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Emotional Durability Design Nine—A Tool for Product Longevity

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Abstract: How can we develop products that consumers want to use for longer? The lifetime of electrical products is an ongoing concern in discussions about the circular economy. It is an issue that begins at an industry level, but that directly influences the way in which consumers use and discard products. Through a series of workshops and knowledge exchange sessions with Philips Lighting, this paper identifies which design factors influence a consumer's tendency to retain their products for longer. These were distilled into a guiding framework for new product developers—The Emotional Durability Design Nine—consisting of nine themes: relationships, narratives, identity, imagination, conversations, consciousness, integrity, materiality, and evolvability. These nine themes are complemented by 38 strategies that help in the development of more emotionally engaging product experiences. We propose that the framework can be applied at multiple points during the new product development process to increase the likelihood that 'emotion building' features are integrated into an end product.

Keywords: emotionally durable design; product longevity; consumer behavior; circular design; product design

1. Introduction

Until recently, research within circular economy (CE) contexts that actively considers a user-centered perspective has been limited, with most studies focusing on the more 'technical narratives' of innovation and feasibility of a functional CE system [1]. The latest models describe consumers seamlessly interchanging modular units of broken and outdated parts, returning products to manufacturers to be disassembled and reassembled, whilst all materials will be captured, reconditioned and reformed, playing out as a complex flowing Mobius whirlwind of production, efficiency, and value. Yet very few have stopped to consider how much energy is used in this process of flow, and why we need to have this cycle of products, components, and materials to begin with.

The speed at which electrical products are being used, consumed and discarded continue to climb. Chapman relates this to emotion-driven consumption practices, arguing that consumers are using products as 'existential mirrors' ([2], p. 36) to reflect dreams and desires, a hangover from the 'nomadic individualism and excessive materialism' ([2], p. 18) of the twentieth century. Many recent circular methods, such as product service systems, whilst aiming to mitigate wasteful patterns of use, do not challenge consumers to take responsibility for their consumption behavior, merely

designing less wasteful networks through which to deliver the same outcome: the mass consumption of durable goods.

While many of the more 'economy'-focused advocates of the CE argue this is necessary to incentivize businesses to make more sustainable product systems, this paper explores how organisations might consider an alternative perspective. This is a viewpoint concerned with uncovering new customer value propositions that slow down the inner loops of use to produce stronger, longer lasting relationships between manufacturers and their customers and hence increase product longevity.

Lighting Industry and CE

Within the lighting industry, product lifetimes have already increased. A light bulb that was once a consumable is now potentially a long-life product. With the development of Philips HUE, a WiFi-controlled home lighting system, Philips Lighting has attempted to tap into this, and go 'beyond illumination' to create objects that facilitate deeper, experiential user engagement, rather than just utility and function. With this in mind, it is essential that we understand better the role that design plays in positively or negatively affecting consumer behavior concerning product lifetimes, and consider approaches that examine not only the physical lifetime but also the emotional lifetime of a product.

Emotionally durable design (EDD) [2,3] is a user-focused approach to product longevity with which to explore this way of thinking. It examines and articulates the unspoken emotional experiences that occur between products and consumers, seeking to uncover the complex emotional drivers for why we use, consume and discard some products faster than others. This view encourages a reduction in consumption and waste of natural resources by encouraging more durable, resilient relationships with products; highlighting, that Product longevity needs to be concerned with not only the physical lifetime but also the psychological lifetime of the product [4] as there is little use in designing products to last longer if the user has no desire to keep them [3].

While existing work on EDD offers some insight into symptomatic issues of over-consumption, the design frameworks and strategies proposed [2,3,5–9] do not yet adequately support this thinking within new product development (NPD). To address this issue this paper explores two research questions: Which design factors influence a consumers' tendency to retain their products? And how can we integrate this thinking into the NPD process of an organization?

2. Literature Review

2.1. Product Lifetimes

With the rise in popularity of the CE, many researchers from academia and industry are developing circular tools and methods for new product development. Some take a systems approach, suggesting Business Model Archetypes and Design Strategies [10,11]; a few suggested design models and strategies [12,13]; while others created tools that can be used by developers to facilitate this thinking [14,15]. While many of these researchers make recommendations on how to keep the product cycle going by extending the physical lifetime of the product, only a few take a user-centered perspective and consider the emotional lifetime as well. Despite several researchers proposing that 'design for attachment and trust' is a core principle of circular design [10,11,14,16], often very little detail is presented on how this can actually be achieved. Nevertheless, Den Hollander, Bakker and Hultink, suggest products can be designed to have an intrinsic long life through physical and emotional durability [16], which points to the adoption and use of emotional durability within NPD.

One stream of research taking a more holistic approach to the examination of both perspectives of product lifetimes is 'product replacement'. Van Nes and Cramer identify wear and tear; improved utility; improved expression and new desires as the main 'push' and 'pull' drivers for why consumers might replace their durable product [17]. This perspective is supported by other findings stating that a 'desire for a better device' is shown to be the main contributing cause for why 75% of consumers

replaced their electrical goods [18]. This brings into focus notions of fashion, aspiration, expression and evolution, as key areas of interest for EDD [3,5,7].

