

EMOTIONAL DURABILITY
DESIGN NINE: DEVELOPING A
TOOL FOR PRODUCT LONGEVITY

MERRYN HAINES-GADD

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Abstract

The lifespan of electrical goods has shown to be diminishing over time. Considering that many of these products being replaced or discarded still function or could be repaired, this situation places an unnecessary burden on the environment. Although product lifetimes is a topic being tackled at an academic and policy level, this research is primarily concerned with optimising and extending the technical lifetime of the product. As of yet, there is no comprehensive method to facilitate the integration of the emotional lifetime perspective into consumer electronics. Therefore, to tackle this issue, this thesis presents the process and outcomes of a research collaboration between the University of Brighton and Philips Lighting that investigated – *Which principles of Emotionally Durable Design are relevant to the extension of the lifetime of a product and how can these be translated into an effective method for new product developers?*

Adopting a Research through Design approach, a new tool was defined and developed by employing narrative inquiry, workshops and facilitated feedback sessions with participants from Philips Lighting. Entitled the ‘Emotional Durability Design Nine’, the framework facilitates the engagement of emotional longevity concepts by new product developers in order to positively influence the lifetime of the products they develop. It consists of nine themes: Narratives, Relationships, Identity, Imagination, Conversations, Consciousness, Integrity, Materiality and Evolvability and is support by a further 38 strategies.

The framework was tested in both product design and digital design development scenarios, utilising workshops and design practice. This was to examine the effectiveness of the method, to explore what design outcomes it would yield and how it operates in practice. As a result of this round of testing, new lighting concepts were created and an effective procedure for using the tool uncovered. Consequently, a final toolkit was devised and delivered to Philips Lighting for final feedback and responses. This revealed that, the tool aided new product developers to engage with emotional durability concepts, and additionally that it could be applied beyond the design stage, and utilised at value engineering and marketing stages. By applying the tool at these other phases, a greater number of product developers would be contemplating emotional longevity factors, which could potentially increase the likelihood and opportunity for these concepts to be retained in the final product.

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Abbreviations

ED - Emotional Durability

EDD – Emotionally Durable Design

CE – Circular Economy

NPD – New Product Development

NP – New Product

Publications

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Authors Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree and does not incorporate any material already submitted for a degree.

Signed

Merryn Haines-Gadd

25 September 2019

Chapter 1 - Introduction

1.1 Background and context

The UK purchases 1.4 million tonnes of electrical goods per year: 38% of this ends up landfill, 55% is recycled and less than 7 % is re-used, even though 25% of discarded products still function or could be repaired. Considering that overall the lifespan of consumer electrical appliances has also shown to be diminishing over time (Prakash et al., 2016), this is a problem that not only has an environmental cost but also demonstrates a missed opportunity with regard to the value that these products could provide (WRAP, 2013). While it could be argued that it is a positive step that these products are at least being recycled, electrical waste (e-waste) is being both legally and illegally exported from the UK to developing countries (Pukket, Brandt & Palmer, 2019), where in many circumstances very few of these devices are safely or effectively recycled (Pukket & Smith, 2002). Aside from the significant risk to human health, there are also substantial environmental issues related to the toxic emissions that e-waste produces when put into landfill, incinerated or improperly recycled (Heacock et al., 2016). Moreover, the processing of these products is also an energy intensive process (Cooper, 2017) and the material and embedded functional value of these objects are not being preserved (Bakker & Schuit, 2017).

Attempts are being made to address these issues of product lifetimes at both an academic and policy level. Firstly, with research reports such as: *The Long View - Exploring Product Lifetime Extension* (Bakker & Schuit, 2017) and *A Longer Lifetime for Products: Benefits for Consumers and Companies* (Montalvo, Peck & Rietveld, 2016) which make recommendations for policy makers and industry on the opportunities and issues within this topic. And secondly, through EU legislation, whereby steps are being taken to abolish planned obsolescence, by endorsing that products must be designed to be durable and can facilitate third-party repair (European Parliament, 2017). While these measures might increase the rates of repair and reduce the number of products that end up in landfill, they do not address the wider concern of why some products that still function are being discarded in the first place.

Walker (2006) proposed that due to the sheer number of objects we own and interact with on a daily basis, a detachment has occurred from the physical material world resulting in a devaluing of material culture. He suggests that society needs to reassess and encourage a re-engagement with our 'things', to help ease the strain of modern consumerism. Chapman (2005) argues design is at fault, arguing that products are being developed from a 'technocentric mindset', and offer very little in terms of emotional experience and satisfaction to the user, fuelling a

‘nomadic individualism and excessive consumption’ (p.18). In addition, with ‘New desires’ shown to be main driver for why consumer replaced a functioning electrical product (Prakash et al., 2016 ; Van Nes & Cramer, 2005). This suggests that emotions influence people’s behaviour when purchasing, consuming and discarding products. However, if changes are made in the way in which these products are designed and produced, there is an opportunity to not only reduce their carbon footprint by up to 15%, but also add £800 million in GDP to the UK economy (WRAP, 2013).

Traditional models of industry

Since the industrial revolution, industry has been adopting a linear approach to both business and production i.e. a ‘Take, make and dispose’ philosophy (McDonough & Braungart, 2002). While this was economically appropriate with materials pricing always in decline, this era of production and utilisation has come to an end and we are moving into a time of volatility (Ellen MacArthur Foundation, 2013). With the population expected to increase to 9 billion by 2050 (OECD, 2012), the consequences of continuing to use this model could not only increase the demand for natural resources and affect the stability of economies, it could also increase the risks of climate-related hazards for human and environmental systems (Ghisellini, Cialani, & Ulgiati, 2016; Ellen MacArthur Foundation, 2013; IPCC, 2018). So, in order to tackle these systemic issues, there needs to be significant shift in the manner in which industry currently operates (Bocken, Rana & Short, 2015).

While environmental awareness is increasing with the introduction of sustainable certification (Sherin, 2017; OECD, 2012), this promise of ‘doing less harm’ will achieve nothing if we are still operating in an ‘economy based on perpetual growth in a finite world’ (Thackera, 2017, p.90). Therefore, perhaps there should be consideration for alternative, more regenerative approaches that provide an opportunity for both a healthy economy, and a healthy environment (Geng et al., 2012). The Circular Economy is one such solution, and is defined as re-thinking, a re-design how we make stuff: a transition from a linear process to something that is restorative by design (Ellen MacArthur Foundation, 2013).

The Circular Economy (CE) is a synthesis of several other theories and approaches: industrial ecology, cradle-to-cradle, blue economy, performance economy and biomimicry (Geissdoerfer et al., 2017; Lewandowski, 2017; Ellen MacArthur Foundation, 2013). A term originally coined by Walter Stahel, the aim of the Circular Economy is to move from the linear industrial economy to a cradle-to-cradle approach in order to reduce end of pipe waste and lower the

demand for virgin materials within production (Stahel, 2010). Figure 3.1 provides an overview of the Circular Economy system, but it can be summarised in three principles:

1. Preserving and enhancing natural capital - being mindful of materials and how they flow
2. Using your resources effectively - getting the most out of what already exists by keeping products and components cycling for longer within the system
3. Fostering system effectiveness - preventing value from falling out of the system and recapturing it after it does

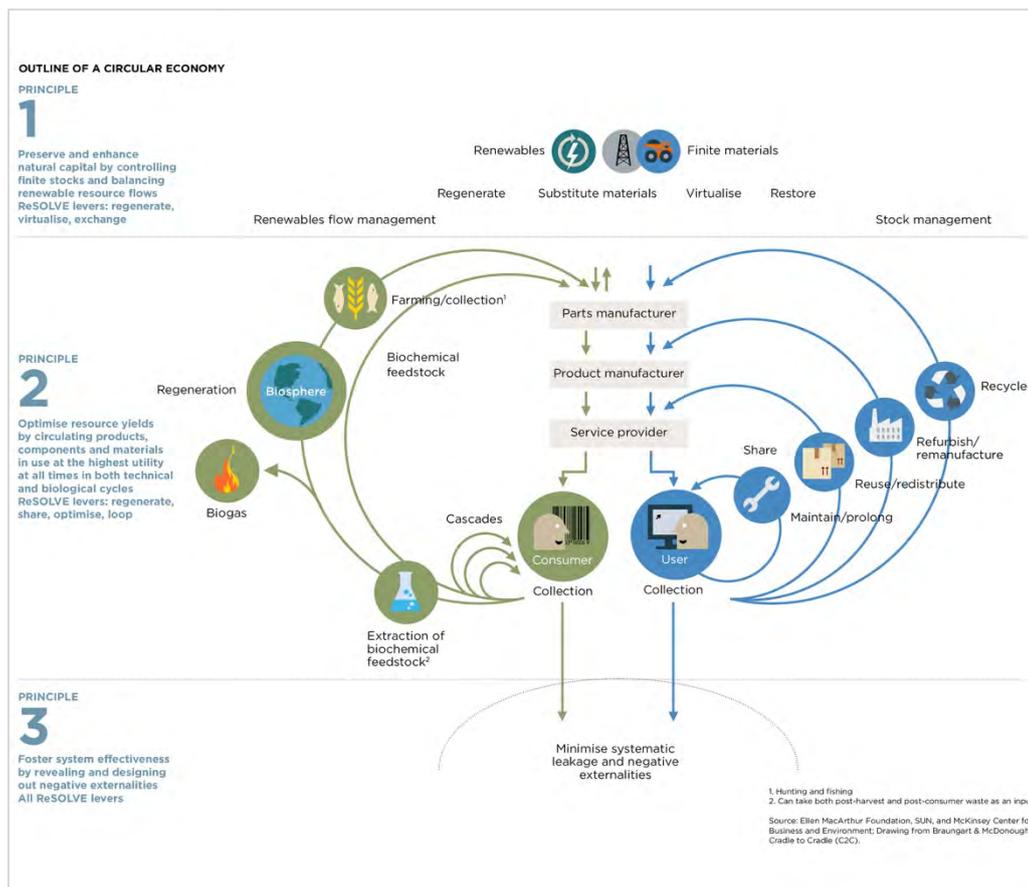


Figure 1.1 Ellen MacArthur Foundation, (2017) Circular Economy System Map

The Circular Economy can also be described through these characteristics:

- **Design out waste** - Separate technical from biological components to prevent materials from falling out of the value chain and create pure streams.
- **Resilience through diversity** - Introduce modularity, versatility and adaptability to create robust systems.

- **Think holistically** - Understand the impact of the individual component of a system while also viewing it as a whole.
- **Think cascades** - Extract value by cascading materials through other applications.
- **Keep products, Components and Materials Cycling Longer** - Longer product lifetimes, reuse, refurbish, remanufacture.
- **Promote Alternative Business Models** - Use product service innovation to make products, components and materials cycle for longer.

(Ellen Macarthur Foundation, 2013)

While characteristics such as promoting alternative business models also positively contribute towards creating longer product lifetimes (Nußholz, 2018), the topic '**Keep products and components cycling longer**' whereby components, products and materials are kept 'at their highest utility and value, at all times' (Webster, 2017, p.16), through extended product lifetimes (Bakker et al., 2014a) is the most pertinent to this issue.

Keep products and components cycling longer - Product Longevity

An outcome of product lifetime extension, Product Longevity (and the benefits it offers) have been extensively researched and accepted as a method for minimising environmental burden of product consumption (Evans & Cooper, 2010). Within a Circular Economy it relates to the inner-most loops of CE system (see figure 1.1) encouraging the 'slowing down' of the resource loops through extended use and reuse of goods (Bocken et al., 2016). Although within the process of 'cycling longer' there are other activities, such as the take-back, disassembly, reassembly and refurbishing for resale and reuse, a great deal of energy will be used in this process (Cooper, 2017). This is why the extension of the primary lifetime of the product should be considered first, and product longevity and product lifetime optimisation has become such a prevalent topic within the sustainability forums (Scott et al., 2009). However, beyond contemplating the inherent durability of the product, 'product longevity is also influenced by consumer behaviour, such as the discarding of functional items' (Cooper, 2010, p.3).

Considering that it has become acceptable to throwaway almost anything these days (Thackera, 2015), landfills have become orphanages for functioning unwanted devices (Chapman, 2017). So, if product lifetime extension were to be adopted more broadly as an approach, it would need to be concerned with not only the physical lifetime but also the psychological lifetime of the product (Ko, Ramirez & Ward, 2011) as there is little use in designing products to last longer if the user has no desire to keep them (Chapman, 2008).

Emotional obsolescence

Psychological or emotional obsolescence is defined as a state when a product is perceived to be 'worn out' by the consumer and thus exchanged whilst still operational (Packard, 1963).

Described as a result of a failed relationship between the product and the user, it signifies a shift in dynamic, a change in intention and attitude towards the product (Chapman & Marmont, 2016) and is a mechanism that has been capitalised by marketers to stimulate consumer spending (Burns, 2010; Spinney et al., 2012).

Previous researchers have attempted to mitigate this issue of emotional obsolescence by approaching it from different perspectives. Van Nes (2003) investigated the motivations for why consumers replace a durable products, concluding that *wear and tear*, *improved utility*, *improved expression* and *new desires* were the main drivers for this to occur. Subsequently suggesting five design directions for alleviating these factors, namely: design for reliability and robustness; design for repair and maintenance; design for upgradability; design for product attachment and design for variability (Van Nes & Cramer, 2005). Whereas Mugge (2007), Schifferstein & Zwartkruis-Pelgrim, (2008), Maclachlan (2011), and Page (2014) focused on solely the notion of Product Attachment, arguing that encouraging the formation of an emotional attachment between the product and user would diminish psychological obsolescence, and result in product lifetime extension. They conclude Memories, Pleasure and Self-Expression are key determinants for why consumers become emotionally connected to products.

While both of these approaches provide a remedy to the issue of emotional obsolescence, it has been suggested that attachment can be counterproductive to lifetime extension, as it can place potentially unattainable expectations on the product-user relationship (Chapman, 2008).

Furthermore, it was observed that attachment does not necessarily slow down purchasing behaviours, and can lead 'to the accumulation and storage of seldom-used items' (Evans & Cooper, 2010, p.334) which when considering the overall objective of improved sustainability through lifetime extension, is also not ideal. Therefore, bearing these factors in mind, it might be suitable to deliberate factors that go beyond attachment and consumer replacement motives.

Emotionally Durable Design (EDD)

A user-focused method of Product longevity, Emotionally Durable Design (Chapman, 2005 & 2008) examines and articulates the unspoken emotional experiences that occur between products and consumers, seeking to take a holistic view in uncovering the complex drivers for why people use, consume and discard some products faster than others. An approach to design,

Emotional Durability (ED) is a set of concepts and recommendations for how to develop more durable, emotionally resilient relationships between people and products, with the ultimate goal of enabling a reduction in consumption and waste of natural resources by facilitating longer product lifetimes (Chapman, 2008).

Used by several researchers as foundation for their research (Lacey, 2009); Russo (2010); Arguin, (2010); Van Krieken (2011); Tokaya, (2013); Padro, (2014) Leube, Ackermann and Keimelmayr (2016); Connor-Crabb, Miller and Chapman,(2016); CLEVER - Closed Loop Emotionally Valuable E-waste Recovery (EPSRC, 2013) , it is cited as a contributing factor for facilitating emotional longevity (Fletcher, 2012; Bakker et al., 2014a; Wastling et al., 2018; Bocken et al., 2016; Huag, 2016). Furthermore, it has been suggested that if we are to design products that can truly resist obsolescence and have an intrinsically longer life, they must have both a Physical and Emotional Durability (Den Hollander, Bakker & Hultink, 2017). However, although as an approach it has become more widely recognised, there is still a lack of practical tools and methods that can help facilitate the integration of these emotionally durable characteristics into products and services (Chapman, 2009).

While researchers have attempted to develop frameworks to integrate this thinking into design (Chapman, 2008; Van Krieken 2011 & 2012; Tokaya, 2013; Padro, 2014; Connor-Crabb, Miller & Chapman, 2016), Emotional durability and attachment as influencers for design are hard to control and predict (Den Hollander, Bakker & Hultink, 2017). The design frameworks and strategies these researchers propose tend not to be validated beyond the theoretical, academic contexts in which they were conceived. This thesis argues that a more comprehensive exploration would reveal more practical and applied potentialities of Emotional Durability thinking within New Product Development (NPD). Furthermore, it has been suggested producers need be more mindful of their role in defining how these relationships develop with their products (Cupchik, 2017).

Therefore, by considering product longevity from these different viewpoints, and contemplating their strengths and weaknesses, this study seeks to understand how the concepts of Emotionally Durable Design might be integrated and translated into a practical, easy-to-use model for new product development within consumer products.

1.2 Subject of study

To ensure the research is applicable and relevant to industry, the study was conducted in partnership with an organisation: Philips Lighting¹, formerly part of Royal Philips. Royal Philips is a Global partner with the Ellen MacArthur Foundation, and a pioneer in adopting and adapting Circular Economy practice in order to reduce dependency on increasingly scarce natural resources and facilitate value creation to ultimately ‘improve the lives of three billion people on the planet by 2025’ (Koninklijke Philips N.V., 2014a). Circular Economy thinking has been embraced by the company at various levels, and research is on-going for how to implement these within the business-to-business (B2B) and business-to-consumer (B2C) markets. It has been realised with the initiative ‘Refurbish Systems’ within Philips Healthcare, which provides refurbished, high quality equipment at lower prices with a Philips warranty (Koninklijke Philips N.V., 2014b); and with ‘light as a service’, a Pay-Per-Lux model developed collaboratively with RAU Architects in Netherlands in 2011 (Ellen Macarthur Foundation, 2017), implemented in Schiphol airport and NUS headquarters London (Koninklijke Philips N.V., 2015a). However, while both projects involved product lifetime extension, within the company these projects are still considered to be pilot studies and only implemented within B2B contexts (Philips Lighting expert 7, 2016).

These cases are only the latest examples of sustainability and lifetime extension initiatives conceptualised within the company. In the 1990’s, an Eco Assessment checklist was developed entitled Philips Fast Five Awareness, which quickly measures the environmental implications of a design against a referenced product (Leal-yepes, 2013; Philips Corporate Design, 1996). It prompts the evaluator to ask questions regarding: *1) Energy, 2) Recyclability, 3) Hazardous Waste, 4) Durability/Repairability/Preciousness and 5) Services.* and was created to measure whether or a not a product could be considered ‘Green Flag Status’ (Bhamra & Lofthouse, 2007, p.108), an internal bench mark created by the organisation. The inclusion of factor: *4) Durability/Repairability/Preciousness* demonstrates that the concepts of emotion and ‘preciousness’ as well as durability have been in the mindset and toolbox of the organisation for the last 20 years. This notion is further supported by the Philips’ ‘Visions of the future report,’ which identified ‘Cherishability’ as a factor that they believed would be important when designing for future (Lambourne et al., 1997). But, the organisation is continuing to explore Circular Economy thinking within their processes, which has created an opportunity for this research to situate itself in the agenda of the organisation, while also providing an additional

¹ In 2018 Philips Lighting N.V. changed its name to Signify N.V. However, the majority of the project was conducted before this rebranding occurred, so to accurately reflect the experience of the research, within this thesis the original company name will be retained.

gateway to explore the integration of product longevity and emotional durability within the company.

In 2016 Royal Philips, an organisation built on a legacy of lighting production, sold off the lighting arm of the business transforming it into a separate company. Although now a smaller company, Philips Lighting (Signify) still has approximately 32,000 employees, in over 70 countries (LinkedIn, 2019), and still leads the market in terms of revenue ranking (LEDinside.com, 2017). Even though they are now entirely separate organisations, Philips Lighting still retains the core values and structure of its originator and is comprised of three main pillars: Business, Research and Design, each strand operating and existing as global leaders in their respective fields. Firstly, within design, the company were pioneers in recognising the value of a design-led approach to technology and innovation, which they adopted from mid 1960's and continue to leverage to this day: 'Design is the art of making technology usable' Knut Yran – Philips Chief Design Officer 1966-1980 (Koninklijke Philips N.V., 2015b). Secondly, within research, aside from ensuring the organisation took a research approach to innovation and technology by establishing in-house laboratories, (Koninklijke Philips N.V. 2018a) the company also began to systematically protecting their innovations and intellectual property (IP) through patents, in part becoming 'bankers of ideas' generating value through licencing (Koninklijke Philips N.V. 2018b). Lastly, within the business sector, since the organisation became a limited company in 1912, they have constantly adapted and changed their business proposition in order to stay competitive within evolving markets. From diversification in the 1920's into X-ray, radios, televisions and electric shavers in the 1930's, to streamlining in 1990's returning to focus on lighting and healthcare, with finally the separation in 2016 of Philips Lighting (Koninklijke Philips N.V., 2018a). Therefore, with all these factors in mind, Philips Lighting proved to be an ideal partner for the research, as the company still retained these qualities and culture, but was now in a state of flux and transition, and potentially open to exploring new ways of providing value to their customers.

Sustainability, product longevity and lighting

For lighting products, the majority of the environmental burden is in use (Schreiber, Sheane & Holloway, 2012); however in terms of energy consumption for domestic lighting, this has reduced by 31% in the last 25 years, due to technology developments and regulation (Smith, 2010; Waters, 2015). A significant percentage of this is due to the phasing out of incandescent bulbs between 2009-2012, underpinning the importance of government regulation within these systems. This, however, also created an unexpected negative consumer backlash, with

consumers feeling patronised by the directive (European Parliament, 2009), resulting in the stockpiling of incandescent bulbs by consumers (Tomkins, 2008). Moreover, as LED's became easier to manufacture, the consumer market was flooded with cheap, short-living LED bulbs that produce poor quality light, resulting in a general dislike in the product category all together (Philips Lighting Expert 1, 2015).

The Waste Electrical and Electronic Equipment Directive (WEEE) was initiated in 2003 and is the main driver for this change to occur across Europe, with the most recent revision setting targets for collection and treatment to be met by authorities, producers, distributors and waste managers (European Commission, 2015; European Parliament, 2012). Minimum targets have been set for category 5 (lighting) for 2015 and 2018 onwards with figures of 75 % recovered, 55 % prepared for re-use & recycle (European Parliament, 2012). However, this only refers to more standard bulbs - halogen, CFL's, LED's, luminaires with increased complexity such as Hue lighting range fall under category 2 (small household appliances) where targets are higher 80% recovered and 70% prepared for reuse and recycle. Within lighting, collection rates remain low, fluctuating between 1-2% from 2013-2016, and with LED technology constantly evolving, this revolution of low-powered alternatives while providing exciting moments for innovation, was also creating new waste streams as well, which is a problem that needs to be addressed at an industry level (Environment Agency, 2015; Recolight, 2016).

Ultimately, the landscape of the lighting industry has fundamentally shifted in the last 10 years; a bulb which was once a consumable is now a long-life product. While from a product longevity perspective this is considered a positive step, from the business and consumer perspectives there are other factors that needs to be considered. Organisations such as Philips Lighting, discovered they need to consider new methods for prolonging engagement between themselves and their customers. Whereas it is not known how these longer living lighting solutions might adapt to evolving consumer needs and desires over time, and what sort of attachments and connections are possible for these more sustainable lighting products.

Light and emotion

Light can significantly impact and effect mood and ambience; can be transformative and used to reveal and delineate but also manipulate and hide faults (Sorrell, 2005). Within philosophy traditions it was seen as a medium of experience to comprehend the world, during the enlightenment associated with objectivity and wisdom (Bille & Sorensen, 2007), a metaphor of existence, truth, clarity, purity, revelation and knowledge (Blumenberg, 1993). Within design contexts, lighting also presents many interior and industrial design opportunities for enhancing

the emotional experiences of daily life (Mead, 2004). The manner in which lighting is set up within the home can also significantly impact mood, health and well-being (Philips Lighting expert 22, 2016). The Philips Hue lighting range includes features that attempt to address several elements of this, utilising technology as an enabler to provide a more personal, emotional and enchanting lighting solutions for the home.

Hue lighting

Hue is an LED ZigBee based connected lighting system that is wirelessly controlled through smart devices, allowing users to have more freedom and functionality in the way can control and design the lighting effects within their home. Hailed as having ‘limitless possibilities’ the colour and white LED lamps can seamlessly synchronise with each other, creating opportunities for more visually and emotional engaging lighting scenes (Signify, 2018). Aside from leading the market in wireless controlled lighting systems (Philips Lighting, 2017), Philips Hue is also a young evolving product line, constantly evolving and maturing, with new features integrated and optimised as it develops over time. However, like most innovations born inside the company, it was a technology-led innovation (Philips Lighting Expert 1, 2016) and the product line has yet to explore of the full range of possibilities for the different types of value it could provide to consumers.

1.3 Rationale and central argument

Challenges and opportunities for Emotional Durability and lighting

There are significant challenges and opportunities the lighting industry is facing. Aside from the increased competition, the extension of the lifetime of light bulbs and luminaires has also fundamentally altered the way in which Philips Lighting are able to engage with their customers. Moreover, awareness and concern for lighting within the home is also quite low, with the average consumer only actively considering a lighting product when it is faulty, broken or they are moving residence (Philips Lighting expert 2, 2016). Therefore, Philips Lighting is interested in understanding how to build emotional engagement, not only between the company and its customers throughout the lifespan of the product, but also between its customers and the product. If Philips Lighting is able to enhance the user’s emotional experience with their product and facilitate a more meaningful relationship, this could not only prolong contact and assist in the ability to meet WEEE targets for collection, reuse and recycle, but also potentially secure a future customer, as attachment to a product may be transferred to the brand, potentially resulting in brand attachment and loyalty (Mugge, Schifferstein & Schoormans,

2010; Davis, 2002). And so, considering the opportunities and challenges that Philips Lighting Hue line offers for exploring the development of emotional longevity, and that it is undergoing constant development and improvement across new generations, it was determined to be an ideal product with which to explore emotionally durable design thinking.

Background to the project and study

Since 2010, Philips and Philips Lighting supported collaborations with TU Delft to explore the implementation of Emotional Durable Design through four master's thesis design projects: two in consumer electronics and two lighting. This doctoral research is an AHRC funded collaboration between University of Brighton and Philips Lighting, and was built upon the foundation research carried out by the Philips Research, TU Delft and Jonathan Chapman. Therefore, in response to information presented in this chapter on the industry, market and the existing research carried out this aim was defined:

Aim

Explore the integration of Emotionally Durable Design concepts into the New Product Development process of consumer lighting through the development of methods and tools.

To achieve this aim, the follow research question was defined:

RQ - Which principles of Emotionally Durable Design are relevant to the extension of the lifetime of a product and how can these be translated into an effective method for new product developers?

1.4 Scope of the study

It has been stated by numerous sources (WRAP, 2013; Stahel, 2010; Bakker et al. 2014b) that the design stage is a beneficial moment for intervention when attempting to integrate sustainability thinking. Therefore, this phase appears to be the most advantageous for implementing environmentally focused philosophies, and thus was chosen as the initial point of intervention. But, before exploring how this can occur, the research needed to understand first: what role does design play within the development process? How does product development operate as a system? And, what approaches and frameworks are used within product development?

New product development frameworks

New product development is a complex organisational system defined as a ‘sequence of steps or activities that an enterprise employs to conceive, design and commercialise a product’ (Ulrich & Eppinger, 2012, p.12) and depending on the product being produced, can vary significantly in duration and scale (ibid). Since there are different approaches that can be utilised by organisations, a scoping literature review was conducted utilising key words: New Product Development, Design, Product and Design Frameworks using the search engines: Proquest, Science Direct and Google Scholar. The approaches that were discovered have been summarised in table 1.1. They were consolidated and analysed to show how the different methods compare and contrast in relation to the steps they take, so the research can firstly understand when and where design occurs, and secondly where these new tools and methods might be integrated.

Universal Principles of Design (Lidwell, Holden & Butler, 2010)	Planning, Scoping, Definition	Exploration, synthesis, design implications	Concept Generation, Early Prototype iteration	Evaluation, Refinement, Production				Launch and Monitor	
Fuzzy Front End (Koen et al., 2002)	Fuzzy Front-End Innovation			Product Development	Implementation				
Double Diamond (Design Council, 2007)	Discover	Define	Develop	Deliver	Product Development				
Design Thinking (IDEO, 2015)	Hear (Inspiration)		Create (Ideation)	Deliver (Implementation)					
Generic NPD Framework (Ulrich & Eppinger, 2012)	Planning / Opportunity		Concept Development		System Design	Detail Design	Pilot Tests		Production Scale
Stage-gate (Cooper, 1990)	Discovery	Scoping	Build Business Case	Development			Test & Validate		
Spiral (or Agile) (Boehm, 2000)	Requirements	Design & Refine	Build	Test & Analyse	Repeat...				

Table 1.1 New product development frameworks

Considering Table 1.1, although each approach has a varying number phases, and use slightly different terminology and levels of detail to describe their respective undertakings, each generally follows a similar process that involves divergent and convergent activities for developing a product.

The inclusion of the design specific frameworks (Design Council, 2007; IDEO, 2015) showcase where the majority of design activities take place within the product development process. However, Trott (2008) argues that in relation to research and development ‘in most cases the word design and the word development often mean the same thing’. Therefore, it can be argued that design activities or practices occur across many other later stages, such as evaluation, refinement and production as well. Regardless, beyond the initial phases of new product development costs tend to increase exponentially, given that from this point prototyping and material production would be undertaken (Trott, 2008). Contemplating this and the information presented in table 1.1, it was determined that this project would explore developing tools that could be applied at the Fuzzy Front End (Koen et al., 2002), Planning/Opportunity and Concept Development Phase (Ulrich & Eppinger, 2012), as at this point within the process there are still opportunities to integrate new thinking without too much disruption or costs incurred.

Important distinctions for the development of the project and tools

The aim for this research is ‘to develop tools and methods for New Product Development’ therefore it is important to make a few distinctions with regard to whom the users of the tools were within this context.

The intended users were those who work within New Product Development. I.e. product managers, researchers, engineers, product designers, service designers and marketers. Within this thesis they are referred to as ‘new product developers’, NP developers’ or ‘developers’ throughout the research.

Aspects of the research also involved interactions with end-users (those interacting with products) in order to gain a deeper knowledge and insight into the concepts of Emotional Durability, therefore in order to avoid confusion they will be referred to as ‘users’ or ‘end-users’.

Next steps

Considering the aim, research question and scope have been defined, the next steps of the research were to conduct a more comprehensive literature review. This was to uncover what are the current tools and methods available related to the Emotional Durability and the emotional longevity of products. This is found in the next chapter.

1.5 Structure of thesis

This thesis is structured in the following way:

Chapter 2 – Literature Review investigates the fields of practice most relevant to the extension of the emotional lifetime of products. It critically reflects upon the design models and principles previously developed, consolidates the most pertinent concepts and strategies in order to create the theoretical foundation for the new tool.

Chapter 3 – Methodology discusses the methodologies and methods considered to explore the aim and research questions identified in Chapter 1. It presents the overall approach that was defined and outlines the methods used to carry out the research.

Chapter 4 – Developing the framework outlines the first phase of the practice journey whereby the key principles identified in the literature review were defined into an initial framework and then refined through seven workshops with participants from NPD.

Chapter 5 – Presenting the framework introduces the ‘Emotional Durability Design Nine’ a tool for product longevity outlining each theme and strategy in detail. It uses product and literature examples to demonstrate how these concepts can materialise within design.

Chapter 6 – Testing the framework outlines the second phase of the practice journey whereby two design workshops and a solo design activity were conducted to test how the framework would operate in practice. It presents the outcomes of these activities and concludes by analysing and reflecting upon the key findings.

Chapter 7 – Results, Discussion and Conclusion presents the final toolkit that was developed in response to the outcomes of Chapter 6, outlining the procedure for how, when and where to use the tool. It critically reflects upon the key findings and offers points of discussion related to the effectiveness of the tool. While lastly, discussing the wider implications and limitations of the study and future research that could be carried out.

Chapter 2 - Literature Review

This chapter presents the bodies of research that were reviewed and demonstrates the gap and opportunity space between knowledge and practice. It shows that while there are numerous strategies and concepts related to emotional lifetime factors, many have not been fully validated or translated into a comprehensive tool for new product development. It concludes with the consolidation of all the strategies uncovered.

2.1 Introduction

Considering the aim and the research question defined in Chapter 1, a thorough review of the literature was needed for two reasons. Firstly, to demonstrate the gap and opportunity space whereby the emotional longevity and emotionally durable design perspective is considered within the scope of tools and methods. Secondly, to identify and consolidate the strategies and principles relevant to extending the emotional lifetime of product, in order to build a theoretical foundation for the new tool. The tools and principles that were uncovered within the review were critically assessed and their content and structure evaluated to reveal any limitations or opportunities for how they can be used, understood or communicated to developers.

Procedure for the review

To understand the ‘state of the art’ for Emotional Durability and uncover other relevant fields of practice, a search was conducted utilising these key terms: ‘Emotionally Durable Design’, ‘Emotional Durability’, ‘Emotions’, ‘Attachment’, ‘Experience’, ‘Product Longevity’, ‘Lighting’, ‘Toolkits’ and ‘Design Strategies’, using the search engines: Proquest, Science Direct and Google Scholar.

To determine which sources to review a selection criterion was defined. This was based upon whether or not the sources contained design strategies, principles or frameworks that related to the lifetime extension of objects, and if they appeared to have been conducted and compiled in a rigorous and academic manner, as not all research projects took place within academia. The books, chapters, articles and reports identified as relevant to the research were then rated and categorised in three groupings A-C:

A - Offered strategies/principles directly related to the central topics and the research question

B - Supporting knowledge to the central topics or strategies from neighbouring fields of research

C - Contributed to background information to the topics and overall research

This next section of the review presents the significant pieces of research that were found.

2.2 Emotional Durable Design

Originally conceived by Jonathan Chapman in 2005, *Emotionally Durable Design* is a book and set of concepts that relate our current sustainability issues and shorter product lifetimes to emotion-driven consumption practices. It argues that consumers are using objects as ‘existential mirrors’ (p.36) to reflect their dreams and desires, a behaviour that is a hangover from the ‘nomadic individualism and excessive materialism’ of the twentieth century (p.18).

This, coupled with a ‘technocentric’ (p.18) approach to design, which delivers static, emotionally void object-user interactions, has trapped consumers in ‘endless cycles of desire and disappointment’ (Chapman, 2005 p.17), resulting in the mindless over-consumption of goods. Beyond highlighting the importance of the emotional experience of consumption, the text also provides recommendations to designers for how to adapt their approach and mind-set to consider this perspective in their practice. At the close of each chapter, a ‘toolbox of ideas’ is presented, which comprehensively summarises the content of the chapter, providing a detailed description and consolidation of the thinking into 24 ‘ideas’.

In 2008, these concepts were developed further and a six-point experiential framework was conceived which consists of: *Narrative, Detachment, Surface, Attachment, Fiction* and *Consciousness*. It is proposed that each point represents a key area for exploring an Emotionally Durable Design perspective, providing a concise description of the approach as a whole. The points are:

- **Narrative** - users share a unique personal history with the object; this often relates to when, how and from whom the object was acquired.
- **Detachment** - feel no emotional connection to the object, have low expectations and thus perceive it in a favourable way due to a lack of emotional demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable).
- **Surface** - the object is physically ageing well, and developing a tangible character through time, use and sometimes misuse.
- **Attachment** - feel a strong emotional connection to the object, due to the service it provides, the information it contains and the meaning it conveys.
- **Fiction** - are delighted or even enchanted by the object as it is not yet fully understood or

know by the user; these are often recently purchased objects that are still being explored and discovered by the user.

- **Consciousness** - the object is perceived as autonomous and in possession of its own free will; it is quirky, often temperamental and interaction is an acquired skill that can be fully acquired only with practice. (Chapman, 2008, p.17)

Stated as ‘having a permanent (rather than transitory) value due to their position within the stable and established construct(s) of human psychological function’ (Chapman, 2008, p.14), the framework was developed as a result of conducting a survey with 2154 respondents and deployed as part of an exhibition at 100% design. The framework was then tested through two pilot workshops and a final creative workshop event conducted with 20 practitioners using the framework. Concepts representing each point were developed as a result.

Overall, it was concluded the framework provided ‘designers with distinct conceptual pathways through which to initiate engagement with the issues of emotional durability’ (Chapman, 2008, p.148). However, contemplating the content of both studies, while the 2008 framework presents a refined and delineated grouping of themes and terminology, the 2005 ‘toolbox of ideas’ provided more detailed descriptions of the concepts and perspective as a whole. Moreover, although the 6-point framework does provide boundaries and opportunity for design exploration, these notions are quite conceptual and diverse, rely on the designer’s ability to interpret them into product features, and provides limited information on how they contribute to emotional longevity.

Since the publication of Emotionally Durable Design these concepts have been used by others in research and practice, and several authors have adopted the concepts as a driver for research within product development. Namely:

- Lacey (2009) *Design for meaningful interaction and Emotional Durability*. An AHRC-funded research project exploring Emotional Durability within her professional practice of ceramics.
- Russo (2010) *SHOES, CARS AND OTHER LOVE STORIES: Investigating the experience of love for products*. Based her PhD research proposition on Chapman’s premise that (p.156) ‘love for products is incapable of mutual evolution and growth as it lacks reciprocity’.
- Arguin, (2010) *Emotional durability is the new Sustainability*. A master’s project that attempted to uncover the emotional drivers for why consumers keep objects beyond their initial function.

- Leube, Ackermann and Keimelmayr (2016) conducted a series of case studies to assess whether Animacy can lead to a stronger sense of emotionality with the product.
- Connor-Crabb, Miller and Chapman (2016) *Fashion Design for Longevity: design strategies and their implementation in practice* is a PhD study into how Emotional Durability and longevity materialises within the fashion industry.
- CLEVER - Closed Loop Emotionally Valuable E-waste Recovery (2013-2016). An EPSRC funded research collaboration between University of Bath, Newcastle, Leicester and Loughborough exploring the feasibility of closed loop recycling of consumer electronics (mobile phones), utilizing product service systems combined with the strategy of ‘ageing gracefully’ (EPSRC, 2013).

While each project relates to different fields of design, some adopted similar approaches for exploration. Studies by Lacey (2009) and Connor-Crabb, Miller and Chapman (2016) interpreted and materialised emotional durability through design practice, producing garments and ceramics to demonstrate how it can be used as a strategy for design. While Leube, Ackermann and Keimelmayr (2016) and the CLEVER Project (EPSRC, 2013) investigated the validity and effectiveness of specific Emotional Durability strategies on emotionality, by developing products and materials that were tested by users. Lastly, Russo (2010) focused on discovering how and when love might be experience between people and objects, and Arguin (2010) attempted to uncover and suggest design principles which can result in emotional longevity.

Though all the projects contribute to the overall understanding of investigating Emotional Durability, concerning how these relate to methods and tools, authors Arguin (2010) and Conner-Crabb, Miller and Chapman (2016) explored more specifically the tensions and complexity for adopting these ideas with in practice. Though Arguin (2010) argues it isn’t possible to define a design methodology for emotionally durable design stating it to be too context-specific. In contrast, Connor-Crabb, Miller and Chapman (2016), suggests longevity strategies need to exist ‘deeply rooted within the heart of the business model’ in order to succeed in practice. Yet, none of these authors proposed a distinct tool or process for developing an emotional longevity perspective within practice.

Philips and Emotion Centred Research Collaborations

Observing a gap in the knowledge whereby the emotional longevity and Emotionally Durable Design perspective can be developed using a tool, four master’s projects were conducted in

partnership with Delft University of Technology and Royal Philips and Philips Lighting (Philips Lighting Expert 1). Three students selected Emotional Durability and one chose Slow Design as the subject for their investigation, each tasked with exploring the integration of the concepts into the design of consumer electronics. These were:

- Van Krieken (2011) - *A Sneaky Kettle: Emotionally Durable Design Explored in Practice*. Developed an Emotional Durable kettle based on ideas of ‘Consciousness’ and ‘Engagement’ and proposed a design card set of 12 Emotional Durability qualities.
- Grosse-Hering (2012) - *Slow Design*. Redesigned a juicer using Slow Design principles, reframed the content to be more explicit for design and proposed a 7th principle of RITUAL.
- Tokaya (2013) - *Ethos: Exploring emotionally durable design strategies in the field of LED lighting*. Developed a lighting prototype based on ideas of ‘Consciousness’, curiosity and ‘Fiction’ proposing design guidelines for animated luminaires.
- Padró (2014) - *Emotionally Durable Lighting: An Exploration of Emotionally Durable Design for the Lighting Domain*. Designed and developed a prototype based on ‘Uniqueness’ and ‘Narrative’ and proposed three constraints for Emotionally Durable lighting design.

Each project explored the issues and opportunities for how Emotional Durability and Slow Design concepts materialise within products, while also proposing design models for how to facilitate the thinking within practice. Considering Grosse-Hering (2012) selected Slow Design as a point of investigation, this will be discussed separately in the next section of the review.

Beginning by deliberating the design models, Van Krieken (2011) took the broadest perspective through the interactive card set of ‘12 Emotional Durability Qualities’ and incorporated concepts from across the whole landscape of Emotional Durability, which were then subsequently refined into 5 Qualities (Van Krieken, 2012). Whereas, the design guidelines and characteristics presented by Padro (2014) and Tokaya (2013) provided insight regarding only a few of the central concepts. Tokaya (2013) investigated ‘Consciousness’ and developed guidelines for how to create an animated luminaire proposing there must be consideration of Character, Light Effect, Sensory Input, Luminaire Design (Construction) and Product Person Interaction. While Padro (2014) outlined three constraints for emotional durable design, stating that a product must have Uniqueness, Meaningfulness and Analogoueness, exploring in detail how these relate to facilitating ‘Narrative’ within a product.

Although each framework advanced the thinking, no singular model provided a comprehensive

overview for applying Emotional Durability within design. Though Van Krieken's (2011) card set was the most advanced in terms of offering a practical tool, Padro's (2014) and Tokaya's (2013) studies presented more granular detail and insight.

Contemplating the products created as a result of using the models, the concepts by Tokaya (2013) and Van Krieken (2011) could be viewed as more sophisticated and complex in terms of the designed experience. This could be because designing with Animacy, Consciousness or Fiction, one might argue, is a slightly simpler prospect than Narratives and Uniqueness. This could be an important factor when considering how designers might engage with the concepts within the new tool and must be deliberated when considering how it will operate in practice. However, it is also important to note, that lighting a subject for design poses challenges that other consumer electronics do not.

Objects like a toaster, kettle, and hair dryer perform specific tasks without much disparity in engagement or output. Whereas lighting as a functional object, depending on its type, has many different uses and meanings and varying scales of involvement. An over-head hallway light bulb is consciously engaged with less than a bedside lamp, and different types of light are produced for different uses, for example: utility lighting (bathroom mirror light), ambient or mood lighting (watching tv), or security lighting (front step). Designing to meet these different needs can be a complex challenge. Lastly, each project conducted small-scale end-user tests to observe if the inclusion of the features inspired by Emotional Durability led to emotional bonding. Although it was observed that the inclusion of these features positively affected the user experience, each study recognised that additional time would be needed to identify whether this would result in an extended product lifetime. Nevertheless, these projects were successful in carrying forward the research on Emotional Durability, as they were studies conducted in partnership with industry, thereby offering key insights regarding which factors are more relevant to new product development.

2.3 Slow Design

Derived from the Slow Movement, Slow Design advocates that approaches to production and consumption should be slower and more contemplative, in order to bring about an increase in positive wellbeing for economies, societies and individuals (Strauss & Fuad-Luke 2008); directly opposing the fast fashion, speed model that has resulted in a deterioration in ethical practices and trust in organisations from consumers (Beverland, 2011). Within the Philips study, Grosse-Hering et al., (2013) embraced and adapted the six Slow Design principles offered by Strauss & Fuad-luke (2008) and proposed additional content to facilitate engagement with the

principles within their practice. Presented as explanation shown in bold below, these were added to original principles and a further 7th principle RITUAL included as well.

