1%)	
	Bone (1%)	
		No secondary material: 55%

## 5. Discussion

### 5.1. Product Categories and Design Properties

Current literature touching upon inherited products focuses on emotional properties of family heirlooms (watches) [7]. However, this research shows that kitchenware and furniture alone cover almost half of the inherited products. In the literature on product attachment, memories are found to be the primary reason why consumers feel attached to their products and hence care to maintain and keep their products for longer [7–9].

The model below (Figure 1) is a graphical representation of owners’ reasons for keeping products in relation to emotional properties, aesthetic properties, and functional properties. In total, 45 out of 175 products have been kept due either to their aesthetic properties (6), functional properties (16), or emotional properties (23) alone. Thus, most inherited products are kept due to a mix of two or three of these properties.



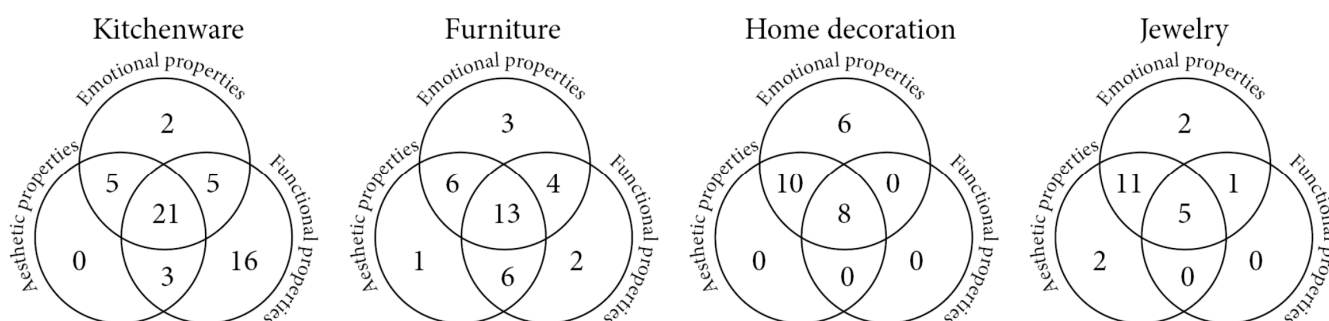
**Figure 1.** Exclusive reasoning among inherited products. Please note that the sum of products is only 174, because one product is not kept due to any of the properties. See explanation in Section 5.1. below.

In this study, the majority of inherited products is kept due to some level of emotional properties. Hence, this aligns with Page’s [7] research. However, we find 117 cases where people suggest aesthetic properties to be a factor explaining why they keep the products, and 101 cases where the functional properties is a part of the explanation. Therefore, this

study indicates that properties regarding product attachment and replacement [8] do not fully apply to inherited products.

One chair does not provide great comfort and the owner does not like its aesthetics and has no sentimental feelings toward it. All of the other inherited products are kept due to one or more of the three qualities. Further, none of the owners express that they plan to throw out any of the other 174 inherited products. Thus, the owners' significant statement of wanting to throw out this single product indicates that inherited products must fulfill one or more of these qualities to be kept.

The four biggest product categories are kitchenware (24%), furniture (21%), home decorations (14%) and jewelry (12%), respectively. As Figure 2 shows, the reasoning within the inherited product categories differs. E.g., home decorations and jewelry are highly dominated by emotional and aesthetic properties in combination. On the contrary, kitchenware is predominantly products kept due to functional properties. Furniture is a more mixed-up category, where the combination of two or more properties is frequently occurring.



**Figure 2.** Reasoning for keeping: Kitchenware (42 products), Furniture (36 products), Home decorations (24 products), Jewelry (21 products). Please note, that the sum of products in the furniture category is only 35, because one furniture is not kept due to any of the properties. See explanation in Section 5.1.