Within these toolkits, frameworks and reports, many 'Design for X' strategies are proposed, such as design for disassembly, re-assembly, etc. These strategies can be evaluated by which stakeholder is most affected within the user product interaction journey and sit on a scale from user-focused to producer-focused. Products that can be disassembled with materials and components recovered, reused and repurposed are more related to the activities of the producer. In contrast, products that are designed to build attachment, adapt, and be maintained are more closely linked to the experience and activities of the user. By understanding which major stakeholder is affected, developers and researchers can make informed decisions about what strategies are the most relevant to a product or service. However, this implies that many CE research projects are still mainly focusing on the activities of the producer. Since emotional durability is an approach concerned with the experience of the user we can identify studies that address the emotional as well as the physical extension of product lifetimes. These are shown in Table 1.

Table 1. Strategies for circular design and product replacement.

Strategies for Product Longevity	Researchers
Design for Attachment and Trust	Bakker et al. [10]; Mugge Schoormans & Schifferstein [19]; Van Nes and Cramer [17]
Design for Adaptability and Upgradability	Bakker et al. [10]; Mugge Schoormans & Schifferstein [19]; Van Nes and Cramer [17]
Design for Ease of Maintenance and Repair	Bakker et al. [10]; Mugge Schoormans & Schifferstein [19]; Van Nes and Cramer [17]
Design for Durability and Longevity	Bakker et al. [10]; Great recovery project [12]; Ellen Macarthur Foundation [20]; Ljungberg [21]; Mugge, Schoormans & Schifferstein [19]; Van Nes and Cramer [17]

2.2. Emotion-Centered Design

One of the most influential bodies of research regarding emotional longevity is Product Attachment, simply defined as the 'strength of the emotional bond a consumer experiences with a durable product' [3,10,22–27]. Many researchers have conducted studies examining which factors positively affect the emotional connection between users and durable products with strategies that result in attachment shown in Table 2.

Table 2. Key strategies proposed for product attachment.

Strategies	Researchers
Memories & (Longevity) (Nostalgia)	Mugge [23]; Schifferstein & Zwartkruis-Pelgrim [22]; Maclachlan [28]; Page [25]
Pleasure	Mugge [23]; Schifferstein & Zwartkruis-Pelgrim [22]; Maclachlan [28]; Page [25]
Enjoyment	Schifferstein & Zwartkruis-Pelgrim [22]
Self-Expression or Support-Self Identity	Mugge [23]; Schifferstein & Zwartkruis-Pelgrim [22]; Maclachlan [28]
Usability	Page [25]
Sensory Design	Maclachlan [28]; Ludden [29]
Superior Appearance	Mugge, Schifferstein & Schoormans [24]
Utility and Reliability	Schifferstein & Zwartkruis-Pelgrim [22]
Product Personality	Mugge [23]; Maclachlan [28]
Group Affiliation	Mugge [23]

Chapman, in the second edition of *Emotionally Durable Design*, presents a six-point experiential framework to increase the emotional connection between product and user: "Narrative, Detachment, Surface, Attachment, Fiction, and Consciousness" [3]. This framework for design and sustainability exploration has been taken up over the last ten years by many researchers undertaking practice-based projects [5–9]. Each picks out an assortment of elements to focus on and while all proposed revised strategies and principles, none were able to encompass the material fully into a method for NPD.

Another concept sharing many theoretical groundings with EDD is slow design, which focuses on creating processes that are slower and more contemplative. This helps bring about an increase in positive well-being for economies, societies, and individuals [30]. Researchers have adapted and refocused the six slow design principles proposed by Fuad-Luke [30] for NPD while also introducing a seventh principle: 'ritual' [31].