- REVEAL
Slow Design reveals spaces and experiences in everyday life that are often missed or forgotten, including the materials and processes that can easily be overlooked in an artefact's existence or creation. **Creating awareness, uncovering the essence of a product.**
- EXPAND
Slow Design considers the real and potential 'expressions' of artefacts and environments beyond their perceived functionality, physical attributes and life spans. **Give a bigger picture: zoom in (what is it made of) and zoom out (where does it come from).**
- REFLECT
Slow Design artefacts and environments induce contemplation and 'reflective consumption'. **Provide time for the user to think about his actions, visualize processes and create narrative products.**
- ENGAGE
Slow Design processes are open-source and collaborative, relying on sharing, cooperation and transparency of information so that designs may continue to evolve into the future. **Do-it-yourself concepts; the user becomes a designer; the user is active in the creation of the product.**
- PARTICIPATE
Slow Design encourages users to become active participants in the design process, embracing ideas of conviviality and exchange to foster social accountability and enhance communities. **Create design opportunities so that the user can re-design and re-configure the product. The user is active during the use of the product.**
- EVOLVE
Slow Design recognizes that richer experiences can emerge from the dynamic maturation of artefacts, environments and systems over time. Looking beyond the needs and circumstances of the present day, Slow Designs are (behavioural) change agents. **Products that are changing or growing over time.**
- RITUAL
Embracing ritual beyond the commodified time of industrial production. These designs offer diverse expressions of ritual and different time experiences. Using rituals to create a better user experience and provides security and stability in a hectic society.

Grosse-hering (2012, p.19)

Reflecting on the content of the model, although the seven principles emphasise different factors to Chapman's (2008) framework, it could be argued that they share similar theoretical foundation to Emotional Durability in their desire to build richer, more reflective consumptive practices that can evolve over time. Moreover, although the titles and explanations are alike in structure, Grosse-Hering's model, similarly to Van Krieken's, features images to showcase the principle in action. See figure 2.1 below.



Figure 2.1. Reverse of design tools (Left) Grosse-hering, 2012; (Right) Van Krieken, 2011.

The inclusion of the images and the additional statements provide more concrete examples of what the principles convey, which may be helpful for demonstrating the content of the new tool to designers. Lastly, as with Grosse-Hering's (2012) work, there are other fields of practice that engage with emotional longevity concepts, such as Product Attachment, that also may offer opportunities to critique and/or enhance the concepts of Emotional Durability previously proposed.

2.4 Product Attachment

One of the more established bodies of research regarding extending the emotional lifetime is Product Attachment. Defined as the 'strength of the emotional bond a consumer experiences with a durable product' (Schifferstein & Zwartkruis-Pelgrim, 2008), it has been recommended by numerous researchers (Mugge, 2007; Chapman, 2008; Schifferstein & Zwartkruis-Pelgrim, 2008; Mugge, Schifferstein & Schoormans, 2010; Page, 2014; Bakker et al., 2014; Cooper, 2000; Van Hinte, 1997) as an approach or strategy that results in a longer product lifetimes. Studies concluded that objects that facilitate enjoyment, pleasure and stimulate memory associations are more successful in the formation of attachment (Mugge, 2007; Schifferstein & Zwartkruis-Pelgrim, 2008; Maclachlan, 2011; Page, 2014). Moreover, if the interaction with the product is engaging it can in turn stimulate prolonged use, increasing the opportunity for a memorable event to occur (Schifferstein & Zwartkruis-Pelgrim, 2008). Consequently, the formation of these emotional bonds can result in the user taking better care of the product and

be less willing to dispose of it at end-of-life (Mugge 2007).

While many of the researchers undertook different procedures for examining the factors that positively affect the emotional connection between users and durable products, the proposed strategies that result in attachment are:

Strategies/determinants	Authors
Memories; Memories & Longevity; Memories & Nostalgia	Mugge (2007); Schifferstein & Zwartkruis-Pelgrim (2008); Maclachlan (2011); Page (2014)
Pleasure	Mugge (2007); Schifferstein & Zwartkruis-Pelgrim (2008); Maclachlan (2011); Page (2014)
Enjoyment	Schifferstein & Zwartkruis-Pelgrim (2008)
Self-Expression; Support-Self Identity	Mugge (2007); Maclachlan (2011); Schifferstein & Zwartkruis-Pelgrim (2008)
Usability	Page (2014)
Sensory Design	Maclachlan (2011); Ludden (2008)
Superior Appearance	Mugge, Schifferstein & Schoormans (2010)
Utility and Reliability	Schifferstein & Zwartkruis-Pelgrim (2008)
Product Personality	Mugge (2007); Maclachlan (2011)
Group Affiliation	Mugge (2007); Schifferstein & Zwartkruis-Pelgrim (2008)

Table 2.1 Product Attachment strategies

The majority of the researchers (Mugge, 2007; Schifferstein & Zwartkruis-Pelgrim, 2008; Maclachlan, 2011; Page, 2014) reached similar conclusions as shown in table 2.1, and the key findings are that *Memories, Pleasure, Enjoyment, Self-Expression, Sensory Design, and Personality*. As Maclachlan, (2011, p.308), states these design strategies ‘were identified as the most influential in terms of enhancing user experience and encouraging product attachment’.

Furthermore, it is also proposed that Product Attachment can influence consumers to retain their durable goods for longer periods of time and assist in designing for emotional longevity, as Mugge, (2007, p.120) observed ‘people who are attached to a product, take better care of this product, and are less eager to dispose of it.’

The only variations of note are firstly that Maclachlan (2011) made stronger associations between *Longevity* with *Memories* and examined ‘product longevity and the role that memories play in establishing emotional bonds’ (p.109), proposing that repeated use of an object coupled with emotional investment results in the product appearing to improve over time. Secondly, Page (2014) proposes new connections relating to Quality and Durability, suggesting that a product able to retain its quality over time becomes something admired by users. While researchers were unable to find evidence that *Group Affiliation* had a positive effect on

emotional longevity (Mugge, 2007), they believed it to be a factor that had some bearing on emotional engagement with a product, and so it was retained as potential strategy at this stage of project.

Regarding using Product Attachment in practice, although studies defined several factors that relate to the extension of the emotional lifetime of an object, putting these principles in practice can often be a challenge (Maclachlan, 2011). As such, design and emotion research has given little guidance for designers on how to integrate this thinking into products (Love, 2009). While Maclachlan (2011) created a set of design guidelines which included suggestions such as: ‘Provide the opportunity to embed meaning and associate memories’ and ‘Express the values and beliefs of the target user’ (p, 310), it could be argued that these terms and instructions are still quite abstract for a practicing designer, supporting the hypothesis that emotional longevity factors do not yet adequately facilitate this thinking within NPD.

Moreover, authors recognise that while the design strategies identified might contribute to increase emotional bonding ‘we do not claim that the presented strategies are exhaustive. Other opportunities may exist to design products in such a way that they are more likely to bring about one or more of the determinants of product attachment.’ (Mugge 2007, p129).

2.5 Preliminary discussions and conclusion

In summary, reflecting on the methods and tools presented in this section regarding Emotionally Durability, several of the authors critically analysed how these strategies are embodied in design features (Lacey, 2009; Chapman, 2008; Van Krieken, 2011; Tokaya, 2013; Padro, 2014). However, these studies only address some aspects of Emotional Durability, and there is material yet to be explored.

The procedures for how the research-derived principles are presented and employed are different, and only Van Krieken, (2011) and Chapman (2008) within Emotional Durability research, and Grosse-Hering, (2012) and Maclachlan (2011) from the other areas of practice, attempted to formalise their strategies into a design tool.

Contemplating all the models and frameworks of Emotional Durability together, the different levels of detail and the various methods that are offered could be viewed as confusing for a practicing designer. Therefore, further research should be undertaken to understand how to translate the thinking into design instructions and design features.

One important point to discuss is the validity of whether or not the strategies or concepts

proposed by previous authors will result in emotional longevity; most are cautious to claim such outcomes. While Van Krieken (2011, p.59) affirms that ED qualities ‘should contribute to enhancing the emotional bond between a user and a product’. Mugge (2007, p.129) states ‘We believe that the presented strategies may serve as inspiration for designers to design products that convey a special meaning’ (Mugge, 2007, P.129). Whereas, Chapman (2008, p.149) offers that ‘This 6-point experiential framework presents a set of core principles that provide a clear, conceptual structure, for creative enquiry into issues of emotional durability and product design.’

Another limitation of carrying out product lifetime research of this nature is that most studies can only be carried out retrospectively, with authors Chapman, (2008), Mugge, (2007) and Maclachlan, (2011) utilising questionnaires and surveys to gather data on emotional connections with objects. Though, subsequent studies attempted to assess the extent of emotional bonding to prototypes developed using emotional longevity concepts, (Van Krieken, 2011; Tokaya, 2013; Padro, 2014; Leube, Ackermann and Keimelmayr, 2016), due to time constraints these were only conducted over short periods of time.

To truly demonstrate whether designing with factors such as Narratives, Surface or Memories results in longer product lifetimes would take years to investigate, which is outside the scope and time frame of a PhD project. Therefore, the primary researcher took the perspective that while it cannot be conclusively determined that the strategies offered will produce emotional longevity, as these principles were developed by previous researchers through observing and recording the drivers for why people have loved and kept some objects longer than others, applying these principles is likely to encourage emotional longevity. It was also concluded that this research project could also collect data on cherished and loved objects and use this data as a means for validating and selecting which principles of emotional longevity are most relevant to NPD. Thus, cherished object stories were collected from users which will be described further in the next chapter.

Overall, it has been observed by many authors that if a user develops an emotional bond with a product they are less likely to discard or replace it (Mugge, 2007; Chapman, 2008; Schifferstein & Zwartkruis-Pelgrim, 2008; Mugge, Schifferstein & Schoormans, 2010; Page, 2014; Bakker et al., 2014; Cooper, 2000; Van Hinte, 1997). However, some pathways for developing this emotional bond have been more thoroughly investigated than others. As shown in Product Attachment, there has been consensus over many studies as to which are more effective. Factors such as ‘Memories’, ‘Pleasure’ and ‘Support Self-Expression’ are drivers for why

emotional connections are formed (Mugge, 2007; Schifferstein & Zwartkruis-Pelgrim, 2008); yet, these could be viewed as abstract concepts to engage with from a practicing designers perspective. Whereas in Emotional Durability, due to the breadth of the material, most studies have only examined aspects of the different conceptual pathways such as Consciousness, Fiction (Van Krieken, 2011; Tokaya, 2013; Lacey, 2009; Chapman, 2008), and Narratives (Padro, 2014; Chapman, 2008), and most as only short term studies.

Therefore, in addition to the concepts from Product Attachment and Slow Design that were deliberated, the primary researcher decided to consider other fields of practice similar to Emotional Durability as well. This was to uncover whether there were other strategies that could provide additional support for facilitating emotional bonding and product lifetime extension. Moreover, Emotionally Durable Design as an approach and set of concepts overlaps with other sustainability methodologies that have been more thoroughly investigated, which could provide a stronger foundation for applying these ideas within design. This will be discussed in more detail in the next section.

Other bodies of literature identified

After this initial deep dive into emotional longevity literature, it was revealed that Emotionally Durable Design could be linked to three other bodies of literature, namely, Emotion Centred Design, Product Lifetimes, and Experience Design as shown in figure 2.2 below.

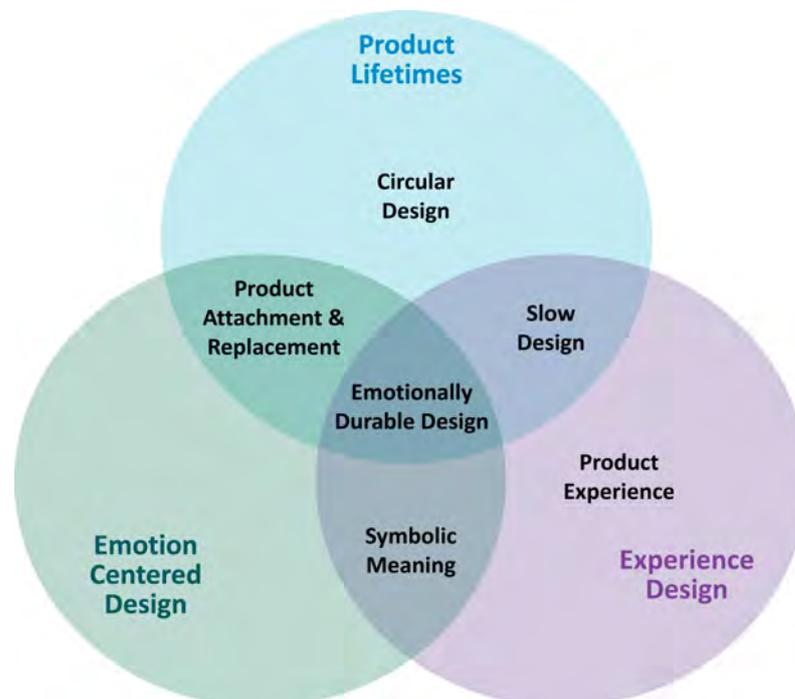


Figure 2.2 Venn diagram demonstrating how Emotional Durability relates to other significant fields of research.

Within these areas of research, the most pertinent disciplines (other than Emotional Durability) were identified: Product Attachment, Slow Design, Product Replacement, Circular Design, Product Experience, and Symbolic Meaning. While some have already been discussed in the review, as stated in the previous section additional insight and strategies from these neighbouring fields of practice could provide support for validating Emotional Durability concepts. Thus, these principles and strategies from each of these areas of practice were reviewed and considered for the construction of the tool.

2.6 Circular Design

The lifetime extension of a product relates to the inner most loops of the Circular Economy system (Bocken et al., 2016), and there are a number of different approaches that facilitate this within products, the most recent known as Circular Design (Moreno et al., 2016). An evolution of previous approaches such green design and design for sustainability, Circular Design is a practice that requires designers to be systems-level thinkers (ibid), who actively integrate lifetimes extension strategies while also being mindful of the implicit business model that surrounds the product (Bakker et al., 2014b).

Though there are numerous Circular Design frameworks and strategies for extending the physical lifetime of a product (IDEO & Ellen MacArthur foundation, 2017; Moreno, Ponte & Charnley, 2017; Moreno et al., 2016; Forum for the future, n.d; Bakker et al., 2014a; The Great Recovery Project, 2013) only a few reflect upon factors of the emotional lifetime as well. The '*Circular Design Guide*' (IDEO & Ellen MacArthur foundation, 2017) incorporates elements of emotion-centred thinking in their tool 'Brand Promise'. While the '*Circular Framework*' (Moreno et al., 2016) and '*Circular Design Tool*' (Moreno, Ponte & Charnley, 2017) mentions 'attachment, trust, loyalty and meaningful design' as a contributing factor of the products' lifetime. However, these inclusions are brief and not comprehensively studied, whereas research undertaken by authors in the next section outline a broader perspective on the topic.

The text '*Products that last*' (Bakker et al., 2014a) provides a holistic approach to Circular Design, by recommending both strategies and business models for extending the emotional and physical lifetime of products. Firstly, through these six strategies:

1. Design for Product Attachment and Trust

2. Design for Product Durability
3. Design for Standardization Compatibility
4. Design for Ease of Maintenance and Repair
5. Design for Upgradability and Adaptability
6. Design for Dis- and Re-assembly

The text recommends that designers should consider the strategies in the order 1-6, proposing that ‘Product attachment and trust’ be considered first. The rationale, is that in order retain the product’s integrity and reduce overall impact, producers should aim to change as little as possible after production (Bakker et al., 2014a, p.83). While this suggestion is positive towards including emotional factors in NPD, within the text only case study examples are provided to demonstrate the tactic. On the other hand, the physical longevity factors recommended have been more thoroughly researched and have been shown to improve the overall physical lifespan of a product (Bakker et al., 2014b). Therefore, if connections can be made between these more established strategies and those for emotional longevity, these could provide additional opportunities for these concepts to be integrated into the product.

‘*Design for Demand*’ is a free online resource that provides guidance for how to circular within production, and was developed by Forum for the future (sustainability-led non-profit organisation) in partnership with Novelis in 2016. As part of their process they suggest three strategies:

Openness – advocates that materials, processes and products should have more transparency to motivate sustainable behaviours from consumers and organisations. It suggests that, if producers provide detailed knowledge of the product, this can empower consumers to make responsible decisions, as well as build trust and authenticity between these two stakeholders. This in turn creates a new type of value, giving producers a competitive edge.

Storytelling - directly quoting Emotional Durability as a source, it recommends fostering emotional connection between people and products, through experiences and interactions to encourage sustainable behaviours. It promotes ideas of thinking local, fostering of community, the appreciation for craftsmanship and the careful consideration of material choices.

Service – focuses on crafting the overall user experience by providing new types of value, support and engagement. An enabler for circular strategies, it is about reconfiguring systems by considering the dematerialisation of products offered, or new

modes of consumption such as sharing or leasing.

(Forum for the future, n.d available at:

<http://designfordemand.forumforthefuture.org/section/4-2-strategies/>

Aside from directly including elements of Emotional Durability in their thinking, (as shown in link above) the strategies are also presented as ‘user-centred’ in the introduction (Forum for the future, n.d: available here <http://designfordemand.forumforthefuture.org/section/4-1-create-change-by-designing-for-demand/>) further showing their intent to consider the consumer in their methodology. Although this resource was not academically developed, and the reviewer was unable to find sources to demonstrate what methods and data were used to develop it, the concepts were still considered as influencers for the new tool. While there could be issues of legitimacy, it is argued that this framework is representing a perspective from industry in regard to this topic, a viewpoint that no other model offers. Moreover, this toolkit provides an alternative outlook to the circular economy discourse predominantly focused on technical elements of the system.

In summary, what the development of these toolkits, models and research studies show is that there is an on-going interest in exploring emotional and physical product longevity through circular design. However, many only provide general guidance to specific entry points of emotional longevity, rather than instruction on how this could be achieved. The lack of consideration of the consumers' emotional experience leaves these ideas of product longevity pending from a user's perspective, as a product will only be able to sustain a long life if it is kept by the user. Based on the literature presented in these models, developers cannot make products that can ‘resist obsolesce’ (Den Hollander, Bakker and Hultink, 2017) if their emotional longevity is not considered as well.

2.7 Product Replacement

Another stream of research attempting to understand which factors affect product lifetimes is Product Replacement (Mugge Schoormans & Schifferstein, 2005; Van Nes & Cramer 2005; Page, 2014). First proposed by Van Nes & Cramer (2005), they uncovered that '*Wear and Tear*', '*Improved Utility*', '*Improved Expression*' and '*New Desires*' are the main drivers for consumers replace their durable product. Findings that are further supported by Prakash et al., (2016) who stated that ‘desire for a better device’ was shown to be a main contributing cause for the replacement of electrical goods. In order to mitigate these replacements motives Van Nes and

Cramer (2005) proposed these five design strategies:

- Design for Reliability & Robustness
- Design for Repair & Maintenance
- Design for Attachment
- Design for Upgradability
- Design for Variability

Though previous methods discussed tend to be biased towards either the physical or emotional lifetime, this approach deliberates both. Aside from discussing factors such as wear and robustness, it also highlights ideas of fashion, desire, expression and evolution, notions that have been previously discussed by researchers examining Emotionally Durable Design (Tokaya, 2013; Van Krieken 2011; Chapman 2008). While the authors take a pragmatic perspective on applying these strategies and are sceptical as to the validity of attachment and emotional qualities, as argued above there is an emotional dimension that could be explored further. Thus, these strategies were also examined in order to provide further depth and insight for the development the tool.

In summary the methods and strategies proposed in this Product Lifetimes section are relevant for understanding the holistic viewpoint on extending the lifetime of a product. Considering these concepts as well could potentially point towards areas of convergence between the two perspectives. Therefore, the strategies and principles presented in this section of the review will be considered for a new tool.

2.8 Experience Design and Product Experience

Product Experience is defined as ‘all the possible affective experiences involved in human-product interaction’ (Desmet & Hekkert 2007) and Experience Design as an ‘approach which focuses on the design of pleasurable and meaningful moments inscribed into and mediated through the material (objects, technology)’ Hassenzahl et al., (2013). While this second definition aligns closer with what EDD is trying to achieve, the ‘Framework for Product Experience’ devised by (Desmet & Hekkert 2007) identified three levels of experience: *aesthetic experience*, *experience of meaning* and *emotional experience*. It argues that both *aesthetic experience* – which describes the objects ability to delight the senses through look, feel, touch, as well as the *experience of meaning* – which describes cognitive process such as accessing memories, making associations and assigning personality, produce and drive an *emotional experience* in the user. This thinking corresponds on several levels with an Emotionally Durable and Product Attachment perspective. As Desmet and Hekkert (2007)

argue, that Product Attachment is merely an outcome of the user product interaction journey, so focus should be placed on the designed experience. While Chapman (2015, p.89) states that

‘any object (no matter how mundane or common place) is capable of eliciting intense arrays of experience within users, and that each design decision (no matter how small) is wholly influential over the way in which the users perceive these experiences’.

Therefore, if contemplating the designed experience of the user is required to develop more emotional connections, it was determined necessary to consider the concepts from Product Experience as influencers for the new tool as well.

2.9 Symbolic Meaning

Symbolic meaning for design is a concept developed by Casais, Mugge & Desmet (2016) within the Positive Design centre at Delft University. Derived from the field of Psychology, the design framework builds upon Carol Ryff's determinants of Psychological Well-being: *positive relations with others, personal growth, purpose in life, environmental mastery, autonomy and self-acceptance*. These determinants were re-interpreted as six happiness-related symbolic meanings for product design and consequently translated into 16 design directions. The framework takes a purely positive perspective on how we could relate to objects within our daily lives and the blog www.symbolicmeaningresearch.weebly.com showcases product examples which embody these in practice. The design concepts on the blog bear similarities to those found in Emotional Durability, as some products include features that can be linked to Narratives, Surface and Fiction. This could be due to their psychological foundations, as Chapman (2008) argues that the Emotional Durability 6-point framework holds a ‘permanent position in the construct of human psychological function’. However, the main difference is the intent of both approaches. Where Symbolic meaning considers the emotional aspect of the product user interaction journey as means to bring about positive emotional interactions. In contrast, Emotional Durability has a broader goal, to generate richer emotional interactions in order to facilitate the development of more environmentally mindful products. Nevertheless, insight can be found in Symbolic Meaning, within the design directions of ‘keeping track of progress’, ‘embody personal growth’ and ‘environmental mastery’ (Casais, Mugge & Desmet, 2016, p. 3), as they emulate elements of an emotionally durable perspective and thus were added to the list of concepts to be considered for the new tool.

Other relevant pieces of research

As a result of the scoping the wider theoretical landscape, two other studies were discovered,

that although were conducted in different fields, bear a resemblance in rationale and intent. Within one study by Jung et al., (2011) ‘*How Deep Is Your Love: Deep Narratives of Ensoulment and Heirloom Status*’, the researchers conducted in-depth user interviews to capture and analyse the stories of how some objects achieve ‘heirloom status’. The findings of the study are pertinent because although they cite Product Attachment as an influencer, Emotional Durability is not mentioned by the researchers even though two of the main conclusions drawn support elements of an ED perspective. The main themes they identified were:

HS Perspective	ED Perspective
Intimacy (attachment) accumulated as an association with an object over time	Building up layers of Narrative that reflect traces of the users invested care and attention (Chapman, 2005).
Investment of effort to learn and control functionality	Fuzzy interfaces are interactions that require learning and skill in order to master the interaction which must be acquired slowly over time. Labour leads to love (Chapman, 2005).

Table 2.2 Strategies of heirloom status compared with Emotional Durability

Another paper that explores this thinking is *Understanding Why We Preserve Some Things and Discard Others in the Context of Interaction Design* by Odom et al., (2009). While their research was within Human-Computer Interaction design, they endeavoured to comprehend product-user relationships in more detail, drawing insight from field work conducted on personal inventories of digital and non-digital artefacts. From their analysis they deduced that this relationship can be described by these four areas:

- Engagement - the extent to which an object invites and promotes physical engagement with its owner during use.
- Histories - the extent to which the materials of an object preserve personal histories or other memories, either by explicitly showing physical signs of use or implicitly by virtue of its persistence over time.
- Augmentation - the extent to which an object has been reused, renewed, modified, altered or otherwise made to be a part of something augmented beyond its original intended use and as such has become a symbol of the resourcefulness and/or creative expression of its owner.
- Perceived durability - the extent to which an object’s owner regards an object as long-lasting either in terms of function or in terms of longevity or both.

(Odom et al., 2009 p.4)

On the surface, 'Histories' is the only finding that directly correlates with the conclusion drawn by Chapman (2008) in regard to 'Narratives', however, 'Material Engagement' is a term often used throughout Chapman's (2005) text. It is presented as a factor that has been lost within product-user interactions, which could be slowed down, to build more intense user experience. However, the way in which this study recognises physical 'Engagement' as a method for building a stronger relationship, highlights elements of Emotionally Durability which will be discussed in the next section and thus were also considered as influencers for the new tool.

2.10 Themes that emerged from the literature

The aim of this next section is to present the key themes that emerged from reviewing concepts from across all the different fields of practice. It discusses the limitations that were uncovered and consolidates the main overlaps that were observed. Each theme that emerged from the literature helps to locate emotional longevity within the field of design and was used to develop the new tool.

Attachment, detachment and Emotional Durable Design

Most researchers exploring Emotional Durability and Product Attachment within design concluded that 'design for attachment', 'emotional bond' or 'emotionally durable' was the main desired outcome, while using these terms interchangeably without distinction. Yet, it could be argued that there are subtler distinctions that can be made between these terms. Principally, that attachment is only a facet of Emotional Durability and not the overall objective of the approach. This is reflected firstly through the structure of Chapman's (2008) framework whereby Attachment is placed at the same conceptual level as Fiction, Surface, Detachment, Consciousness and Narratives, and secondly more specifically within the description of Detachment whereby it is argued that if the user were to:

'feel no emotional connection to the object, have low expectations and thus perceive it in a favourable way due to a lack of emotional demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable)' p.17

Likewise, Marchand (2004, p.114) observed that some users actively practiced 'detachment' as sustainable strategy, arguing it 'predisposed them to accept an object's eventual ageing'. While within the review it was evidenced that Product Attachment principles are useful in developing emotional bonding, these examples above also show that 'designing for attachment'

might not be productive. And so, to facilitate extended product lifetimes a broader understanding of the types of relationships and mechanisms that can be produced may be needed, which would consider the richer forms of emotional engagements and interactions that an Emotionally Durable Design perspective promotes.

Engagement, involvement and relationships

Throughout the literature review, one topic that emerged was the notion of ‘engagement’.

Observed as intersecting with concepts from Emotional Durability, Product Attachment and Slow Design, it not only provides a means for bridging the different areas of practice, but also could potentially be used as a mechanism for facilitating emotional longevity. However, in the literature, there are several different definitions for engagement that have to be proposed.

Firstly, Odom et al., (2009, p.4) concluded that ‘Engagement’, is ‘the extent to which an object invites and promotes physical engagement with its owner during use’ and suggested it as one of the central drivers for why participants kept some objects longer than others. They further outline that these objects often require a certain skill or direct involvement which enhances the likelihood of product longevity, a similar concept to the ‘fuzzy interactions’ proposed by Chapman (2005) who states that some products:

‘must be learned and mastered – a novel departure from the unconsciously simple, spoon-fed manner in which interface design has become accustomed, toward a craft-like engagement in which the skill and mastery of an object must be acquired slowly, over time.’ (p.78)

Whereas Slow Design presents ‘Engage’ as one of its 7 principles, which Grosse-Hering (2012) related more closely to open source design, collaboration and DIY concepts, whereby the user is active in the creation and development of the product. This perspective is supported by Mugge, Schoormans and Schifferstein (2008), who found that when time and effort is spent personalising and customising a product, a stronger emotional bond was produced.

Lastly, Van Krieken (2012) (inspired by Chapman, 2005, p.74) redefines this notion as ‘Involvement’ and recommends that products must intrigue and inspire the user, so they can ‘achieve deeper and more immersive modes of prolonged user engagement’ being ‘producers not observers of the interaction’ (Chapman 2005, p.136).

What these varying definitions for ‘Engagement’ offer is input towards our understanding of the types of interactions that designers could be striving to develop. As proposed by Desmet and Hekkert (2007), interactions that engage users on both an *aesthetic level* (physically, visually) and a *meaningful level* (cognition, attention, associations) do facilitate emotional engagement.

Even though processes of emotional bonding between users and objects can be unpredictable and context-specific (Den Hollander, Bakker and Hultink, 2017; Arguin, 2010), developing product features that encourage physical, creative and cognitive forms of engagement is attainable as demonstrated above and, therefore, potentially a productive method for design for emotional longevity.

Identity

Another theme that emerged from the literature is the concept of identity, and is discussed in relation to the identity of the user and the identity of the product, exploring how it is constructed within the product-user relationship, and the effect it has on the emotional longevity.

Regarding the user's identity within the product interaction, within Emotional Durability Chapman (2005) argues that our consumption of goods is an act that 'assists [in] the construction of a desired identity through which the self and other may be subsequently defined' (p.50) and, that products 'help us to construct an identity that we feel is individual, while also being indicative of our individual aspirations and dreams.' (Chapman 2016, p.76).

These statements propose that people buy, use and consume objects for more complex reason than just necessity and functionality. That, 'we transfer resources into products that – in a sense – provide us with existential mirrors, allowing us to view and experience our dreams and desires in real time' (Chapman, 2005, p.50). However, the mass of modern designed products currently available 'leave no space for the user to incorporate their own identity, and any post-purchase alterations that do occur, grate harshly against the existing overly-programmed aesthetic' (Chapman 2005, p.132). Therefore, it could be argued that developers need to create 'space' for the identity of the user when designing for product longevity. Otherwise, if the user cannot embed and project aspects of their personality and identity into the product, it would be expected that they would struggle to emotionally connect with the object (Van Krieken, 2011). Finally, this is a perspective also that supported by researchers from Product Attachment, who concluded that objects that allow for self-expression or support of self-identity positively influence levels of attachment, increasing the likelihood that the product will be kept by the user (Mugge, 2007; Maclachlan, 2011; Schifferstein & Zwartkruis-Pelgrim, 2008).

Differently from the user's identity, factors associated to the product's Identity are two-fold. The first is linked to points of Consciousness and Anthropomorphism which have been discussed in detail by several authors within Emotional Durability (Chapman, 2008; Van Krieken, 2011; Tokaya, 2013). The second, related to product personality and potential for

brand differentiation.

Deliberating the first, while Chapman (2005) does not directly suggest that a product should have an Identity, he alludes to it by stating that:

‘Provoke a response: whereby a design interaction elicits an emotional response from the user which gives the product ‘sense of individuality, self-definition and the affirmation of identity within users.’ (Chapman, 2005, p.109)

and

‘A mind of its own: give objects the appearance of having a mind of their own, or at least aim to simulate the subtle and random presence of free will’ (Chapman, 2005, p.82)

From Tokaya’s (2014) perspective, this notion is described as ‘Character’ that should be embedded in the object to assist in the development of Consciousness within lighting products. Overall, it argued that engendering a perceived sense of consciousness, or assertion of identity from the product to the user, facilitates deeper modes of engagement (Chapman, 2008; Van Krieken, 2011; Tokaya, 2013)

Contemplating the second, Lacey (2009) suggests that designers can integrate unique elements into objects in order to imbue them with an individual identity. Furthermore if they are perceived to match and reflect aspects their own personality, this can positively affect their preference towards the product (Govers, Hekkert & Schoormans, 2005; Mugge 2007). While this could be beneficial for developing more cognitive forms of engagement, it could also be useful in regard to brand differentiation.

In summary, multiple authors from Emotional Durability and Product Attachment recommend the inclusion of identity traits within the product, from both the users and products perspective. Which not only would allow opportunities for self-expression through the product, but also the chance to develop more immersive richer forms of product and user engagement through animacy and perceived consciousness.

Upgradability, adaptability or variability

Upgradability, Adaptability and Variability refer to the ways in which a product has the potential to evolve with the user through time. Yet, considering contemporary trends of mass consumption and the social factors of product replacement, these concepts have to be looked at with certain reservation, in particular the term Upgradability. This term can be problematic if used to imply that products need to be improved or replaced over time, potentially becoming a

driver for planned emotional obsolescence. Whereas, ‘Adaptability or Variability’ could be viewed as a more sympathetic approach for the evolving needs and wants of users, mitigating premature replacement. In addition, terms such as Evolution or Evolvability could also conceptualise this type of progression over time. One of the main references to evolution found in the literature was within Slow Design. The ‘Evolve’ principle was described by researchers as strategy whereby:

‘richer experiences can emerge from the dynamic maturation of artefacts, environments and systems over time. Looking beyond the needs and circumstances of the present day, Slow Designs are (behavioural) change agents. Products that are changing or growing over time’ (Grosse-Hering, 2012, p.19)

Notions of adaptability and evolution add the dimension of time to product development, forcing designers to contemplate lifecycle thinking and the potential changes that can occur throughout the product-user relationship. However, Time as a concept in itself is also present within emotional longevity research.

Time

Time and/or temporality is shown to be central premise within all the sets of literatures, however there is a significant difference in how it is approached. Within Product Lifetimes, Time is a factor to battle against, whereas within Emotion Centred Design and Experience Design it is a tool for crafting a journey.

Emotional Durability and Experience Design strategies such as ‘Build Anticipation’ and ‘Pace the Discovery’ suggest that the product-user experience should unfold with mindfulness and timeliness, as to not give away the whole story at once, maximising feelings of love and anticipation (Chapman, 2005; Nicolas, Aurisicchio & Desmet, 2014; Hassenzahl et al., 2013).

Similarly, Slow Design addresses Time in several of its principles. One example of this applied in practice, is the project developed by Grosse-Hering (2012) who developed the ‘JuicyMo’. The design facilitates the optimisation the more pleasurable activity (juicing) rather than the less pleasurable activity (cleaning), positively altering the overall user experience.

Lastly, ‘Ageing Gracefully’ is also a strategy concerned with Time as it proposes that products should be designed to wear and age with grace, accepting and celebrating the inevitability of time (Chapman, 2005 & 2008; Van Hinte, 1997; Bridgens et al., 2015; Rognoli & Karana, 2014; Van Krieken, 2011). All of these examples use the theme of time as a positive resource of design, not an obstacle to be overcome, which one could argue is a more honest, human and empathetic perspective, a viewpoint that is central to Emotional Durability.

Integrity

Integrity, as a concept, is present in literature in two significant ways, physical integrity and integrity as a social value. Bakker et al. (2014a), discusses integrity from a product engineering perspective, highlighting that in order for a product to have a long life its physical integrity must be maintained. Whereas, Lacey (2009, p.87) describes Integrity in relation to the product's *Function* (usefulness, comfortable, works well), *Aesthetics* (balanced, tactile, inviting) and *Design* (value, ethics, purpose, appropriate materials).

While both studies describe the importance of the physical Integrity of an object, the latter presents a broader definition of Integrity, more focused on the user. Therefore, Integrity can be seen in two ways: through the common social value understanding, relating to notions of honesty, sincerity and ethics; or from the engineering perspective engineering objects as robust, durable and strong. By embracing both meanings, the theme of Integrity could be used as a valuable concept for bridging the emotional and physical elements of product longevity, linking the user-focused, meaning driven elements of Emotional Durability, with the physical product factors of Circular Design.

In summary, within this discussion section several new themes emerged from the literature that go to describe what an emotional longevity perspective can be within design. Firstly, 'engagement' was shown to be a new factor for building emotional connection, and Identity, Integrity, Evolution and Time were all shown to be significant themes. These will be taken forward and used to influence the development of the new tool using the strategies that have been selected.

2.11 Conclusions

Identifying a gap

Within each area of research presented in this review, strategies were discussed and presented relevant to the extension of products. While Emotional Durability as an area of exploration is diverse and still evolving, and has been suggested as a necessary factor for facilitating longer product lifetimes (Den Hollander, Bakker & Hultink, 2017; Bocken et al., 2016; Maclachlan 2011), Emotional Durability and attachment as influencers for design can be hard to control and predict (Den Hollander, Bakker & Hultink, 2017). Although attempts were made by researchers (Van Krieken, 2011; Tokaya, 2013; Padro, 2014) to develop these concepts into design models, these studies were unable to develop a tool or method **that is both quick and easy to use,**

which successfully presents a comprehensive Emotional Durability perspective within NPD. Therefore, this research project sought to consolidate and translate these intangible concepts into an easy to understand framework.

Lastly, based on the information uncovered in the review, the new tool will be built from not only the strategies presented by Emotionally Durable Design researchers, but also fields of research such as Slow Design, Product Attachment, Circular Design and Symbolic Meaning. The strategies and principles uncovered have been amalgamated in next section below.

Consolidation of all strategies and principles

From all the researchers discussed in this review the most relevant sets of strategies and principles were selected for consolidation and analysis to create the new tool. These have been summarised in table 2.3, 2.4, 2.5 and 2.6 below.

Area of Practice	Authors	Key findings from Strategies, Qualities, Principles proposed
Emotionally Durable Design	Emotionally Durable design (ed.1) - Tool box of ideas Chapman (2005)	Immersive Sensory Experience, Ageing Gracefully, Consume Meaning Not Matter, Cherishability, Document The Narrative, Gift Giving, Multiple Product Lifetimes, Keep It Moving, Environment as a User (Mindfulness), Avoid Cheap Tricks, Design for Dependency, Strike a Balance, Objects show group belonging, Mirrors and Projectors of core values, Relinquish Control, Mind of Its own, Inherent feedback & Feedforward, Provoke a response, Fuzzy Interactions, Poetic Potential, Pace the Discovery
	Chapman (2008) - 6-point Experiential framework	Narrative, Detachment, Surface, Attachment, Fiction, Consciousness
	Lacey (2009) – 3 strategies	Integrity, Uniqueness, Surprise
	Van Krieken (2011) – 12 Qualities	Sensory Engagement, Ageing Gracefully, Metaphor to Old Products, Evolve Through Use, Share The Experience, Co-Creation & Personalise, Mimic Human Action, Inherent feedback & Feedforward, Fuzzy Interactions, Leave room for Interpretation, Keep the Magic Alive, Respond to Environment
	Van Krieken (2012) – 5 Qualities	Evoke Memories, Rewarding, Adapt to user identity, Animacy and Involvement.
	Tokaya (2013) – 5 Guidelines	Character, Light Effect, Sensory Input, Luminaire Design (Construction), Product Person Interaction.
	Padro (2014) – 3 constraints	Uniqueness, Meaningfulness and Analogoueness.
Slow Design	Grosse-Hering (2012) - 7 Principles	Reveal, Expand, Reflect, Engage, Participate, Evolve, Ritual

Table 2.3 Summary of strategies proposed for Emotional Durability and Slow Design

Area of Practice	Authors	Key findings from Strategies, Qualities, Principles proposed
Product Replacement	Van Nes & Cramer (2005)	Design for Reliability & Robustness, Design for Repair & Maintenance, Design for Attachment, Design for Upgradability, Design for Variability
Circular Design	Bakker et al., 2014	Design for Product Attachment and Trust, Design for Product Durability, Design for Standardization Compatibility, Design for Ease of Maintenance and Repair, Design for Upgradability and Adaptability Design for Dis- and Reassembly
	Forum for the future (2016)	Openness, Storytelling, Services

Table 2.4 Summary of strategies proposed for Product Replacement and Circular Design

Area of Practice	Authors	Key findings from Strategies, Qualities, Principles proposed
Product Attachment	Mugge (2007)	Memories, Self-Identity, Group Affiliation, Pleasure
	Schifferstein & Zwartkruis-Pelgrim (2008)	Memories, Utility and Reliability, Group Affiliation, Support-Self Identity, Enjoyment
	Mugge, Schifferstein & Schoormans (2010)	Superior Appearance, Superior Utility
	Maclachlan (2011)	Sensory Design, Memories & (Longevity), Self-Expression, Personality, Pleasure,
	Page (2014)	Memories and Nostalgia, Reliability

Table 2.5 Summary of strategies proposed for Product Attachment

Area of Practice	Research project	Key findings from Strategies, Qualities, Principles proposed
Heirloom Status	Odom et al., (2009)	Engagement, Histories, Augmentation, Perceived durability
Symbolic Meaning	Casais, Mugge & Desmet (2016)	Keeping track of progress, embody personal growth, environmental mastery

Table 2.6 Summary of strategies proposed for Heirloom Status and Symbolic Meaning

Next steps

Before continuing with the study, and exploring how these concepts and strategies might converge into one model, a clear methodology, set of methods and list of objectives needed to be defined with which to carry out the research, which can be found in the next chapter.

Chapter 3 – Methodology Review

This chapter discusses the methodologies and methods that were used to explore the research questions identified in Chapter 1. It will present the different types of practice research methodologies that were considered, and the final approaches chosen outlining the methods that were used to undertake the project.

3.1 Introduction

Before defining an approach, there are three key factors that must be deliberated for the context of the project. Firstly, concerning the collaborator of the research (Philips Lighting), secondly the nature of the subject matter we are exploring (Emotionally Durable Design) and thirdly the outcomes the research intends to achieve (development of a tool).

While a project with an industry partner provides opportunities to access knowledge and expertise from practicing NPD professionals, at the start, it was unknown as to what extent the Philips Lighting experts would be willing to engage with the research. Furthermore, it was unknown as to what internal developments might occur over the lifecycle, as some industry processes operate at either faster or slower speeds than a PhD project. So, to ensure the research could always be moving, an approach that was exploratory, flexible and adaptable to evolving circumstances would be needed. Which, would also need to be sympathetic to the types of activities that occur in NPD so that this new tool, and the ideas of Emotional Durability would be more easily accepted.

Since Emotionally Durable Design is a topic that explores the emotions of people, it seemed appropriate to consider approaches that would be in tune with the subject matter. Thus methods that were more qualitative in nature were considered, in order to capture and explore the rich content that this subject affords.

Thirdly, since our aim is to develop a new tool to be used in the design stage of NPD, the research would also need to consider a methodology for the construction, development and testing of this new tool. Therefore, with all of these factors in mind, the research first set about defining an overarching approach which is outlined in this next section.

3.2 Methodology

Understanding practice within research

Traditionally, the term research was understood as an activity undertaken by universities, which advanced new knowledge through laboratory experimentation, hands-off observations and was developed through words and not action (Frayling, 1993). However, from the mid 1980's a new understanding of 'research' and 'practice' was beginning to emerge within higher education which proposed that 'in certain disciplines knowledge can be partly advanced by means of practice' (Candy, 2006, p.4).

Focused specifically on the notion of practice, Candy (2006) proposed that academic research students could adopt the practice of their discipline as the subject of their study. The final submission would consist of both the results of their practice, such as an artefact, and a thesis which outlines their reflections on the process conducted. She defined this approach as either *practice-led*, whereby new knowledge is discovered about the operational nature of the practice itself or *practice-based*, where new knowledge is generated through the means of practice (Frayling et al., 1997; Candy, 2006).

Another perspective was defined by Frayling (1993) who proposed three different methods for engaging in creative research, namely: **Research Into Art and Design** – which engages with historical, theoretical or aesthetic analysis; **Research Through Art and Design** – which involves material, technological and methodological development; and lastly **Research For Art and Design** – where the outcome is an artefact and the thinking is embodied in the object.

Within design research contexts these terms were adapted and expanded by Mullaney (2016, p.68). She offered this description, based not only upon the work of Frayling (1993), but also Friedman (2008) and Johnson (2010) and proposed these revised definitions:

- **Research into Design** describes design research where design is the subject of inquiry. The design process is observed by the researcher, who generates knowledge about this process without engaging with it.
- **Research for Design** describes design research where design is the subject of inquiry and the method, with the end goal of the research being the designed artefact itself.
- **Research through Design** describes design research in which the researcher engages in the design process as a method to research their subject of inquiry. In taking a 'research through design' approach to design research, the researcher creates new knowledge within their subject of inquiry through the creation of designed artifacts.

Regardless of which type one is undertaking, any research that actively involves practice can also be classified as a type of ‘Applied Research’ Muratovski, (2016). When this is implemented within design, it tends to be more focused on the process, aiming to develop culturally new knowledge and understanding, not only for the designer and client but within the field as well (ibid). This type of research aims to:

- Solve specific problems
- Apply developed knowledge and methods to the examination of a specific context in order to solve a problem in that context
- Create new or improved artifacts products, processes, materials, devices, services or systems of thoughts and ways of seeing
- Applies outcomes from pure and developmental research to a specific context or project where long-term economic, social and or cultural benefits are a direct objective.