### 5.2. Inherited Plastic

Trends might affect what products are likely to be inherited. Hence, attitudes toward inherited versus new products, and what kinds of products are likely to be inherited, concerning materials, functionality, brands, etc., might change with time. For instance, the younger generations tend to dislike and avoid plastics and might not want to inherit plastic products even if they are in a condition that would enable them to be kept in use.

Bridgens and Lilley [27] asserted that plastics are considered to age ungracefully because aging occurs suddenly. However, Bridgens and Lilley [27] did not specify product category, which we determined from this research has an influence as well. In our study, twenty-six products have plastic as either their primary or secondary material, among which we identify the majority to be kitchenware, electronic goods and toys. However, we do not know for certain whether the small number of inherited plastic products is a sign of plastic being an un-trendy material, if it lacks durability, or if there is another explanation.

Further, Bridgens and Lilley [27] argued that people consider the aging of natural materials (wood, leather, stone, paper) as graceful, whereas invented materials (plastic) degrade. However, this study shows several other materials not included in their definition, including materials that, in our understanding, do not fit either of the two categories; one such example is a gemstone that, just like wood, is harvested from nature as a raw material but, unlike wood, has a surface without imperfections when it is cut to a diamond and sold by a jeweler. Hence, it lays somewhere between the definitions of Bridgens and Lilley [27]. To fully understand the qualities of the other materials, and hence why they may qualify as materials ideal for designing long-lasting products, further research is required.

### 5.3. Relationship between Color, Material, and Product Category

As identified in the theoretical framework, there is little to no literature linking color, material, and product category. However, our study shows some interesting and more nuanced relations. Most of the colors are a result of the materials; hence, most of the brown products have their color from wood and leather, and the white/transparent products are made of porcelain and glass. The few “added colors” (red/pink, multi, green, blue, yellow) are often muted, dusty, and with natural nuances. One might argue that the color nuances of, for example, the dusty blue ceramic jug, to some extent imitates the heterogeneous surface of wood, which Bridgens and Lilley [27] argued is the reason why wood is perceived as aging gracefully. The very small number of products with a completely homogenous colored surface might indicate that, in general, uneven surfaces age more gracefully and are consequently more frequent among inherited products.

Brown is found to be the most frequently occurring color (37%) among the inherited products. A possible hypothesis for this observation could be that brown shades hide dirt and stains to some extent better than other colors, and hence the wear and tear of old products is not as visible. However, based on this research, it can neither be confirmed nor denied, and thus a further study is required to clarify this. Among the brown products, only five are made of a material that is not naturally brown. Besides these five products, most of the other 60 brown products are wooden furniture. Likewise, the gold(en) and gray/silver products often obtain their color from the materials (gold, brass, silver, and other metals). Hence, a common factor across most of the inherited products is that they have an honest design [16], meaning that the surface does not mimic something else.

Regarding the white/transparent products, there is a clear pattern in product categories. Most of the white/transparent products are characterized as kitchenware (18 white/transparent kitchen supplies): dining sets, drinking glasses, and kitchen tools, such as mixers, coffee machines, and microwaves. What these products have in common is that they are used in a context requiring a high level of hygiene. Consequently, the white/transparent color might serve the functional purpose [16] of making it easier to see if the products are contaminated [10].

Common for the majority of the multicolored products (e.g., books, LPs, toys, and clothing) is that these that are not bought/kept/inherited to increase the aesthetics of one's home. They serve another purpose.

### 5.4. Electrical Products and Functions

Wallner et al. [20] argued that a simplistic aesthetic design could increase a product's lifetime. Considering the large number of single-function inherited products (94.3%), we argue that a simplistic design may not only apply to the aesthetic but also to the functional properties of a product.

In general, the numbers of both electrical and multifunctional products are low among the 175 inherited products. This confirms that the lifetimes of electronic products are in decline [28]. Only 10 out of the 175 products have more than one function: a carafe with a music box, printer/scanner, planer bench, three sets of LEGO, sofa bed, drill, cookie press with changeable tins, and mixer with accessories. Among the multifunctional products, one may argue that some of the products, such as the planer bench, drill, and perhaps the LEGO set, are multifunctional by definition. Across all the inherited products, only the carafe with a music box is a product with a core function (being a carafe) with an add-on function (being a music box).