2.3. Interim Summary

Although the two main bodies of research on product longevity and emotion-centered design have been discussed separately, there are significant overlaps with emotional durability as the idea that relates to both. To demonstrate this, all the relevant insights and principles were consolidated in Figure 1. All strategies pertaining to product attachment are shown in red, and those related to circular design in orange. The remaining strategies from emotionally durable design have been color-coded according to each researcher (see the key, bottom right). By studying the strategies on the vertical axis across the three different areas of practice, one can begin to see how these different ideas correlate. Figure 1 also shows the limitations of existing research, revealing a gap in describing and understanding an EDD perspective for NPD. In Section 4, we develop the concepts from Figure 1 into a framework for design.
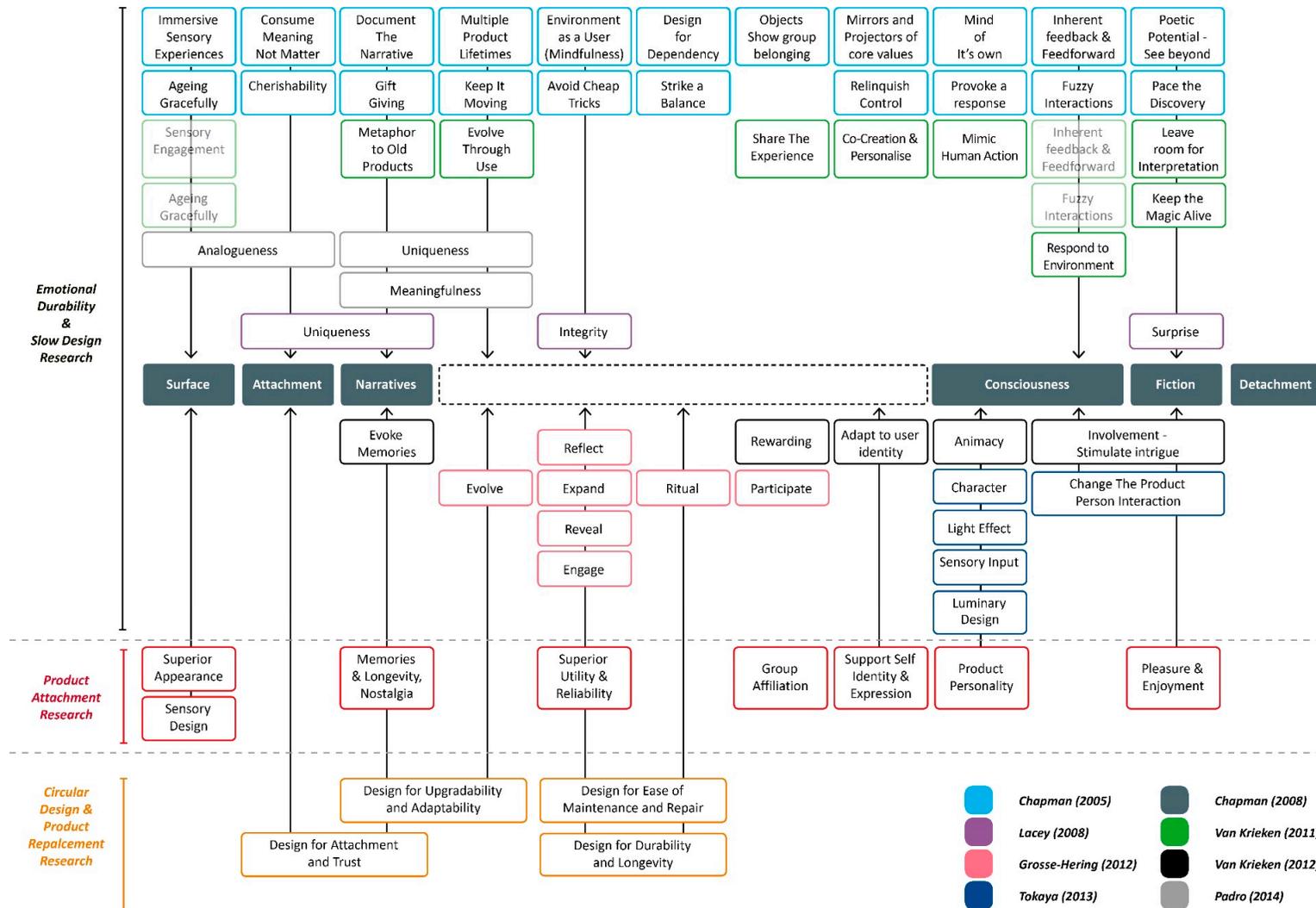
Figure 1. Relationship between emotional durability, product attachment, and circular design.

3. Methodology

Due to the context and nature and of the research, it was decided to adopt a design practice-based approach to the development of the framework. This method allowed the primary researcher to use design tools and methods as a means for investigation, which are described in more detail in the next section. In order to fully leverage the industry partnership, three field trips to Philips Lighting took place between 2016 and 2018. During these, ethnographic methods of analysis were employed, such as passive observations and semi-structured interviews with Philips experts operating within NPD, allowing the research and framework to be developed and enhanced using the data gathered. Lastly, a series of workshops were organized facilitating fast and effective exchange of knowledge allowing the participants and the research to be mutually enriched throughout the process.

4. Developing the Framework

4.1. Understanding NPD as a System

Throughout the literature review and practice-based phase described next, 21 individual interviews were conducted with product designers, business managers, product managers, sustainability managers, design researchers and engineers from Philips Lighting. This activity informed this research about the processes and approaches used within the company, while also provided a general overview of how NPD operates as a system, thus ensuring the tools and methods developed would apply to the practices not only within Philips Lighting, but in other NPD processes as well.

4.2. Refining Concepts into a Framework

To create the first iteration of the framework, the concepts from Figure 1 were set into 'concept cards' and then were refined through a process of clustering and classification: firstly, using concept mapping, which 'is a visual framework that allows designers to absorb new concepts into an existing understanding of a domain so that new meaning can be made' ([32] p. 38); and secondly, through affinity diagramming, a 'process used to externalize and meaningfully cluster observations and insights from research, keeping design teams grounded in data as they design' ([32] p. 12) as shown in Figures 2 and 3.

Figure 2. Concept cards defined from Figure 1.

Figure 3. Early iterations of concept mapping.

This iterative process was conducted over three months and was guided by the two following questions:

- What are the meaningful, emotion-driven engagements that exist in the user product interaction journey?
- How can we use these to design things that people can and want to keep for longer?

This activity culminated in the framework being developed at two levels, strategic and thematic, resulting in a new set of cards being produced. Mindful of the risks of oversimplifying the material, the resources were designed to ensure that the tool could explain higher-level thinking while retaining the rich, expressive quality of each concept. We used techniques that engage both the left and right brain [33] to ensure the framework could be quickly comprehended and navigated with ease by the user/participant. This was achieved by formatting the themes and strategies at two different sizes and using a simple color-coding system. However, at this initial stage the framework was rough and untested, so it was necessary to hold workshops to refine and evaluate how the framework was received and used by those within the NPD process.