(Brown, Gough, & Roddis, 2004, p.5)

In summary, there are many schools of thought for conducting research that involves practice, demonstrating how there is yet to be consensus for how this can be approached. Considering this project was collaborating with practicing NPD professionals, adopting a process that is applied could result in the outcomes being better comprehended and more practical to use, as they would be more in line with how developers conduct their work activities.

Understanding design and designers

Within industry and academia, the roles of designers have evolved over time, as ‘we have seen design grow from a trade activity to a segmented profession to a field for technical research and to what now should be recognized as a new liberal art of technological culture’ (Buchanan, 1992, p.5). The modern-day designer is expected to be a strategic, holistic thinker, adept at adopting formal research techniques, multidisciplinary, and an empathetic, user centred tactic in order to solve complex issues (Cross, 2011; Goldschmidt & Rodgers, 2013; Muratovski, 2016; Seidel & Fixson, 2013).

In terms of how the design process itself is being described, Seidel and Fixson, (2013) state it as process of: need-finding, brainstorming, and prototyping. Shapira, Ketchie and Nehe (2017) as a process that has a fundamental Human-Centredness, is Research-Based, Knowing of the surrounding context and involves Collaboration, Optimism and Non-linearity and

experimentation. While not all of the qualities are relevant to this project, there are several that resonate with the ethos of this research. These are:

Collaboration: Design is about collaboration, as it advocates that not only should all stakeholders be included throughout the designing process (Shapira, Ketchie and Nehe 2017; IDEO, 2015), but that it engage with other disciplines as well, to ensure the complex needs of the product and service experience are considered (Brown, 2008).

Non-linearity, adaptable and iterative: Designers constantly redefine and reframe the problem throughout the design process (Goldschmidt & Rodgers, 2013), iterate frequently and building in learning loops into their solutions to improve them over time (IDEO, 2015). As ‘the iterative development of a concept is, after all, a designerly process’ (Swann, 2002, p.517).

User-Centred and empathetic: Designers situate the requirements and behaviours of the user at the heart of their methods (IDEO, 2015, Shapira, Ketchie & Nehe, 2017) which also helps with the need-finding procedure as well (Seidel & Fixson, 2013). It is essentially a process of practicing empathy and immersion, in order to imagine desirable solutions that can meet any latent needs (Brown, 2008; Leonard & Rayport, 1997).

Within sustainability research discussions, designers are also described as *communicators, educators, facilitators, activists and entrepreneurs* working to provide experiences that benefit societal, ecological and psychological well-being (Fletcher & Grose, 2012, p.156). While these new diverse roles are helping to define a new generation of designers within industry, within academia it provides an opportunity to take a more holistic and immersive approach to research, allowing practitioners to embody and explore broader themes beyond the traditional models and understandings of design practice.

Defining the characteristics of the approach

Contemplating the information presented above, and that it involves an industry partnership adopting an approach and mind-set that is sympathetic to the subject and partner of the research would be advantageous. Therefore, this project will be undertaken in these following ways: utilising a Research Through Design approach, which is collaborative, exploratory, adaptable and reflective in nature.

Regarding collaboration, although within traditional ethnographic research the flow of insight is typically one-sided (from participant to researcher), since this project is a partnership with an organisation, the company represents two main roles within the project. Firstly, the subjects of study, whereby their expertise is leveraged and collected as data, but also, as stakeholders and

future users of the tool, where new knowledge and insight uncovered throughout the process will be ultimately shared. Therefore, bearing this mind, all the engagements with Philips Lighting were framed as 'Knowledge Exchange Sessions' which encouraged a more collaborative and open environment.

Regarding practice, as the research was engaging with those who actively practice design and development of products, it is argued that the activities of a product manufacturer are more applied than theoretical. Therefore, adopting activities in line with these processes would be more appropriate, cohesive and collectively beneficial process, as the outputs of the research will be relevant and applicable to both parties.

Regarding the exploratory and adaptable elements required, at the start of the project it was not known as to whom within Philips Lighting would be willing to participate, and so the research was unable to clearly define what activities might occur. Thus, adopting a rigid linear, or hypothesis approach, would not be suitable for such an endeavour, as the circumstances and levels of participant engagement were likely to evolve over time. Therefore, it was decided to utilise processes that could be flexible enough to ensure the project could evolve regardless of what changes or activities were occurring within Philips Lighting.

Regarding reflective nature of the process, as well as being exploratory, between cycles of activity there needed to be points of reflection and analysis on the data that had been gathered. This was so that the outcomes of previous or current activities could guide and inform the next, therefore it was necessary to adopt an approach that also allowed for this as well.

Defining a strategy for the development of the tool

The central aim for this thesis is to: *Explore the integration of Emotionally Durable Design concepts into the New Product Development process of consumer lighting through the development of methods and tools.* In order to successfully carry this out, a strategy must be devised for how to construct and validate this new tool. Considering the research is adopting a Research through Design approach, this thesis argues that design and NPD frameworks can be employed, as a new product (a tool) is being created. To understand what are available table 1.1 p.12 lists known design and NPD approaches for consideration.

Universal Principles of Design (Lidwell, Holden & Butler, 2010)	Planning, Scoping, Definition	Exploration, synthesis, design implications	Concept Generation, Early Prototype iteration	Evaluation, Refinement, Production				Launch and Monitor	
Fuzzy Front End (Koen et al., 2002)	Fuzzy Front-End Innovation			Product Development	Implementation				
Double Diamond (Design Council, 2007)	Discover	Define	Develop	Deliver	Product Development				
Design Thinking (IDEO, 2015)	Hear (Inspiration)	Create (Ideation)		Deliver (Implementation)					
Generic NPD Framework (Ulrich & Eppinger, 2012)	Planning / Opportunity		Concept Development		System Design	Detail Design	Pilot Tests		Production Scale
Stage-gate (Cooper, 1990)	Discovery	Scoping	Build Business Case	Development		Test & Validate			
Spiral (or Agile) (Boehm, 2000)	Requirements	Design & Refine	Build	Test & Analyse	Repeat...				

Table 3.1 - New product development Frameworks and approaches

While any of these processes could be used, those that are more generic in nature potentially could be more flexible to the specific needs of this research. Therefore, for the development of the tool a divergent-convergent, double diamond was used. This is a method that encourages designers to diverge in order to collect insight and consider a wide-range of possibilities, and converge to help narrow focus and define more concrete objectives (Design Council, 2007). The Double Diamond process consisting of four distinctive phases: Discovery – Define – Develop – Deliver.

- Discovery is investigative and is about gathering knowledge, insights and inspiration for the forming of initial ideas.
- Define is the sense making phase, which explores the challenge in more depth and identifies opportunities.
- Develop is about prototyping, testing and iteration in order to refine the concepts for implementation.
- Deliver is where the concepts go through final testing and are launched; the concepts are evaluated, and feedback loops are implemented to capture final insights. It is a moment for sharing knowledge on the process and feedback lessons learned.

This approach has steps that involve data gathering, synthesis and development, which align with the requirements needed to carry out an exploratory research through design academic research project. Therefore, it was adopted as a general framework and is presented in more detail in the next section.

Methods used in each phase of the research

A number of different tools and techniques were used to gather data and carry out the research. Figure 3.1 presents the aim of the research in relation to each phase, the data gathering method employed and how this facilitated the creation of four iterations of the tool and a final toolkit. The stages Define and Develop were merged into one, owing to the fact that the tool was undergoing constant cycles of redefinition and development.

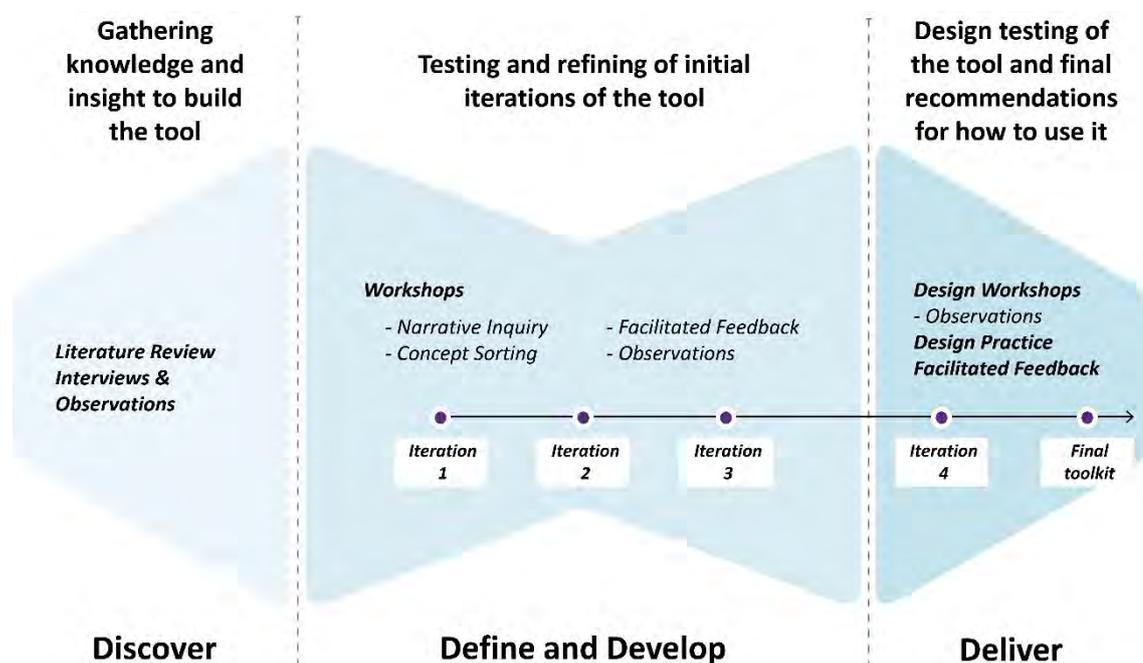


Figure 3.1 Research framework for developing the tool

Discover – aimed to gather knowledge from the literature and Philips Lighting in regards to emotional longevity concepts and new product development as a process in order to start developing a new tool.

Define and Develop – aimed to define and select which concepts of Emotional Durability were relevant to NPD and develop them into a working tool. This was carried iteratively, and three iterations of the tool were:

- **Built** using Affinity Diagrams and Concept Mapping (Chapter 4 presents this in detail)
- **Tested** using workshops
- **Refined** in response to facilitated feedback from the participants and data gathered on cherished objects

Deliver - aimed to test and evaluate the effectiveness of iteration four and develop the final toolkit. This was carried out using design charrette¹ workshops and design practice. The outcomes were presented to Philips Lighting and their feedback and responses used to develop the final toolkit.

3.3 Data Gathering Methods

Literature Review

In order to begin constructing the new tool, the research needed to understand what concepts and strategies currently existed for a mitigating emotional longevity. Therefore, a Literature Review was employed. This method was deemed the most appropriate as the majority of models and tools developed were inside academia. Thus, all the principles, concepts and strategies uncovered in the review in Chapter 2 that relate to the extending the lifetime of products, were consolidated and used as the main data set for developing the tool in Chapter 4.

Interviews and observations

Before the tool/method could be developed, a key piece of information relating to the context needed to be understood; namely, how new product development operates in practice within Philips Lighting. To gather this data the methods that were chosen were observations and interviews. These techniques were determined the most appropriate as they would give the research primary data on the activities, perceptions and experience of new product developers. Although with design contexts these methods are often referred to as ‘Ethnographic’ in nature (Muratovski, 2016), Ethnography is a rigorous qualitative research technique with a long-standing history of application within anthropology (Plowman, 2003; Crouch & Peirce, 2012). For this research project, this calibre of research method was not required, and so certain elements of the approach were adopted. These were: *Semi-structured Interviews* conducted with

¹ Design Charrette is a workshop activity whereby group design task takes place. See later section in this chapter for more information.

Philips Lighting new product developers, and *Observations* carried out on Philips lighting as an organisation, and of the workshop participants using various iterations of the tool. Table 3.2 below shows the methods used and their purpose in more detail:

Subjects	Method	Purpose
Philips Lighting	Passive Observations	Gain a greater understanding into the structure, atmosphere and culture of the organisation
New product developers (In Philips Lighting)	Semi-Structured Interviews	Gain subject specific knowledge into lighting, design, market, capabilities and opportunities
	Participant Observation	Gain insight into how the tools and methods developed are used in NPD

Table 3.2 - Methods and their purpose within the study (Plowman, 2003, p.23)

Semi-structured interviews

In the first year of the research 21 interviews were conducted with Philips lighting employees. They took place both in person and through video conferencing and were documented using voice recording and hand written notes. The aim of the interviews were to uncover domain specific knowledge in regard to consumer lighting, the Hue product line and understand the tasks, roles and activities that occur within NPD for consumer lighting. The knowledge that was uncovered was used to develop the thinking around the tool and helped to inform which concepts of Emotional Durability were relevant, and what stages the tool might be used in.

Workshops

Workshops are a widely used method of research within industry and academia and were chosen because they would be familiar to participants as a method of knowledge transfer and participation. Considering that the primary researcher visited Philips Lighting only once or twice a year it was also the most beneficial and productive method for quickly disseminating knowledge and investigating the concepts and the tool. Thus were employed as a means for data gathering, testing of ideas and iterations of the tool. In total 10 workshops were conducted and were carried out in two distinct stages. The first round of workshops (1-7) were used for gathering insight and data regarding the content and concepts of the new tool and are part of *Define and Develop Phase* (See Chapter 4). The second (8-9) employed as design workshops to test the effectiveness of the tool as part of the *Deliver Phase* (see Chapter 6).

Within every workshop the primary researcher captured data by taking notes and pictures of the participants using the tool. These workshop were not voice recorded, as, although there was a

Non Disclose Agreement (NDA) in place, it was advised by the industry supervisor that the Philips Lighting participants would not be comfortable with these being recorded. While taking notes is not as reliable as recordings, in order to minimise this the notes and reflections were typed up directly after each session.

Narrative inquiry

In order to validate and critique the concepts and strategies found in the literature review, narrative inquiry or directed storytelling (Connelly & Clandinin, 1990; Martin & Hannington 2012, p.68) was employed at the start of workshops 1-7 to gather data on potentially emotionally durable objects, i.e. items that had been loved and kept by users. This information was used to refine, fill the gaps and confirm the relevance of emotional longevity concepts of the tool. This data was captured on post-it notes by the participants and the stories transcribed into digital format for analysis.

Card sorting

This method was employed to analyse and categorise the themes of tool in relation to the object stories. This was carried out firstly by the participants during the workshop and secondly by the primary researcher in order to uncover which elements of the tool were more present in loved objects than others. The results of this process were collated into a spreadsheet which can be found in Appendix A. Chapter 4 presents the procedure and rationale for why these methods were employed in more detail.

Design charrette workshops

A design charrette (Martin & Hannington, 2012) is a workshop style activity that provides an opportunity for stakeholders to collaborate, explore and generate concepts through the creation of design ideas. This method was employed for two reasons, the first was to test the effectiveness of the tool in regard to the design concepts it would yield. Using the tool, concepts were developed by the participants in groups and were captured on sheets of paper, which collected and photographed at the end of the session.

The second was so the primary researcher could observe the tool being used by new product developers so any weaknesses or limitations in regard to its structure, content or method of delivery could be identified. Throughout the design sessions the primary researcher conducted passive observations and asked questions of the participants, which were recorded in hand written notes. The procedure and results of this investigation can be found in Chapter 6.

Design practice exploration

One of the central benefits of utilising a *Research through Design* approach for the research, is the ability of the primary researcher to inhabit one of the main actors of this system - new product developer. To leverage this experience concept design was employed. 'Concept Development or ideation' is a process which involves the 'generation of many possible different solutions' (Zimmerman, Forlizzi & Evenson, 2007). This method was used to test more comprehensively how the framework would yield design outcomes and was conducted as a solo activity by the primary researcher. This was engaged with as a 3 month project and the concepts that were generated by the primary researcher were captured in two sketch books (Appendix B).

3.4 Knowledge exchange sessions

Facilitated feedback from workshop participants on the tool

At the close of each workshop a facilitated feedback session took place whereby the participants were asked to share their thoughts and responses on the structure and content of the tool. This method of feedback, instead of online or paper questionnaires was deemed the most appropriate as it allowed the participants to immediately, and efficiently share a rich picture of their perceptions of the tool. These were captured using handwritten notes and were consolidated into a digital format directly after the session.

Feedback from Philips Lighting on the outcomes

Aside from the interviews and participation in workshops, responses and feedback on the tool and outcomes of the research were also collected from Philips Lighting experts in the final phases of the project. Firstly, in November 2017, twelve meetings were conducted with nineteen Philips Lighting participants from different areas of new product development department.

Their responses and insights were gathered regarding:

- The usefulness and relevance of the tool for their activities
- Potential next steps for how it could be integrated into their process

Secondly, in September 2018, the final toolkit was presented within four meetings and used in an ideation session by the design team on a live project. This was the last data gathering activity that took place and was used to collect final thoughts and reflections on the tool which was used to inform the final discussion section of the thesis.

Techniques of reflection and data recording

Throughout the research, several techniques were used as a method for reflecting on the progress and outcomes of the research. These were a reflective digital diary, photographs and 4 notebooks were kept as both as a record of progression, but also an active tool that nourished the development of the central concepts (Appendix C). These were consistently maintained throughout the research process and were vital for recording insights as the project developed.

Summary of methods used and data collected at each stage of the project

In summary, table 3.3 presents which method was used at what stage of the project and provides a summary of the data that was collected.

Stage	Data Collection Technique	Summary of data collected
Discover	Literature Review	60+ strategies
	Interviews (Plowman, 2003)	21 interviews
	Observations (Crouch & Pearce, 2012.p.92; Plowman, 2003)	Participants were observed in 2 field trips Jan and Oct 2016
Define & Develop	Workshops (Sims, 2006)	7 workshops carried out
	Narrative Inquiry/directed storytelling (Connelly & Clandinin, 1990; Martin & Hannington, 2012, P.68)	36 cherished object stories
	Card Sorting (Martin & Hannington 2012, p.26)	36 stories were analysed and information collated in spreadsheet
	Observations (Crouch & Pearce, 2012.p. 92; Plowman, 2003)	7 workshops observed
Deliver	Design Charrette Workshop (Roggema, 2014; Martin & Hannington 2012.p58)	2 design workshop carried out and 18 concepts were developed
	Observations (Crouch & Pearce, 2012, p.92; Plowman, 2003)	3 design workshops observed
	Design Practice (Zimmerman, Forlizzi & Evenson, 2007)	17 concepts developed into a booklet

Table 3.3 Summary of methods used for the development of the tool

Selection of participants

The industry supervisor had the most detailed knowledge of the company, and thus was the point of contact for selecting and inviting Philips lighting experts to participate in the research. While this could potentially create bias and a narrow pool of participants rather than sending out a companywide call for participation this allowed the research to engage with only those who worked in NPD. Overall 36 Philips Lighting new product development practitioners volunteered to be part of the research.

Regarding the participants outside of the company, the project only engaged with those who also operate within in NPD or studying aspects of design and development as their primary practice. This included students who studied Design and Sustainability related subjects at both Masters and Undergraduate level. In total 115 students participated in the research. All responses and results from participants were anonymised within the thesis.

Limitations of the approach and methods used

Due to the sensitivity of carrying out a project with an organisation, one key limitation is that a majority of the data such as the responses from participants, and observations were captured using handwritten notes. However, the benefit of not recording all sessions is that potentially participants were able to be more candid in their answers, as some responses were not always entirely complimentary in regard to the NPD process that occurred within Philips Lighting.

Ethics

The procedures for the interviews and workshops were submitted to the University of Brighton ethics review board for approval. All research activities were determined to be Tier 1, the lowest risk factor. Participants were given consent forms and participation information sheets and were informed that their participation could be withdrawn at any time. Although this research was determined as low risk, the primary researcher tried to ensure that all data gathering activities were handled with empathy and care.

3.5 Conclusions

In conclusion this project was carried out using a practice-based, Research through Design approach, employing the double diamond as a general framework for the how the tool was developed. Several methods and techniques were utilised to gather data, namely: literature review, interviews, observations, workshops, narrative inquiry, design charrette, design practice and facilitated feedback. This approach and these methods were determined to appropriate

because collectively they addressed the factors outlined at the start of this chapter. Methods such as Narrative Inquiry facilitate the gathering of rich qualitative data directly associated with Emotionally Durable Design concepts. While taking a Research through Design approach which is more practice-based in nature, allowed the research to engage in activities which align closer with the collaborators and the subject matter. Each of these methods will be presented and discussed in more detail in the subsequent chapters.

Considering the methods chosen a set of objectives was defined for how the rest of the research would be carried out.

1. Consolidate the key concepts identified in the literature review and translate them into a practical tool that can facilitate their implementation into the NPD process.
2. Host workshops with NPD practitioners using a narrative inquiry data gathering approach to uncover insights into why people keep some objects and not others, to validate the concepts uncovered in the review.
3. Present iterations of the tools and methods to new product developers within industry and academia to gain understanding into the feasibility and practicality of their application.
4. Use the tools and methods to develop ED lighting concepts to demonstrate the concepts in practice.

This next chapter outlines how the research tackled objective 1 - 3 and developed initial iterations of the tool.

Chapter 4 – Developing the Framework

This chapter outlines how the framework was consolidated from the literature and refined through seven workshops with participants from New Product Development in both academia and industry. This occurred in two stages: the first was ‘**Defining the framework from the literature**’ which utilised, *Affinity Diagrams* and *Concept Mapping* to develop a working prototype of the framework. The second, was ‘**Refining the framework**’, which employed *Workshops*, *Narrative Inquiry* and *Concept Sorting* to create a tool ready for testing and application in design practice. The chapter concludes with the findings and analysis of the object stories gathered in the *Narrative Inquiry* exercise and presents the final iteration of the emotional durability framework.

4.1 Defining the framework from the literature

Creating iteration 1 of the tool

Within Chapter 2, the review identified the most salient strategies from the main overarching bodies of research which were consolidated into tables 2.3, 2.4, 2.5 and 2.6. In order to start building the tool, all of the principles from each of the tables were distilled into ‘Concept Cards’ which are shown below in figure 4.1.



Figure 4.1 Concepts cards - first attempts at mapping and clustering

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’ (Martin and Hannington, 2012 p. 38) and, *Affinity Diagrams* which is a ‘process used to externalize and meaningfully cluster observations and insights from research, keeping design teams grounded in

data as they design’ (Martin and Hannington, 2012 p.12), the concepts were mapped and thematically clustered, to merge overlapping elements, remove those not relevant and gain a deeper understanding of the concepts. This iterative process of categorization and reformulation was conducted over several months, and guided by these two central questions:

- Do these concepts contribute to facilitating meaningful, emotion driven engagements that exist in the user product interaction journey?
- How can these concepts facilitate this thinking within design and can assist in creating products that people want to keep for longer?

Before mapping and consolidating these across the different bodies of literature, it seemed pertinent to uncover the overlaps that already exist within each field of practice. This will ensure that the mapping process of the new tool will be much simpler and easier to undertake.

Product lifetimes research

Beginning with concepts uncovered from Circular Design and Product Replacement research, the concepts were mapped in figure 4.2 below. This highlighted the similarity between several of the strategies across the different studies. These are presented in chronological order along vertical and their respective strategies shown along the horizontal.

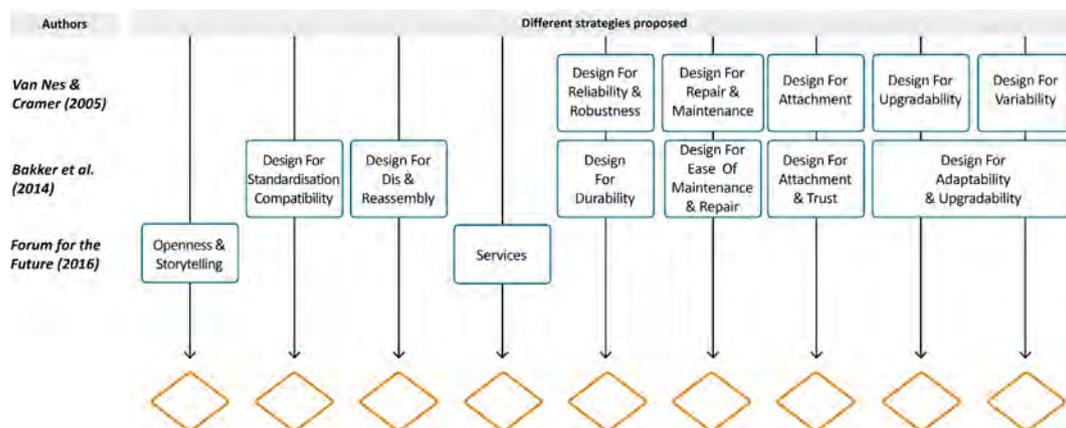


Figure 4.2 Strategies of Circular Design and Product Replacement

Aside from uncovering the overlaps that exist within these strategies, a few suppositions can be drawn. Firstly, that these strategies can be viewed in terms of which stakeholder is most affected within the entire lifecycle of the product and sit along a scale from user-focused to producer-focused. Products that are designed to build attachment, adapt and be maintained in

terms of infrastructure and design are more related to the experience and activities of the user, whereas products that can be disassembled, materials and components recovered, reused and repurposed are more actively related to experience and activities of the producer as shown in the figure 4.3. However, importantly, these factors are not mutually exclusive of emotional attachment. A product that is able to be disassembled could be treasured by a user, but from a designer and organizational perspective, disassembly and/or material recovery is a type of engagement the user is less likely to participate in.

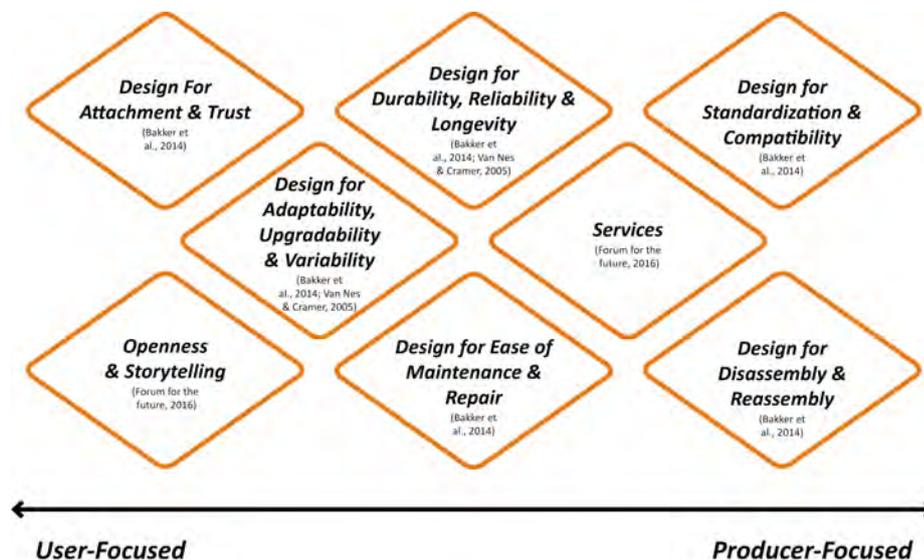


Figure 4.3 Identified strategies and which stakeholders they are more relevant to

By understanding which major stakeholder is more affected, developers and researchers can make a more informed decision on which strategies are more relevant to their product or service. For this project, Emotional Durability is a sustainability approach more concerned with the experience of the user and so would relate more significantly to the strategies:

- Openness and Storytelling
- Design for Attachment and Trust
- Design for Durability, Reliability and Longevity
- Design for Adaptability, Upgradability and Variability
- Design for Ease of Maintenance and Repair

Secondly, the terminology of strategies were mostly kept the same, except for those where terms were merged. This was so all the concepts could be retained at this stage. Later during the

further advanced in regard to development of practical design tactics. The strategies relating to Consciousness and Fiction offered by Tokaya (2013) and Van Krieken (2011 & 2012) such as ‘change the product person interaction’ and ‘stimulate intrigue’ one could argue are more practical for designers to use, than say those offered by Padro (2014) which were ‘meaningfulness’ and ‘uniqueness’ which are more concerned with Narratives and Attachment. This uneven development shows how there is still great deal of research to be undertaken to translate these ideas into practical strategies for developers to use.

Product Attachment

Lastly, taking the strategies identified from Product Attachment research, these were mapped to uncover the overlaps that exist within the strategies and were combined into figure 4.5. These are presented chronologically along the vertical and their respective strategies along the horizontal.

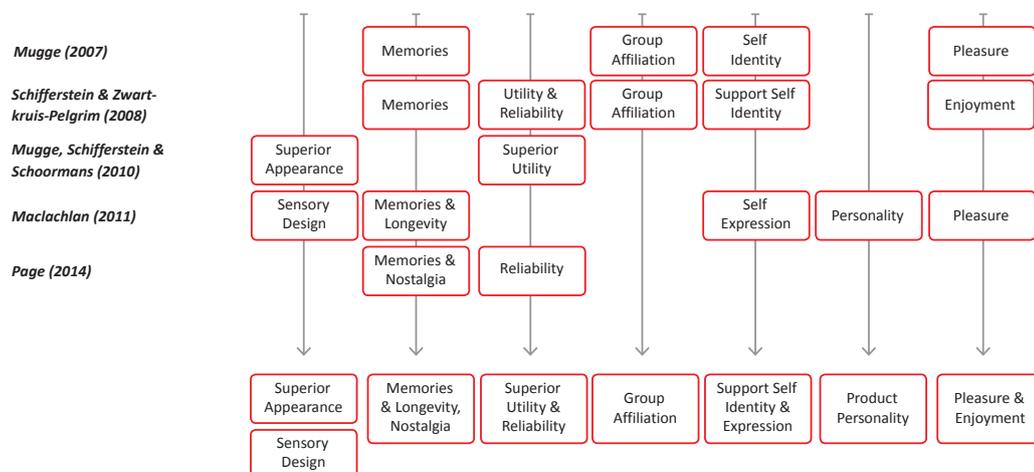


Figure 4.5 Consolidated strategies from Product Attachment

As figure 4.5 shows, several of the researchers proposed similar strategies, such as Memories, Support of Self-identity and Enjoyment and Pleasure, whereas others such as Product Personality were added and developed over time. Nevertheless, these overlaps were acknowledged, and the main concepts of Product Attachment identified and added to the tool as well. Furthermore, this process of analysis revealed, that although the concepts mentioned above are well established emotional longevity factors, as an instruction for designers they are

still quite abstract. Thus, further research would need to be conducted to translate these into practical design tactics.

Experience Design

The concepts identified in table 2.6 from symbolic meaning and heirloom status were determined to be conceptually different and related more to broader themes within the research. Therefore, it was unnecessary to map these in relation to one another and were added to list of strategies used to make the tool.

Bringing the strategies together in one model

In order to display how the concepts from figure 4.3, 4.4 and 4.5 relate to one another as a whole, they were mapped into one diagram figure 4.6. This shows where the strategies complement and critique one another.

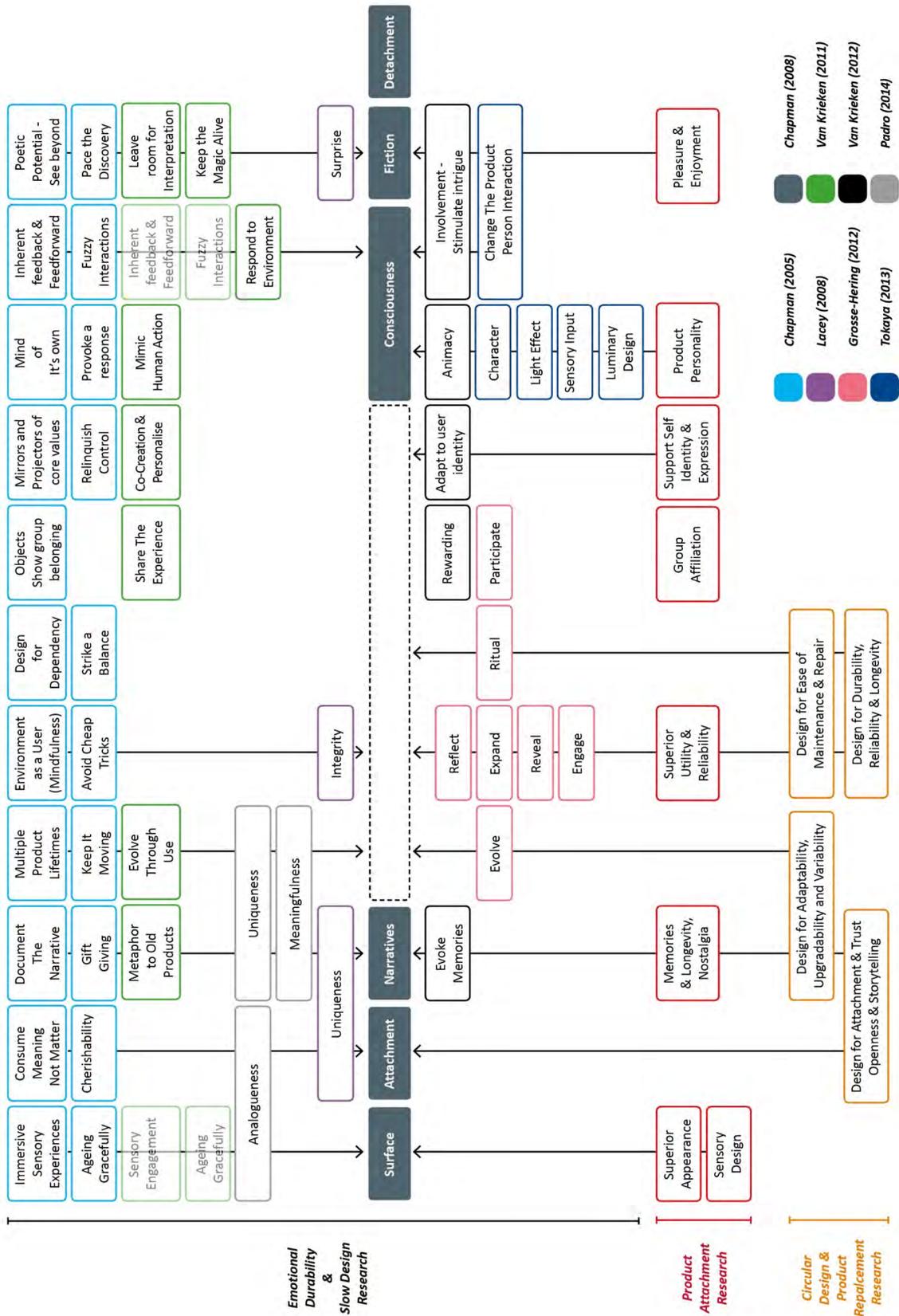


Figure 4.6 Emotional Durable Design, Slow Design, Product Attachment and Circular Design strategies mapped in relation to each other

Analysis of figure 4.6 and how they come together in one model

While it would be expected that all of the strategies of Product Attachment (red) would sit under 'Attachment' within this map, through this process of analysis it was revealed that they in fact relate more broadly across Emotional Durability. Concepts such as 'Sensory design' and 'Superior appearance' relate more to 'Surface', 'Product Personality' to 'Consciousness' and 'Pleasure and Enjoyment' to 'Fiction'. This demonstrates two key insights. Firstly, it goes to further validate the conclusions drawn by Chapman, (2005 & 2008) in regard to his 6-point framework, that Fiction, Surface etc. do assist in building emotional relationships between users and products. Secondly, that perhaps placing 'attachment' as a central point within the model is conceptually redundant, as it seems that attachment is woven broadly across the whole landscape.

Positioning the Circular Design strategies (orange) against the others demonstrated two things. Although Van Krieken's (2011) 'Qualities of ED' (green and black) had the most breadth across the landscape of Emotional Durability, they did not include much consideration of the 'Pragmatic qualities' of Emotional Durability and Product Replacement i.e. notions of Repair, Modularity, Upgradability, Robustness and Reliability and neither did any of the other researchers, aside from Chapman (2005). While in the original text, there are many suggestions relating to these more physical longevity factors, the 6-point framework again does not cover this aspect in full, as shown by the gap in the middle. Secondly, the Circular Design strategies could also be viewed as simpler and easier to use, as they use unambiguous language to describe what they do. Therefore, these can be used as a benchmark for deliberating how to translate Emotional Durability concepts into useable strategies later on.

In summary, Emotional Durability and Slow Design and aspects of Circular Design and Product Attachment were chosen as models for exploration because they provide both a depth and breadth of material with which to explore extending the lifetime of a product. However, while the strategies by existing researchers in Emotional Durability and Product Attachment provide insight into how to remedy the situation, they do not provide clear instructions for how to integrate them into NPD, unlike Circular Design strategies. Therefore, the next stages of this research were to conceptually fill the gaps as shown in the figure 4.6, translate the emotional longevity thinking into easier to use design directions and examine the synergies between these concepts and Circular Design strategies. This last point was explored to discover if the physical longevity perspective could be enhanced in relation to Emotional Durability.

Results of mapping process

By bringing all the concepts together in one process, two main conceptual levels emerged: a thematic level and strategy level. This resulted in an initial framework being developed (figure 4.7). A framework was devised rather than a tool at this point in order provide flexibility, because the research was still determining conceptually what would be included, allowing the research to devise a coherent taxonomy of all the concepts.

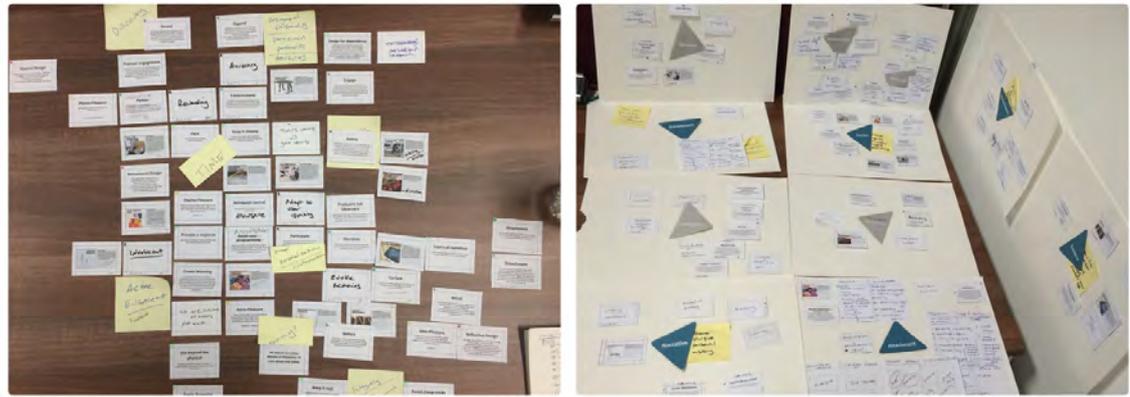


Figure 4.7 Concept cards - thematic and strategy levels

Drawing insight from the discussion points presented in the literature review in section 2.10 and the classification and clustering shown in the figures 4.3, 4.4, 4.5 and 4.6, eleven main themes emerged which were: Narratives, Integrity, Identity, Evolution, Surface, Relationships, Fiction, Conversations, Consciousness, Attachment and Detachment. Aside from the themes, 48 individual concepts were included and make up the detail of the framework. These have been merged into one diagram found in figure 4.8 opposite. This figure shows, how these new themes close the gap that was identified in the concepts, which goes to create a more comprehensive perspective for creating emotional longevity within new product development.

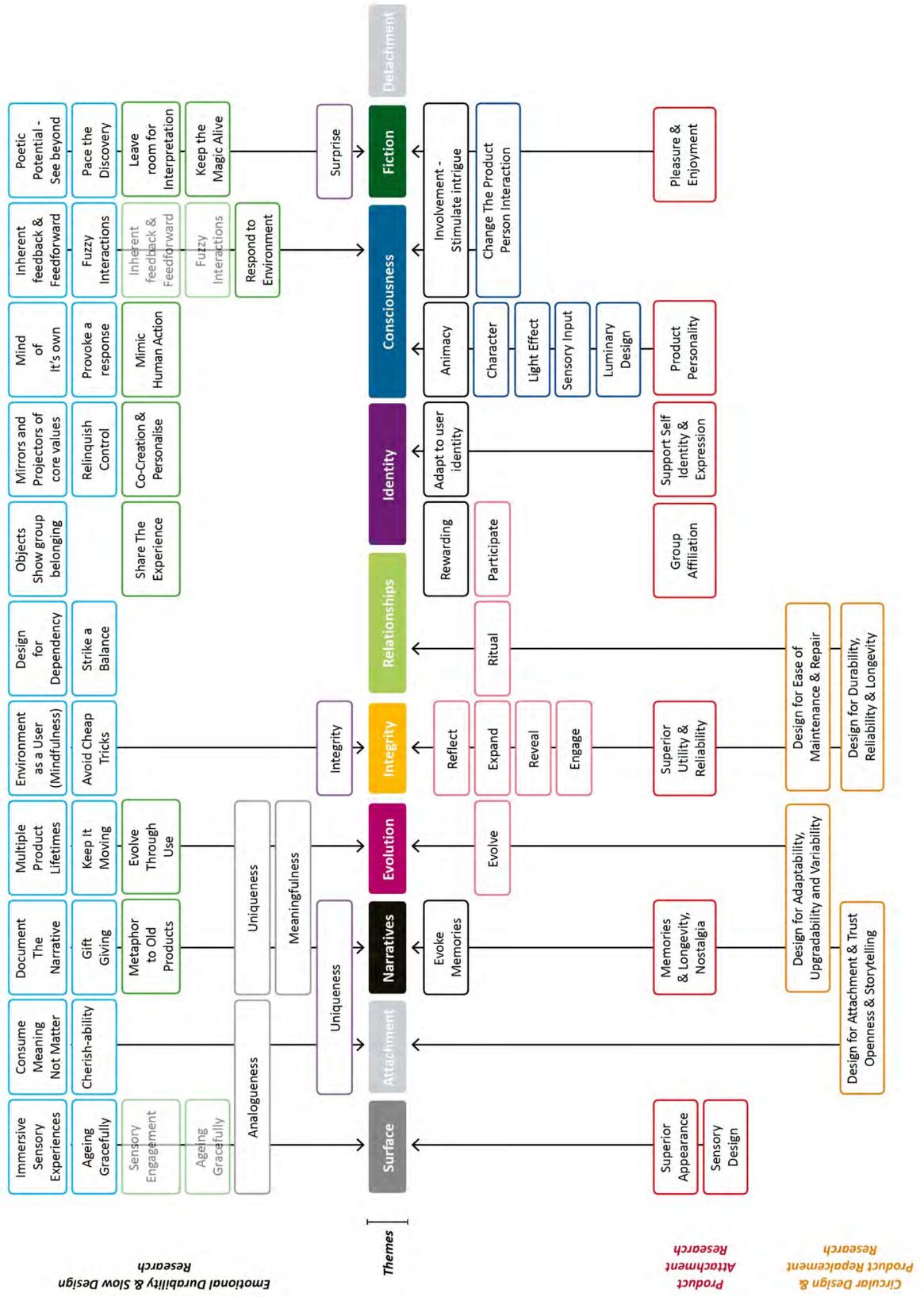


Figure 4.8 Demonstrates how the strategies of Emotional Durability, Product Attachment and Circular Design come together to form the themes of the framework

Designing the framework

The aim of this research was to develop tools that allow new product developers to be able to easily incorporate Emotionally Durable Design ideas into their products and services. Mindful of the risks of oversimplifying the material, the resources were designed to ensure that the tool could explain the higher-level thinking while also retaining the rich, expressive quality of the concepts.

To achieve this, techniques were employed that engage both the left and right brain as this facilitates faster learning and comprehension of concepts (Sims, 2006). As a result, the themes and strategies were formatted at two different sizes and a simple colour coding system used of one colour per theme. This design and structure was conceived so the framework can be quickly comprehended and navigated with ease by the user/participant.

Triangles

The materials were designed into asymmetrical triangles, to be visually striking and memorable, and also to facilitate a sense of playfulness which the research hoped would encourage engagement and exploration by the users of the tool.