Furthermore, only 17 products are electrical. Most of the electrical products are static products, such as lamps and kitchen tools, and hence cannot be connected to other products, etc., and the evolution of the technology of these products is slow. For instance, a lamp inherited from grandparents does not provide less lamp function compared to a brand-new lamp. The printer/scanner is characterized as both a multifunctional and electronic product; thus, it differs considerably from the other inherited products. Further, it is the

only product across the 175 inherited products that must be connected to other products (in this case, a computer) to be fully functional.

Hence, this research indicates that functions among products kept for generations are specific; the products cannot be used for multiple purposes; they have one specific purpose. If the products have multiple functions, it is because the specific product category in itself requires that the product has more than one function.

## 6. Contribution and Implications

With this research, we aimed to understand if there are distinct design properties of inherited products, and if so, what characterizes the products that are passed on for generations. We have investigated what inherited products have in common across different product categories in respect to emotional properties, such as the following: memories/sentimental value and brand; aesthetic properties, such as materials and colors; functional properties, such as functional complexity. Thus, rather than enticing the need to replace a product [29], our research has investigated the long-lasting attachment to products.

One can hardly argue against the importance of emotional value in the survival of products for more than one generation. However, this study suggests that other properties can be just as important depending on the product category. This research indicates that emotional properties (memories/sentimental value and brand), aesthetic properties (colors, materials, etc.), and functional properties (functional complexity) are core properties within inherited products. In this research, a product devoid of all three properties does not appear to have the right properties to be kept as heirlooms. Furthermore, this study indicates that the combination of two or more properties strengthens the chances of a product to be passed on.

### 6.1. Design Recommendations

For practitioners such as product designers, who have limited control over product attachment [2], this research suggests that they should consider the following product categories and design properties when designing. Among the inherited products, the largest groups of product categories were kitchenware, furniture, home decoration, and jewelry. Whereas many of the home decoration and jewelry products have been kept due to emotional and aesthetic properties, the kitchenware is kept for functional reasons, and the furniture due to a mix of the three. Hence, we specifically argue that practitioners should consider the following design properties to extend the product lifetime of these product categories.

Aesthetic qualities:

- Durable and/or gracefully aging materials—consider wood or metals;
- Honest materials—no materials mimicking something else;
- Honest colors—the colors are dictated by the material. If colors are added, for example, with glaze or paint, consider muted colors and creating a heterogeneous surface to hide wear and tear;

Functional qualities:

- Single function—the design must be “cut to the bone,” and hence, all added features must be considered wisely;
- Independent products—the product does not rely on other products to be fully functional.

### 6.2. Limitations and Further Research

This research only focuses on the visible materials of the inherited products. Thus, speakers might be characterized as “plastic” and “none,” placing them in the same category as porcelain figures that only contain one material, even though the speakers have internal components of other materials. The 55.4% of inherited products characterized with “none” as their second material are hence not all made of one material from inside to outside,

which means that this research does not clarify whether there is a pattern in how many materials inherited products contain.

Like studies of product attachment in general (e.g., [7,10,15]), this study found emotional attachment to be strong among the inherited products too. However, as each participant was asked to bring photos of a few inherited products of their choice, we can neither confirm nor deny whether inherited products with emotional properties are the most common from a general perspective. That is, we do not know whether the participants choose to bring products with emotional properties because they were the first that came to their mind, or because those products are what they inherit the most. To elaborate on this, new research is required.

Lastly, the study was conducted in Denmark. Thus, we argue that local design preference, such as LEGO products, may be over-represented, and more research across countries could advance our understanding of global as well as local tendencies within inherited long-lasting products.

As this study shows signs of new potentially key insights on how to design long lasting products of different categories, we highly encourage other researchers to continue diving into specific product categories and explore these even further, hence creating operational knowledge related to inheritance-suited product categories for product designers to use.

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