4.3. Testing the Concepts and the Framework

Early iterations of the framework were presented and tested within seven generative workshops conducted with 44 participants from both Philips Lighting and elsewhere operating within an NPD process. The aim of these workshops was to firstly, validate the concepts developed by Chapman [2,3] and the extension of the framework derived from Figure 1; secondly, refine and develop the framework to ensure the ideas were suitable and relevant to NPD; and thirdly, inform the participants of the concepts and demonstrate how they manifest within design. These were achieved through:

- Narrative-based enquiry [32], whereby stories and insights were gathered from participants regarding their 'cherished objects'
- Presentations and design charrette [32], where the participants directly engaged and designed with the framework
- Facilitated feedback session and passive observations

These three activities enabled the framework, the fundamental concepts of EDD and its application within NPD undergo a process of critique, leveraged by the expertise of the participants. The workshops involving 5–10 participants were conducted in three rounds over eight months, with the primary researcher acting as a facilitator throughout.

The participants were also the target user for the framework, so these workshops were presented and framed as a collaborative process. Therefore, throughout the process, the participants were encouraged to offer their thoughts and responses on the feasibility, opportunities and issues for how these ideas might integrate within their operations.

4.3.1. Narrative-Based Enquiry

For this exercise, participants were asked to bring an item or an image of an item they cherished, as shown in Figure 4. This process was utilized firstly to demonstrate to the developers that it is natural for people to have objects they are emotionally connected to—a point especially crucial for those who create products to realize and understand. The process of introspection induces the developers to reflect upon their feelings and behavior, providing a better cognitive position to apply emotional durability thinking to their product development practice. Secondly, to gather and document stories about objects that have been loved and kept; this allowed the participants to reflect as consumers as well as product developers, while also providing the research with data with which to critique and enrich the insights drawn from the literature in Section 2. We predicted that the idea of emotional durability would be unfamiliar to the participants, so we constructed data based on 'cherishability' looking to uncover underlying emotional triggers that build this principle into products. Other phrases were also considered (e.g., emotionally connected, emotionally attached, emotionally treasured), but it was decided to use a term more indicative of the original theory and not as potentially polarizing as the term 'attached'.

Figure 4. Participants telling the stories of their cherished object.

4.3.2. Design Charrette

We asked the participants to choose one or two themes from the concept cards and develop a proposal for an emotionally durable desk light as shown in Figure 5. This gave the developers the opportunity to synthesize the theory presented and engage with the strategies and themes in a more meaningful manner, while also allowing the researchers to observe the framework in action, revealing any issues or opportunities for how these concepts might be implemented in practice.

Figure 5. Participants engaging with the framework for the design charrette.

4.4. Feedback and Reflection

At the close of each workshop, a facilitated discussion took place where participants were asked to reflect on the following questions:

- Did the framework influence the way you thought about designing the object?
- Was the framework a help or a hindrance to the design process?
- Do you feel you have a better understanding of emotional durability?
- Which of these themes do you think would apply to the design of a light?

Feedback sessions were used to discover if there were any issues with how the participants understood the concepts and where they might be easily applied or potentially rejected.

4.5. Results from the Workshop 1–7

All feedback and reflections from the participants were captured by the researchers and 36 stories were collected and analysed providing insight that allowed further development of the framework. Between each round of workshops, the framework went through a process of development and improvement, whereby the content of the themes and strategies were evaluated and revised (shown in Figures 6–8). In the final iteration, the strategies were reworded to include more task-focused language, which transformed the concepts from theory into actionable design directions.

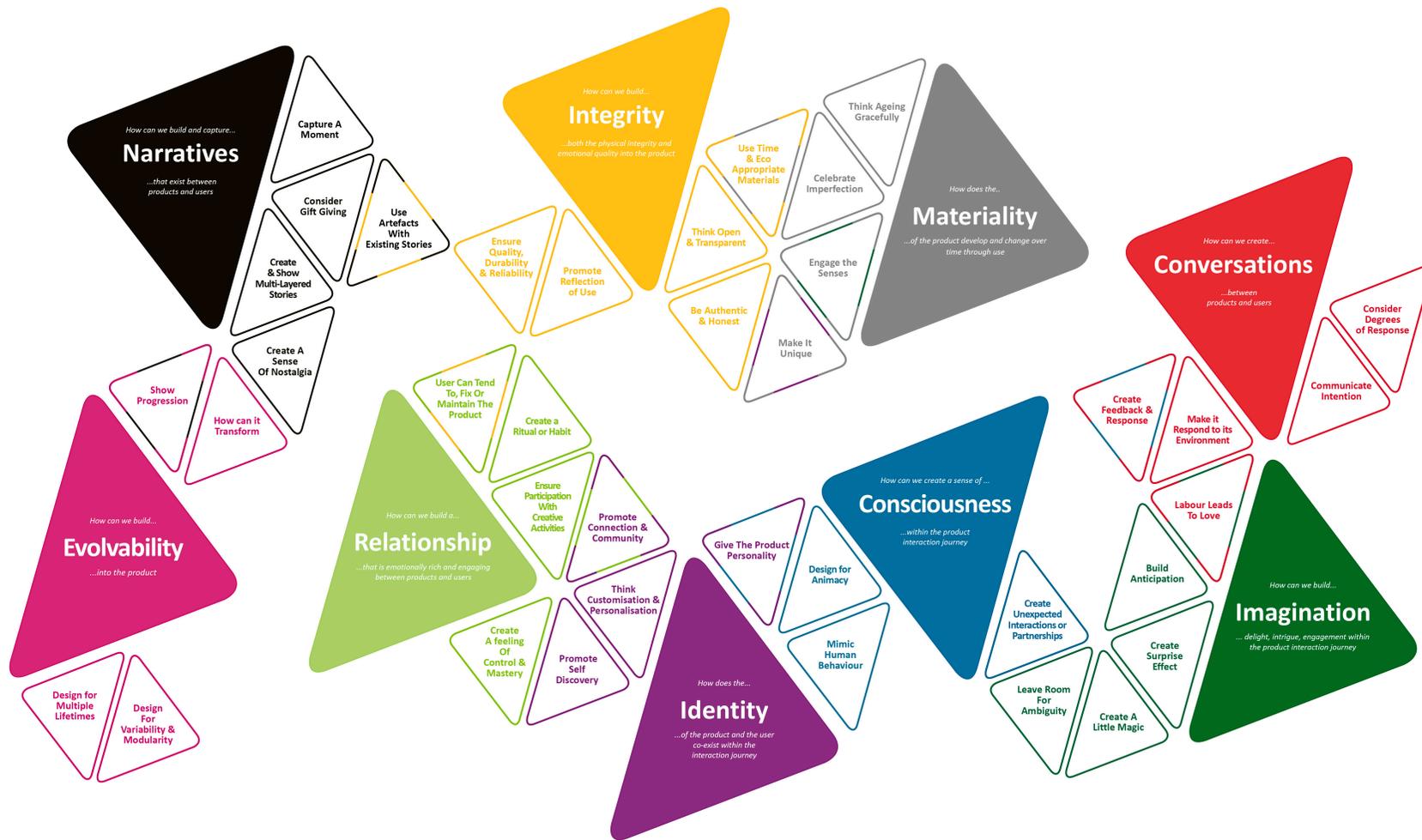**Figure 6.** Iteration 1 of the framework April 2016.