Figure 4.9 Shows Iteration 1 - Designed and Set - April 2016.

Conclusion from defining the framework

As shown in figure 4.9, this first iteration was larger than the final framework and consisted of 11 themes and over 40 strategies. At this stage, the framework was rough and untested and not a finished tool, merely a collection of colour coded theory. However, the heart of the framework had been identified from the literature which would later be enriched by the outputs from the workshops. This next section outlines this next stage of the practice journey which was conducted over seven months, showing the testing and refinement of the Emotionally Durable Design framework.

4.2 Procedure for testing and refining the framework

In order to refine and test the framework, seven workshops were conducted at the University of Brighton, Oxford, London and Philips Lighting, Eindhoven, involving 44 participants from both industry and academia within NPD. This activity was undertaken so the research could comprehensively investigate the RQ beyond the literature regarding - *Which principles of Emotionally Durable Design are relevant to the extension of the lifetime of a product and how can these be translated into an effective method for new product developers?*

This activity achieved this in several ways. Firstly, by **gathering data** on cherished objects to uncover which factors were present in objects that had been loved and kept. Which, then secondly, helped the research to further **validate** the concepts developed by Chapman (2005 & 2008) and the extension of the framework thereof. Lastly, to **receive critique and feedback** on the fundamentals of the framework and identify any barriers or opportunities for implementation within NPD.

These workshops were conducted using the methods: *Narrative Inquiry, Presentations and Concept Sorting*. As mentioned in Chapter 3, this process of testing was iterative, so with each new round of activity all the new insights and limitations that were uncovered throughout the process were evaluated and fed back into the framework for further reflection and improvement. Figure 4.10 below shows the timeline for how these workshop and iterations of the tool were developed over time.

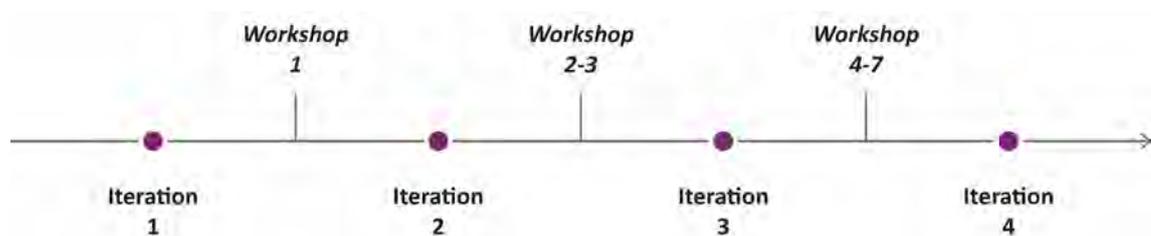


Figure 4.10 Timeline of workshops and iterations

Methodology for the refinement workshops

As presented in the Chapter 3, workshops are one of the primary methods employed in the research. This next section presents how these workshops were developed in more detail.

Developing the process for the workshops

Sims (2006) argues that to be able to design and deliver a successful, fantastic, memorable workshop these factors must be considered: *who, what, why and where* and *whole-brain learning*.

Who, what, why and where

One must consider these questions: Who are your participants? What type of session do you want to deliver? Why are you running a workshop? What outcomes are you hoping to achieve? Where can we create the optimum environment and conditions for effective learning? So, when defining what kind of process you want to deliver you must be aware of the difference between information and learning:

Information:

- Read for themselves - Passive Learning

Learning:

- Find out for themselves - Active Learning
- Draw from their own experience - Active Learning
- Find out from each other - Active Learning
- Research and feedback to you / each other - Active Learning

Content can be delivered through handouts and presentations, but if a researcher is looking to create a meaningful learning experience that encourages knowledge retention one must aim to use these four categories as a guide for the design of your materials (Sims, 2006, p.32).

What can they read or find out themselves OUTSIDE the SESSION Welcome packs, pre-reading materials	What's already in them INSIDE/OUTSIDE the SESSION Draw from experience to inform on discussion
Active learning INSIDE the SESSION Games, puzzle, hunt, active research	Active teaching INSIDE the SESSION What they could assimilate and teach back

Table 4.1 Exert from (Sims 2006, p.32)

Whole brain learning

A process of teaching and training, whole brain learning aims to engage the brain more fully which helps to: retain information longer; recall information easier; take in new information

faster; enjoy the process more (Sims, 2006, p.37). This is achieved by employing these facets: engage both left brain and right brain; use multi-channel learning; consider multi intelligences and have fun! The rationale for creating a learning environment within these workshops was so that the participants could meaningfully engage with the concepts of Emotional Durability in order to given substantive feedback and insight on the concept from their perspective.

Procedure for presenting the framework

Taking into account all of the recommendations (Sims, 2006) the workshops were run in two formats: Half day and full day and included these activities and objectives shown in table 4.2:

<i>Activities</i>	<i>Objectives</i>	<i>Learning style</i>
Pre-workshop info pack	Provide a broad introduction to EDD through links to papers, books, video, websites	Passive
Exercise 1 - Cherish Object session	Share emotion driven knowledge to help connect the participants with the theory, each other and set a tone for the workshop. Gather data on objects that have been loved and kept.	Active
Presentations on the theory	Provide context and overview of EDD, present the research outcomes and framework in detail	Passive
Exercise 2 - Concept Sorting	Contextualise the theory with their object, to create a synthesis of knowledge. Gather data on how the themes correlate with the cherished objects.	Active
Facilitated Feedback	Gather impressions and insight from participants on how to improve and develop the framework further.	Active
Post workshop Info pack	Provide a copy of the framework along with referenced materials for further reflection to be used in own practice	Active

Table 4.2 Activities, objectives and learning style for workshops

Protocols for data collection and analysis

Data collection and analysis

Three key data sets were being collected using the activities outlines above: expert feedback from participants, cherished object stories (exercise 1) and categorisation of the themes (exercise 2).

Between each iteration of the framework, the expert feedback from participants was evaluated using content analysis and key insights used to develop the framework further. It was only after all the workshop were completed (1-7), that the data from the cherished objects and card sorting

exercise were analysed separately and the final iteration developed. The results of this process can be found at the end of this chapter.

Controls for testing

The procedure for how the workshops were carried out remained the same throughout each workshop. The only factor that was changed was the framework as it underwent rounds of refinement and improvement.

The number of participants varied between workshops, however for each exercise there was no more than 5 people per group. This was to ensure that each person had the opportunity to participate equally.

This next section outlines in more detail how each of the activities was conducted and data was collected.

Key activities within the workshops

Exercise 1 - Narrative inquiry ‘cherished object session’

The workshops began with a narrative inquiry or directed storytelling (Connelly & Clandinin, 1990; Martin & Hannington 2012, p.68) which is a method that ‘allows designers to easily gather rich stories of lived experience from participants using thoughtful prompts, guiding and framing questions in conversation’. Described as a ‘Cherished Object Session’ participants were asked to bring an item or an image of an item they cherished. This was applied, firstly to set the tone of the workshop demonstrating that it is natural for people to have objects they are connected to. 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 data with which to critique and enrich the insights drawn from the literature. It was predicted that the notion of Emotional Durability would be unfamiliar to the participants, so the data was constructed based on ‘cherishability’ (Chapman, 2005, p.75), and was looking to uncover the underlying emotional triggers that build this principle into products.

Chapman (2005, p.76) defines ‘Cherishability’ as the ‘a powerful signifier of an object’s capacity to be cherished, loved and cared for by whatever means’ further stating that it will ‘become an increasingly relevant design consideration in the sustainable marketplace’.

Chapman (2005) originally referenced Philips Design (1996) as inspiration for the term, which provided a unique opportunity for the study to bring previously embedded and understood ideas back into the mindset of the organization as well. Other phrases were considered: emotionally connected, attached, treasured, possession, however it was decided that this term was more

appropriate and indicative of the original theory, and not as potentially polarizing as ‘attached’. The stories were relayed in groups of 3-5, with participants taking it in turn to speak. While each story was told, the other participants were asked to record phrases, words and thoughts that reflect the nature of the story on post-its. It was implemented in this manner to gather a rich picture of what each story was about, while also building robustness into the recording of the data. Figure 4.11 shows this process.



Figure 4.11 Cherished objects and the captured stories on post-its.

Presentations on the theory

After exercise 1, a 20-30-minute presentation was given which introduced the background to the study and presented each theme and strategy with product examples (figure 4.12). This allowed



the participants to contextualize the concepts, while also showcasing how some are already present in product design, adding a layer of understanding and validity to ideas. Participants were encouraged to ask question throughout, and all thoughts and questions were captured through written notation.

Figure 4.12 Presentation slides of the framework as it was presented with examples

Exercise 2 - Card sorting

Concluding the presentations, a second exercise was conducted. Card sorting (Martin & Hannington, 2012) is a participatory method used for categorization and exploration and is a technique that is useful when seeking to gain clarity and comprehension of concepts. Used in more evaluative manner, participants were asked to read and explore the themes, and match them to their cherished object. This allowed the participants to assess the theory in relation to their own object, becoming an activity that achieved two things. Firstly, an initial classification method for the primary researcher to understand which themes relate to which object, and secondly a mechanism for assimilating the knowledge of the theory in minds of the participants by creating the conditions for active learning (Sims, 2006). It also showed if any of the themes do not correspond to any of the objects as well. This will be discussed later in the chapter.

Facilitated Feedback Session

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

- Are any of the concepts or strategies presented here not relevant to NPD?
- Have any of the themes not been represented by the cherished objects?
- Do you have any suggestions of improvement for the framework?
- Could you see this framework being used in other contexts?

All feedback, thoughts and reflections from the participants were captured through handwritten notation and voice recordings, and any limitations or new insights uncovered were fed back into the framework for further refinement.

Outcomes and analysis of the workshops

After each workshop 1-7, an adapted SWOT Analysis (Hill & Westbrook, 1997) was applied to analyse what were the Strength, Weaknesses, Reflections and Plans for Improvement for the process and content that was delivered within the workshops. This iterative procedure of analysis, reflection and planning allowed the both the workshop and framework to be improved and refined between each session.

4.3 Testing and refining Iteration 1

Workshop 1 was conducted with 14 Sustainable Design MA students at the University of Brighton in April 2016 (figure 4.13) and was carried out using the methods described in the

previous section. The group was familiar with elements of the concepts but had not actively used Emotional Durability in practice.



Figure 4.13 Workshop 1 - Participants using framework and facilitated feedback session

Results and reflections of the testing iteration 1

Although this first iteration of the tool was still in development and contained overlaps and untested ideas, the participants through observations and conversation showed a good general understanding of the main concepts of Emotional Durability by the close of the workshop. The main feedback from participants were that the tool had too much detailed content, some of the wording was a little ambiguous and materials were difficult to engage with as the graphics were too small.

After reflecting on the outputs, it was determined that content and design of the tool needed to be reviewed and refined to make it easier to use and understand. Regarding the general structure (colour coded themes and strategies), this appeared to be appropriate for facilitating comprehension and engagement with the tool. The participants expressed that they enjoyed matching the colour coded sections together and reflecting on their meaning as a grouping before beginning to design. Therefore this structure was kept the same, but the content reassessed and developed.

How the framework was refined

The changes made to this iteration of the tool were, the naming of the themes, simplifying of the concept explanations and the formatting of the cards. From the feedback, it was shown that some of the terms did not adequately embody the sentiment they were trying to convey. Consequently, Fiction was altered to Imagination, Surface to Materiality and Evolution to Evolve. To streamline and improve engagement of the concepts, the text which describes the

concepts was simplified and the cards were formatted to be physically larger. The materials were then reprinted to be tested in the next round of workshops.

4.4 Testing and refining Iteration 2

Workshop 2 and 3

The second iteration of the framework was delivered in 2-3 hour workshop sessions (figure 4.14). These took place in Oxford (August 2016) and London (September 2016) with 10 participants who operated in new product development, with backgrounds in engineering, design, marketing, business and sustainability. The mix of experience was especially helpful as it allowed the framework to be analysed from a variety of perspectives within NPD. While participants from workshop 2 were recruited from the primary researcher's network, participants for workshop 3 were open to the public and recruited through Eventbrite. This scenario was beneficial to the research as not only did this provide a broader set of participants, but also potentially allowed for more candid feedback as the participants were not invested in the outcome.



Figure 4.14 Workshop 2 and 3 - Participants exploring the framework

Results and reflections from testing iteration 2

This round of testing revealed several key insights regarding the content and data that was being collected. Firstly, these workshops were smaller in size, which allowed for more in depth discussion on the content of the tool. As a result, in workshop 3 the themes of attachment and detachment were discussed by the group at length and observed as potentially conceptually different to other themes in the tool.

Secondly, the outputs from the cherished object session were proving to be valuable to the comprehension of Emotional Durability by facilitating moments of reflection upon themselves

and their objects. One participant commented how they were now viewing the objects they owned through a different lens, understanding better their own motivations for why they liked some objects better than others. It could be argued that this process of introspection could be especially important for those who develop products themselves, as it forces a moment of reflection upon their own feelings and behaviour, providing a better cognitive position to apply this thinking to their product development practice. The cherished object stories were also developing into a valuable data set for analysing the concepts within the framework. They assisted the primary researcher in better comprehending and locating aspects of the concepts within tangible examples, while also showing where some ideas were not present, or had not been adequately understood or explained. Moreover, these sessions were beginning to show which themes were reoccurring more frequently than others.

How the framework was refined

The themes of Attachment and Detachment were removed from the tool. On reflection these themes were determined to be states of being, rather drivers for building emotional connection. When a product enters our lives, we start from a place of detachment and move to attachment, the themes acting as drivers to reaching this state. Figure 4.15 shows this thinking in more detail and was presented as part of iteration 3 of the tool in the next round of workshops.

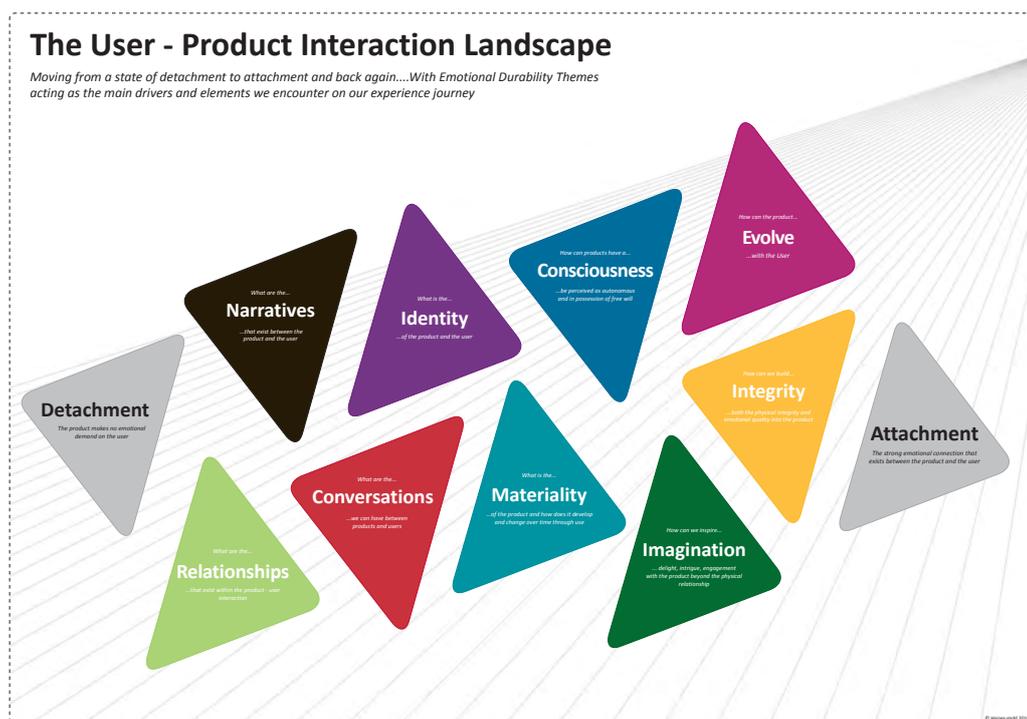


Figure 4.15 Moving from state of Detachment to Attachment

4.5 Testing and refining iteration 3

Workshops 4-7

A second field trip to Philips Lighting in Eindhoven took place from 3rd-7th October 2016 to deliver four workshops and conduct nine interviews. The 23 participants who attended the workshops were a mixture of product managers, designers, senior scientists, quality control engineers, circular economy experts and senior managers from all areas on the company, research, design and business. Considering that Philips lighting were a stakeholder in the project, these workshops were approached as a more collaborative, participatory process, while also acting as an interim progress update with the managers and supervisors that were invested in the project outcomes.

Results and reflections from testing iteration 3

The site visit to Philips Lighting in Eindhoven assisted in the development of the tool in various ways. Primarily it was the opportunity to spend time presenting and developing the theory alongside the company in order to gain industry specific knowledge regarding Lighting and NPD. It could be argued that this increases the likelihood that methods might be embraced and integrated by the company. As developing ideas, tools or methods for design only inside academia disregards the perspective of the future users of the tool (new product developers).

Reflection on the framework as a tool

Even though the framework had been through several iterations, rounds of feedback and refinement, limitations were uncovered in the knowledge exchange sessions. Firstly, in regard to concepts/strategies within the framework, there were still some that overlapped between themes, others that needed better explanation, and a few that were shown to irrelevant to be NPD. As a result, some were discarded, and others were reworded. But for those that overlapped, in order to retain their conceptual richness, a new category of concept was devised that allowed them to embody both themes at once. These particular concepts' colour codes were adapted to include both. Secondly, as a tool was to be used for design, several of the participants expressed that some of the ideas were still too abstract and hard to contextualize. Therefore in response product examples were found and added to the reverse of the concept triangles. Thirdly, several new application areas were identified, and it was suggested that the framework could potentially be used as a communication tool, consumer profiling tool, for personas,

consumer journey mapping and possibly marketing communication. Thus, in response several of these avenues were explored which is discussed more in Chapter 6.

Reflection and insights on the research as whole

Other than how the framework might be used, two other significant insights emerged from the knowledge exchange sessions. Firstly, there was concern regarding how the concepts materialise and apply to lighting. While at this stage, the research was still determining this avenue, it revealed that further research would need to be conducted to ‘prove’ or demonstrate these concepts more clearly in action if we were going to continue to get meaningful participation from some at Philips Lighting. As many of the participants have their own work flows, deadlines and targets to meet, to some the prospect of exploring ideas where the benefits have yet to be fully understood or defined, was not an activity they were able to engage with. Secondly, several questions emerged which asked: how can we ensure that emotion led thinking is embedded into the product beyond the design drawing board? Who has creative control of the product in the NPD system and where do these sorts of ideas get lost in the process? These points were raised by a senior designer, who offered that within his experience, the designers were often attempting to push more emotion led thinking within the design, but that this design intent would often get lost or removed somewhere down the pipe line. Therefore, after investigating this further, it was shown that, at least in Philips Lighting, product managers also appear to have a degree of creative control over the product as well as the product designers, and secondly, the next most significant actors within this scenario is Value Engineering.

Feedback to the participants

After returning from the fieldtrip, all object stories, questions, reflections and feedback were consolidated into a PowerPoint document, and an infographic created to feedback some interim findings to the participants. This is shown in figure 4.16 below. This was carried out to continue to encourage that the collaborative spirit and potentially maintain engagement between Philips Lighting participants and the research project.

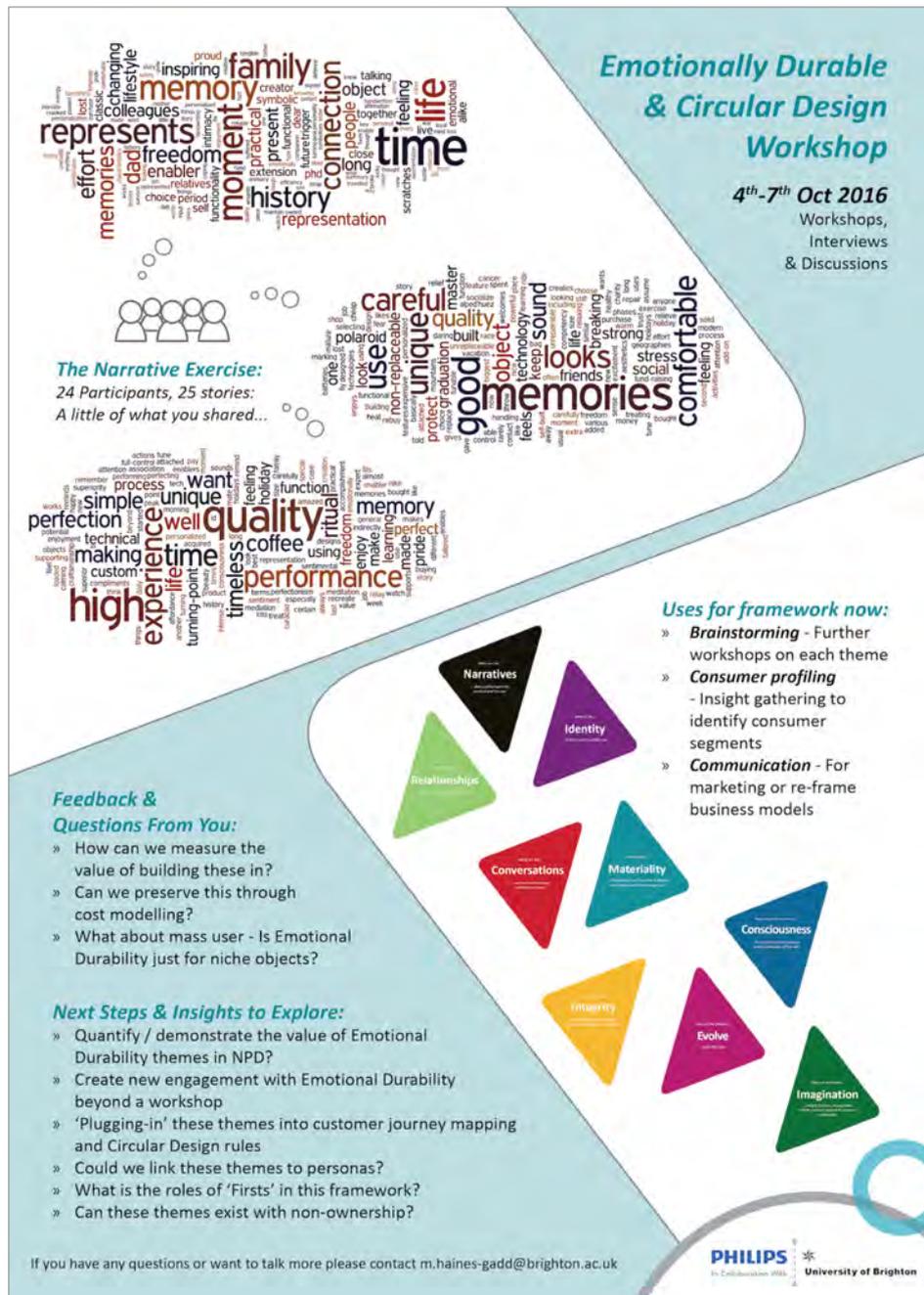


Figure 4.16 Infographic summarizing the workshops for participants

4.6 Results of the narrative inquiry

In total 36 object stories were gathered from 44 participants, as the stories from the first workshop were not documented. The stories from the workshops were captured on post-its and cards and placed around each object as they were told, creating a paper tapestry of memories. This can be seen in figure 4.17 below. These stories were captured and analysed for the following reasons. Firstly, so the research could discover if there were any motivations for cherishing an object that isn't being captured by the framework. Secondly, to gain new insight into the framework itself, to see if there are any aspects that are more relevant than others.



Figure 4.17 - Cherished objects and the captured stories on post-its.

Analysis

The key words from the post-its of each story were transcribed into a table and analysed utilising two main approaches, textual and thematic. Regarding textual analysis, two different free online text analyser tools were used: www.tools.seobook.com and www.Wordle.net. The first tool measures the frequency and density of the text, producing data that showed the most common combinations of word, which was conducted to uncover if there were a reoccurrence of simple phrases across the data set. The second tool analyses the frequency of individual words, displaying the most used more prominently within word clouds. The outcome of these processes can be seen in figure 4.18 and table 4.3 below respectively. Although these tools are not specifically designed for academic analysis, the level of evaluation required, and the data documented was not complex, as participants only recorded simple two- or three-word phrases. Therefore more sophisticated language analysis was not necessary, and these two methods were deemed to be sufficient.

lack of frequency is mostly likely due to how they feature more subtly within product-user experience. While themes such as NARRATIVE act as key drivers for emotional connection to be formed, these others themes enhance the experiential quality of the interaction.

But also, much like MATERIALITY and EVOLVABILITY these types of characteristics do not feature as much in day to day products, demonstrating how there is room for elaboration of these themes within design activities.

All but six of the cherished artefacts were classified as being related to NARRATIVE, however these six objects had only been in the possession of the participants for less than 1 year, so a NARRATIVE and history had yet to be built. While these findings concur with Chapman's (2008), who through surveys found that the majority of objects that people felt emotional connection to had Narrative associations, what differed with these conclusions is that they were analysed through more than one theme, so were able to construct more detailed picture of the motivations for emotional longevity. Although Narratives might be the most dominant motivator for emotional longevity, there is value in understanding what else drives emotional engagement, as there was always more than one reason for why people loved and kept objects. Thus, analysing the objects through this lens demonstrated which combinations reoccurred, the most common shown as:

- Narrative/Integrity (7)
- Narratives/Relationships/Integrity (5)
- Narratives/Identity (5)

At this stage of the research it was hard to assess whether or not these combinations provide any meaningful insight, but if we were to conduct a longer study they could be explored in more detail.

Object Statistics

Lastly, the objects were analysed from a series of different factors such as gender, length of ownership, and whether or not they are still in active use. This was conducted to uncover if there were any further insights or potential limitations that can be drawn from this data set.

Looking at the objects in more detail, all of which has been visualised in the figure 4.20 below:

The most common objects: Watches (4), Mugs (3), Toys (3), Shoes (3) and Bikes (2).

Gender split: 28 % (F) and 72% (M)

Still in active use: 78%

Digital / electronic objects: 20%
 Inherited: 20%
 Gifts: 17%
 Lighting: 0%
 Duration on ownership:
 <1Yr = 16%
 1-5yr = 9%
 5yr + = 44%
 10yr+ = 31%
 1/3 of the objects are maintained and fixed by the user

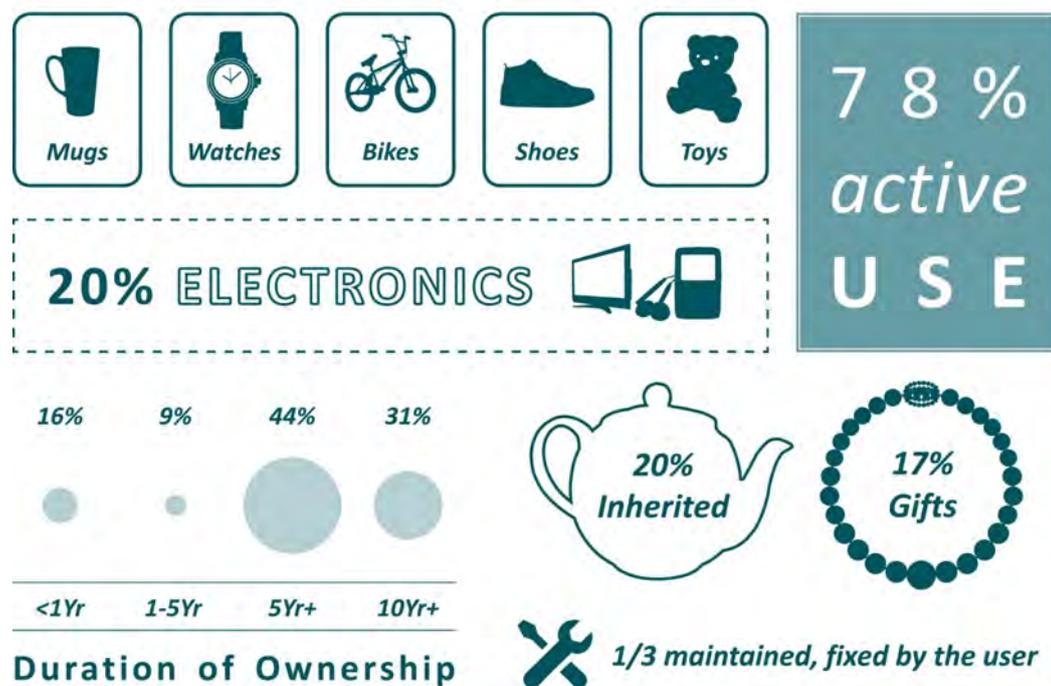


Figure 4.20 Statistics of the cherished objects

Reflections and conclusions

Active use vs ornamental

In terms of Product Longevity, it is encouraging to see how most of the objects are in active use, as they have been kept for at least 5 years or longer, showing that people do keep and use objects with which they have emotional connection to. Furthermore, that emotional connection takes time to build. However, it was also revealed that about a quarter of the objects do not have an active use function within the participants day to day life, yet are being stored and kept because they feel emotionally connected to them. Of these, some had become ornamental, others were being retained with the anticipation for their function to be restored in the future.

While one (which were entirely broken and outdated) was being kept as token reminders of the joy they brought while being used.

From a sustainability perspective, this is not always the best use of a resource, as some products such as mobile phones for example, might still have resource value, which over time diminishes. However, there are also projects that look to transform these objects and give them new life through transformative repair (Keulemans, Rubenis, & Marks, 2017) allowing users to take loved broken objects and create a renewed sense of engagement with the object. This viewpoint will be discussed in more detail in the next chapter.

None of the cherished objects were lighting products

Since the overall aim of the project is to develop methods and tools for facilitating the emotional longevity between consumers and lighting products, it strengthens the rationale for the study that none of the participants brought lighting products as a cherished object. So, if this tool or framework were able to assist in the design of lighting products that increase the emotional engagement just a little, it will be still be an improvement on the current level of consideration.

Limitations

Only 36 stories were gathered and analysed, the gender split was more biased towards men than women and all worked in new product development. It would be interesting to see if there are differences in the way people care for or consider products if they are not directly involved in their design and development. However, as an exercise for engendering empathy it became invaluable.

Conclusions and key findings from the objects story analysis

Analysis of both the concepts from the literature and the stories demonstrated that there are common factors why people choose to keep some objects in their lives longer than others. These have been summarised into the points below.

New Insights that emerged from the object and theme analysis

Firsts - One topic that reoccurred in several different stories was an idea of 'Firsts'; that either the object itself reminded the participant of a first time, a first experience, or the first type of object they had owned, such as first Iphone which to one participant was a memorable event. A few participants presented objects that were acting as place holders or proxies for another much loved first object that this one had replaced, such as first video camera for one participant and

first Casio watch of another. This idea of firsts as a factor of emotional connection has not been discussed in other emotion centred design literature and is a new insight from the research.

Markers (in Time) and of Identity - Many of the objects were used as identity markers, emulating particular features or aspects of the user's identity, becoming an act of self-expression, which confirmed findings found by other researchers (Mugge, 2007; Gosling, 2009). Several others were deliberately purchased to commemorate moments in time or new stage in life, becoming a physical reminder, a marker, of a particular moment the user wanted to remember. While other researchers have discussed this in relation to souvenirs (Page, 2014; Machlachlan, 2011) they have not been framed in this manner before regarding important stages in life, or how they are essentially trying to 'capture a moment in time'.

Quality, Reliability and Durability - Many of the participants described their object as having or being high quality and reliable, admiring this perceived quality of their object, as well as its ability to last a long time without deteriorating. This was also observed by Page, (2014) and Odem et al., (2009) who argued that sustaining quality over time helps to build attachment in the mind of the user (Page, 2014; Odem et al., 2009). A topic that is related to INTEGRITY, these insights will be discussed in more detail in the next chapter.

Build relationships through engagement and active material participation – One common factor amongst the objects is the active material engagement and participation within the interaction journey. Some were valued because they could be fixed and maintained by the user, others had a daily, tactile experience associated with them. While emotional bonding as a result of participation has been suggested by previous researchers (Mugge, Schoormans & Schifferstein, 2009), this was only in reference to Product Personalisation. Yet, as many of the objects stories demonstrated, the participants were materially and experientially engaged with their cherished objects. These findings support conclusions drawn in the literature review, that 'Engagements' which are more physical, visual, or involve cognition are more likely to result in a more emotional experience. Therefore this was contemplated and actively integrated as part of the framework.

Build richer narratives - The stories revealed that most emotionally charged objects were those 'linked to friends and family' and 'markers in time' as seen in table in appendix A.

Therefore, NP developers should consider how to build richer narratives into the product interaction, so the user can develop a more meaningful emotional experience with the product.

In conclusion, looking at the findings of the textual and thematic analysis and the object statistics, NARRATIVES, INTEGRITY, IDENTITY and RELATIONSHIPS were the most common themes linked to cherished objects. Even though the remaining themes of the framework (CONSCIOUSNESS, CONVERSATIONS, MATERIALITY, EVOLVABILITY, and IMAGINATION) are not as evidently present within the cherished objects, this could be because their role in building emotional engagement manifests more subtly within the product user interaction. The most useful outcome of this analysis was a more detailed, well-rounded understanding of each object, which was vital for uncovering limitations within the framework, as well as strengthening features of it as well. Each object gave the framework validity by providing concrete examples of the theme's qualities in material form, which helped to confirm and conclude the final iteration of the framework.

4.7 Final iteration of the framework

After these last round of workshops, the framework was re-examined and adapted in response to the feedback, insights from the exercises, facilitated discussion and finally the analysis of the objects stories. Figure 4.21 below shows the iterations of the framework as it evolved throughout this process of refinement.



Figure 4.21 Iteration 1-3 of the framework from April 2016 - January 2017

Over the lifespan of this process of analysis, the content of each of the themes and individual concepts were carefully revised taking on board the insights presented. All were reworded to include more task focused language transforming them into more actionable design directions, while others were absorbed into the embodiment of the themes and some cut as they were found to be not relevant to NPD. This resulted in a final iteration which consists of nine themes:

Narratives, Integrity, Identity, Evolvability, Materiality, Relationships, Imagination, Conversations, and Consciousness; with a further 38 strategies that support the creation or evaluation of an Emotionally Durable product or service. The full set of cards can be seen on the figure 4.22 below.

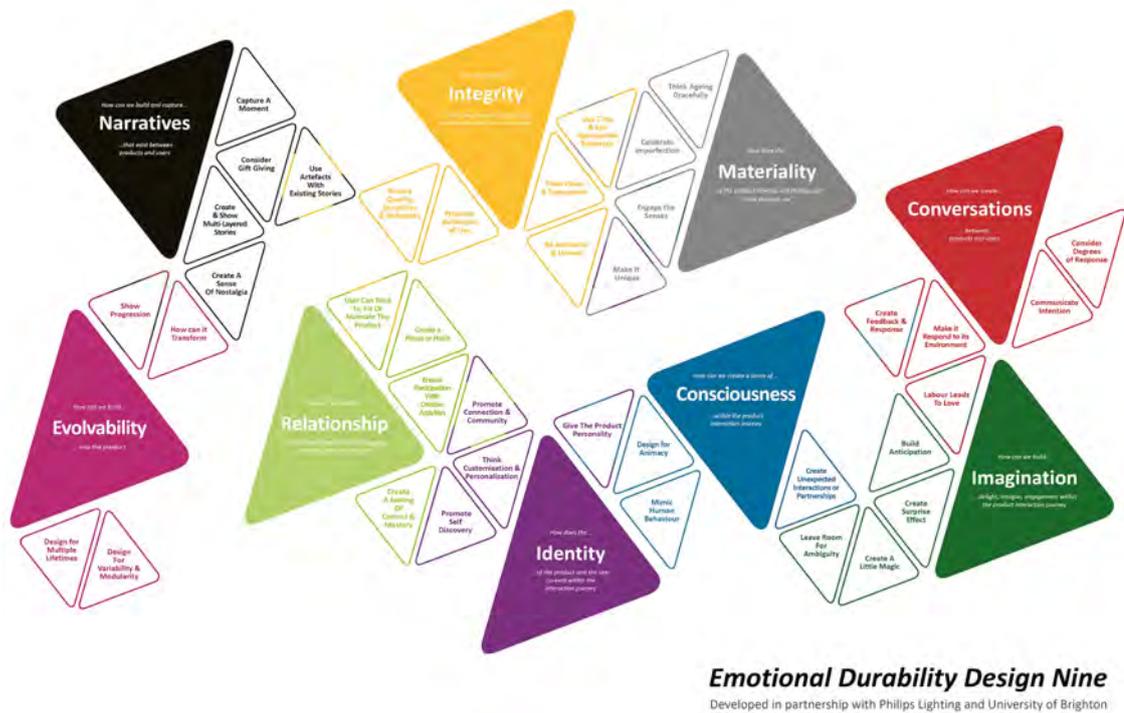


Figure 4.22 The final iteration of the Emotionally Durable Design Framework

The themes and strategies presented here will be discussed in more detail in the next chapter utilising and reflecting upon the literature, product examples and insights from data gathered in the workshop 1-7.

Chapter 5 – Presenting the Framework

The Emotional Durability tool presented in this chapter encapsulates the strategies and concepts for extending the emotional longevity of products. Initially consolidated from the literature, early iterations of the framework were refined through participant workshops and user data on cherished objects. This next section presents the results of these processes, the final iteration of the tool now entitled '*Emotional Durability Design Nine framework*'. It consists of the themes: Relationships, Narratives, Identity, Imagination, Conversations, Consciousness, Integrity, Materiality, and Evolvability. For each theme there are 3-5 strategies that support the embodiment of the theme within an object. The framework incorporates lifetime extension thinking in its application, showcasing the design factors that influence consumer behaviour to retain their products for longer. It also provides a clear structure and taxonomy for how to engage with Emotional Durability from a new product development perspective, providing easier access to concepts that until now have been considered challenging to implement within a design context.

5.1 Introduction

Approaching the Emotional Durability Design Nine framework

There are several ways to approach this framework, but firstly it is essential it is regarded as being Rhizomatic, whereby the themes and strategies are viewed as non-hierarchical entry and exit points for exploration into the theory. Furthermore certain 'entry points' or 'groupings' can be more relevant to particular avenues of exploration over others, which will be presented and discussed further in the Chapter 7. Secondly, the framework can also be viewed almost like a periodic table, full of powerful individual elements that can be used as sources for inspiration and knowledge; and, if explored as a composite or compound in varied combinations, could also provide innovative ideas that are emotionally rich, engaging and sustainable. Thirdly, if looking to generally introduce the concepts to developers, it is beneficial to present them specifically in the order presented here in section 5.2-10. It was observed from the knowledge exchange sessions that delivering and discussing the theme in this order tells the most coherent story from start to finish of what Emotional Durability perspective can be.

The framework as a card set and tool

The framework was designed into a card set as and consists of 9 theme double-sided large triangles as seen in figure 5.1. The front side of the card asks the central question the theme is

trying to achieve. The reverse provides additional detail and description of what it embodies as shown in figure 5.2.

9 Themes of Emotional Durability

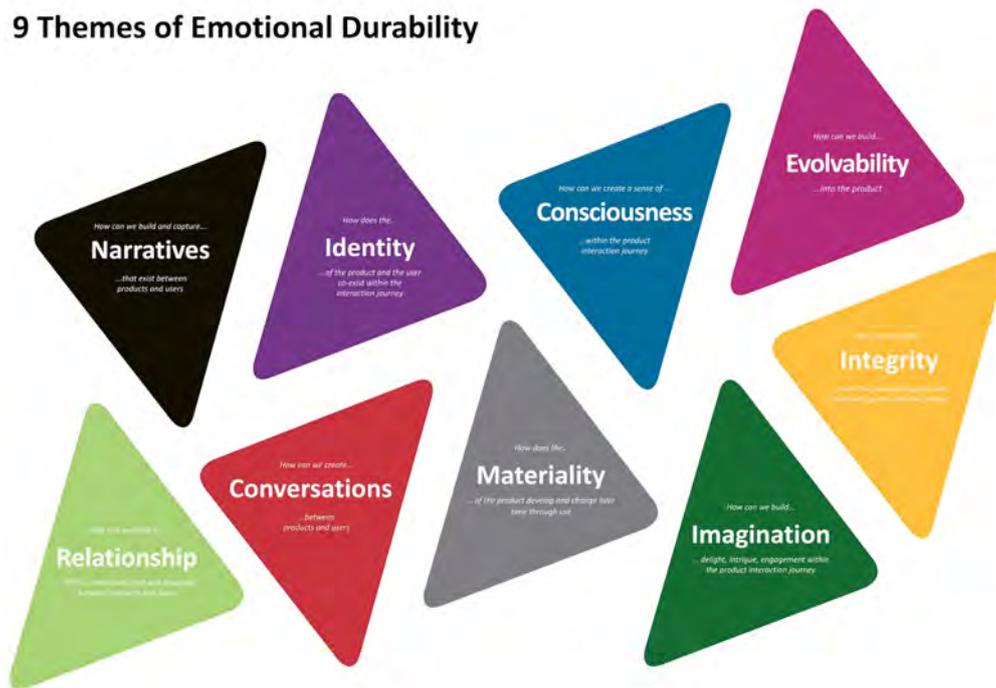


Figure 5.1 Nine theme cards

Front:
Asks the reader the central question of theme

Reverse:
(a) Description of theme
(b) Examples of the themes and what they embody



Figure 5.2 Theme cards explained

The strategies were set into smaller double-sided colour coded cards, which correlate with the theme they are associated to as seen in figure 5.3 below.

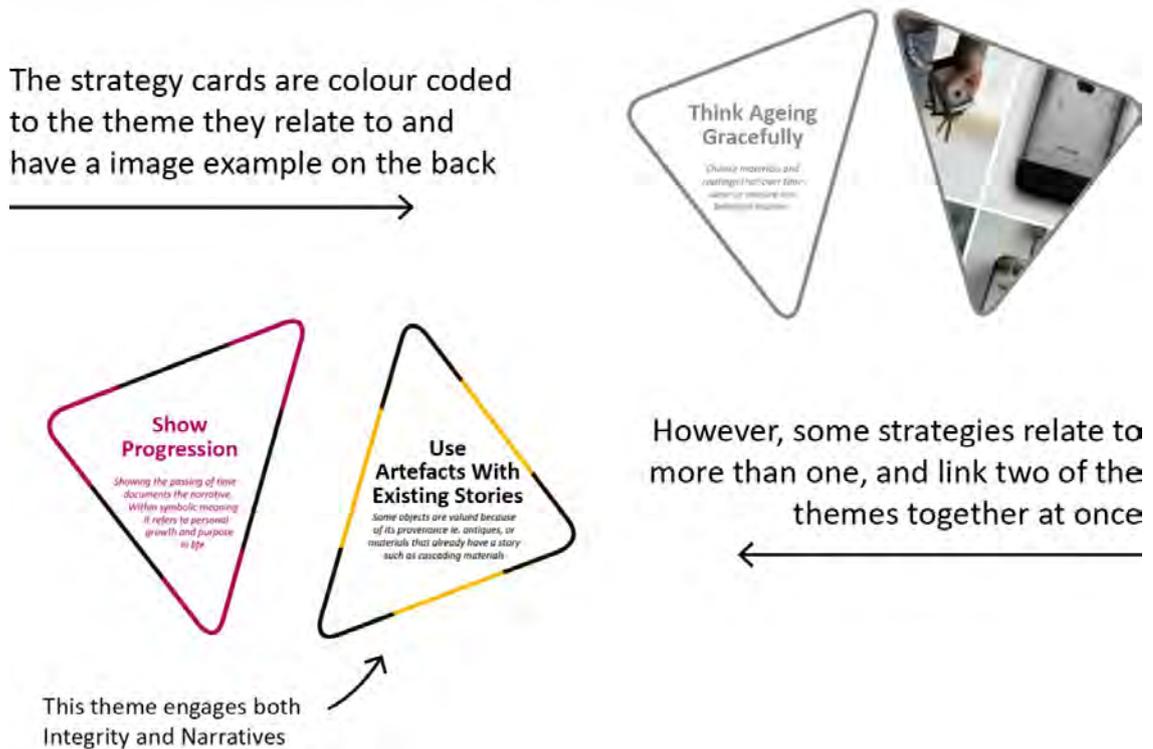


Figure 5.3 Strategy cards explained

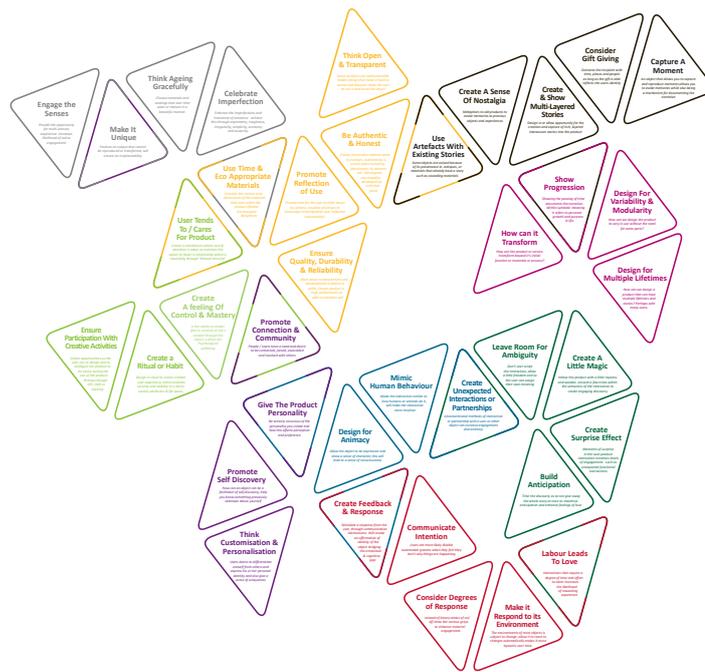
In their final iteration, product examples were added to the reverse of the strategy cards to provide the developer with more tangible examples of the concept in action. When the strategies related to two themes, they show not only where the meaningful conceptual overlaps occur, but also act as a bridge between the themes, facilitating the Rhizomatic nature of the tool. The framework was designed in such a way to prompt developers to consider emotional longevity thinking when designing their products. Similar to the method Chapman (2008) proposed in his 6-point framework, the themes and strategies should be used as exploratory drivers for inspiring design. Ideally, the tool would be used at the early stages of concept development, so that the thinking would be embedded at the heart of the proposition. However, it could also be used to influence new features for existing products.

Levels of complexity

The framework was constructed with various layers of detail so it could be engaged with at different levels of complexity, depending on the situation. When developers are looking for top level understanding, they could begin with the front side of the theme cards and consider the question posed. For example: ‘how can we build INTEGRITY, both the physical and emotional quality in their product’. If looking for more detail, the reverse gives a more well-rounded understanding of the theme as a whole; then additionally the strategies offer specific, more tangible design directions to show how these concepts can materialise within a product. This structure allows the framework to have both breadth and depth, so that the richness of the original material could be respected and showcased appropriately.

Framework, tool, or set of resources?

The framework by itself was intended to be both a conceptual taxonomy and a practical tool for developers to use. However, the research was also mindful of how the materials would be used, applied and accepted by developers. Aside from the tangible examples and task focused language in the wording of material, consideration was given to the process of design and an additional resource were created to use in conjunction with the card set. An Idea checklist was created. This is a reflective version of 38 strategies, aimed to draw the designers back to the fundamental concepts after they have gone through an initial process of design. This was set adjacent to the strategies to remind the NP developers visually of how the framework fits together. This is shown in figure 5.4 below. However at this stage of the research, the tool had not been comprehensively tested within a design setting, and so the practical procedure for using it was still in development. This will be explored in more detail in Chapter 6.



38 Strategies to support EDD

Emotionally Durable Design idea checklist:

1. Does the object or material already have a story? Could it?
2. Could it be a gift? or parts of it be a gift?
3. Can it capture a moment? Mark a time?
4. Create a sense nostalgia, metaphors to old products?
5. Is it a multi-layered & multi-dimensional experience?
6. Is it Honest and authentic in what it delivers?
7. Is it high quality and reliable? How is that shown?
8. Promote reflection of how it is used?
9. Transparent and open to the user?
10. Made of Environmentally and time mindful materials?
11. Can the user repair and care for product?
12. Is the interaction/relationship about participation and creativity?
13. Does the product create a sense of mastery?
14. Can it create a ritual or habit?
15. Is the interaction / relationship rewarding?
16. Does it show progression?
17. Has it been designed for multiple lifetime uses?
18. Designed for variability? Can it adapt? Upgrade?
19. Can it transform into something else? Materials be reused?
20. Can the design age gracefully over time?
21. Does it engage multiple senses?
22. Celebrate imperfection?
23. Does it have a uniqueness?
24. Does it allow the user to express their identity? How?
25. Does it promote connection and community?
26. Can it promote self discovery?
27. Does the product have personality?
28. Does the product seem as if it is autonomous? A soul?
29. Involve unexpected or unconventional forms of user interaction?
30. Mimic Human A Behaviour or Action?
31. Create feedback & response from the user?
32. Have a variable degrees of response?
33. Is it a labour of love to use?
34. Respond to its environment?
35. Product communicate intention with the user?
36. Does it have a little magic? Is it fun to use?
37. Does it build anticipation?
38. Have some surprise effects? More than one?
39. Does the interaction have a little freedom for interpretation?

Figure 5.4 Idea checklist and 38 strategies map

Structure of the next section

Each theme and their corresponding strategies will be discussed separately shown in section 2-10 of this chapter. It will present brief excerpts from the literature, product examples and insights from the object stories, to demonstrate where these design factors can be found within existing products, while also providing instruction for New Product (NP) developers on how to use these strategies in practice.

Quick Definitions:

Relationships - Building engaging partnerships by creating interactions that are about active participation, connection, community, maintenance and a sense of mastery.

Narratives - Capturing the unique shared history that exists between the object and user and embedding it into the product. Perhaps using gifting, it's the catalyst that evokes memories, metaphors to previous times, objects or interactions.

Identity - Being mindful of the object's and the user's identity and how these negotiate. Objects are used as projectors or mirrors of values. Therefore create space and allow self-expression as well as a clear product personality.

Imagination - See beyond the functional interaction to understand the mystery, excitement and captivation objects can provide. This can be created through surprise, anticipation and facilitate enjoyment and pleasure.

Conversations - Viewing the interaction as a conversation, by creating inherent feedback and feed forward interactions to create a relationship that is more evolutionary, durable and emotionally rich.

Consciousness - Creating a sense that products have character and free will, have quirks and can be temperamental, sometime resulting in the interaction becoming an acquired skill. This makes the product seem unique and have personality and expression.

Integrity – Consider creating products with not only a structural integrity but enduring values through quality, reliability, honesty, transparency which deliberate the process and materials used as well.

Materiality - Think about the physical way that users relate to products. Does the object get better or worse with time? What are the senses it engages, the look, the feel, the style.

Evolvability – Breaking perceptions that interactions with products are static, so time can be embraced as a design factor. Consider the multiple lifetimes, adaptability and transformation a product could achieve.

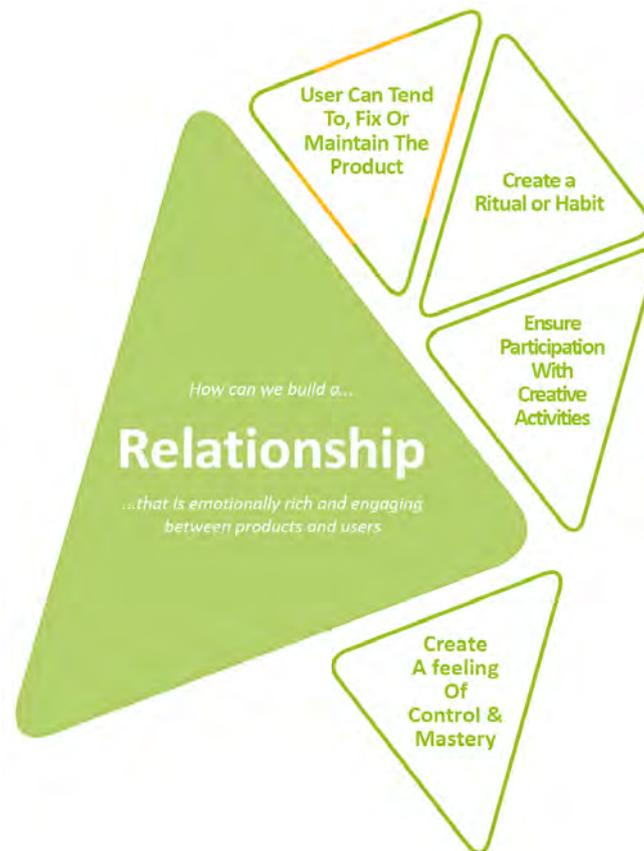


Figure 5.5 Theme of Relationships and its four strategies

5.2 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. This can also be achieved by letting the user reconfigure the product, learn a new skill or acquire knowledge through using it. Designing in mechanisms that encourage users to **care, tend to and maintain the product** builds a relationship of mutual altruism, also providing moments to **create a ritual or habit** with the product helps form a relationship of stability and reliability. All of these also engender **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.

RELATIONSHIP is a theme that emerged from the literature and practice, and is centrally concerned with developing engaging, rewarding partnerships between objects and people through active participation. The creation of a strong consumer-object RELATIONSHIP is a term and concept often discussed within Emotional Durability and Product Attachment research and is fundamentally the end result that these models advocate and encourage. Therefore, this is

an essential factor that needed to be highlighted to developers, and become the platform for strategies that embody the higher level, holistic experiences that occur between products and users. So, *how can we build a RELATIONSHIP that is emotionally rich and engaging between products and users?*

5.2.1 Ensure Participation with Creative Activities - *Create opportunities so the user can re-design and re-configure the product to be active during the use of the product. Perhaps through DIY, craft or hacking.*

Active participation of the user with the product was uncovered as a central concept within the literature and the object stories which can be facilitated in several ways. For example, by the user redesigning and reconfiguring the product which ensures the user is active during use (Grosse-Hering, 2012). It can also be achieved through co-design or co-production such as DIY or self-construction of the product (Grosse-Hering 2012; Norton, Mochon & Ariely 2012). This allows the user to be a producer not just an observer of the interaction (Chapman, 2005). However, regardless of how it produced, all researchers concluded that active participation will produce a more emotional engaging experience, which in turn increases the likelihood of an emotional bond. Therefore, NP developers should consider the various ways in which they can ensure the user can be actively involved with product, either through material engagement or activities that allow for creativity.

5.2.2 User Can Tend To, Fix or Maintain the Product - *Create a mechanism where care and attention is taken to maintain the object, this fosters a relationship which is rewarding through 'mutual altruism'*

Design for ease of maintenance and repair, and variations of this strategy, have been proposed by many researchers within product lifetimes research (Bakker et al., 2014a; Mugge Schoormans & Schifferstein, 2005; Van Nes & Cramer, 2005). Beyond the ecological benefits this strategy offers, allowing the user to actively and easily care for and tend to the object could also be seen as an act of 'Mutual Altruism'. This delivers satisfaction to the user in the act and maintenance and care to the object (Van Krieken, 2011). Chapman (2005, p.82) described this as 'Design for Dependency'. Therefore, NP developers can use this strategy not only to ensure the physical longevity but also the emotional longevity, as the time and effort invested in the product by the user is also an example of 'active participation'.

5.2.3 Create A Ritual or Habit - Design in ritual to create a better user experience, which provides security and stability in a hectic society.

Defined by Grosse-Hering (2012), this strategy was proposed as additional 7th principle for Slow Design:

‘Embracing ritual beyond the commodified time of industrial production. These designs offer diverse expressions of ritual and different time experiences. Using rituals to create a better user experience and provides security and stability in a hectic society’ (p.19)

This idea highlights how some product-user interactions, such as the polishing of the car on Sunday afternoon, or preparation of a morning coffee, could be considered as type of meditative practice or ritual. Which in turn, by engaging with these objects produces a sense of wellbeing and emotional connection. Therefore, NP developers should use this strategy to contemplate an alternative type of interaction which encourages the user to slow down and actively engage with product in a ritualistic manner, much like the matcha tea set shown in figure 5.6 below.



Figure 5.6 Tseng, T (2014) Matcha Preparation set

5.2.4 Create A feeling Of Control & Mastery - Is the ability to master (feel in control) of one's context through the object; a driver for Psychological wellbeing

This strategy was inspired from ‘Environmental mastery’ and is one of the six happiness-related symbolic meanings in products (Casais, Mugge & Desmet, 2016), and emerged as a design factor through the practice. Several participants described the way in which their cherished object made them feel secure or in control, which the researchers above believe can assist producing psychological wellbeing. For example, one participant loved his BBQ and felt it was an activity he was good at and had mastered through the object. Therefore, this strategy demonstrates to NP developers the positive emotions that objects can engender when they are being used, which this thesis argues builds a stronger emotional connection between the object and the user.

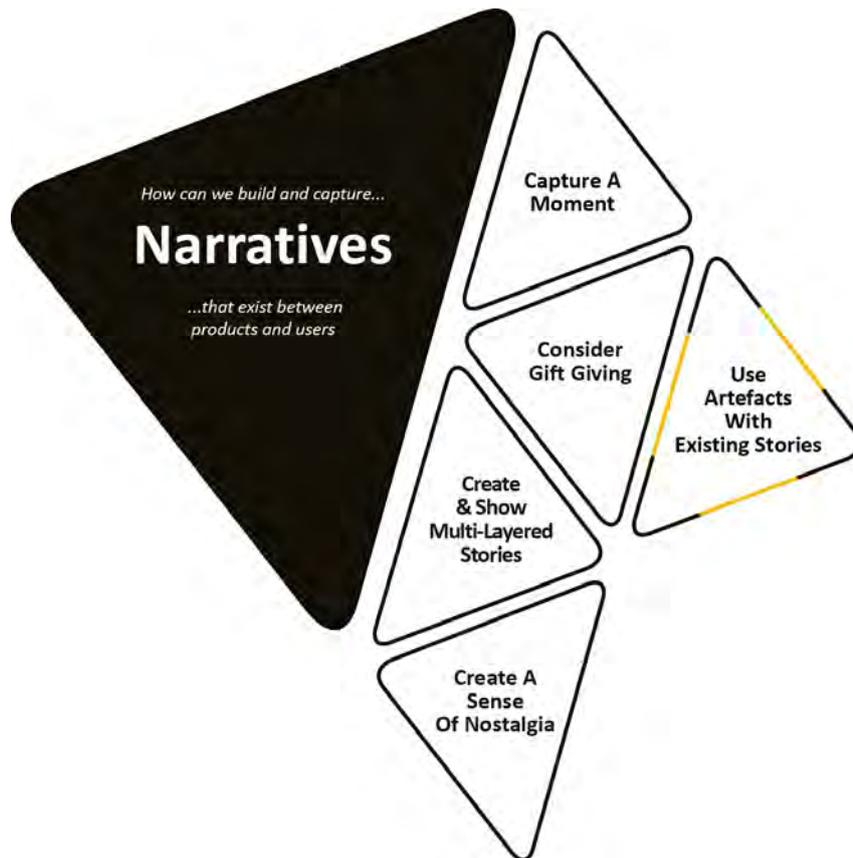


Figure 5.7 Theme of Narratives with its 5 respective strategies

5.3 Narratives - Capturing the unique shared history that exists between objects and users and embedding this into the product interaction. This can be achieved through **gift giving**, which initiates a narrative, or through **creating a sense of nostalgia** providing tangible metaphors to previously loved products or interactions, or by using objects, materials or **artefacts with existing stories** highlighting and valuing an item for its previous history and provenance. Effectively, trying to **capture a moment**, create markers in time and build **multi-layered 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.

NARRATIVES is a central point within Chapman’s (2008) experiential framework and proved to be a critical theme within this framework as well. Shown to be the most common driver for why an electrical product ‘meant’ something the participants (Chapman 2008, p.105), it was the most frequently identified theme within cherished objects presented in Chapter 4. This perspective is also supported by the literature, as it is proposed that ‘special items all evoked

stories' (Norman, 2004, p.48) and that an objects ability to 'preserve personal histories or other memories' is the reason we keep and care for these objects longer than others (Odom et al., (2009). However, beyond only offering NARRATIVES as point of reflection for developers, like previous works, (Chapman, 2008; Maclachlan, 2011) more detail can be proposed to facilitate this theme within products, which contemplates *how can we build and capture NARRATIVES that exist between products and users?*

5.3.1 Consider Gift Giving - Connects the recipient with time, places and people as long as the gift is able reflects the user's identity

Researchers found some objects associated with narratives and attachment were given as gifts (Chapman, 2008; Page, 2014), as they become reminders to the user of the 'specific event when the gift was received' (Mugge, 2007, p.30). Therefore, NP developers can use gifting as a mechanism for beginning and documenting a 'Narrative', a tactic which allows the user to make a marker in time, creating a connection to others.

5.3.2 Use Materials or Artefacts with Existing Stories - Some objects are valued because of its provenance i.e. antiques, or materials that already have a story such as cascading materials.

A central principle within circular systems is cascading materials, which are 'waste' items that become feedstock for alternative industries (Ellen MacArthur Foundation, 2013), and from sustainable design perspective could be classified as upcycling. However, they can also be viewed as matter with existing narratives, a previous life and history, actively demonstrating to consumers and developers the multiple lifetimes that objects and materials can have. Therefore, if NP developers use and celebrate the story of 'waste' materials, there is a deeper value of provenance that can be conveyed to consumers, in addition to the environmental gains that can be made.

5.3.3 Create A Sense of Nostalgia - Use metaphors of old products to evoke memories of previous times, experiences and objects

Several researchers propose that nostalgia can be an effective mechanism for evoking memories or eliciting feelings of sentimentality (Page, 2014; Hood, 2016). As Memories are a key determinant for generating product attachment, NP developers can use nostalgia or metaphors as a design factor to trigger reminiscence and memory association. This could create a more

engaging emotional experience for the consumer. This factor is currently being capitalised by lighting developers to produce LED like incandescent bulbs as shown in figure 5.8 below.



Figure 5.8 Cowley, D (2016) *The light Fantastic*

5.3.4 Capture A Moment - *An object that allows you to capture and reproduce moments allows you to evoke memories while also being a mechanism for documenting the narrative*

In previous frameworks, researchers (Mugge, 2007; Van Krieken 2011 & 2012) discuss ‘Evoking or triggering Memories’ as a mechanism for producing attachment. However, it was determined that ‘evoke memories’ is a tricky design direction to follow, therefore ‘Capture a moment’ was proposed as a more actionable phrase for design and is a strategy and new insight which emerged from the practice and object stories.

5.3.5 Create & Show Multi-Layered Stories - *Design in or allow opportunity for the creation and capture of rich, layered interwoven stories into the product*

Layers of narrative is a central concept of Emotional Durability, as 'Objects that evolve slowly over time build up layers of narrative by reflecting traces of the user's invested care and attention.' (Chapman 2005, p.112). Therefore, highlighting how objects can be keepers of stories and memories is a powerful insight that can provoke developers to consider design interventions that allow the user to embed their narrative into the composition of the product. Much like the patchwork quilt or charm bracelet as shown in figure 5.9 and 5.10 below.



Figure 5.9 Heather, (2013) Funky Junky Charm Bracelet (left);

Figure 5.10 Hunter, C (2008) Patchwork Quilt (right)



Figure 5.11 Theme of Identity and its 4 themes

5.4 Identity - Crafting and negotiating the object's and the user's identity within the interaction. Developers can create space and allow for self-expression through **customisation and personalisation**, so users can demonstrate important stages in life, religion or values. Or they can craft and project a defined **product personality** through design, this creates characteristics which users can connect to, which also assists in brand differentiation. There is also potential for the product to create **connection and community** with others resulting in group affiliation, such as a football shirt, or Mini driver club. 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.

IDENTITY is a theme that emerged from the literature and affinity mapping, challenging developers to recognise the ways in which the IDENTITY of both the user, and the product, are

constructed and materialised within designed products. As within the literature, researchers revealed that products that allow for self-expression, or support of self-identity, positively affect levels of Product Attachment (Mugge, 2007; Maclachlan, 2011; Schifferstein & Zwartkruis-Pelgrim, 2008), as consumers often use products as either mirrors or projectors of core values (Chapman, 2005). Furthermore, products designed to have their own perceived IDENTITY elicit emotional responses from users as well (Govers, Hekkert, Schoormans, 2004). Therefore, while these elements are present within the research, their application for NPD could be more prominent, and so this thesis offers these strategies and theme together asking developers to consider, *how does the Identity of the product and the user co-exist within the interaction journey?*

5.4.1 Think Customisation & Personalisation - Users desire to differentiate themselves from others and express their identity, as this gives a sense of uniqueness.

Personalisation is a strategy for facilitating self-expression and is a central determinant of Product Attachment. It creates opportunities for the user to invest time and effort into the product while asserting aspects of their personality, which increases the emotional bond the user experiences with the product (Mugge, Schoormans and Schifferstein 2008). Therefore, developers need to design in and ‘allow space for the user’s identity’ within the products structure (Chapman 2005; Van Krieken, 2011). While the sustainability of mass customisation as an approach has yet to be determined (Kang & Wimmer 2008), perhaps if developers create a mechanism for meaningful after sale personalisation this forces the user to invest time in effort in the product, increasing the likelihood of emotional and physical longevity. E.g. personalised number plates for cars.

Give the Product Personality - Be actively conscious of the personality you create and how this affects perception and preference

Product Personality is a concept driven by user perception of objects, as researchers found that users will ‘assign personality or other expressive characteristics and assess the personal or symbolic significance of products’ (Desmet & Hekkert 2007, p.62). If they are perceived to match and reflect aspects their own personality, this positively influences their preference (Govers, Hekkert & Schoormans, 2004; Mugge 2007). Therefore, NP developers should seek to design objects which have clear product personalities, much like the iconic Mini shown in figure 5.12 below. This gives the user a something to connect to, while also helping to define a strong brand differentiation.



Figure 5.12 The NRMA, (2011) *2011Mini Cooper D - NRMA Drivers Seat*

5.4.3 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.*

‘Group Affiliation’, is a central concept of Product Attachment. While there is yet to be a consensus on whether ‘Group affiliation’ will lead to attachment, researchers argue that consumers, both consciously and unconsciously acquire things that label themselves, indicating a group they belong to (Van Hinte, 1997; Jordon, 2000; Chapman, 2005). However, objects can also be a bridge, connecting with us others, helping to support more ‘Meaningful Affiliations’ through group and communal activities (Casais, Mugge & Desmet, 2016). Therefore, this strategy displays to NP developers how products can be more than just brands and the materialisation of function, they can be connectors, like the football shirt shown in figure 5.13 below, which can facilitate the creation of more meaningful relationships between people and things.



Figure 5.13 Footballshirtculture.com (2014), *Southampton 14/15 Home football shirt.*

5.4.4 Promote Self Discovery - How can an object can be a facilitator of self-discovery, help you know something previously unknown about yourself

Many researchers have proposed 'Discovery' as a mechanism within design. Either, to prolong active engagement between objects and users (Chapman, 2005), as a factor of slow design to reveal things lost or forgotten (Grosse-Hering, 2012) or a method of exploration and participation to enhance user experience (Lacey, 2009; Van Krieken, 2010). However, with technological advancements products can now be facilitators of self-discovery, a means through which to discover something previously unknown about their identity. Therefore, NP developers have opportunities to allow users to measure, account and take responsibility for their consumption behaviours, creating new moments for sustainability intervention. Much like the Fitbit or the smart energy meter below (figure 5.14 & 5.15), these devices are giving user the opportunity to gain knowledge and insight of their habits and behaviours, which is building a relationship built on transparency.



Figure 5.14 (left) - Butt, H (2017) Fitbit

Figure 5.15 (right) - The Telegraph, (2014) British Gas smart meter

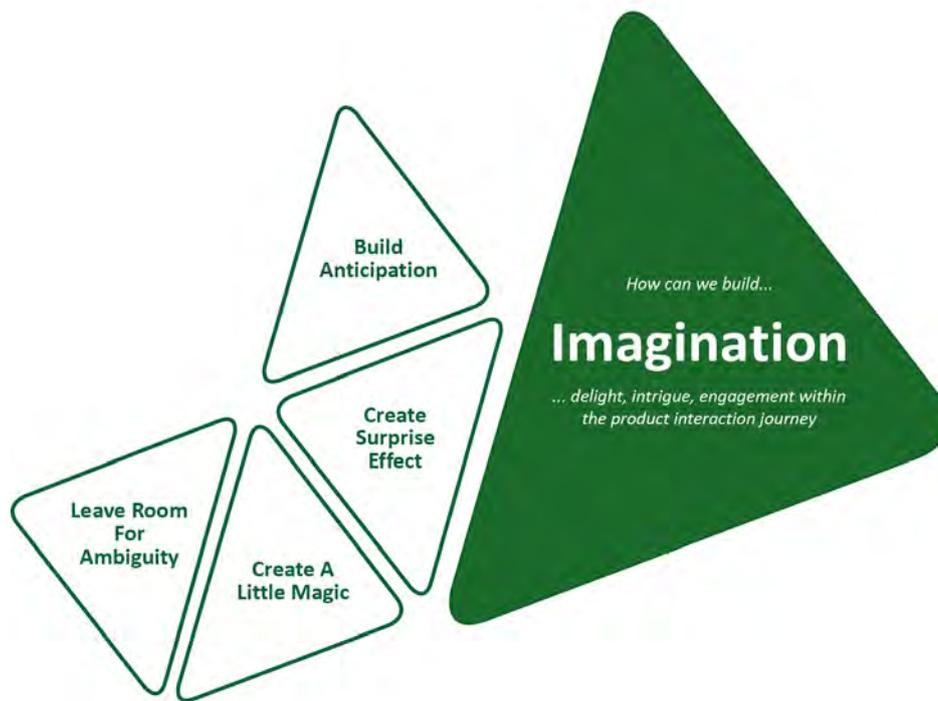


Figure 5.16 Imagination and its 4 strategies

5.5 Imagination - Moving beyond functional interaction to understand the mystery, excitement and captivation that objects can provide. This can be achieved through **building anticipation** within the interaction, to maximise feelings of love and discovery, or by **creating a little magic** through unconventional methods of interaction that exceed expectations. Eliciting feelings of enjoyment and pleasure is a critical factor in building attachment and emotional engagement, however, users can become immune to such stimulation over time, therefore to ensure continued involvement, the product must try to **create surprise effects or unexpected interactions**. It is also important to **leave room for ambiguity** for the user to find their own meaning in the interaction.

IMAGINATION is a reconstruction of the point 'Fiction' from Chapman's (2008) experiential framework. This theme is related more directly to interaction, user experience and the emotional lifetime of the objects and prompts NP developers to consider the 'poetic potential', intrigue, enjoyment and pleasure that products can provide beyond the functional interaction. Users can become immune to stimulation over time (Chapman, 2005; Van Krieken, 2012), therefore we need to consider how to prolong engagement to ensure emotional longevity. While Chapman's original definition (of Fiction) is the basis for the theme, other concepts within Product

Attachment, (Enjoyment and Pleasure) were uncovered in the review and determined to be complimentary to the central objectives of Fiction. Therefore, these additional notions were consolidated into the theme and the strategies presented in this next section to ask, *how can we build Imagination delight, intrigue, and engagement within the product interaction journey?*

5.5.1 Create Surprise Effect - Moments of surprise in the user-product interaction increases levels of engagement - such as unexpected functional interactions

Incorporating surprise effects into the product cultivates enjoyment and positive emotions within product user interaction journey (Ludden, Schifferstein & Hekkert, 2012; Schifferstein & Zwartkruis-Pelgrim, 2008). However, although the outcome diminishes over time, the effect can be employed multiple times within the interaction journey (Ludden, Schifferstein & Hekkert, 2012). Therefore, developers can use this as an actionable design strategy for provoking a response from the user, which will prolong engagement with the product, and in turn extend the psychological lifetime of the object.

5.5.2 Leave Room for Ambiguity - Don't over script the interaction, allow a little freedom so the user can assign their own meaning

By relinquishing some control and avoiding over programming of the product user interaction, this leaves room for interpretation, allowing the user to employ their imagination and discover their own methods of interaction with the product (Chapman, 2005; Van Krieken, 2011). These 'ambiguous qualities' create moments for 'randomness and intimacy, which, in turn, facilitate the nurture of subject-object empathy' (Chapman, 2005, p55). Therefore, developers can create features that allow a little freedom for play and discovery, which will increase the likelihood that an enjoyable experience will occur.

5.5.3 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

Some modern-day popular products have been designed to be static and experientially one dimensional. However developers can 'keep the magic alive' by concealing functionality of the product. This helps to prevent all meaning being revealed at once, which will keep the user captivated increasing the emotional lifetime of the product (Chapman, 2005; Van Krieken, 2011). Therefore, NP developers can incorporate features that allow for continuous discovery and unexpected features or interactions, which can also facilitate a sense of EVOLVABILITY

in the interaction as well. An example of this thinking is the clock installation by Maarten Baas in Schiphol airport below in figure 5.17.



Figure 5.17 Tucker, L (2016) *Hands drawn on by Maarten Baas on clock in real time*

5.5.4 Build Anticipation - Time the discovery as to not give away the whole story at once to maximise anticipation and enhance feelings of love

Researchers identified anticipation as an important first phase of (shared) consumption, which if absent make act of consuming feel incomplete (Hassenzahl et al., 2013). Also, other authors identified it as a factor that evokes mildly pleasant emotions in users and can be used a median for arousal (Nicolas, Aurisicchio & Desmet, 2014). Therefore, this strategy can help developers to contemplate the pace of the interaction in order to create pleasure and excitement which in turn supports the nurturing of ‘an intense connectedness between subject and object’ (Chapman, 2005, p.136). It can also be a marketing tool for building emotion from customers as well, as shown in 5.18 by apple’s countdown release for new products.



Figure 5.18 Oliver, S. (2014) *Apple count down for newly released products*



Figure 5.19 Theme of Conversations with its five strategies

5.6 Conversations - Viewing the interaction as a conversation, creating opportunities for **feedback and response** between people and products. By designing in mechanisms of feedback, such as making the product **respond to the environment**, makes it seem more dynamic over time. Feed-forward interactions such as **communicating intention** let the user know why the product is behaving in a particular way, facilitating a relationship that is more open and evolutionary. Thus, instead of binary on/off, **consider degrees of response** allowing contemplation of the various distinctions that can exist to enhance product experience. Fuzzy Interactions such as **labour 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.

A theme that emerged from the literature and practice, CONVERSATIONS is principally concerned with assisting developers characterise the nature of interaction between the product and the user. Similar to the theme IMAGINATION, these ideas are more rooted in experience

design and would have a more directly influence the emotional lifetime of the product. However, it has versatility and a subtlety that enables it to engage with the other themes as well. For example, by viewing the interaction as a ‘conversation’ rather than a set of communications between the user and product, it frames the interaction as something mutually beneficial, nuanced and evolutionary which can help cultivate a RELATIONSHIP. It can be used as mechanism to help produce CONSCIOUSNESS, by developing an open, reflexive channel of dialogue this can engender and project notions of personality and IDENTITY onto the object. Therefore, concepts relating to these points were consolidated from the literature and are presented as strategies below to answer, *how can we create Conversations between products and users?*

5.6.1 Create Inherent Feedback and Response - *Stimulate a response from the user, through communication mechanisms this will invoke an affirmation of identity of the object bridging the emotional and cognitive gap*

Incorporating inherent feedback and feed-forward interactions are a central point of Emotional Durability which can be used to:

‘destabilize this one-way process by encouraging users to re-evaluate the relationship, and subconsciously update their feelings toward a given object. The relationship between subject and object becomes evolutionary, as the subtle exchange of feed-forward and inherent feedback creates the illusion of mutual growth’ (Chapman, 2005, p.78-79)

Jordon (2000) supports this notion as well as a central feature of a useable interface. Therefore, this strategy could be useful for reframing how the product user interaction can develop, as well being a central driver for constructing Emotional Durability in the product interaction.

5.6.2 Consider Degrees of Response - *Instead of binary states of on/off show the distinctions to enhance material engagement*

Originally presented as a factor of ‘inherent feedback and feed-forward’ interactions , the notion that there can be exchanges that can exist in the ‘shades of grey between black and white world of on and off’ (Chapman, 2005, p. 82) presents an opportunity for nuanced expressive interactions. This is a type of interaction was determined to be important and significant for encouraging CONVERSATIONS. Therefore, it was separated and elevated to be a strategy of its own, which can prompt NP developers to consider less prescriptive, binary approaches to

product user interfaces. As shown in the lamp shade in figure 5.20 below, it has many levels of open, closed, on and off, each presenting a subtly different variation of lighting experience.



Figure 5.20 Treehugger.com (2012) *Flower inspired 3D printed Lamp Blooms open and closed*

5.6.3 Labour Leads to Love - Interactions that require a degree of time and effort to learn increases the likelihood of rewarding experience

Chapman (2005) originally presented this strategy as ‘Fuzzy Interactions’ whereby the product interaction becomes an acquired skill, which must be mastered slowly over time, like learning a musical instrument. Similar to this, other researchers proposed the concept ‘labor leads to love’ and found that users felt more positively towards objects they built themselves (Norton, Mochon & Ariely, 2012). Therefore, considering these two points together there is an opportunity for NP developers to craft interactions that encourage the user to invest more time and effort into the product interaction resulting in a stronger emotional bond. As for example like with a guitar as shown in figure 5.21 below. This product, while requiring investment, also allows the user to be an active participant which can help to create a RELATIONSHIP between the product and user. Moreover, other examples such as building car kits or knitting could also apply.



Figure 5.21 Pexels (2016) *Guitar - Musical Instrument*

5.6.4 Make it Respond to its Environment - *The environments of most objects are subject to change; allowing it to react to changes automatically makes it more dynamic over time*

Inspired by Mullaney (2010), researcher Van Krieken (2011) defined this strategy. Aside from being a mechanism for creating more dynamic engagements, it can also create a sense of EVOLVABILITY as well, allowing the product to appear more autonomous. Therefore, NP developers can use this strategy not only as a prompt for being mindful of the environment of the product, but also potentially as a vehicle for capturing a NARRATIVE, as shown in Padro's (2014) prototype shown in the figure 5.22 below.



Figure 5.22 Padro (2014, p.38) An emotionally durable light - This lighting prototype records activity within its environment and in response scratches a line within a glass panel that represents the activity, producing a one off, constantly evolving lighting effect, while also documenting the NARRATIVE of use.

5.6.5 Communicate Intention - *Users are more likely disable automated systems when they feel they don't know why things are happening*

Products that provide insufficient feedback regarding their actions can cause great frustration to users and are the result of poorly devised behavioural design (Norman, 2004). This point is supported by research conducted within Philips Lighting, where it was found that automatic systems for environmental control were disabled less often when the user understood why they were behaving in a particular way (Philips Lighting expert, 19). This could also be a mechanism for allowing the user to understand the motivations of products' systems and functions, bridging the emotional cognitive divide. Therefore, for NP developers this strategy can be vital for ensuring that the functions of a system are able to operate at maximum efficiency without having unhelpful user interference.

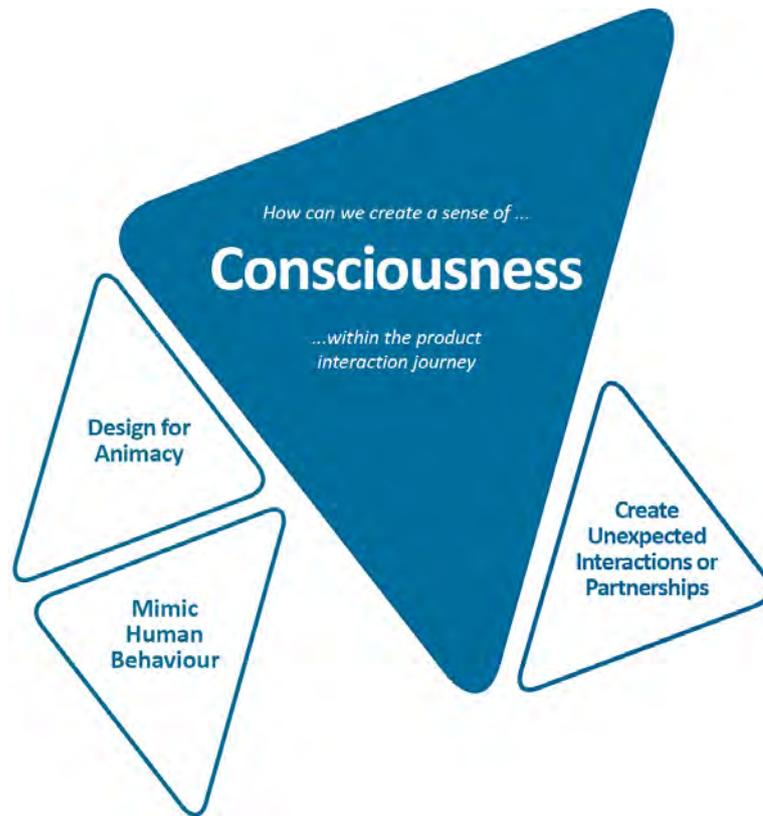


Figure 5.23 Theme of Consciousness with its three strategies

5.7 Consciousness - Design in mechanisms that allow products to 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 artefacts are imbued with a soul. This can be achieved by **designing for animacy** by creating mechanisms which give the perception of character traits and expression, such as **mimicking human behaviour**. This makes the interaction seem more intuitive, while **creating unexpected interactions** generating richer moments of engagement with the product.

One of the 6 points of Chapman’s (2008) framework, CONSCIOUSNESS is a concept that has been more broadly explored within Emotional Durability research. Investigated through design practice, researchers Van Krieken (2011 & 2012), Tokaya (2013) and Leube, Ackermann and Keimelmayr (2016) demonstrated how the theme lends itself to digital electronic systems. These researchers each produced concepts that explored the scope of the expressive, interactive user-object exchanges that these systems afford. However, this thesis argues there are also

additional perspectives to this theme that can be considered. Firstly, it can be linked to IDENTITY, by designing interactions that make the product appear to have traits and expression, while giving the perception of character and a life beyond you. This adds to the construction of a Product Identity or ‘Product Personality’. Secondly, that it could also be associated with the Japanese philosophical thinking called ‘Kami’, whereby artefacts and objects are said to be in possession of a soul. A central premise within Shinto and Shinto Animism, Kami is translated to mean to ‘god’ or ‘spirit’ and is referred as the ‘essence of many phenomena that the Japanese believed were endowed with an aura of divinity’ (Picken, 1994, p. xxii). Many things can have ‘Kami’: houses, trees, rocks, rivers, animals, mountains and elements (Picken, 1994). Aside from the philosophical mindset this engenders, the value it might offer to product lifetime research, is the potential to cultivate a stronger sense of reverence for natural and manmade things in users. Potentially encouraging respect and mindfulness, which assist consumers to develop more responsible consumptive practices. Thus, *how can we create a sense of Consciousness within the product interaction journey?*

5.7.1 Design for Animacy - *Allow the object to be expressive and show a sense of character, this will lead to a sense of consciousness*

Recommended by Van Krieken (2011 & 2012) as a central quality of Emotional Durability, ‘Animacy’ can be defined as ‘the degree to which the product has a soul’, and the stronger this feeling is, the more likely the user will cherish the product (Van Krieken, 2011). It is also described by Chapman (2005) an approach that is about giving an object a ‘mind of its own’ (p.82). Integrating characteristics of Animism will give a product a sense of ‘Aliveness’ (Leube, Ackermann & Keimelmayr, 2016; Tokaya, 2013), a tactic that is already present in mainstream products as with Roomba and see figure 5.24 below. Therefore, NP developers should consider this strategy as a method for building a more engaging, interactive experience, as research has shown that users developed an intimacy with their Roomba over time (Sung et al., 2007).



Figure 5.24 5th Luna (2010) *Roomba new550*.

5.7.2 Mimic Human Behaviour - *Make the interaction similar to how humans or animals behave will make the interaction more intuitive*

Inspired by Chapman (2005) and Mullaney (2010), researcher Van Krieken, (2011) coined this term and strategy and defined it as:

‘Do it like humans would do it. Making the interaction similar to the way in which humans or animals do it does not only make the interaction more intuitive, it is also likely to increase the degree of animacy. Additionally you could try to give the product a mind of its own in order to make the interaction more dynamic over time’ (2011, Appendix C)

However, this thinking should only be applied to functional interaction, because if the design of the form is too lifelike this can reduce the intimacy responses to the product (Sung et al., 2007). Therefore, developers should use this strategy with subtlety and care as shown for examples in this lighting concept developed by Hedda Torgersen in figure 5.25 below.



Figure 5.25 Dezeen.com (2014), Hedda Torgersen's Boo lamp

5.7.3 Create Unexpected Interactions or Partnerships - *Unconventional methods of interaction or partnerships with a user or other object can increase engagement and animacy*

Originally entitled ‘**Change product-person interaction**’ (Tokaya, 2013, p.77) unusual methods of interaction give perception of autonomy and animacy, as shown the products developed by Van Krieken, (2011) and Tokaya, (2013) shown in figure 5.26 and 5.27 below.

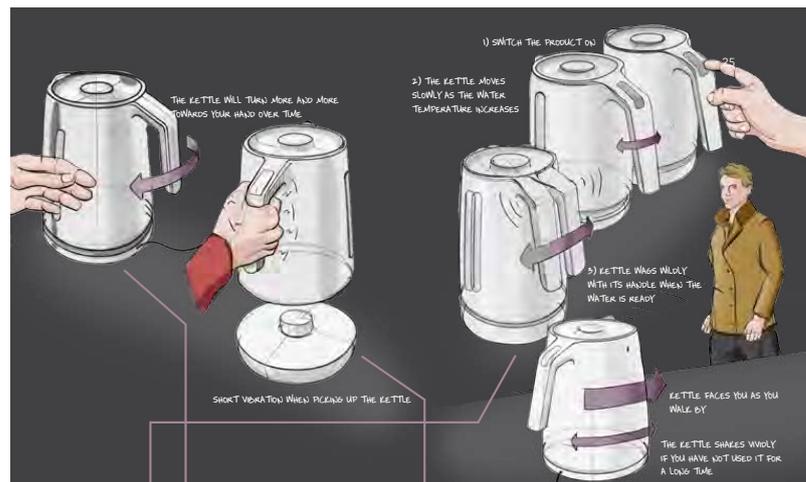


Figure 5.26 Van Krieken (2011, p.25) *Sneaky little kettle*. The kettle interacts with the user by rotating towards or away from the user, wags its handle or shakes wildly in response to how much attention it gets.

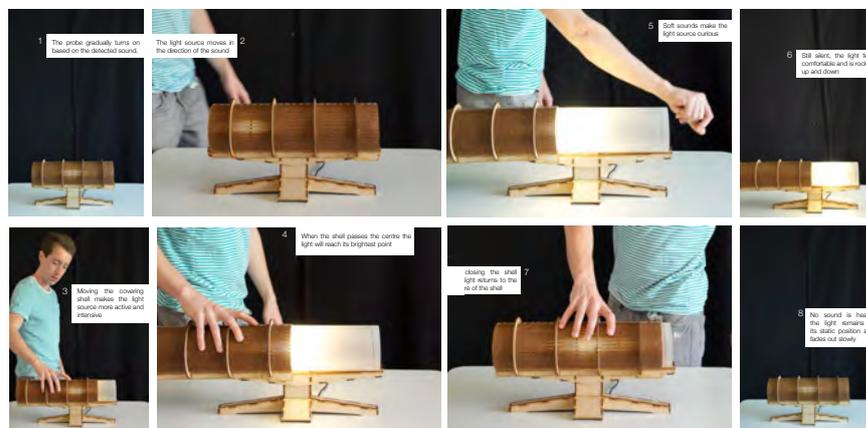


Figure 5.27 Tokaya (2013, p52-53) *Ethos light*. The light activates to the sound of activity, and when the user slides back the outer casing the light retreats back inside, then slowly emerges once it is quiet.

These unusual methods of product user interaction can help to create surprise and enchantment. This encourages the user to actively engage and participate with the product, which increases the likelihood that an emotional bond will be created (Mugge et al., 2009).