Figure 7. Iteration 2 of the framework August 2016.

Figure 8. Iteration 3 of the framework January 2017.

From this process of development and analysis, nine themes and 38 strategies emerged describing what an EDD perspective can bring to NPD. This process of testing and evaluation of the concepts with Philips Lighting helped leverage their expertise to ensure the themes and ideas proposed might be more easily integrated into the process of NPD. Figure 9 shows the final set of concept cards for the framework in full. We go into more detail about each theme in the following section.

How can we build and capture...
Narratives
...that exist between products and users

Capture A Moment

Consider Gift Giving

Use Artefacts With Existing Stories

Create & Show Multi-Layered Stories

Create A Sense Of Nostalgia

How can we build...
Integrity
...both the physical integrity and emotional quality into the product

Use Time & Eco Appropriate Materials

Think Ageing Gracefully

Celebrate Imperfection

How does the...
Materiality
...of the product develop and change over time through use

Engage the Senses

Make It Unique

Ensure Quality, Durability & Reliability

Promote Reflection of Use

Think Open & Transparent

Be Authentic & Honest

How can we create...
Conversations
...between products and users

Consider Degrees of Response

Communicate Intention

Create Feedback & Response

Make it Respond to its Environment

Labour Leads To Love

Show Progression

How can it Transform

User Can Tend To, Fix Or Maintain The Product

Create a Ritual or Habit

Ensure Participation With Creative Activities

Promote Connection & Community

How can we create a sense of ...
Consciousness
...within the product interaction journey

Give The Product Personality

Design for Animacy

Build Anticipation

Create Surprise Effect

How can we build...
Evolvability
...into the product

How can we build a...
Relationship
...that is emotionally rich and engaging between products and users

Think Customisation & Personalisation

Create A feeling Of Control & Mastery

Promote Self Discovery

How does the...
Identity
...of the product and the user co-exist within the interaction journey

Mimic Human Behaviour

Create Unexpected Interactions or Partnerships

Leave Room For Ambiguity

Create A Little Magic

How can we build...
Imagination
... delight, intrigue, engagement within the product interaction journey

Design for Multiple Lifetimes

Design For Variability & Modularity

Emotional Durability Design Nine
Developed in partnership with Philips Lighting and University of Brighton

Figure 9. Emotionally durable design framework in full.

5. Presentation of the Framework

In this section, we present the EDD framework consisting of nine themes: relationships, narratives, identity, imagination, conversations, consciousness, integrity, materiality, and evolvability. The framework reveals the design factors that influence consumer's behavior to retain their products for longer. There are 3–5 strategies supporting the embodiment of each theme within an object which are underlined in Sections 5.1–5.9 and consolidated in Table 3.

The framework can also be regarded as being rhizomatic, where the themes and strategies are viewed as non-hierarchal entry and exit points for exploration. Like a periodic table, the framework is full of powerful individual elements that can be used as sources for inspiration but also explored as compounds in varied combinations. The framework can also be used in a sequence to introduce the concepts of emotional durability by delivering and discussing the themes in the order they are presented here and in Table 3. This tells the most coherent story from start to finish of what an emotional durability perspective can be.

5.1. Relationships

Building engaging, rewarding, active partnerships between people and products by ensuring participation through creative activities. This allows users to become producers, not observers of their interaction, which can also be achieved by letting the user reconfigure the product or learn a new skill or acquire knowledge through using it. And, designing in mechanisms that encourages users to care, tend to and maintain the product building a relationship of mutual altruism. Or providing moments to create a ritual or habit with the product forming a relationship of stability and reliability. Engendering a feeling of control, a sense of mastery through the object, either through intimate knowledge of the product and its inner workings or the ability to use it well.