Figure 5.28 Theme of Integrity with its five strategies

5.8 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 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. Lastly, ensuring that we **use time and eco appropriate materials** to build products that have a **quality, durability, and reliability** for high performance and long life, to increase the chance for emotional connections to form.

Inspired by ideas highlighted by Lacey (2009) and Bakker et al., (2014a), INTEGRITY is a theme that fundamentally relates to both the physical and emotional lifetime of the object. It asks developers to consider how a product can have both a physical INTEGRITY, which ensures a longer lasting durability, and an emotional quality of INTEGRITY whereby the product emulates virtues such as honesty, sincerity and openness. While elements of both

perspectives are present within some of primary fields of study (Emotional Durability, Slow Design and Circular Design), Emotional Durability and Slow Design research places more emphasis the emotional elements, whereas Circular Design research on the more physical elements. Therefore, through the literature review and practice it was determined that INTEGRITY is the term and theme where these two ideas can converge. By marrying the two main factors, this could create more intrinsically longer lasting products that can resist obsolescence (Den Hollander, Bakker & Hultink, 2017). So, *how can we build Integrity both the physical integrity and emotional quality into the product?*

5.8.1 Be Authentic & Honest - *Ensure the product delivers what it promises. Authenticity is crucial when nurturing attachment; its absence will disintegrate any empathy developed up until that point*

This strategy was inspired by two concepts within Emotional Durability (Chapman, 2005) concerned with influencing the intent of developers. Firstly, suggesting that developers must:

‘Keep it real: always ensure that objects deliver what they promise. Authenticity plays a crucial role in the nurturing of sustainable subject and object attachments; its absence drives a colossal wedge between subject and object, and what empathy may have been developed prior to this realization promptly disintegrates’ (p.82)

Secondly, it is proposed that developers must ‘Avoid cheap tricks: Phantile Drives are, indeed, potent meaning generators, but only when they are deployed in a subtle and artful manner’ (p.161). Therefore, if NP developers are looking to construct longer lasting relationships with their customers, they should reflect on what is authentic and honest about their offering. They should highlight and develop these areas in order to develop trust between the user, the product and the organisation.

5.8.2 Think Open & Transparent - *Some products are hard to access and discover. Allow the user to see in and know the object*

Modern day consumer electronics are currently lacking in transparent design principles, preventing the everyday user from being able to foster curiosity and inventiveness through understanding and discovery of the world and the products around them (Mann, 2016). However, if developers were to depart from the impenetrable sealed casings that forbid repair and allow products to be ‘transparent’, this would be sustainable in both a technical and psychological sense. This approach permits users to continue and maintain their involvement

and relationship with the product (Verbeek & Kockelkoren, 1997). Therefore, NP developers should consider ways in which products can be more open to users, not only will it assist repair and maintenance, adaptability and upgradability but also because that it can be a mechanism for developing knowledge and intimacy. As, how are consumers expected to connect or feel responsible towards a product they are never allowed to see inside or understand? Fairphone celebrates this factor, by being transparent with the sourcing of their materials but also in the way they designed their phones as shown in figure 5.29, inviting the user to look inside, ‘yours to open, yours to keep’.



Figure 5.29 Fairphone (2017) *Fairphone 2*

5.8.3 Use Time & Eco Appropriate Materials - Consider the various time and ecological dimensions of the materials that exist within the product lifetime (i.e. technosphere & biosphere)

One of the central principles of a circular economy is understanding the difference between technical and biological nutrients of materials and how they flow within the wider system as a whole (McDonough & Braungart, 2002; Ellen MacArthur Foundation 2013). As ‘the economic and environmental value of materials are preserved for as long as possible by keeping them in the economic system’ (Den Hollander, Bakker & Hultink 2017, p.517). This can be achieved through mindful management and separation of these two systems. However, there is also an important time dimension that should be understood as well, as all materials have different rates at which they age and degrade with most materials lasting much longer than the lifespan of the product. Therefore, NP developers need to be mindful of these disparities and make suitable, appropriate material choices within their design to ensure the MATERIALITY of product can develop over time with a sense of harmony and physical INTEGRITY.

5.8.4 Promote Reflection of Use - Provide time for the user to think about their actions, visualize processes to encourage contemplation and ‘reflective consumption’

Inspired from the Slow Design principle ‘Reflect’, this strategy is about the embodiment that: ‘artefacts and environments induce contemplation and ‘reflective consumption’. Provide time for the user to think about their actions, visualize processes and create narrative products.’ (Grosse-Hering et al., 2013, p19; Strauss & Fuad-Luke, 2008). This strategy advocates that consumers should practice mindful consumption not only with the existing products they own, but with future purchases they may make as well. Therefore, NP developers should consider the design interventions that not only could interrupt negative consumptive habits like with the Goedzak in figure 5.30 below, but also reinforce positive ones like water bottle in figure 5.31. These moments force the user to think more carefully about their actions, in turn facilitating the opportunity for more informed, considered choices which will positively affect both the emotional and physical lifetime of the object.



Figure 5.30 (left) Waarmakers (n.d) Goedzak project

Figure 5.31 (right) Artefactgroup (2011) 999 bottles

5.8.5 Ensure Quality, Durability, & Reliability - Main driver to detachment and dissatisfaction is failure in utility. Ensure product is high performance or able to maintain itself

Within the literature, product durability is defined as objects that have both, optimum reliability and robustness that ensure a physical longevity (Van Nes & Cramer, 2005; Bakker et al., 2014a). They also possess the sense of ‘Quality’, as consumers deduced that ‘high quality products tended to function better and last longer’ (Page, 2014, p.276). Similarly, within the object stories, ‘Quality’ was shown to be a recurring trait amongst cherished objects, demonstrating its pertinence to Emotional Durability. However, Marchand, (2004) argues for a product to have quality it must also have utility, implying that quality objects must be both functional and useful. However, there is an emotional dimension that can be understood from these terms, whereby the user can feel confidence and stability in the product, as they know it will deliver the same material experience with each use. Therefore, to engender this response from users, NP developers must design products that are of a high quality, reliable and useful, as this can produce both a physical and emotional longevity in the product.

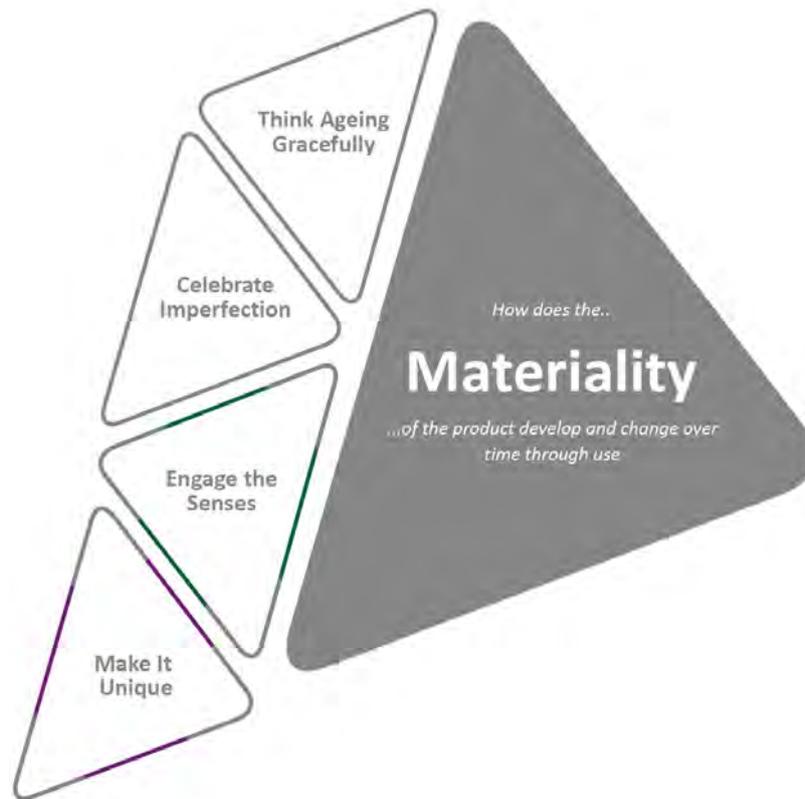


Figure 5.32 Theme of Materiality and its four strategies

5.9 Materiality - Think about the physical way in which users relate to products. Does the object get better or worse with time? Developers need to design objects that can **age with grace**, while also providing a **multisensory experience**, eliciting satisfaction and pleasure derived from the look, feel, and smell of a product. Consideration can also be placed on **celebrating the imperfection** of the object, its materials, and the transience and fallibility of interactions with it, while also deliberating how users are able to embed aspects of their personality into the material of the product to **make it unique**.

MATERIALITY is a theme based on ‘Surface’ from Chapman’s (2008) experiential framework and is described as ‘the object is physically ageing well, and developing a tangible character through time, use and sometimes misuse’ (p.112). Even though the surface of a product is often the point of engagement for the user, it could be argued that there is a deeper understanding that can be considered of how products age over time, as there are broader ideas that relate to the INTEGRITY and durability of the product as whole. Therefore, MATERIALITY was

determined to be a more suitable term and idea in which to explore this aspect of Emotional Durability. As ‘Designers should not only create things that are meaningful, but things in which meaning is firmly anchored in their materiality’ (Verbeek & Kockelkoren 1997, p.105). Thus, *how does the Materiality of the product develop and change over time through use?*

5.9.1 Think Ageing Gracefully - Choose materials and coatings that over time wear or mature in a beautiful or interesting manner.

This strategy has been proposed by many researchers as a mechanism for prolonging user engagement (Van Hinte, 1997; Chapman, 2005 & 2008; Van Kreiken, 2011; Rognoli & Karana, 2014; Bridgens, et al., 2015). However, in reference to circular economy systems, this perspective whereby products and components cycle for longer is especially important. Researchers and developers need to be aware of how their products will deal with time, wear and use throughout their first, and consecutive lives as they are re-used, refurbished and remanufactured. Therefore, like the mug shown in figure 5.33 or the ring in figure 5.34, NP developers use this strategy to prolong the emotional and physical lifetime of the product. When that inevitable first scratch or dent occurs, rather than causing annoyance or disgust to the user it could be perhaps welcomed, adding a new chapter to the NARRATIVE of use while also allowing it to evolve and develop.



Figure 5.33 (left) Chapman (2015) Ageing gracefully teacup designed by Bethan Laura Wood

Figure 5.34 (right) Designboom (2012) Torafu silver plated gold wedding ring

5.9.2 Celebrate Imperfection - Embrace the imperfections and transience of existence - achieve this through asymmetry, roughness, irregularity, simplicity, economy and austerity

Inspired from the Japanese art and philosophy of Wabi Sabi and Kintsugi, this strategy is about challenging designers and consumers to ‘unlearn’ their ideals of attractiveness (Juniper, 2003) and embrace ‘the beauty of things imperfect, impermanent and incomplete’ (Koren, 2008, p.2).

As ‘Perfection is vulnerable’ (Chapman, 2005, p.47). Therefore developers can consider alternative practices that can manage and perhaps even commemorate the fallibility of our interaction with the product. This can be achieved in a number of ways, either through visible repair (Kintsugi) as shown in figure 5.35 below, or by highlighting or reframing the imperfection as shown in the wooden table in figure 5.36 below.



Figure 5.35 (left) Humade (2010-2019) *New kintsugi repair kit*
Figure 5.36 (right) Freshideen.com (2014) *60 Naturholzmöbel*

5.9.3 Engage the Senses - Provide the opportunity for multi-sensory experiences as it increases likelihood of active engagement

Many researchers have recommended that designers should create products that ‘engage our senses’ or use Sensory Design, (Chapman, 2005; Van Krieken, 2012; Ludden, 2008; Maclachlan, 2011). This creates a more immersive prolonged and pleasurable user experience (Chapman, 2005; Van Krieken, 2012), which is one of the most influential factors when designing for product attachment (Maclachlan, 2011). Therefore, NP developers can consider the various elements of the sensorial experience of the product interaction, how it looks, feels, smells to the user as this will produce a more emotional rich engaging experience.

Make It Unique - Produce an output that cannot be reproduced or transferred will ensure irreplaceability

Researchers concluded that ‘Uniqueness’ is a quality that designers must strive to accomplish when designing for emotional connection and attachment (Rognoli & Karana, 2014; Padro, 2014; Lacey, 2009). This can be achieved by various means. Firstly, through material experiences that are based on imperfection and ageing gracefully (Rognoli & Karana, 2014) like a worn leather bag, or as an outcome of handmade products and crafts (Lacey, 2009) like

bespoke jewellery as seen on Etsy. However, NP developers can go one step further and create products that can be both unique and personal to the user, absorbing aspects of the users IDENTITY and NARRATIVE of use. For example, the design in figure 5.37 (left), empowers the user to take a ‘mass manufactured’ product and make it something utterly unique, turning the user into a co-creator. Similarly, the light design in figure 5.38 (right) records activity using sensors within a space and slowly scratches it into the surface of the laminated glass panel, which will over time produce a light affect that is entirely personal and unique to the user allowing the product to evolve in response to its environment (Padro, 2014).



Figure 5.37 (left) Droog (2019) *Do hit chair* designed by Marijn van der Poll for Droog
Figure 5.38 (right) Padro (2014) Prototyped outcome of the EDD and Lighting masters project

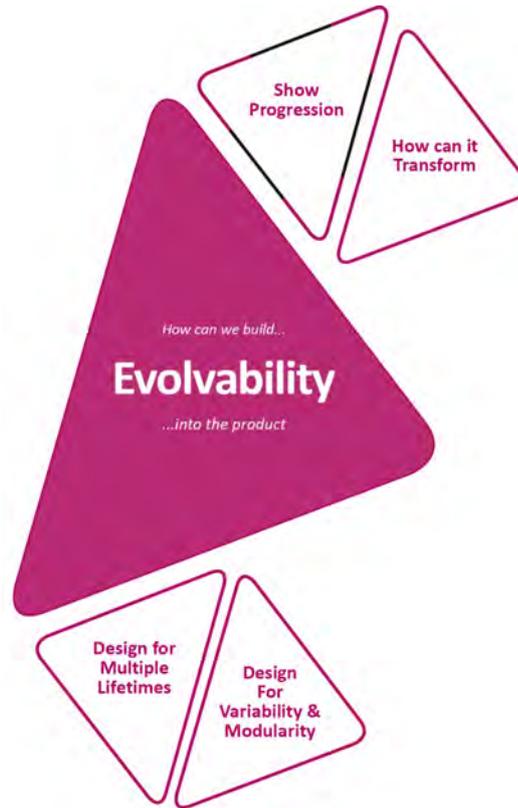


Figure 5.39 Theme of Evolvability and its 4 strategies

5.10 Evolvability - Breaking our perception that interactions 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 designed 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

EVOLVABILITY is a theme directly inspired by 'Evolve' one of the key principles of Slow Design (Grosse-Hering et al., 2013; Strauss & Fuad-Luke, 2008). It is a concept that supports the maturation of systems, arguing that there is the beauty, depth and environmental gain that can be found through the acceptance and embracing of time within the product interaction journey. A central concept within Emotional Durability, Chapman (2008) argues as well that:

‘Consumer desires continually evolve and adapt whilst the DEPs¹ deployed to both mediate and satisfy those desires remain relatively frozen in time; it is this incapacity for evolution and growth that renders most DEPs incapable of both establishing and sustaining relationships with users.’ (p. 4-5)

By ‘Keeping it moving’ and creating fictions that can evolve and grow, this will maintain engagement, allowing the user to build up layers of narrative within the product (Chapman 2005) and provide the opportunity to create unique and personalised products (Padro, 2014). From a circular design perspective, strategies such as upgradability and adaptability also promote similar notions of evolution within the product lifetime. Therefore, through the practice it was determined that these concepts should be more prominent within the research, as this term provides a simple and accessible entry point for engaging with a fundamental philosophy of both emotion centred design and circular thinking. Thus, *how do we build Evolvability in the product interaction journey?*

5.10.1 Design for Variability and Modularity - Design the product to vary in use without the need for extra parts

Many researchers have proposed variations of this strategy as method for mitigating premature product replacement; namely, **Variability** (Van Nes & Cramer, 2005; Mugge, Schoormans & Schifferstein, 2005), **Upgradability and Adaptability** (Bakker et al., 2014; Van Nes & Cramer, 2005) and a **Modular Product Structure** (Mugge, Schoormans & Schifferstein, 2005). However, there is an emotional value dimension to this activity as well, as upgradability while being a mechanism for product longevity can also be a vehicle for self-expression and personalisation (Maclachlan, 2011). Therefore, developers could consider how products can evolve and adapt, as figure 5.40 illustrates, there are user scenarios which have predictable evolving needs, which developers could embrace as part of design intent.



Figure 5.40 Mumsnet (2018) Stokke tripp trapp high chair.

¹ DEP is defined by Chapman (2008, p.i) as a ‘Domestic Electronic Product’

5.10.2 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*

This strategy was inspired from the object stories and the literature. Within the framework of Symbolic Meaning it is proposed that products that facilitate 'Personal growth' and 'Purpose in life' bring about psychological well-being (Casais, Mugge & Desmet, 2016). The design directions that support the formation of these factors are: *'keeping track of progress - by providing visual feedback on progress towards personally significant goals'* and *'Support acceptance and growth from past experiences' - by providing a tangible representation of the passage of time'* (Casais, Mugge & Desmet, 2016, p.3). From an Emotional Durability perspective, these could be viewed as mechanisms for documenting the NARRATIVE of use. Within Product Attachment, Maclachlan (2011) proposed that product and user must be able to develop together. However, this thesis suggests these can be simplified to 'Show Progression' which will allow users to embed their own stories and journey into the DNA of product while engaging both of the factors, something that is seen in practices where travellers used to collect stickers on their suitcases (figure 5.41)



Figure 5.41 Friedmann, L (2012) stock Two Leather Suitcases with Stickers.

5.10.3 Design for Multiple Lifetimes - *How can we design a product that can have multiple lifetimes and stories? Perhaps with many users*

Within product lifetimes research related to leasing, researchers advocate that products should have multiple users and lifecycles and contemplate how to facilitate the acceptance of this process after the first lifetime (Baxter et al., 2017; Mugge, Person and Hultink, 2017). However, if developers started with this as a factor of design intent and took the position that they are

designing for multiple generations of user, this could affect which materials, coatings and fixings of the product are considered. Therefore, much like the example shown in Patek Philippe watches below, if developers adopt this perspective and considered the wider NARRATIVE that could exist across the multiple lifetimes, this could help to facilitate both a physical and emotional lifetime extension.



Figure 5.42 (left) Ehrlic, J (2011) 1949 Patek Philippe Ad

Figure 5.43 (right) Naas, R (2016) Patek Philippe Celebrates 20 Years of Its Iconic Advertising Campaign

5.10.4 How Can It Transform - How can the product or service transform beyond its initial function or materials or process?

Due to technological developments or market changes some product lines become entirely obsolete but are still fully functioning beautiful examples of human ingenuity and engineering. While some become feedstock for upcycling practices, others that might be damaged or broken and are often disposed. However, there is another perspective that could be considered which is transformation. Adopting ideas of re-use, it prompts the developer to consider how the products' components and materials might be reborn and transformed into something new. Similar to practices of 'transformative repair' which frees users from the burden and responsibility of having and or loving a broken item (Keulemans et al., 2017). This project demonstrates how this concept, if put into general practice could alter the way damaged objects are regarded and assist in the reduction of product waste in landfill. Therefore, this strategy can prompt NP developers to consider end of life scenarios when designing their product, so they can transform when they are no longer useful.

5.11 Conclusions

This chapter presented the *Emotional Durability Design Nine Framework* in full, which can be found in figure 5.44. It offered the theoretical foundation and rationale for how the themes and strategies were developed. While this tool was created in response to the literature and object stories, a key insight from the knowledge exchange sessions, were that the concepts would benefit from more comprehensive product examples of these ideas in action. Moreover, the tool had yet to be thoroughly examined within a NPD scenario beyond the initial workshops. Therefore, the framework was tested in a further round of workshops and a practice-based process that focused solely on developing emotionally durable lighting propositions. This activity was undertaken so the research could comprehend the opportunities and limitations for the practical use of the framework and gain more meaningful insight into how these emotional and physical longevity concepts translate into design products propositions. Chapter 6 presents this in more detail



Figure 5.44 The Emotional Durability Design framework in full

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

Chapter 6 – Testing the framework

This chapter presents the outcomes of testing the framework in a NPD setting. This was achieved by conducting product design workshops and through the primary researcher undertaking design practice.

6.1 Introduction

Although the content and structure of framework had been developed and refined in Chapter 4 it had not been finalised by this point, hence could not be thoroughly tested to uncover how it operates in practice. Moreover, feedback from Philips Lighting participants revealed there was an uncertainty as to how the concepts related to lighting and what design outcomes they would yield. Therefore, in response to this and to address the second part of the research question guiding this research, which aims to develop *an effective method for new product developers*, the framework was tested in three activities using Hue lighting system as the subject for exploration. Below presents the three rounds of testing and the order of how they are presented in the chapter:

6.2 – Theme-led product design workshop with 45 BSc Product Design students at the University of Brighton

6.3 - Strategy-led product design workshop with 44 BSc Product Design students at the University of Brighton

6.4 – Design practice undertaken by the primary researcher exploring Digital Design of the Hue lighting App

These tests were employed to explore, how the framework practically operates as a method and tool and how the concepts within the framework manifest within product propositions, to better evidence their value to Philips Lighting. These activities took place over 12 months and exposed the strengths, weaknesses, limitations, and opportunities of the framework for exploring Emotional Durability within NPD situations.

Defining effectiveness in relation to the testing

The research question states that the project is seeking to develop an ‘effective method’. For this research ‘effective’ was defined as:

- Effective in its ability to allow the developers to engage with the concepts of Emotional Durability (disseminating the knowledge/concepts of Emotional Durability)

- Effective in facilitating the creation of emotionally engaging product propositions (aiding their practice)

Overall, the central aim of the workshops and design practice was to explore:

- How Emotional Durability could manifest within lighting
- Identify issues for applying the framework
- Understand better a process for using the framework

The protocol for how these activities took place will be described in the next section and in each respective section of the chapter.

Protocol for the Product Design workshops

Participants

Within the workshops two different groups of third year Product Design undergraduates at the University of Brighton were used as participants. Product Design students were selected for this activity over Sustainable Design students as they were more likely to be neutral towards and unacquainted with sustainability thinking, while also having a more product focused rather than systems focused approach to design. Additionally, Emotionally Durable Design was not part of their formal training, and so it was unlikely that they would be acquainted with the concepts.

Procedure and rationale for theme-led vs strategy-led

The two design workshops were approached using different protocols: the first was theme-led, whereby each team of students had one or two of the nine themes; the second was strategy-led, whereby a group of strategies were selected across different themes and given to students to use for inspiration. To introduce a control factor to the investigation, the procedure, product category and user groups were the same, so the two batches of concepts could be assessed in relation to one another. These two experiments were chosen because they allowed the researcher to understand the effect on the design process and the outcome, if the developers were:

- engaging with only one theme versus engaging with more than one theme
- engaging with one theme and their strategies versus engaging with multiple different strategies across the framework

This line of enquiry was investigated because through the knowledge exchange sessions, it was revealed that the size of framework was intimidating to participants when viewed as a whole. Thus, any insight on how to manage the scope and complexity of it would be useful to NP developers and the research.

The other significant difference between the two workshops was that the theme-led workshop included an additional prototyping activity that took place after the workshops. This workshop was framed as a challenge for the students, and the prize for winning was the opportunity to further develop their concept and prototype and exhibit the final ideas. This gave the students an opportunity to work on a live project within an industry partner, and the research additional insight for how Emotion Durability thinking evolves in the NPD process.

Control factors for testing

Procedure: *Cherished object exercise, presentations, length and set up of design session.* The setting, process and exercises that were employed were the same for both sets of workshops. Students were split into groups of 4 or 5 and were given an equal amount of time to complete the exercises.

Product Category: *Philips Hue Lighting system.* The teams were instructed to base their design in reference to, but not limited to, the capabilities that the Hue lighting system offers. They were asked to consider: the light product (hardware, luminaire), the light effect (effects the light can produce) and light ecosystem (App, WIFI connected system).

Persona User Groups: *couple moving in together, home renovator and student.* Based on knowledge from Philips Lighting experts, these personas were selected as they represent a typical customer or user group who consider purchasing new lighting systems.

Lastly, at the time of the research it was determined that a control group of designers would not be needed, i.e. a group given the same brief, but would design without the tool.

This was because understanding how the tool operates in practice, what designed concepts it would yield and whether these concepts were relevant to industry practice was more pertinent to addressing central the research questions, rather than proving 'if' or 'how' the tool changed a designer's practice. However, in hindsight if the research were to be conduct again, adding a control group to the testing process would provide additional dimension of rigour to the research.

Facilitated feedback and data collection

During the workshops, the primary researcher observed and questioned the participants as they used the framework. The participants were asked these questions below:

- Did the framework influence the way you thought about designing the object? If so How?
- Was it helpful or a hindrance to the design process?
- How was your experience engaging with the materials?

The observations and responses were captured using handwritten notes and photographs. One limitation identified, is that a workshop of this size can be difficult to manage in terms of keeping time, answering queries and observing the participants. To minimise this, the researcher was assisted by academic and industry supervisors and other PhD researchers in carrying out the workshops, and any insights observed by these colleagues were fed back to primary researcher. To capture the designs at the close of the session, the participants presented their final ideas through drawings and presentations to ensure that each solution could be clearly understood. These were also documented using photography and handwritten notes.

How the product propositions were analysed

The designs were analysed in reference to the framework to examine how the emotional longevity factors manifested within the product proposition. It is impossible to determine whether these outcomes are, or could achieve ‘emotional durability’, as studies would need to be conducted over several years to answer this question. However, through the literature review and object stories, the notion of ‘engagement’ was uncovered as a possible key factor for assisting the development of emotional connection, and thus emotional durability.

Consequently, this process of analysis will also be deliberating what type of product-user engagements these ideas facilitate, to discover if this a common factor within designs and contemplate whether this outcome was as a result of using the framework. Lastly, aside from the emotional longevity factors integrated into the framework, there are several physical longevity elements also present. Therefore, it was decided to analyse the concepts in reference to their physical longevity potential as well, to uncover how these also materialise within the design.

Industry supervisors as judges of the challenge

During the theme-led workshop, the Philips lighting supervisors were asked to provide feedback on the designed outcomes and act as judges of the challenge. This was employed so that the research could assess whether the outcomes produced by the framework were industrially relevant from their expert opinion as practitioners within industry. This helped the research to gain additional insight as to how these ideas might be integrated in practice and help us to understand whether these outputs would be of value to industry.

6.2 Test 1 – Theme-led workshop

Workshop 8

A full day workshop with 45 BSc Product Design students at the University of Brighton was conducted with the academic and industry supervisors. The central aim of this workshop was to investigate the effectiveness (as described above) of adopting a theme-led approach to using the framework.

Procedure for workshop 8

The workshop began with the cherished object session and was followed by presentations introducing Emotional Durability, the framework and current capabilities of lighting technology. After the presentations the participants were split into nine teams of four or five and given 2.5 hours to design a light proposal. Each team was given a design pack of materials shown in figure 6.1 which included:

- One copy of the framework - 9 themes and 38 strategies
- Persona Worksheet
- EDD strategies map with design checklist
- One persona: either couple moving in together, renovators, students
- Instructions and guidelines worksheet



Figure 6.1 Pack of materials

The teams were asked to use one primary theme and a possible second if they wished. At the close of the day, each team presented their ideas to the Philips Lighting and academic supervisors who acted as judges of the challenge. To capture these insights, pictures and notes were taken and collated for further analysis and reviewed by the whole project team.



Figure 6.2 Participants engaging with the framework

Results of workshop 8 – Designed outcomes

Nine concepts were developed, however not all are needed to illustrate the issues and opportunities of using the framework. Therefore, six concepts will be presented in figure 6.3-6.9.¹ The concepts will be analysed individually after each figure and discussed as a whole at the end of this section, and reflections presented on how they relate to the research objectives identified at the beginning of this chapter, namely;

- How Emotional Durability manifests in lighting
- Identify issues for applying the framework
- Understand better a process for using the framework

¹ The figures shown in 6.3-6.9 have been illustrated by Cam Bacchus. These were produced only for the thesis to showcase the concepts, and were drawn from the final sketches and descriptions from the participants. Analysis of the concepts were conducted on the original workshop sketches and materials.

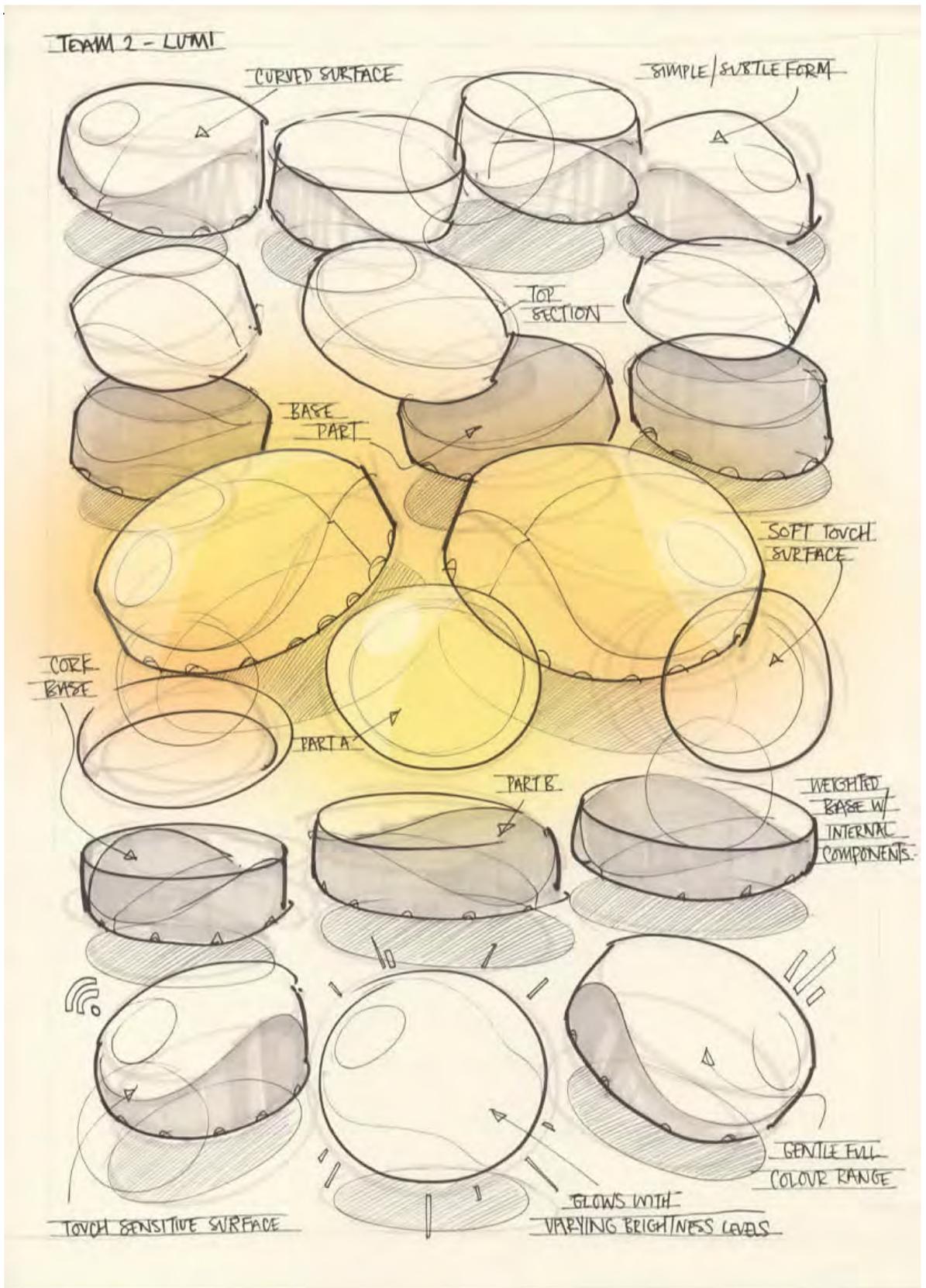


Figure 6.3 NARRATIVES product proposition. Image credit: Cam Bacchus

Team NARRATIVES developed Lumi, a touch responsive light voice messaging system, that records and send messages and expresses tone of speech through different hues and shades of light as the message is played. The organic shape and smooth surface were designed to encourage the user to stroke and touch the lamp, which also acts as the mechanism for hearing and sending voice messages providing a more expressive and immersive way for loved ones to stay connected.

Analysing the concept against the theme, there are several elements of NARRATIVES present. It allows users to be *linked to family and friends*, *capture a moment*, engages in a *nostalgia* (answering machines) and allows for the creation of *multi-layered stories*, all of which could be used to *evoke memories* in the mind of the user. While there are strategies the team did not integrate such as *gifting* or *provenance*, as a whole, they captured the spirit of the theme.

Analysing it in reference to its emotional and physical longevity potential, this could be developed to be modular and constructed out of suitable sustainable materials in addition to cork base that was suggested, however these were not mentioned by the designers. Aside from relating to *family and friends*, (which the object stories showed were a strong factor of cherishability), the tactile nature of the concept, coupled with the animated light effect are examples of how it could produce richer material engagement, whilst also making the user an active participant in the interaction.

One limitation noted by the judges was that this concept could viewed as redundant when considered alongside technologies such as Skype and WhatsApp. Nevertheless, the elements of the theme were clearly present in this concept and it showed reasonable potential for emotional engagement.

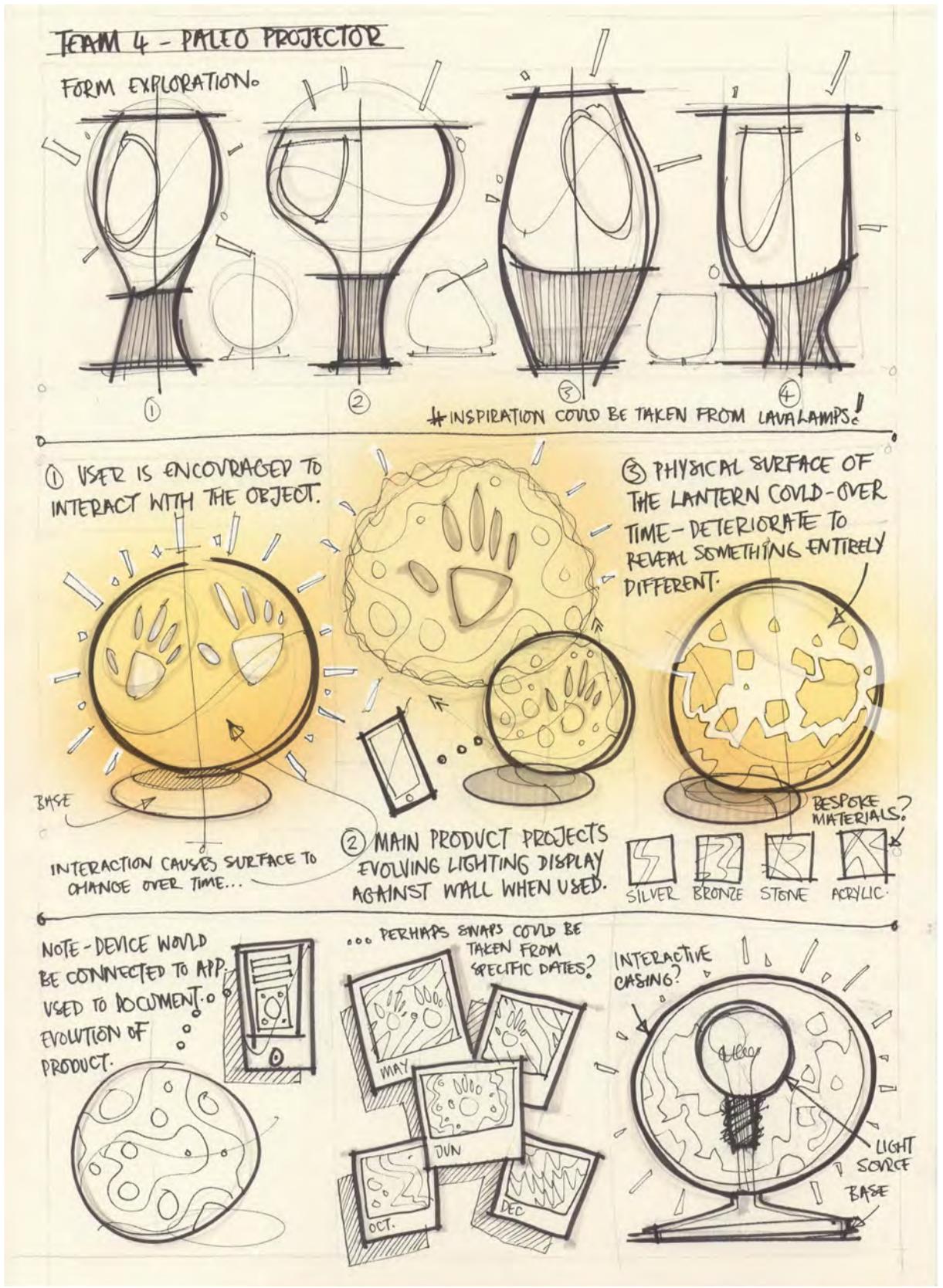


Figure 6.4 CONVERSATIONS product proposition. Image credit: Cam Bacchus

Team CONVERSATIONS developed Paleo, a multisensory, projected and ambient light with a tactile touch surface which wears and ages over time, changing the light affect that is produced. As the users touch the warm surface of the light, the interaction is recorded and captured digitally. The surface coating also subtly wears where it has been touched, documenting and capturing the narrative of use, producing a bespoke and entirely unique lighting product and effect.

This team choose to use MATERIALITY as well as CONVERSATIONS, which is demonstrated in several ways. It *creates inherent feedback and feedforward interactions, responds to environment, provides a multi-sensory experience, and is designed to age with grace over time.* The concept integrates elements of both themes into single functions which shows how the strategies can be combined to produce periodic table like compounds of emotional functions as mentioned in Chapter 5.

Analysing it against its emotional and physical longevity potential, the designers selected materials such as ceramics, brass or bronze for the main light. However, other than considering material choices no other sustainability elements were integrated. In reference to emotional engagement, the concept focused on producing and developing a satisfying, pleasurable, multi-faceted material experience. This was achieved through the subtle aging of both the physical product as well as the light effect that is produced. The judges felt this concept exemplified some of the fundamentals of emotional durability, and elements of the two themes were clearly present in the design.

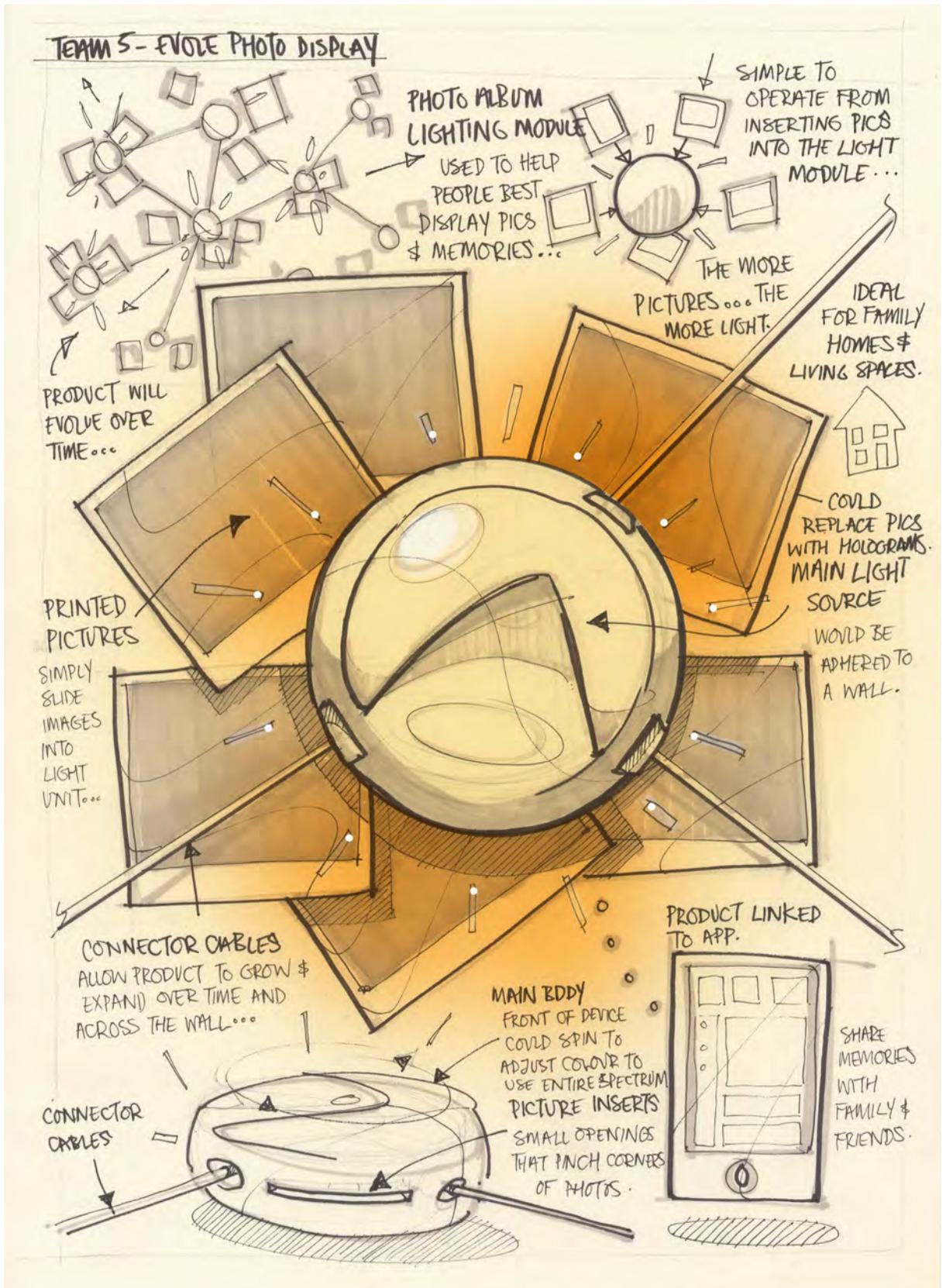


Figure 6.5 EVOLVABILITY product proposition. Image credit: Cam Bacchus.

Team EVOLVABILITY developed Illumi, an adaptable modular lighting system that assists the user to build, display and celebrate their memories by encouraging the exhibiting of pictures around the home, creating a unique collage of light, images and stories.

Although the team did not present NARRATIVES as an influencer, the strategy *show progression* links NARRATIVES to EVOLVABILITY, and this synergy of thinking is present within the design as shown by the evolving story of pictures that the concept facilitates. It also presents ideas of *design for variability and modularity*, which could allow the user to collect the units over time depending on varying needs, or have the ability to use them as connected separate models of light around the home as well.

Analysing their physical and emotional potential, the modularity of the concept presents opportunities relating to product service systems as the units could be rented out as multiples and added to over time. In terms of their emotional potential, the core of the idea is associated to evoking memories of *family and friends*, and also facilitates moments for *active participation through creative activities*, both which form more active material and cognitive engagement with the lighting product.

The Philips judges and primary researcher saw potential in this concept regarding product service systems and thought these could be explored further in reference to emotional and physical longevity potential.