5.2. Narratives

Capturing the unique shared history that exists between objects and users and embedding this into the product interaction. This can be done through gift giving, which initiates a narrative, or through creating a sense of nostalgia providing tangible metaphors to previously loved products or interactions. Or, using objects, materials or artefacts with existing stories highlighting and valuing an item for its previous history and creating a sense of provenance. Effectively, we are trying to capture a moment, create markers in time and build multilayered stories that evoke memories of first times, turning points, commemorations, and celebrations as well as linking us to family and friends through inherited objects, traditions, and shared moments.

5.3. Identity

Crafting the object's and the user's identity while understanding how these are negotiated. We need to create space and allow for self-expression through customization and personalization, demonstrating stages in life, religion or values. We can also create a defined product personality through design. Or explore the potential that a product can create connection and community with others resulting in group affiliation, such as a football shirt, or Mini driver club, as these products connect us to others while projecting a feature of ourselves to the world. Lastly, consider how a product might facilitate self-discovery, letting the user access or understand previously unknown aspects of themselves or their consumption habits.

5.4. Imagination

Moving beyond functional interaction to understand the mystery, excitement and captivation objects can provide. This can be achieved through building anticipation within the interaction, to maximize feelings of love and discovery. Or creating a little magic through unconventional methods of interaction that exceed expectations. As we are trying to elicit feelings of enjoyment

and pleasure, a critical factor that leads to attachment and emotional engagement. But users can become immune to such stimulation over time so, to ensure continued involvement, the product must try to create surprise effects or unexpected interactions. But, it is also important to leave room for ambiguity for the user to find their own meaning in the interaction.

5.5. Conversations

Viewing the interaction as a conversation, creating opportunities for inherent feedback and response between people and products. By designing in mechanisms of feedback such as making a product respond to the environment makes it seem more dynamic over time. Feed-forward interactions like communicating intention let the user know why the product is behaving in a particular way, facilitating a relationship that is more open and evolutionary. And, instead of binary on/off consider degrees of response allowing contemplation of the various distinctions that can exist to enhance product experience. Lastly, Fuzzy Interactions such as labor leads to love is an interaction that requires a degree of time and effort, like learning a language or instrument, consequently increasing the likelihood of a rewarding experience.

5.6. Consciousness

Design in a way so that products have quirks and can be temperamental, indicating that the object has its own character and free will. Within Japanese philosophy, this would be considered Kami—'spirit in everything'—whereby all artifacts are imbued with a soul. This can be achieved by designing for animacy by creating mechanisms that give the perception of character traits and expression, such as mimicking human behavior. This makes the interaction seem more intuitive while creating unexpected interactions, which generates richer moments of engagement with the product.

5.7. Integrity

Creating products not only with structural integrity but also with embedded enduring values. This is about being honest and authentic in what the product delivers, which is crucial for developing attachment and empathy with the object. This fosters a sense of openness and transparency with the user about the processes and materials used. This can also be assisted through repairability and maintenance, designing products to be explored, understood and fixed. Slowing things down to reveal spaces forgotten or overlooked promotes reflection in use creating moments of intervention for the user to stop and consider their own agency within the interaction. While lastly, ensuring that we use time and eco-appropriate materials to build products that have a quality, durability, and reliability for high performance and a long life to increase the chance for emotional connection to be built.

5.8. Materiality

Thinking about the physical way in which users relate to products. Does the object get better or worse with time? It's about designing an object that can age with grace, while also providing a multisensory experience and eliciting satisfaction and pleasure derived from the look, feel, and smell of a product. Or seeing the beauty by celebrating the imperfection in the transience and fallibility of our interactions with our products, which allows users to embed aspects of their personality into the material of a product to make it unique.

5.9. Evolvability

Breaking our perception that interaction with products are static so we can truly embrace time as a design factor. Through adaptability and upgradability designed objects can have different phases of use or adjust to developing needs and technology through variability and modularity. Consider the multiple lifetimes a product can have, or design for multiple generations of user, as this can create a

sense of legacy for a product. While, also helping to show progression, demonstrating the passing of time by documenting the narrative of use. Lastly, when the product does come to the end of its life how can it transform beyond its initial function or use.

Table 3. The nine themes and 38 strategies of the Design Nine framework.