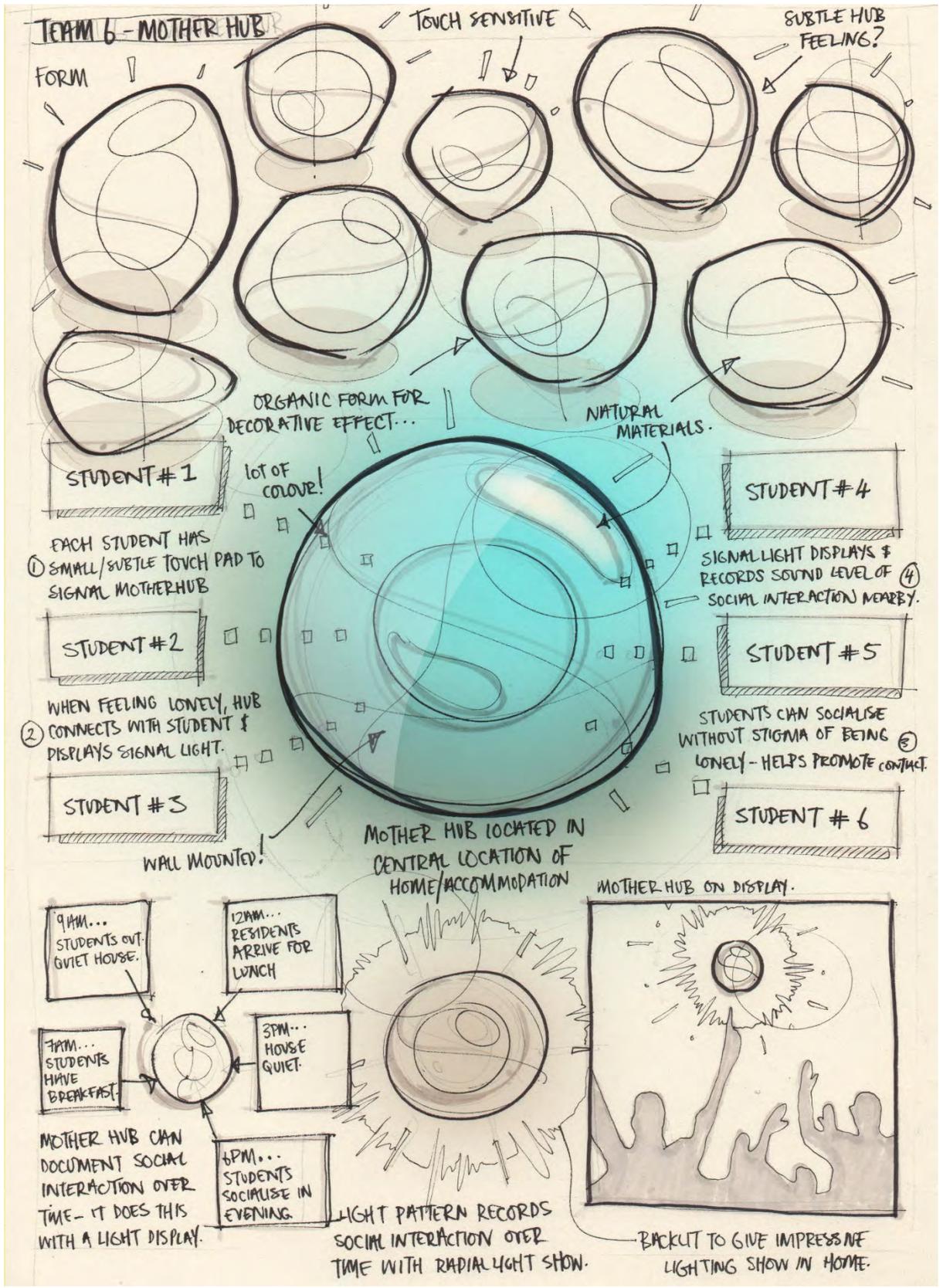


Figure 6.6 INTEGRITY product proposition. Image credit: Cam Bacchus

Team INTEGRITY developed the Mother Hub, a lighting unit system that aims to encourage sociability and interaction between users who live in halls of residence, in order to try and reduce isolation and loneliness at university. Each user has a switch in their room which activates a pulsing light in the middle of the hub located in the central communal areas. This shows which room wants to socialise, whilst also recording this activity as an evolving timeline around the hub.

Analysing the theme against the concept, the team had a different perspective on the main principles of the theme. Their concept did engage with ideas of *mindfulness and reflection* but from a more sociological perspective. Moreover, the central premise and features of the idea could be more closely associated to *group affiliation*, a strategy of RELATIONSHIPS, and *change the interaction* which relates to CONSCIOUSNESS and IMAGINATION.

In terms of its emotional and physical longevity potential, the design interactions were innovative in their manner in which users could interact with a collective light system, and utilised more physical engagement. However, all judges were sceptical as to what extent emotional connection could be achieved with this system. The evolving timeline shows some potential for emotional engagement as it *shows progression*, but the concept as a whole seemed muddled, and was not representative of the theme INTEGRITY.

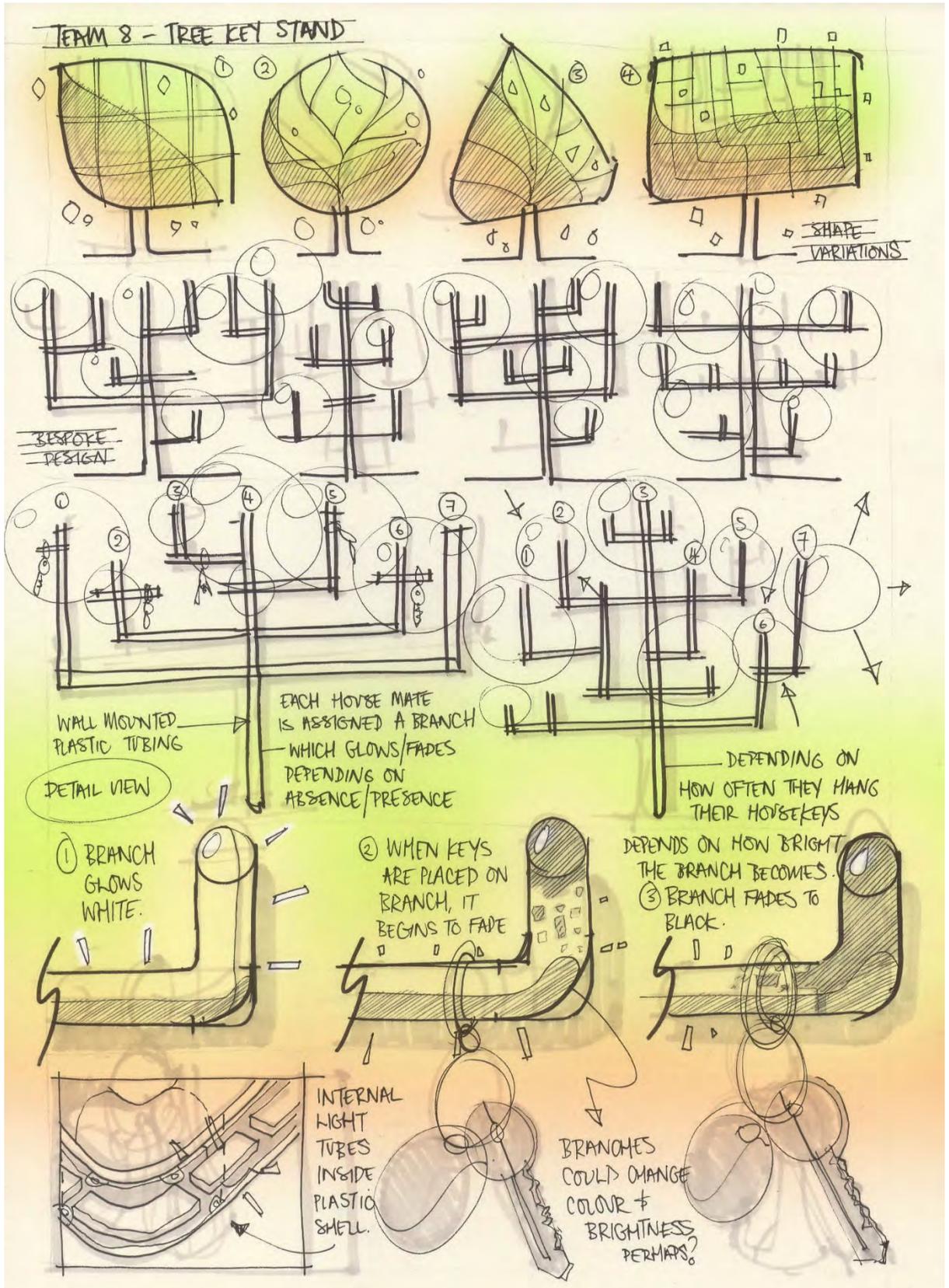


Figure 6.7 CONSCIOUSNESS product proposition. Image credit: Cam Bacchus

Team CONSCIOUSNESS developed Key Tree, which is an illuminated key stand that indicates who is home by lighting up the branches with different colours, creating a multi-coloured bright pattern of light. When the user leaves and take their keys, the light slowly fades away, to show the passing the time.

This team chose to use the theme IDENTITY and CONSCIOUSNESS which can be seen in the design. The two main strategies it engages with are notions of *customisation and personalisation* by producing personalised lighting effects, and *create unexpected interactions or partnerships* as shown through key fob activation and the fading of the light effect. These two functions together could facilitate engagement through active participation, while also resulting in a product that performs additional useful functions beyond just lighting.

In regard to its emotional and physical potential, there was no mention of the physical longevity elements of the design, however it could be easily designed to be modular, and customisable depending on the needs of the user group. In terms of its emotional potential, the unusual method for activating the light and the slow fading away over time, provides a much richer visual and material engagement experience. Furthermore, the personalisation element allows for *self-expression* which has shown to build product attachment.

Designs chosen for prototyping

Three concepts were selected for prototyping by the judging panel. The concepts were assessed and selected based upon if the design displayed emotional durability potential. Each judge considered the designs according to their own experience and knowledge of emotional durability and lighting and offered their picks. The concepts chosen were inspired from the themes: CONVERSATIONS, EVOLVABILITY and CONSCIOUSNESS.

Developing the prototypes

The three concepts underwent a further round of product development which were conducted by the participants over several weeks in their own time. The three teams produced rapid prototype models which were presented with displays boards (see figure 6.9 below) and were exhibited from 27th Feb- March 10th 2017 at the University of Brighton as part of the ‘Imaginative Investigations’ post-graduate show which are shown in the images in figure 6.8.



Figure 6.8 Prototyped concepts in the exhibition

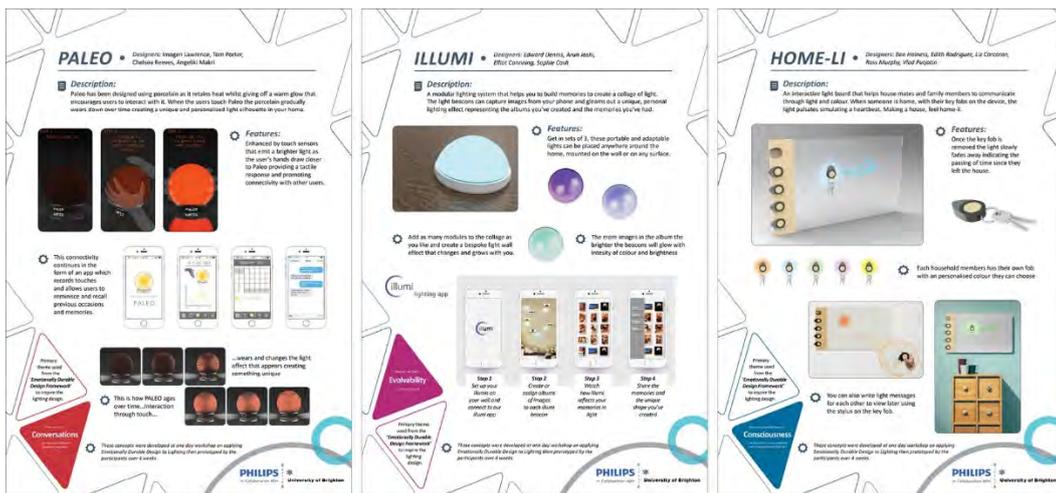


Figure 6.9 Exhibition Display board of the three prototyped concepts – full page examples found in Appendix D.

Analysis and reflection on outcomes as a whole

Using the framework

Observations and questioning of the participants using the framework revealed several points for consideration. Firstly, some participants found their themes harder to design with than others, and the teams designing with RELATIONSHIPS and IDENTITY, found these ideas difficult to apply to lighting. On reflection this could be because the concepts such as ‘*create a ritual or habit*’ or ‘*promote self-discovery*’ within these two themes are more intangible in nature and require the designer to think more abstractly than say ‘*design for adaptability*’. Secondly, it was observed that the teams that used more than one theme struggled less with ideation. Thirdly, although it can be challenging to apply unfamiliar methods in a short time frame, all the teams managed to develop new lighting propositions that included emotionally engaging features, which this thesis argues demonstrates how the framework was able to facilitate this process.

How the framework manifested in design

It could be argued that some designs had more ‘emotionally engaging’ potential than others. It was noted that the teams designing with only one theme created adequate solutions, developing one or two suitable features but the proposition as a whole could be viewed as one-dimensional in what they delivered. However, the teams who designed with at least two themes created more interactively complex, diverse ideas, proposing not only engaging features but also a well-considered over-all proposition. Interestingly, all of the teams incorporated features which can be traced back to themes they were not using for design inspiration, which this thesis argues is a reinforcement of the notion that the framework is Rhizomatic. The themes each team used acted as initial entry points, which then allowed the participants to explore other concepts outside the theme they were actively deliberating. Lastly, all the designs featured interactions that are more physically, visually, and cognitively engaging than a typical lighting product which will be described in more detail in the next section.

Emotionally engaging features

All the designs featured novel approaches for interacting with a lighting product. On a physical material level by encouraging different forms of touch, on a visual level through complex light affect outputs but also on a cognitive level, associating light with tone of speech (Lumi), the passing of time (Key tree) or as something that can deteriorate with beauty (Paleo). These types of engagements, while they may not directly relate to emotional longevity, they encourage

active participation with the product and prompt the user to contemplate their actions and behaviours, which Chapman (2005) argues mitigates the shallow, static forms of interaction that result in the premature discarding and replacement of products.

Reflections from prototyping

Reflecting on the outcomes of the second round of development, whereby three of the concepts were advanced through prototyping, two factors became evident. Firstly, some concepts along the development process from drawing board to prototype, the feature that related to the emotional durable potential fell away. Illumi designed by team EVOLVABILITY, adapted their design and lost the features that related to building stories over time, and the final outcome was very similar to a product that Philips Light already produces. Home-li designed by team CONSCIOUSNESS, changed their design to be a notice board, which didn't lose the heart of what made the idea emotionally engaging, but perhaps was less visually and conceptually sophisticated. Secondly, aside from the emotionally engaging features presented, it could be argued that the concepts are not explicitly sustainability focused or addressing the physical longevity.

Reflecting on the first, as an idea progresses through development it can often change due to issues relating to feasibility of materials, digital modelling or fabrication methods, and is a common challenge within product development (Mengoni & Germani, 2007; Price et al., 2013). This factor prompted the primary researcher to reflect upon how the framework could be engaged across the whole process of NPD to ensure that the emotionally engaging features are retained beyond the drawing board. This insight also builds upon the findings of the knowledge exchange sessions, in regard to value engineering and will be discussed further in the Chapter 7. Regarding the second, analysis of the ideas revealed that strategies relating to the emotional and psychological extension were the most dominant. Although there are eco-focused, sustainable concepts throughout the framework, these are featured sporadically within the designs. Only one or two teams actively integrated the sustainability focused elements, and only from a materials perspective. Whilst it was predicted that the students would be less sustainability focused, this was made evident through their designs. It is unclear whether these were overlooked because of the mind-set of the students, tone of the workshop, or brief presented, but what could be argued is that perhaps the heavy-handed sustainability approach is not what Emotional Durability is concerned with.

Limitations

The teams were only given 2-3 hours to design with themes, and some were more actively engaged in the activity than others.

Conclusions

In conclusion, this round of testing revealed:

- Engaging with more than one theme at a time resulted in more complex design ideas,
- Regardless of which theme was used, the framework assisted the participants in producing a product experience that could be viewed as more emotionally engaging,
- The sustainability factor of the designs was not very prominent.

6.3. Test 2 – Strategy-led workshop

Workshop 9

The second product design workshops involved another group of 3rd year Product Design BSc students from the University of Brighton. This workshop was framed and presented in the similar manner to the first, and was carried out by the primary researcher and another PhD researcher.

Procedure for workshop 9

The 44 students were split into nine teams of four or five and tasked to re-design the Philips Lighting ‘Hue Go’ (Figure 6.10) using selected strategies from the framework. An existing product line was picked for this study to create more focus for the participants, while also investigating how this thinking applies to existing concepts.



Figure 6.10 Astral.com (2012) Hue Go, Wifi controlled portable light.

Each team was given a design pack of materials which included:

- 9 themes
- Selection of strategies
- One persona - Couple moving in together, home renovators, students

- Persona worksheet
- Instructions and guidelines worksheet

Aim of the strategy-led approach and rationale

The rationale for this approach was to gain insight into managing the scope and complexity of framework by exploring if there is merit in taking a strategy-led approach. As observed in the end of Chapter 4, cherished objects often related to at least 2-4 themes. Thus, by selecting strategies from across the whole framework this would allow developers to engage with more than one at a time. Moreover, as shown in Chapter 2 and 5, Emotional Durability as a set of concepts intersects with many other topics, such as Experience, Meaning, Temporality, Maintenance, and Adaptability, which can be linked to more than one theme as well. Therefore, this workshop examined: the effectiveness of this approach over a theme-led approach and whether or not certain groupings of the strategies could significantly influence the designed outcome.

Selecting the strategies

Considering the workshop involved a similar number of participants nine groups of strategies needed to be determined. This was carried in two ways. The first, was to reflect on the strategies as a whole and consider whether there were any significant potential groupings that could be made. The second was to analyse existing products that could be considered to have ‘emotionally durable features’ and trace/match these features to specific strategies. Addressing the first, the primary researcher studied each of the strategies irrespective of their themes and began to consider them through different conceptual lenses, such as sustainability, user experience, and temporality. As a result, seven groupings were defined which will be explained in more detail in table 6.1.

Strategy Grouping	Rationale for selection	Strategies
Extending both the Physical & Emotional lifetime of a product	It was observed that all the strategies fell into two categories: those which ONLY relate to the psychological lifetime and those linked to BOTH the emotional lifetime and physical lifetime.	<i>How Can It Transform, Show Progression, Design for Variability & Modularity, Design for Multiple Lifetimes, Think Ageing Gracefully, Celebrate Imperfection, User Can Tend To, Fix or Maintain the Product, Ensure Participation with Creative Activities, Use Artefacts with Existing Stories, Think Open & Transparent, Use Time & Eco Appropriate Materials, Ensure Quality, Durability, & Reliability, Promote Reflection of Use, Labour Leads to Love</i>

Core strategies of Emotional Durability	An exercise was conducted whereby only the most vital strategies of Emotional Durability could be picked i.e. 10-12. During the selection process it was also noted that a strategy from each theme should be represented.	<i>Create A Little Magic, Create Unexpected Interactions or Partnerships, Think Customisation & Personalisation, Show Progression, Create Inherent Feedback & Response, Ensure Participation with Creative Activities, Create & Show Multi-Layered Stories, Capture A Moment, Think Ageing Gracefully Make It Unique, Ensure Quality, Durability, & Reliability, Be Authentic & Honest</i>
User Experience	As shown in Chapter 5, strategies within Consciousness, Imagination, Conversations and Relationships are more concerned with user experience, therefore these were grouped.	<i>Design for Animacy, Mimic Human Behaviour Create Unexpected Interactions or Partnerships Create Inherent Feedback & Response, Consider Degrees of Response, Labour Leads to Love, Communicate Intention, Respond to the Environment, Create Surprise Effect, Leave Room for Ambiguity, Create A Little Magic, Build Anticipation, Create A Ritual or Habit, Create A feeling Of Control & Mastery</i>
Maintenance and repair	Maintenance and repair is central topic within product longevity, and so the strategies the literature and objects stories showed could relate to this subject were grouped.	<i>Use Artefacts with Existing Stories, Create & Show Multi-Layered Stories, Think Customisation & Personalisation, Think Ageing Gracefully, Celebrate Imperfection, Use Time & Eco Appropriate Materials, Think Open & Transparent, Design for Multiple Lifetimes, Ensure Participation with Creative Activities, User Can Tend To, Fix or Maintain the Product, Create A Ritual or Habit</i>
Adaptability and Upgradability	Similarly, adaptability and upgradability is also a central topic to product longevity, thus strategies associated with this factor were collected.	<i>User Can Tend To, Fix or Maintain the Product, Make It Unique, Think Ageing Gracefully, Think Customisation & Personalisation, Design for Variability & Modularity, Design for Multiple Lifetimes, Show Progression, How Can It Transform, Consider Gift Giving, Create & Show Multi-Layered Stories, Use Artefacts with Existing Stories</i>
Materiality and Time	Time was shown to be key feature of the cherished objects, consequently strategies related to this topic and aspects of material nature of the product were selected.	<i>Make It Unique, Engage the Senses, Celebrate Imperfection, Respond to the Environment, Ensure Quality, Durability, & Reliability, Use Time & Eco Appropriate Materials, Design for Variability & Modularity, Design for Multiple Lifetimes, Capture A Moment</i>
Random	A random selection of strategies were chosen to discover is this also had an effect the designed outcome.	<i>Consider Degrees of Response, Communicate Intention, Respond to the Environment, Promote Reflection of Use, Ensure Quality, Durability, & Reliability, Promote Connection & Community, Give the Product Personality, Ensure Participation with Creative Activities, Create A feeling Of Control & Mastery, Leave Room for Ambiguity, Create A Sense of Nostalgia</i>

Table 6.1 Groupings of strategies defined

For the second, eight concepts that can be classified as being examples of ‘Emotionally Durable thinking’ were evaluated against the framework to see which strategies they might embody. The concepts were analysed are listed shown below in figure 6.11 and 6.12.

- Fiction Toaster – developed from Chapman (2008, p.135)
- 365 clock - Siren Elise Wilhelmsen, (2010)
- Lamp made from photographic slides (author unknown)
- An Emotionally Durable Light – Padro, (2014)
- Narrative Phone – Chapman (2008, p.127)
- Suitcases with stickers (author unknown)
- The Good Night lamp – (Alexandra Deschamps-Sonsino)
- Patchwork Quilt (author unknown)

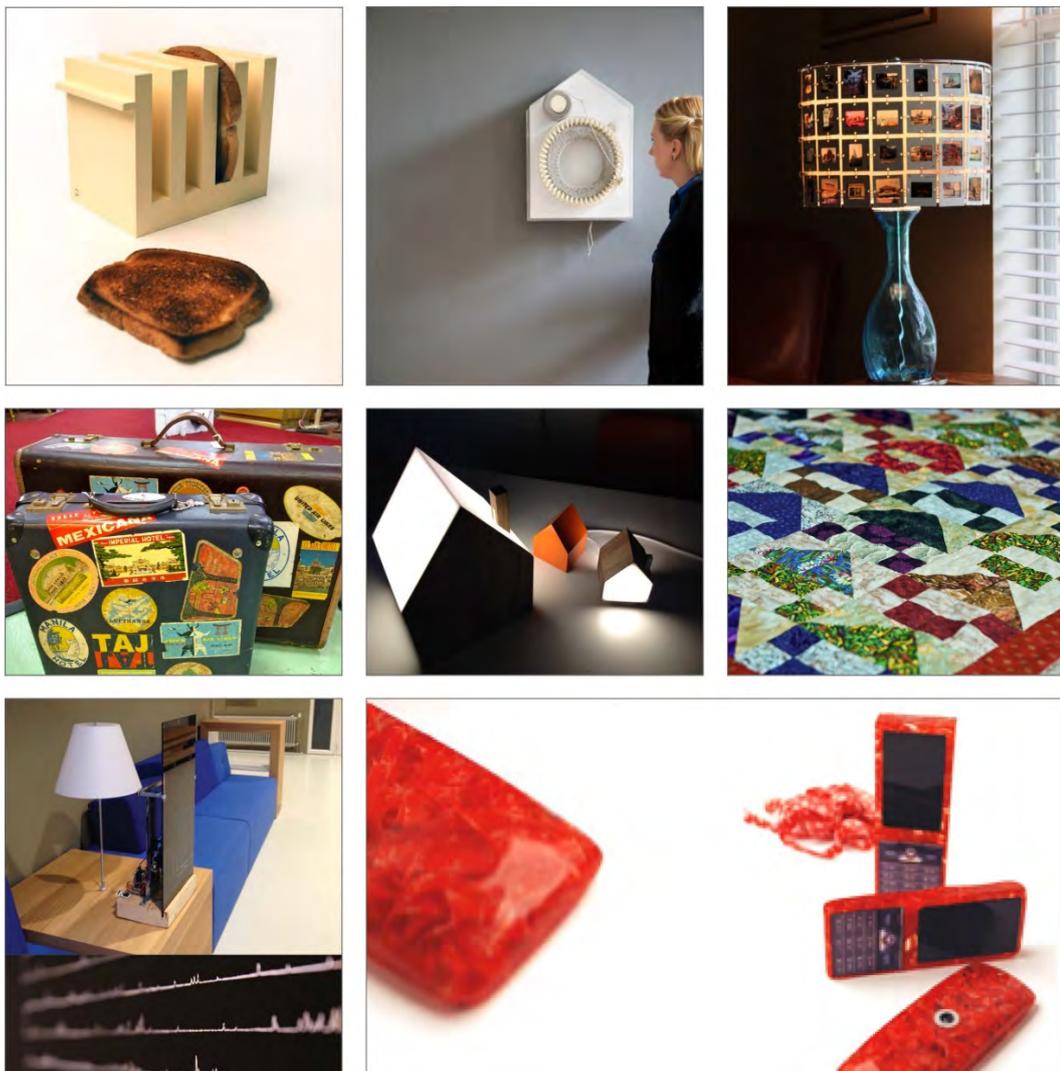


Figure 6.11 ‘Emotionally Durable’ concepts that were analysed

Reflections on the analysis

This process of analysis revealed that some concepts had similar strategy groupings or ‘DNA’. Considering figure 6.12, Photo Lamp and Patchwork Quilt have very similar strategy origins (see orange box), and there are other comparable combinations between the products analysed (see blue box). Secondly, most of the strategies fell into the ‘core strategy’ as defined in the previous section, validating the assessments made regarding this grouping.

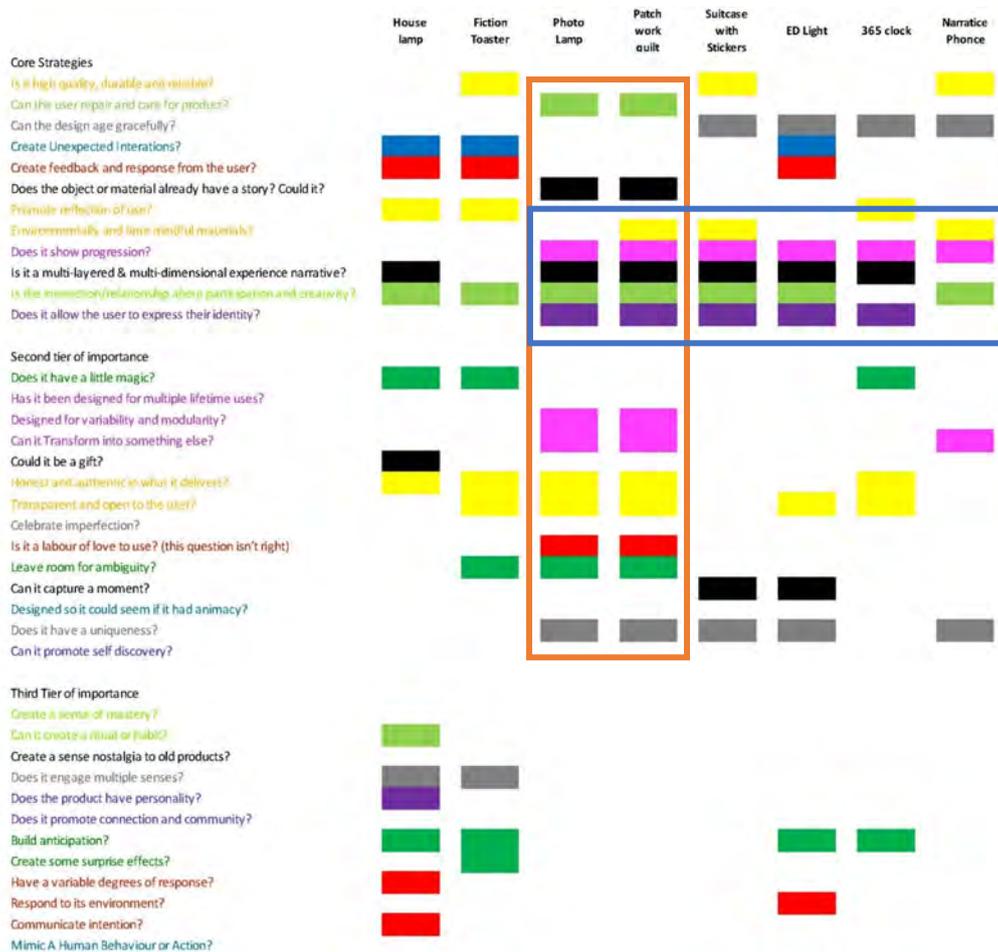


Figure 6.12 Table showing the results of the ED concept analysis against the framework

In addition to the seven groupings already defined, the two that were picked as a result of this process were the ‘Fiction toaster’ and ‘Good night lamp’. The other concepts such as Photo Lamp, Patchwork Quilt and Suitcases were shown to have similar strategies to the group adaptability and upgradability, so in order to have a broader testing set, these two groupings

were determined to be more suitable. The participants were not informed as to which grouping they were assigned as to prevent bias.

Results of workshop 9 – Designed outcomes

Nine concepts were developed however, similarly to the previous test only selection of the ideas were discussed, which can be found in figure 6.17-6.25. Each product proposition was discussed separately and as a whole at the end of this section, and reflections presented on how they relate to the research objectives identified at the beginning of this chapter, namely;

- How Emotional Durability manifests in lighting
- Identify issues for applying the framework
- Understand better a process for using the framework

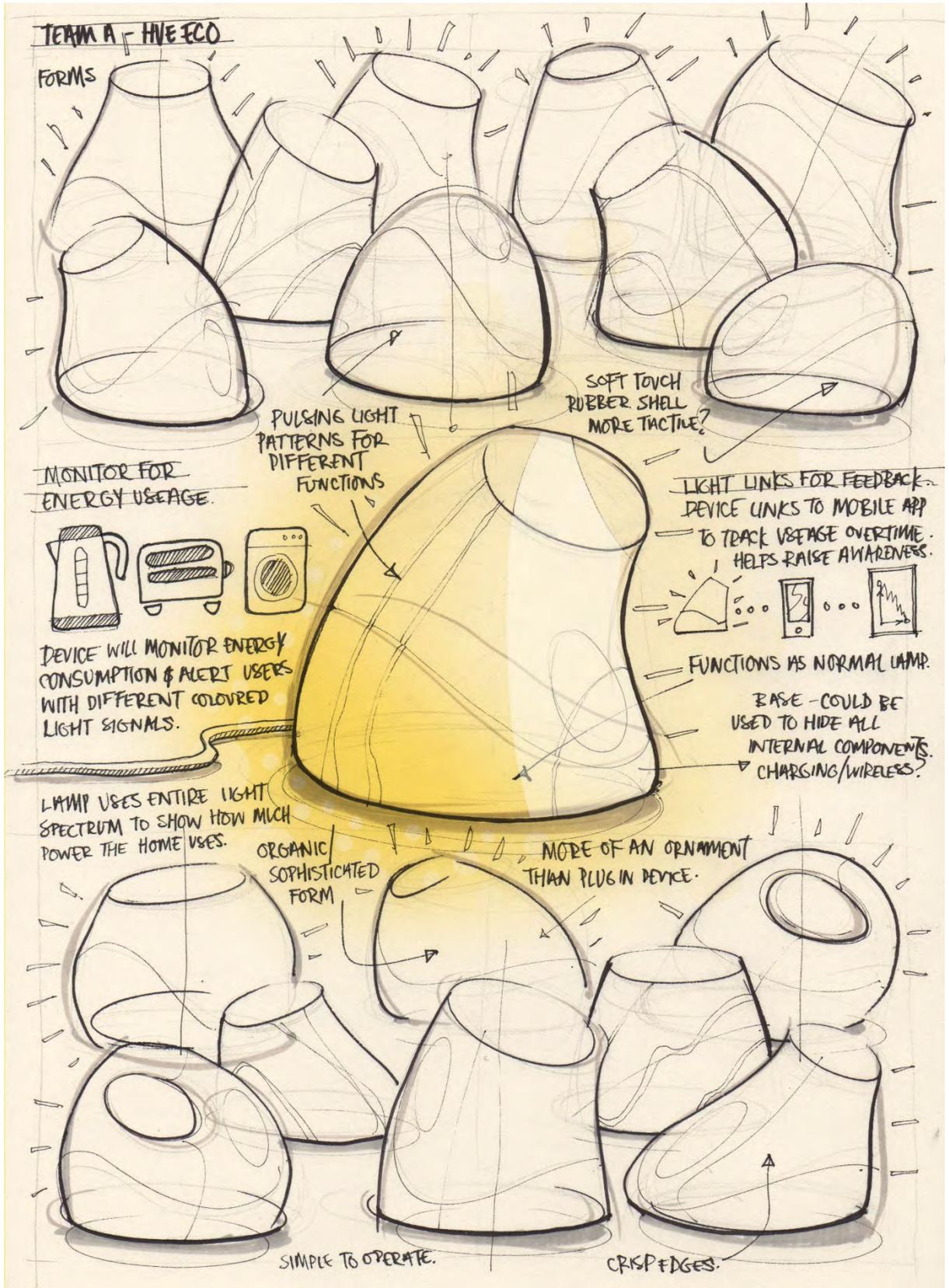


Figure 6.13 Fiction toaster product proposition. Image credit: Cam Bacchus

Team A designed with the *Fiction Toaster* grouping to develop Hue Eco. It is a lamp that also acts as energy monitor within the home to create a dynamic mechanism for understanding one's energy consumption per month/week. It dims as energy use usage increases, creates warning sounds and red lights when a set maximum energy use is reached. It also works on a reward system encouraging and rewarding users when they adopt more sustainable behaviours within their home.

Analysing the concept against the strategies, *promoting reflection of use, building anticipation and creating feedback and response* were the most dominant within the design. These were merged to create single features which resulted in an proposition that is more sustainability focused than the other designs.

Regarding its physical longevity, the designers did not elaborate on this factor. However these could be considered later in development. In terms of its emotional longevity, it creates more exciting interactions that are more visually and cognitively engaging.

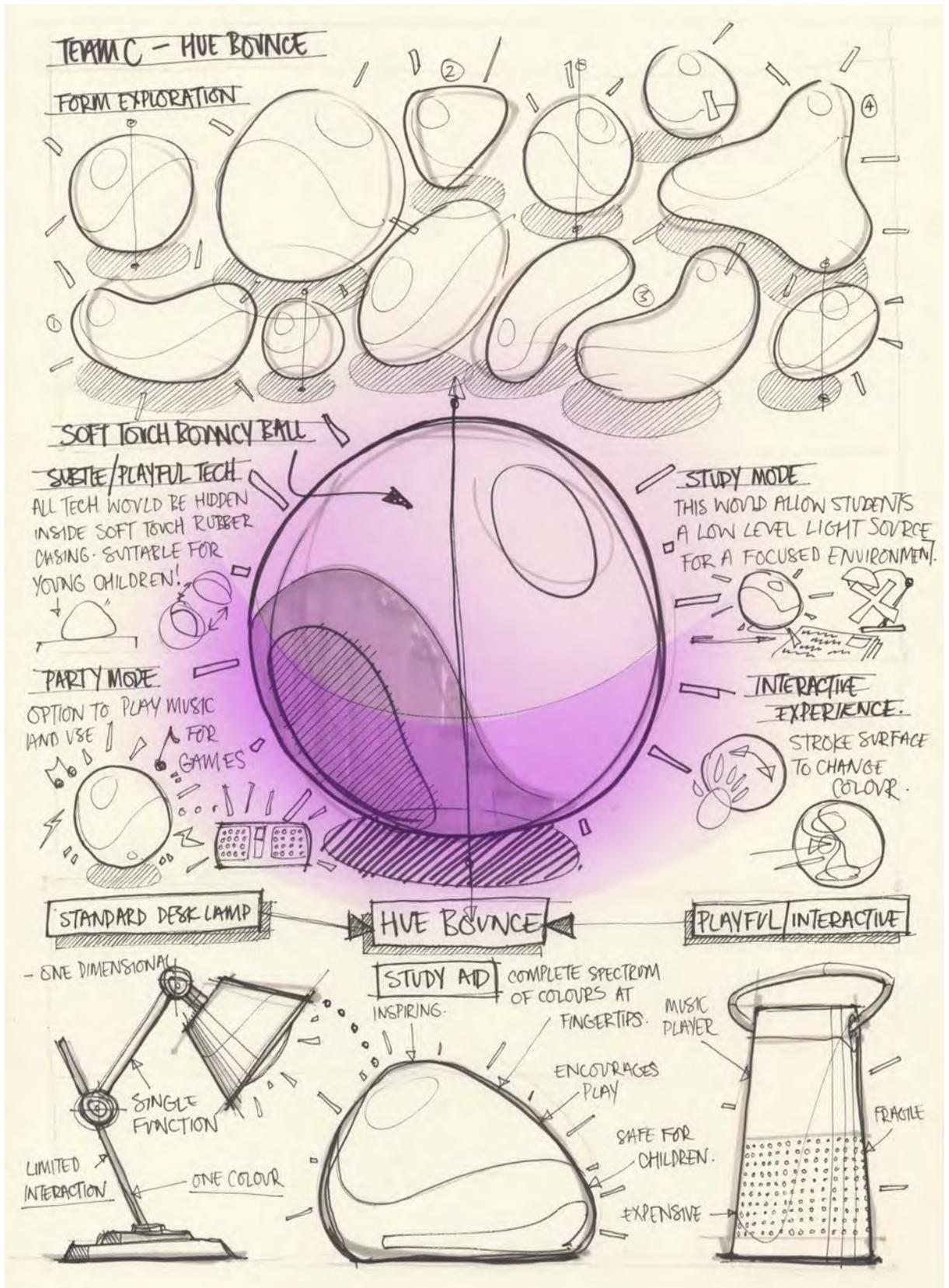


Figure 6.14 Miscellaneous product proposition. Image credit: Cam Bacchus

Team C designed with the *Random* grouping to develop Hue Bounce. It is a super durable, playful, exploratory lighting system that encourages active participation and interaction between people. The light changes colour when squeezed or kicked making it a versatile product that can be used in a few different manners within the home. Either as a game for children and adults, a bedside lamp, or a product that can be kicked into a corner to create ambient lighting.

Analysing the concept in relation to the strategies chosen, there are many elements that can be traced back to the framework. The main features of the concept are concerned with *Ensuring Participation with Creative Activities, Promoting Connection and Community and Ensuring Quality, Durability and Reliability* in the way the product is used and interacted with. While other strategies such as *Consider Degrees of Response* and *Respond to the environment* were subtler, these could be easily developed further to create a product interaction could be more interactive and engaging.

Analysing it in terms of its physical longevity potential, it was conceived to be super durable and long lasting, able to withstand hard use. In terms of its emotional longevity potential, the tactile, physical manner in the interaction coupled with the playful nature could result in it being *fun and enjoyable* to use, which is one of the determinants of building attachment. Moreover, the nature of active participation and *promoting communication and community* create opportunities to build memories that are linked to *family a friends*, which the object stories showed were important features of cherishability.

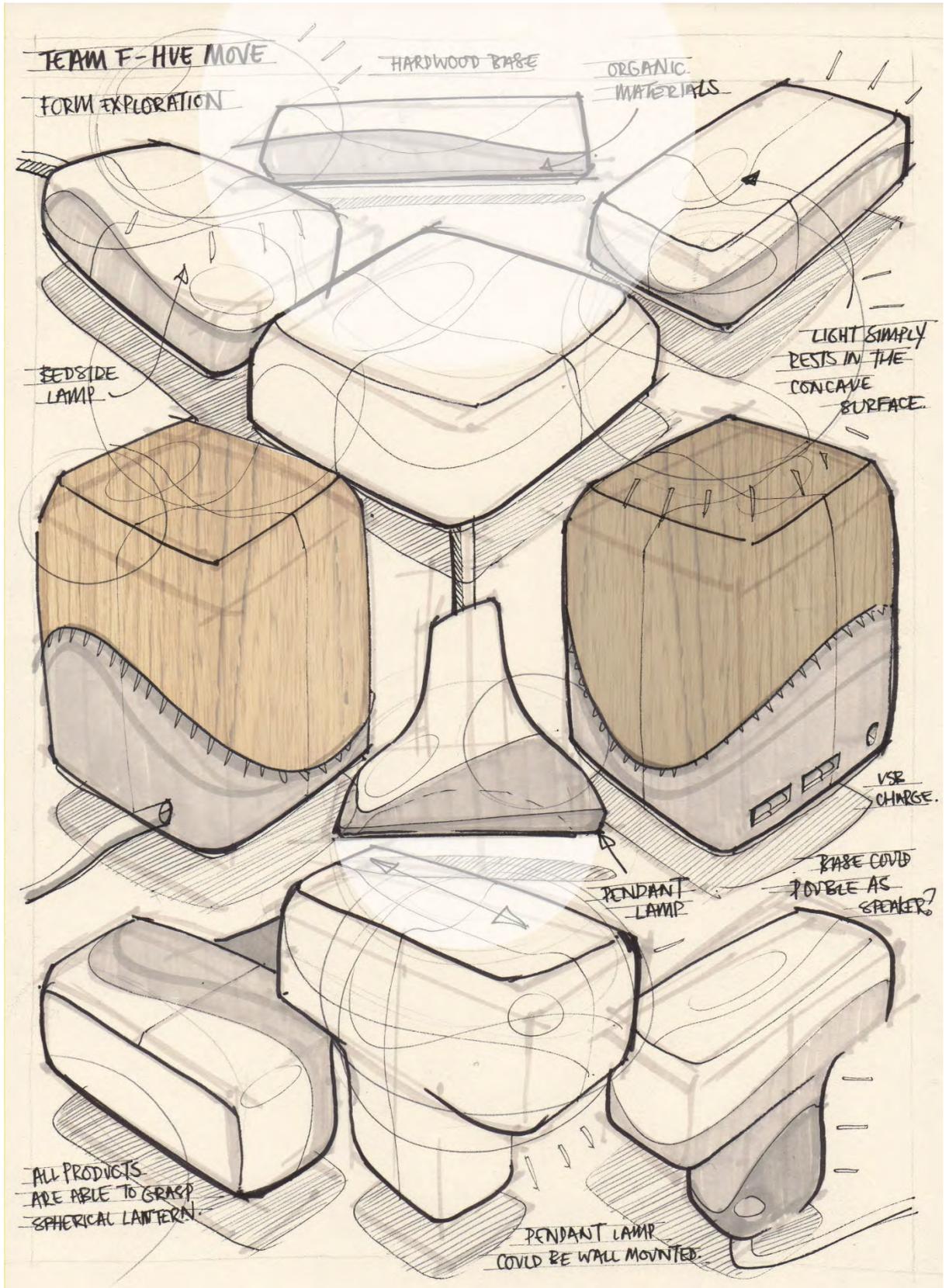


Figure 6.15 User Experience product proposition. Image credit: Cam Bacchus

Team F used *User Experience* grouping to design Hue Move. It is an adaptable light that can be placed in a series of different holders and positions around a room to meet different light needs room while living in one room. The luminaire can transform from being an overhead to a bedside lamp and adapt to the user's needs.

While this grouping used strategies from IMAGINATION, CONVERSATIONS and CONSCIOUSNESS the resulting design could be viewed as more related to EVOLVABILITY. However, considering the types of interactions, it could also be linked to *leaving room for ambiguity*, and *creating unexpected interactions or partnerships*.

The physical way in which the user interacts with the product creates active engagement which could increase the emotional longevity. The modularity of the concepts whereby one lighting unit is shared amongst several bases, could result in less materials being needed to produce the same number of light products.