9 Themes	38 Strategies
Relationships How can we build a relationship that is emotionally rich and engaging between products and users?	***Ensure Participation with Creative Activities***—*Create opportunities so the user can re-design and reconfigure the product during the use of the product. Perhaps though DIY, craft or hacking.* [2,5,8,31,34]
	User Can, Fix or Maintain the Product—*Create a mechanism where care and attention is taken to maintain the object, this fosters a relationship that is rewarding through 'mutual altruism'.* [2,5,10]
	Create A Ritual or Habit—*Design in a ritual to create a better user experience, providing security and stability in a hectic society.* [31,35]
	Create A feeling Of Control & Mastery—*The ability to master (feel in control of) one's context through the object; a driver for psychological well-being.* [36]
Narratives How can we build and capture narratives that exist between products and users?	***Consider Gift Giving***—*Connects the recipient with time, places and people as long as the gift is able to reflect the user's identity.* [3,23]
	Create A Sense of Nostalgia—*Use metaphors of old products to evoke memories of previous times, experiences and objects.* [5,27,37]
	Use Artefacts with Existing Stories—*Some objects are valued because of their provenance, i.e., antiques, or materials that already have a story.*
	Capture A Moment—*An object that allows you to capture and reproduce moments will enable you to evoke memories while also being a mechanism for documenting the narrative.*
	Create & Show Multi-Layered Stories—*Design in or allow the opportunity for the creation and capture of rich, layered interwoven stories into the product.* [2]
Identity How does the identity of the product and the user coexist within the interaction journey?	***Think Customisation & Personalisation***—*Users desire to differentiate themselves from others and express their identity, as this gives a sense of uniqueness.* [23,28]
	Give the Product a Personality—*Be actively conscious of the personality you create and how this affects perception and preference.* [37,38]
	Promote Connection & Community—*People have a need to be connected and involved with others, consider the ways the product can connect people together and produce group affiliation.* [8,22,23]
	Promote Self Discovery—*How can an object can be a facilitator of self-discovery or help you know something previously unknown about yourself?*
Imagination How can we build imagination delight, intrigue, engagement within the product interaction journey?	***Create Surprise Effect***—*Moments of surprise in the user–product interaction increase levels of engagement—such as unexpected functional interactions.* [29]
	Leave Room for Ambiguity—*Don't over script the interaction, allow a little freedom for the user to assign their own meaning.* [2,5]
	Create A Little Magic—*Imbue the product with a little mystery and wonder, conceal a few tricks within the semantics of the interaction to create engaging discovery.* [2]
	Build Anticipation—*Time the discovery as to not give away the whole story at once, this helps maximize anticipation and enhance feelings of love.* [2,39,40]
Conversations How can we create conversations between products and users?	***Create Inherent Feedback & Response***—*Stimulate a response from the user through communication mechanisms, this will invoke an affirmation of identity bridging the emotional gap.* [2,5,41]
	Consider Degrees of Response—*Instead of binary states of on/off show more distinctions to enhance material engagement.* [2,5,42]
	Labor Leads to Love—*Interactions that require a degree of time and effort to learn increase the likelihood of a rewarding experience.* [2,34]
	Respond to the Environment—*The environments of most objects are subject to change; allowing it to react to changes automatically makes it more dynamic over time.* [43]
	Communicate Intention—*Users are more likely to disable automated systems when they feel they don't know why things are happening.* [43,44]
Consciousness How can we create a sense of consciousness within the product interaction journey?	***Design for Animacy***—*Allow the object to be expressive and show a sense of character, this will lead to a sense of consciousness.* [5,7,45]
	Mimic Human Behavior—*Make the interaction similar to how humans or animals behave will make the interaction more intuitive.* [5,7]
	Create Unexpected Interactions or Partnerships—*Unconventional methods of interaction or partnerships with other users or objects can increase engagement and animacy.* [7]
Integrity How can we build integrity both the physical integrity and emotional quality into the product?	***Be Authentic & Honest***—*Ensure the product delivers what it promises. Authenticity is crucial when nurturing attachment; its absence will dissolve any empathy developed up until that point.* [2,3]
	Think Open & Transparent—*Some products are hard to access and discover. Allow the user to see in and know the object.* [46]
	Promote Reflection of Use—*Provide time for the user to think about their actions, visualize processes to encourage contemplation and 'reflective consumption'.* [2,3,31]
	Use Time & Eco-Appropriate Materials—*Consider the various time and ecological dimensions of the materials that exist within the product lifetime (e.g., technosphere-biosphere).* [10,20,47,48]
	Ensure Quality, Durability, & Reliability—*The main driver to detachment and dissatisfaction is a failure in utility. Ensure the product performs well and can maintain itself.* [5,10,49,50]

Table 3. *Cont.*

9 Themes	38 Strategies
Materiality How does the materiality of the product develop and change over time through use?	***Think Ageing Gracefully***—*Choose materials and coatings that over time wear or mature in a beautiful or interesting manner.* [2,3,5,27,51,52]
	Celebrate Imperfection—*Embrace the imperfections and transience of existence—achieve this through asymmetry, roughness, irregularity, simplicity, economy, and austerity.* [53,54]
	Engage the Senses—*Provide the opportunity for a multi-sensory experience to increase the likelihood of active engagement.* [5,28,29]
	Make It Unique—*Produce an output that cannot be reproduced or transferred will ensure its irreplaceability.* [8,9,52]
Evolvability How can the product evolve with the user?	***Design for Variability & Modularity***—*Design the product to vary in use without the need for extra parts.* [19,50]
	Design for Multiple Lifetimes—*How can we design a product that can have multiple lifetimes and stories—perhaps with many generations of users?*
	Show Progression—*Showing the passing of time documents the product's narrative, which could also facilitate psychological wellbeing through personal growth and purpose in life.* [2,37]
	How Can It Transform?—*How can the product or service transform beyond its initial function or materials or process?*

6. Discussion

At the beginning of this paper, we identified two questions: which factors influence a consumers' tendency to retain their products? And how can we integrate this thinking into the new product development (NPD) process of an organization? In response, we have presented 'The Emotionally Durable Design Nine'—a framework that offers themes and strategies for why people tend to retain some objects over others. Of course we cannot definitively argue that embedding these factors into a product will produce emotional durability. However based on the information we gathered from the object stories and the literature we argue that considering these design factors will increase the likelihood that a more emotion-centered user experience will occur. This, in turn, can lead to the building of emotional attachment to the product, which researchers have shown results in product longevity [3,23,25,28,55].

During the knowledge exchange session with Philips Lighting experts, we found that the framework could not only be used as a roadmap and source of inspiration, but also as a tool for revealing new perceptions about products. This is where we believe the true power of this framework lies; in its ability to promote an alternative perspective to the two main actors we are attempting to influence: producers and consumers.

6.1. Alternative Perspective for Producers

Within the NPD process of high volume producers, the design stage involves a large number of actors. For Philips Lighting, product managers have more creative control over the outcome of a product than a product designer; however, the next most influential actors within this process are value engineers. The market defines stringent targets and price points and it is the role of the value engineer to ensure the bill of materials and processes used allow for a sufficient margin for profit. This applies not just to new products, as existing product lines also get value engineered between generations as well, meaning that the original design intentions can be lost.

For example, between the first and second generations of the Philips HUE bulb, several slight cosmetic styling changes were made to the outer casing material and shape of the lamp. These might appear small and inconsequential, but from an emotional durability perspective, these modifications erode the distinct product personality and identity that was created by the development team. So, how can we ensure that new product longevity features not only make it into the end product but are retained in subsequent product generations?

This factor is why we initially identified integration at the early concept stage, to increase the likelihood that an emotion building feature might exist at the heart of the original proposal. But as the knowledge exchange sessions with the Philips Lighting experts revealed, we also need to be considering the pipeline as a whole and look to understand where else interventions can be made.

Beyond the initial design phases, another application of the 'ED Design Nine' framework is as an evaluative tool, assisting developers in identifying the themes a product or concept could embody to benefit further stages of NPD such as marketing and value engineering. With respect to value engineering, the ability to identify an emotional feature allows the evaluator (usually a product manager) to understand, defend and prioritize why a particular feature should be retained through the trimming process. With respect to marketing, many products have the capacity to tell an emotionally engaging narrative, as stories are intrinsic to the way we process and remember information [56], therefore by communicating emotion-building information we can allow a user to put the product in context bridging the 'emotional gap'. This is what drives an emotional durability approach; an intent that places the consumer's emotions and behaviors at its core. It is a position that many other circular economy methodologies do not take and which is, we argue, where more value for product longevity can be found.

6.2. Identifying Emotion Value Propositions within Product Longevity Strategies

One aspect that is significant to the literature of product lifetimes is recognising the potential emotion value potential of existing strategies and how these might help in the adoption of these ideas within the circular economy.

6.2.1. Upgradeability and Adaptability

Maclachlan argues that upgradability, while being a mechanism for product longevity, is also a vehicle for self-expression and personalization ([28], p. 310). However, it could also be used to elicit feelings of satisfaction, surprise, or enchantment from discovering a product can adapt to new needs. This might be achieved by building anticipation from knowing that there are elements that can be upgraded. Or like a charm bracelet, a product can be modular and 'collect' stories, memories to show progression of the user's journey with it. This builds up a multilayered narrative, a process producers could support through after-sales servicing, customization or digital products.

6.2.2. Maintenance and Repair

The iFixit repair manifesto [57] states that repair is an act of freedom and independence ('if you can't fix it, you don't own it'). From an emotional durability perspective, maintenance is a mechanism for ensuring active material participation, which can develop into a ritual or habit providing security in a hectic society. Maintenance and repair also allow the user to see inside the product. Fairfone writes on the back of their product 'yours to open, yours to keep', liberating their customers from feeling paralysed by warranties. Could consumers adopt the point of view that repair and maintenance need not be a chore and instead be an act of love, care, and appreciation, like newly polished shoes or a watered plant actively nourished by the user?

6.2.3. Durability and Longevity

Some products, like Le Creuset pans, Dr. Martens shoes, or Osprey bags, while sold with a lifetime guarantee, also create a sense of stability and reliability. They deliver the same material and functional experience with each use, allowing the consumer to feel confidence towards the product, never faltering in quality or utility, representing fully the emotional benefits this strategy can provide. As Russo argues the durability of this product-person relationship can benefit well-being as well as sustainability [55].

By highlighting how emotional durability links with circular design and product longevity strategies we can see that, the EDD framework is a versatile approach that can complement other methods or processes. Our aim is to inspire designers, developers, and researchers to use the framework in their practice, exploring new possibilities and embedding the framework themes and strategies into objects to explore further how to make products that provide long and meaningful experiences for consumers.

6.3. Future Research

This study was conducted with one product type relating to one organisation—the Philips HUE lighting system. While some of the design factors have been tested in enhancing engagement with products, some are relatively new insights that emerged from the workshops we held. Further study involving the application of the Design Nine framework to other product categories and over the full lifetime of a product would be extremely beneficial to the field of NPD practice.

7. Conclusions

Our Emotionally Durable Design Nine framework, consisting of nine themes and 38 strategies, is a comprehensive guide for designers and developers to explore the integration of emotional durability into product development. Making the concept of emotionally durable design accessible to new product developers (beyond just design) provides the opportunity to realize the value and market potential that this alternative perspective can offer. Furthermore, this paper shows how the framework closely aligns with existing circular design strategies, highlighting the emotional value that can be gained in offering new consumer value propositions within organizations. The intention of this framework is to be a tool that influences the way developers view the value of specific design factors thus changing the nature of the products that are being designed and marketed.

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