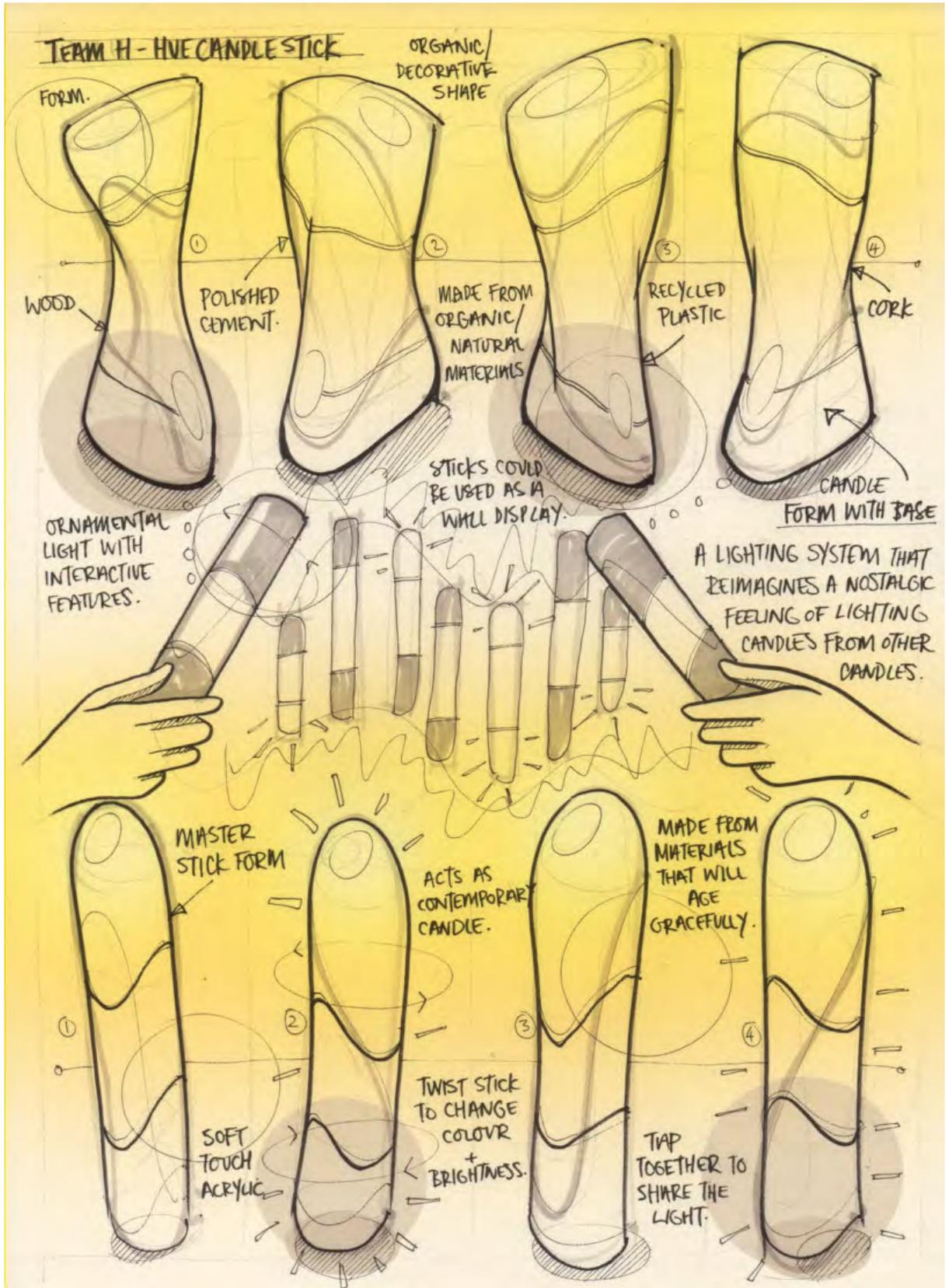


Figure 6.16 Good night lamp product proposition. *Image credit: Cam Bacchus*

Team H used the *good night lamp* grouping to create the Hue Candle stick and is inspired by the nostalgic practice of lighting candles. It re-imagines previous practices to encourage more sustainable lighting behaviours, as the user must go around and individually light each one, forcing a moment of reflection while also creating a materially engaging user experience.

Analysing the design against the strategies several can be directly traced back to the framework. The main intent of the concept is to *promote reflection of use* within user, *create an interaction that ensures active participation, engages the senses* and have a *clear product personality*.

These forms of engagement could potentially not only increase the emotional longevity by creating engaging material experience with the product, but also potentially encourages the user to be mindful of their energy and lighting behaviours. In terms of the physical longevity, aside from suggesting that materials that could *age with grace* (a strategy they weren't assigned), the designers did not elaborate further on how this could be facilitated.

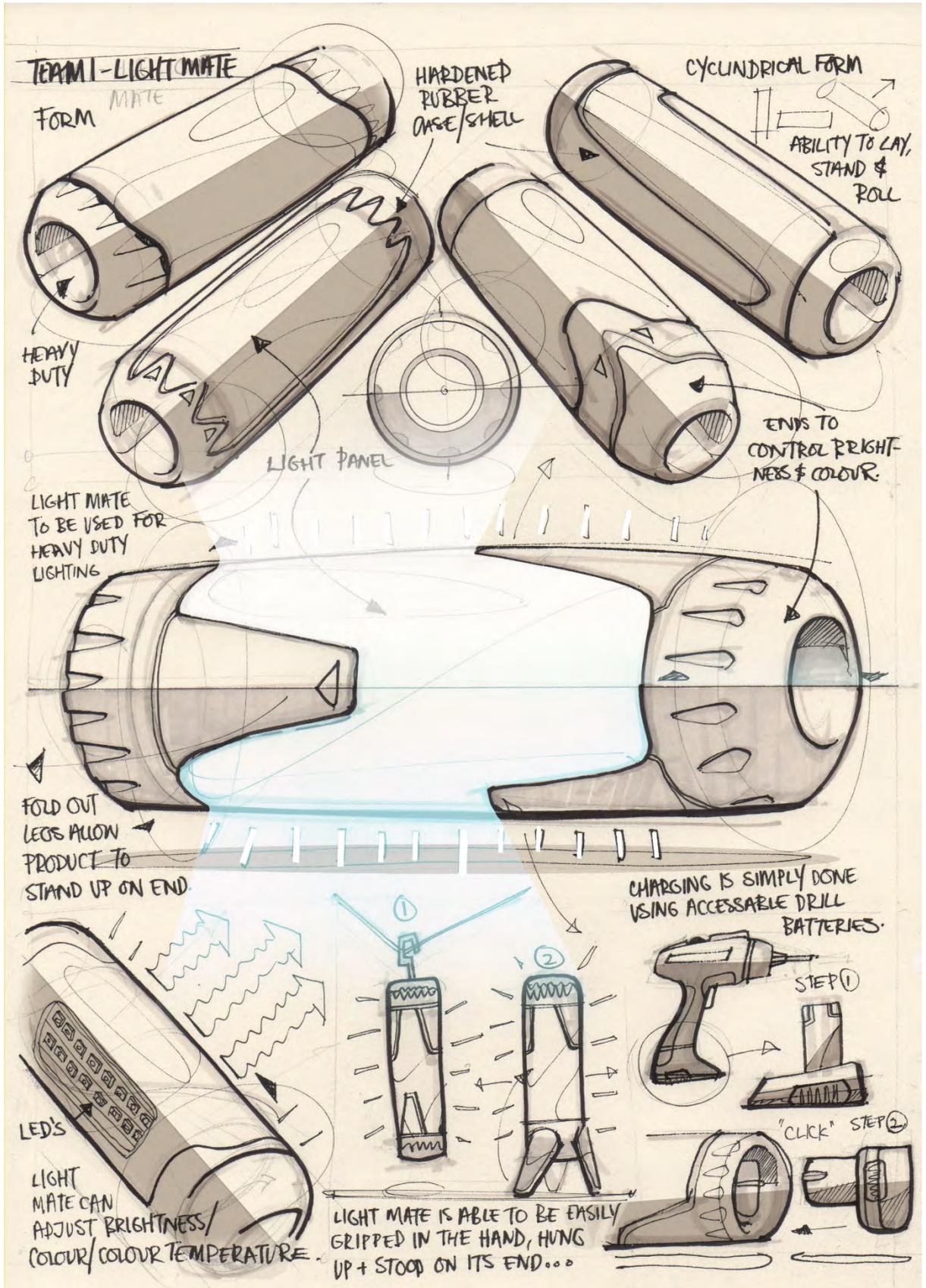


Figure 6.17 Adaptability and upgradability product proposition. Image credit: Cam Bacchus

Team I design used the *adaptability and upgradability* grouping to create Hue Light Mate. It is a robust, modular work light for tradesmen which can create directional light, ambient light and light scenes to assist painters, builders and decorators in their work. Adaptable, it can be hung from the ceiling, or be used free standing and is charged using existing tool battery packs. Designed to be tough, long-lasting and reliable.

Analysing the design against the strategies, this team embraced concepts linked to the physical longevity of the product and developed a concept that can be *maintained or fixed by the user*, is *designed for variability and modularity* and *can age with grace*.

The emotional longevity elements of the product are less present, however as the literature and the object stories suggested, a product that can withstand time can become admired by the users. Therefore, it is possible that the emotional connection could occur as it could imbues a sense of reliability and trust in the user over time.

Analysis and reflection on the outcomes of workshop 9 as a whole

Using the framework

Observing the participants using the framework, most traced the strategies back to their corresponding themes, discussed their meanings and intent and then ideated using one strategy at a time. During this session, there were very few queries regarding the meaning of the strategies and how they could be used. It was only team I who voiced a concern at not being able to integrate the emotional factors into the design, which is possibly due to the user group the team was assigned - 'a home renovator'. The team were focused on creating a utility product and were unable to imagine what NARRATIVE factors could be possible.

By taking a strategy-led approach rather than a theme-led approach the participants were able to consider and engage with more themes, which on observation gave the participants more design avenues to explore and very few teams appeared stuck or limited by the material they were using. However, it could also be argued that by having an abundance of material could result in an inability to explore the depth of the concepts and meaningfully engage with what they could produce.

How the framework materialised in design

While all the outcomes challenged the norms of traditional user light product interactions by incorporating active participation and material engagement, the physical longevity and sustainability elements featured more heavily, and the NARRATIVE aspects were less prominent. This could be due to the primary researcher emphasising that the tool was a method for sustainability, which may have set a tone for the workshop in the mind of the participants. While this was a different tactic to the first workshop, this does point to a new insight regarding how the framework is presented to the developers.

In terms of how this might affect the ‘emotional engaging potential’ of the concepts, the literature proposed that products that engender sense of durability and quality can result in an emotional connection being formed (Page 2014, Odom et al., 2009; Schifferstein & Zwartzkuis-Pelgrim 2008). Moreover, as stated previously at the beginning of this chapter ‘engagement’ could be the factor that facilitates emotional connection, and most of these concepts incorporate new forms of engagement, from physical material engagement, to visual and cognitive engagement. However, as the object story analysis showed NARRATIVES was the most reoccurring theme within in cherished objects, so if this perspective were better incorporated the resulting concept might be better-rounded. Similar to the outcomes of workshop 9, several features can be traced back to strategies that were not assigned to the teams showing again the Rhizomatic nature of the tool.

Similarities and differences between the concepts themselves

The concept developed using the grouping ‘Core Strategies’, had the most emotionally intriguing premise, however they were unable to translate it into a practical idea by the end of the session. The concepts developed using the groupings of ‘Adaptability and Upgradability’ and ‘Extend both the Physical and Emotional Lifetime’ produced very similar outputs, which is due to two factors. Firstly, they were designing using the same persona, and secondly, they had seven of the same strategies in each set. From a research perspective, it would have been beneficial if they were designing for two very different user groups, which in hindsight is a factor that should be checked. Lastly, similarly to the outputs from workshop 8, the ideas that were inspired from ‘User Experience’ it could be argued are more associated to ‘Adaptability and Upgradability’. This, and the fact that none of the other designed outcomes showed significant features of the grouping they were assigned, negates the hypothesis that certain groups of strategies would produce particular outcomes.

The teams were not made aware of the intention of their groupings to prevent bias. However it is suspected that if a team were looking to explore a specific factor, certain themes would be more useful than others, but perhaps not quite in the prescriptive manner the research had proposed.

Limitations

The teams were only given 2-3 hours to design with strategies, and some were more actively engaged in the activity than others.

Conclusions

In conclusion, this round of testing revealed:

- While engaging with up to 4 or 5 themes prevents developers from being limited, it also could result in a shallow engagement with what the strategy could embody,
- Adopting a strategy-led approach still results in the development of emotionally engaging interactions
- The groupings defined did not result in any significant specific outcomes
- It is suspected that framing of the intent of the tool changes the way it is regarded, and in turn the designs as result

Analysis and conclusions of the two workshops

Examining the outcomes from both workshops, it could be argued that the framework assisted participants to develop lighting features that encourage immersive, engaging interactions. The types of interactions created encourages the user to embed a story, engage with light products in new ways and produce moments of animacy and autonomy, which would most likely result in more emotionally engaging product experiences.

On observation, most participants found the framework informative, and the package of materials easy to navigate and understand. However, since the framework is quite broad, finding the right balance of how many strategies to use while designing needs further deliberation and will be considered further in the next section.

On reflection, attempting to determine which combinations of strategies might produce the most 'emotionally durable' output was a futile endeavour. Nonetheless, what is clear is that the Rhizomatic nature of the framework is a benefit that enables developers explore the different layers of meaning that exists inside the framework as a whole. Finally, the design of lighting

product itself is only one part of the system, and there are elements still be explored within Hue, such as the Hue lighting Application (App), which this next section will discuss.

6.4 Test 3 - Application of the framework within design practice

In previous chapters, the digital product was mentioned as a potential new path for understanding how emotional durability might materialise within lighting. This presented a unique opportunity for investigating the framework. Therefore, the primary researcher collaborated for several months with a senior UX designer at Philips Lighting managing the redesign of the Philips Lighting Hue App. This round of activity began with weekly skype meetings whereby the App and the concepts of framework were discussed in order to uncover opportunities for investigation. As a result of these conversations, it was determined that the research would examine what new features could be conceived if the digital product (the App) were to be considered through the lens of the ED framework. While being an entirely unexplored area of Emotional Durability, it also provided an opportunity for the research to consider the framework from a purely emotional longevity perspective. This investigation was undertaken by the primary researcher as an activity of *Research through Design* and employed concept development as the method.

Applying the framework to a Digital Product

This activity was a challenge, as aside from controlling the lights, the App is a stand only product in itself and has layers of complexity associated with how it programmed and engaged with by the user. This allowed the primary researcher to contemplate how a user might engage with an App or a digital product in an emotionally durable way. After further reflection, an App could be understood as an interface comprised of features that either, provide a visualization of information, or a widget that the user asserts an action upon to perform a function. Therefore, by understanding these two factors the researcher was able to identify what part the user could become more 'engaged' with in an App product system. As a result of this analysis it was determined that the main components that the user engages with within the system are: Icons, Colour Wheels and Scenes. By separating out these components the researcher was able to get a clearer notion of where the themes and strategies could be applied, which provided the starting point for ideation.

Approach towards the practice

The primary researcher used two approaches to the framework. A systematic approach - ideating with each theme and the corresponding strategies individually, and free form – where 2 or 3 strategies are picked at random and used as inspiration. The researcher was also given access to an online prototype of the App to ensure that the ideas developed would be suitable and relevant to the new format. See figure 6.18.



Figure 6.18 Prototype of the Hue APP

Initially 30-35 features and concepts were conceived using the framework which were captured in a sketch book. These were transcribed onto small cards so they could be merged, refined and clustered into categories shown in figure 6.19 below.

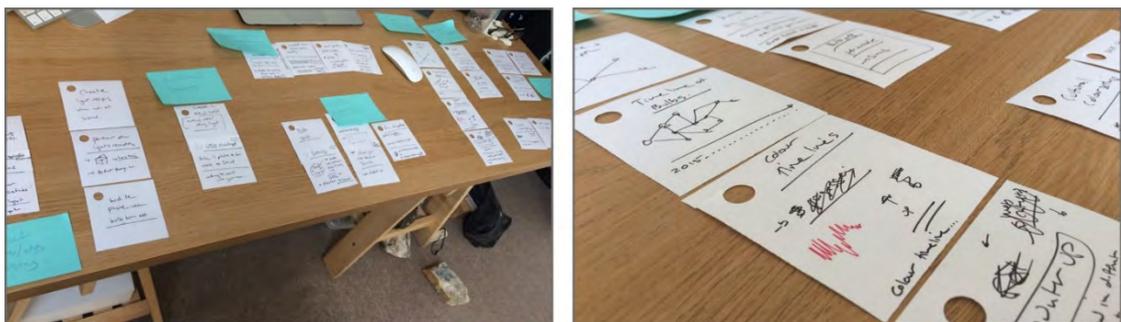


Figure 6.19 Process of merging, refining and clustering the concepts designed

17 of these concepts were then formalised within a booklet that was presented to the Hue lighting team in November 2017. Excerpts of the booklet can be found in the figure on the next page figure 6.20, but the full PDF booklet can be found in the package of materials submitted as part of the thesis submission.

Booklet as a tool for research

This booklet was developed to serve as tool for presenting ideas and report progress of the last stage of activity to Philips Lighting, and also to act a catalyst to receive responses from the Philips Hue team within the next round of facilitated feedback sessions.

The ideas within the booklet along with the final version of the framework were presented in 12 separate meetings over two days to 17 Philips Lighting Experts. Eight packs of materials were given to those who directly operate in new product development: Product Managers, Product Designers, Interaction Designers, Industrial Designers, UX Designers, Lighting Researchers and Technologists. This activity was undertaken to receive critique and analysis on the ideas developed as well as the latest version of the framework. To provide a control factor to this process, the materials were presented in the same order and in the same manner. The responses from the Philips lighting professionals recorded on audio and through notes and observations.

Insights Booklet

Emotional Durability and Lighting

November 2017

Philips Lighting Research and University of Brighton
Merryn Haines-Gadd, Jonathan Chapman, Peter Lloyd
Jon Mason and Dmitry Alakseyev



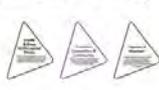

Create opportunities to build richer stories and context

What does this mean?
Create and show Multi Layered Stories & Capture A Moment

What does the literature say?
Design in or allow opportunity for the creation and capture of rich, layered experiences: objects into the product.

An object that allows you to capture and reproduce moments allows you to make memories while also being a mechanism for documenting the narrative. (Van Velsdonk 2008 & Chapman 2008)

What parts of the framework does it engage with?



Ideas Developed Through Digital Exploration - APP Design

Create light ambassadors to capture light stories building richer narratives of use

A photo or light scene with no context has no opportunity for meaning. Allow the APP to be the place where meaning, memories and captured in richer way.

Details
Hague aims to be light ambassadors, to go out and capture light from various places around the world using photos or maybe light meters. Which can then be downloaded / shared by others.

'Bringing the radiance of the world into your home'



You could be prompted by challenges perhaps - encourage users to go out and take pictures of things / places they want to take home with them.

Share it - QR it?
Create a mechanism whereby a captured light scene can be gifted to someone.

Ideas Developed Through Digital Exploration - APP Design

An in APP prompt to add more detail to the active light scene

Materiality - Simpler idea
When capturing the scene, prompt the user - why / where / when did you take this photo?

Allow the user to add a more detailed story to the image.



How is this about emotional engagement?
By engaging and recovering us with the materiality of how a photo is about capturing light.

Ideas Developed Through Digital Exploration - APP Design

Capture light of spaces through the APP

Materiality - Use the phones camera technology to capture and store light in your phone using a light meter.

Encourage the user to go outside and capture the light and bring it inside your home.

How is this different from the previous idea?
It goes beyond creating scenes with pictures... you are capturing it... lighting it...
The Light in Paris... or of the same chapel... Phuket beach...



Ideas Developed Through Digital Exploration - APP Design

Use visualisations to create a sense of consciousness within the system

What does this mean?
Activity, Mimicking human behaviour and Unexplored literatures

What does the literature say?
If you interact with the system with the sense of a soul people are more likely to cherish it. Mass produced, perfect objects often fail and seem sterile and distant. (Chapman 2005)

Kami - Spirit in Learning - Japanese tradition of animism; emphasising the notion that all objects have a spirit to encourage mindfulness.

What parts of the framework does it engage with?



Ideas Developed Through Digital Exploration - APP Design

Animate, reconfigure or design bespoke icons for the bulbs in your home

This creates a stronger identity for how you've captured your light bulb within the lighting system or your home while creating a sense of consciousness and animism.

Ways we could do this?

- Pulse when ON - Show when OFF
- Rotate or wobble



How is this about emotional engagement?
The icons within the APP are the point of engagement: they are the objects you interact with. By applying LED strips to them should in principle have the same outcome.

Similar ideas?
Change the design of the icons



Ideas Developed Through Digital Exploration - APP Design

Allow the user to design or choose bespoke icons that more accurately represent the future light they are in

- Icons appear different to sleep or wake depending on whether it's used they get, or maybe if they are ON or OFF?

Current APP icons: Could work in this section - or to their place on the page.




Ideas Developed Through Digital Exploration - APP Design

Encourage the user to treat light bulbs like Sims or pets living in your home

Clarify the platform and allow the user to build a 2d or 3d visualisation of their residence in order to 'house' their lights inside the APP.

Why?
So the user can care where the light is, how they are doing, provide data on their status - just then a sense of consciousness.



Name: Emily
Age: 8 hours old
No. scenes played: 10
Favourite colour: yellow

How is this about emotional engagement?
The user is likely to become more attached to them being like a companion or a pet of the lights.

Ideas Developed Through Digital Exploration - APP Design

Creating a sense of time & progression

What does this mean?
Documents the narrative & Shows progression

What does the literature say?
The literature suggests that rich experiences emerge from materiality of artefacts and systems. Looking beyond the web and abundance of the present - Changing or growing over time. (Gross-Herring 2012)

By creating mechanisms that allow users to show progression of time the facilities 'personal growth' which is a determinant of psychological well-being. (Kawachi, Murgu & Deaton 2016)

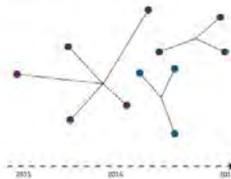
What parts of the framework does it engage with?



Ideas Developed Through Digital Exploration - APP Design

Create a graphic representation of how many bulbs are in the home

Shows how many bulbs you've got in your system. Will create a sense of space and depth - producing a diagram that grows and changes over time.



Similar ideas?
Can also create timeline of the video action and arrange your work over a month.



Ideas Developed Through Digital Exploration - APP Design

Colour Scenes Timeline

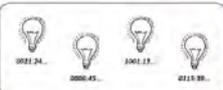
Can vary from abstract shapes and blocks - Perhaps the user can pick and develop their own.



Ideas Developed Through Digital Exploration - APP Design

Create count up of hours, mins used by the bulb

Engages ideas of energy, reflection of use and showing progression of the object.



Show which generation of bulbs the user has

Creates a sense of progression in the bulbs and deeper knowledge of your system, also shows the collaboration in the system between generations of bulbs.



Ideas Developed Through Digital Exploration - APP Design

If you have any questions or would like to further explore any

Figure 6.20 Hue APP concepts developed using the ED Framework

Analysis and reflection on the outcomes of digital design practice

Using the framework

The application of Emotional Durability to the design of an App was an entirely new territory for both fields. Employing concepts such as MATERIALITY and physical INTEGRITY proved to be particularly challenging, as the context of both the App and lighting itself has an inherent intangibility. However, this process did highlight the potential and importance of other aspects of the framework and many of the resulting designs were more associated with capturing NARRATIVES and understanding context. Reflecting on the process of using the framework, both approaches were useful. Systematically considering each theme proved beneficial as for periods at a time, substantive reflection was able to take place to contemplate the intention and outcomes the theme might produce. The free form method was useful at the end of the process for sparking new unconsidered combinations. Lastly, the product examples on the back of each card also proved to be advantageous for inspiration, especially when attempting to extrapolate thinking to a subject that is abstract.

How emotional durability materialised in digital design

The virtual nature of an App allows information to be crafted and embedded around an object that wouldn't be possible with a freestanding product; for example, within the settings of the App the user could be told where the product is made, materials it is made of, or who designed it. This feature builds in opportunities for transparency and INTEGRITY without the need for a giant product label, which in some products, such as sofas, is often removed negatively affecting the resale potential. It also facilitates ideas of CONSCIOUSNESS to be easily integrated, without the need for advanced robotics. However, the most opportune aspect an Emotionally Durable App might offer, is the ability to absorb a story or create new or different contexts, without changing the physical product. The concept that is proposed on p.6 of the booklet called '*capture light spaces through the app*' allows moments such as a sunset while on holiday, or light of new city, to be bottled, kept and reproduced back a home, which with a physical product would be hard to reproduce. While this might contradict some of the fundamental arguments that this thesis has already stated regarding the MATERIALITY of a product and their role in building emotional connection, from a digital product perspective this could prove useful towards the Internet of Things (IOT) movement. As products are becoming embedded with IOT technology it is not yet known what affect this might have on the emotional longevity of such items. Explorations into the emotional engagement of these products could provide insight.

Responses from the Philips Lighting experts

Most Philips lighting experts responded positively towards the concepts developed and the latest version of the framework. The lead UX designer in particular was excited with the outcomes developed and expressed that several ideas were new, viable options that his team could take forward. The product managers also discovered new perspectives for how they could frame and market features of the App and the product. They also expressed a desire to link elements of the EDD framework to their internal processes. The team that was the most sceptical of the framework were the product designers. They questioned whether the thinking could still be easily translated into lighting products and found the product examples on the back of each card not lighting focused enough. The different levels of enthusiasm for how the outcomes were received was interesting, which is why it was vital that the research gathered responses from many different actors across the whole NPD process.

Limitations

This activity was undertaken only by the primary researcher, who while is a designer by background, has no experience in App design. Furthermore, these outcomes were only early stage concepts and so their feasibility of development was unknown.

Conclusions

In conclusion, this process revealed that aspects of the framework can be more useful at different times and in different scenarios. Although the tangible material engagement side of Emotional Durability were not able to be used, themes such as NARRATIVES, IDENTITY and EVOLVABILITY were more easily incorporated and inspired the most emotionally exciting concepts. As a result of knowledge exchange sessions, a few were considered and picked up for development by those working within the Hue team. Some of the ideas had not yet been considered by the developers, which shows how the framework was able to bring a new perspectives to Philips Lighting. But also, how the primary researcher, who had no experience in App design or UX design was able to, using the tool, develop new ideas that were relevant and innovative to those who work in lighting design as a profession. Lastly, from the responses collected also revealed new stages where the tool could be used. It was suggested by the Product Managers that the framework could also be used as inspiration for marketing products as well and potentially frame the way the product is perceived by the user.

6.5 Reflections and Conclusions From Test 1,2 and 3

In summary, this chapter presented three rounds of testing, whereby the framework was assessed in two workshop and through design practice to understand the effectiveness of the method as stated in the research question. This process of testing helped the research to investigate several pertinent factors, namely: understand better the method and process of using the framework and demonstrate the outcomes that the framework produces.

Regarding the process of using the framework, the research investigated two different approaches, theme-led and strategy-led. It was discovered that in theme-led session using at least two or three themes tended to result in more complex emotionally engaging product propositions than just using one theme. Whereas in the strategy-led sessions, where the designers were engaging with concepts from up to four or five themes this did not increase the levels of complexity or emotional potential of the product propositions. This led the research to conclude that a saturation point can be reached, whereby engaging with more themes does not result in more interesting ideas, and in some cases resulted in the themes being lost in the outcome entirely. Therefore, it can be determined that engaging with and providing a focus around 2-3 themes at a time is a better method. However, also when using the framework in a solo design activity, systematically going through each theme and allowing for more substantive reflection is also effective.

Furthermore, the strategy-led session demonstrated that defined groupings (user experience, adaptability etc.) did not produce defined outcomes. However the framing of the activity as a method of sustainability, produced outcomes more focused on this topic. Therefore, what can be concluded, is that the context of the tool is just as important as the themes themselves, and must be considered when developing the final package of materials.

Regarding demonstrating the outcomes of the framework, this chapter revealed how the tool aided designers and primary researcher to create design features that included more physical, visual and cognitive forms of engagement. While the designed outcomes developed by the primary researcher were of more interest to Philips Lighting than the outcomes of the workshop sessions. This is most likely due to the fact that this activity was a direct collaboration with the organisation.

As a result of these three tests, additional knowledge was gained into how to approach the framework and develop the final toolkit. This will be presented in the next and final chapter of this thesis and all of the key insights uncovered throughout the research discussed in more detail.

Chapter 7 - Results, Discussion and Conclusions

This chapter presents the final results of this study, ‘The Emotional Durability Design Nine’ toolkit. It contains the framework and additional resources that assist new product developers to know how, when and where to use it. This chapter critically reflects upon the outcomes and key findings of the project in relation to the research questions identified in Chapter 1 and also discusses the wider implications of the research and the manners in which it impacts the primary field of research.

7.1 Results

Final toolkit

The Emotional Durability Design Nine toolkit is a set of resources that lists design factors that can potentially influence consumers to retain their products for longer. It assists new product developers to create more emotionally engaging product interactions, through a design approach called Emotional Durability. The tool can be used at various stages of new product development and aims to:

- Inspire and influence the design of new products
- Realise the emotional potential in the marketing of products
- Offer means to evaluate the emotional features of existing products

The toolkit represents a consolidation of the key findings of the research, and consists of five main components: the framework (a set of theme and strategy cards), a prompt booklet, instruction sheets, workshop instruction cards, and a set of worksheets (Personas, Value Engineering), as shown in figure 7.1. The next section explains each component in more detail and also elaborates on the process for using each tool.



Figure 7.1 Final toolkit – The Emotional Durability Design Nine

The framework - set of theme cards and strategy cards

The framework consists of a set of 9 theme cards (double sided large triangles with a description of what the themes embody) and 38 strategy cards (double sided smaller triangles which contain a short description and product example), which was presented in more detail on Chapter 5. The themes are the main qualities developers should seek to achieve and explore, and the strategies are mechanisms and suggestions that support the development of the themes. The full card set is shown below, on Figure 7.2.

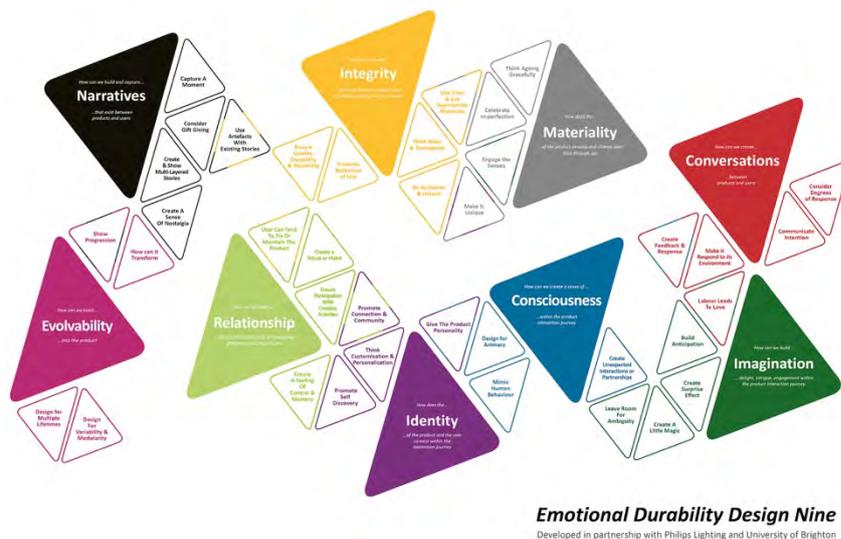


Figure 7.2 The Emotional Durability Design Nine framework

Prompt booklet

During a knowledge exchange session, it was suggested it might be beneficial if the toolkit included a resource that could be a quick prompt or reminder of what strategies relate to which theme. Thus, to facilitate this fast access to this content, an A5 prompt booklet was devised, which not only concisely summarises the themes and strategies of the framework but also offers product examples of each of them. In the booklet, each theme and their respective strategies are explained in one spread, along with their examples, as shown below (figure 7.3).



Figure 7.3 Prompt Booklet spreads for RELATIONSHIPS and NARRATIVES

Instruction sheets

As a result of the testing in Chapter 4 & 6, it was surmised that the tool would need additional resources if it were to function as a standalone resource. Consequently, the instruction sheets were created to act as an introduction and a step-by-step guide for using the toolkit. It explains: what the framework is and what it can do (page 1), how and when to use the framework within the different stages of NPD (page 2), how to use the theme and strategy cards (page 3), and the different approaches for using it (page 4). The aim of the instructions is to provide the user of the framework with the appropriate information they need to use it and to explain fully the context and procedures of usage. Page 1 of the instruction sheets is shown below, on figure 7.4. See Appendix E for the full version.

What is the framework for Emotional Durability

→ **Start Here!**

What is the tool and what can it do?

The Emotional Durability Design Nine is a tool which reveals the design factors that influence consumers to retain their products for longer, and assists new product developers in understanding how to design and create more emotionally engaging product interactions, through a design approach called Emotional Durability.

What is the intended outcome?

Mainly, the creation of products that facilitate emotionally engaging experiences, however the other central outcome we want to produce is product longevity. Our intention with this tool is to give developers the knowledge they need to create products that users want to use, and can use for longer periods of time.

What is Emotional Durability?

It is a design approach which examines the emotional connections that occur between products and users, so designers and developers can understand emotional drivers for why consumers keep some products longer than others. It aims to foster more durable, emotionally resilient relationships with the designed object so we can reduce consumption and waste of natural resources. The goal is to create product experiences that *inspire* and delight, *promote connection*, meaningful interaction and reflection, which can *endure* and *evolve* with the user over time. So if a product breaks, the user might fix it, care for it, and keep it maintained; and then at the end of life, which is the natural progression of all things, the user might transform or disposed it with care, dignity, and responsibility.

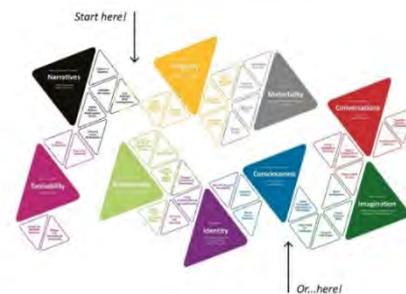
Where in development can it be used?

This tool can be used at various stages of new product development, such as design, marketing or value engineering, with the aim to:

- › Inspire and influence the design of new products;
- › Realise the emotional marketing potential of developing concepts;
- › Evaluate the emotional features of existing products for value engineering.

How do I approach the tool?

The tool works in a Rhizomatic manner, so the themes and strategies overlap and feed into each other in various ways, which basically means there is no hierarchy for how they can be used or viewed.



So in essence start anywhere! Pick a theme, starting reading and begin exploring what the concepts are all about.

Figure 7.4 Page 1 of the instruction sheets

Workshop instruction cards

Throughout the process of research it was observed that workshops are an efficient and effective method for engaging with the framework, thus was adopted as a suggested procedure for using of the toolkit. The workshop instruction cards, shown on figure 7.5, outline three different types of sessions that can be conducted with the toolkit. The **Quick Pass** involves considering the questions posed on the front of the theme cards. I.e. *How does the Materiality of the product develop and change over time and through use? Or How can we build Evolvability into the product?* The other two, **Broad Strokes** and a **Deep Dive**, involve carrying out an object handling session and design charrette using the full toolkit. The primary difference between these two sessions is how much time they require and the level of detail they explore. **Broad Strokes** is a 1-2 hour session which involves just the theme cards, and **Deep Dive**, is a half day or full day session that uses the theme and strategy cards together. The decision to include both exercises (object handling and design charrette) was a result of the observations of the workshops presented in Chapter 4, as it became clear that these activities were vital in setting the tone and solidifying the thinking of Emotional Durability in the minds of the participants. The benefit of providing instructions to three different types of sessions not only gives the user more options for engaging with the framework, but also demonstrates the different conceptual levels and adaptability of the tool. See Appendix F to see the workshop cards in full.

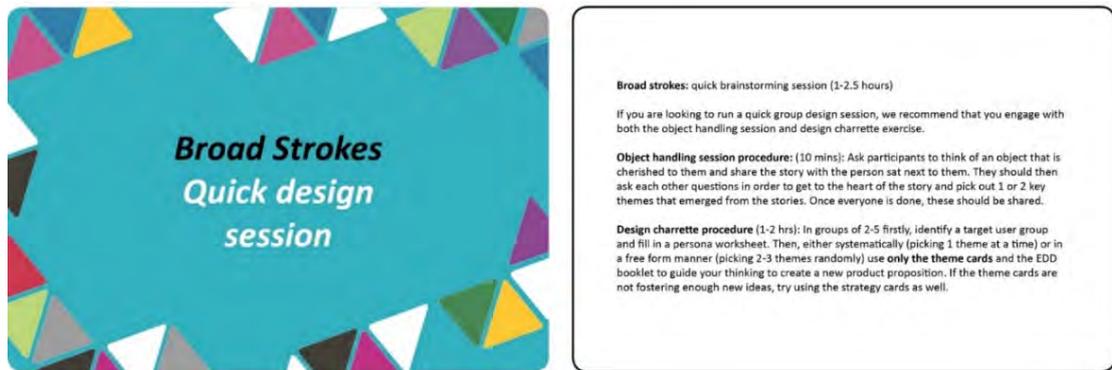


Figure 7.5 Workshop instructions card – broad strokes

Additional tools and worksheets

‘Personas’ worksheet

Within the knowledge exchange sessions, it was suggested that there could be an opportunity to explore Personas in relation to the framework. During the testing phase of the research, this was embraced and a new Personas tool developed which was used in the workshops 8 and 9.

Drawing on the DIY Toolkit developed by Nesta (Nesta, n.d), a new worksheet was created (see in figure 7.6).

> **Personas**

Who am I? What is my story?

What are my interests?

What do I value?

What are my dreams and aspirations?

What is my social environment?

Draw me!... What do I look like?

Figure 7.6 Personas worksheet

Although a simple tool, the intent of this worksheet is to prompt developers to consider the ‘stories’, ‘values’, ‘dreams’ and ‘social environment’ of the consumer and to remind the developer they are designing a product for a person that experiences emotions. It is also hoped that this worksheet might help to facilitate engagement with the framework in the later stages of the design process.

‘Value Engineering’ worksheet

In several of the knowledge exchange sessions, the value engineering process was highlighted as having major impact on why emotional building features did not make it into the final product. In response to this issue an additional tool and checklist was conceived for the product managers (see figure 7.7 below or Appendix G). An adaptation of the checklist presented in Chapter 5, the aim of this worksheet was to help product managers or designers to realise, defend and prioritise the emotion building design features that exist within their product system, so these can be highlighted to value engineers and perhaps retained throughout this trimming process.

Does your product have these qualities or features?

What is this tool for? Helping product managers, designers to identify, realise and highlight the Emotion building qualities that their product has or could have to ensure that through value engineering, the most important factors that relate to the emotional quality of the idea are retained.

Relationships	Level of importance
User can repair and care for product?	y/n 0-1-2-3-4
The interaction/relationship about participation and creativity?	y/n 0-1-2-3-4
Does the product give the user a sense of mastery?	y/n 0-1-2-3-4
Does it create a ritual or habit?	y/n 0-1-2-3-4
Is the interaction / relationship rewarding?	y/n 0-1-2-3-4

Imagination	Level of importance
Have a little magic in the way its used? Is it fun to use?	y/n 0-1-2-3-4
That builds anticipation?	y/n 0-1-2-3-4
Have some surprise effects? More than one?	y/n 0-1-2-3-4
Does the interaction have a little freedom for interpretation?	y/n 0-1-2-3-4

Integrity	Level of importance
Is Honest and authentic in what it delivers?	y/n 0-1-2-3-4
Is it high quality and reliable?	y/n 0-1-2-3-4
Promotes reflection of how it is used?	y/n 0-1-2-3-4
Transparent and open to the user?	y/n 0-1-2-3-4
Made of Environmentally and time mindful materials?	y/n 0-1-2-3-4

Narratives	Level of importance
The object or material already have a story? Provenance worth sharing.	y/n 0-1-2-3-4
Giftng mechanism? or parts of it be a gift?	y/n 0-1-2-3-4
Capture a moment? Mark a time?	y/n 0-1-2-3-4
Create a sense nostalgia, metaphors to old products?	y/n 0-1-2-3-4
Provide a multi-layered & multi-dimensional experience?	y/n 0-1-2-3-4

Conversations	Level of importance
Create a feedback & response from the user?	y/n 0-1-2-3-4
Have a variable degrees of response?	y/n 0-1-2-3-4
Is it a labour of love to use?	y/n 0-1-2-3-4
Product communicate intention of functions to the user?	y/n 0-1-2-3-4
Respond to its environment?	y/n 0-1-2-3-4

Materiality	Level of importance
The design can age gracefully over time?	y/n 0-1-2-3-4
Does the material interaction engage multiple senses? Is it pleasurable?	y/n 0-1-2-3-4
Can celebrate a little imperfection of the materials and interactions?	y/n 0-1-2-3-4
Does it have a uniqueness?	y/n 0-1-2-3-4

Identity	Level of importance
Allows the user to express their identity?	y/n 0-1-2-3-4
Promote connection and community with others?	y/n 0-1-2-3-4
Allow the user to think about self discovery?	y/n 0-1-2-3-4
Have a strong product personality and brand differentiation?	y/n 0-1-2-3-4

Consciousness	Level of importance
The product seem as if it is autonomous? Has a soul?	y/n 0-1-2-3-4
Involve unexpected or unconventional forms of user interaction?	y/n 0-1-2-3-4
Mimic Human A Behaviour or Action?	y/n 0-1-2-3-4

Evolve	Level of importance
All for user to show progression of use in some way?	y/n 0-1-2-3-4
Designed for multiple lifetimes, multiple users over time?	y/n 0-1-2-3-4
Designed for variability? Can it adapt? Upgrade?	y/n 0-1-2-3-4
Can it transform into something else? Materials, components be reused?	y/n 0-1-2-3-4

Total no. of Emotional Durability Features =

Results:
If your product has any of these features, these are design factors that help to facilitate more emotional engagement with products, and therefore more emotional attachment and a more enjoyable user experience.

Emotional Durability Score:
20+ : Very emotionally engaging product experience - prioritise which are the most important
10+ : Good level of Emotional engagement - highlight these through marketing
5-10 : OK level - are there any that could be highlighted or introduced more in marketing?
1-5: Technocentric product - try an include more features in design, business model & marketing
0: Utility Product - Value engineering will probably not affect the emotional experience

Value Engineering
Pick out the features you have identified and first rate their importance to the overall offering of the product then prioritise them according to these factors:
‘Primary emotion centred feature’ ‘Must haves’ ‘Nice to haves’

Figure 7.7 Additional Tool - Value Engineering Checklist

Using the toolkit

Ways of using the framework

As demonstrated by the two tests carried out in Chapter 6, the framework can be used in groups or in individual sessions. For group activities, the three workshop instruction cards outline the procedures for the different sessions that can be carried out. For individual sessions, it is suggested that the framework can be used either: *Systematically*, whereby brainstorming is carried out using one theme and its strategies at a time, or *Free-form*, whereby 2 or 3 themes and/or 4-6 strategies are picked at random. These different procedures of using the themes and strategies were defined based on the results of testing whereby it was found, while using one theme at a time allowed for more in-depth consideration, engaging with 2 or 3 themes led to a more complex product proposition, and that engaging with too many strategies results in a muddled product proposition.

Targeted ways of engaging with the framework

Although it was concluded that selecting certain grouping of strategies did not significantly alter the designed outcome, after analysing the results of theme-led workshops it can be argued that themes are more successful at directing outcomes. Furthermore, as shown in Chapter 5 & 6, some themes are more associated to product lifetimes, while others are linked to user experience. Therefore, if developers are looking to use the themes in a targeted way, such as to develop richer emotional interactions that relate to emotional and physical lifetime extension, they should start with: Integrity, Relationships, Narratives, Materiality, Evolvability. Or, if instead, they are looking to develop an exciting and emotionally engaging user experience, they should start with: Identity, Relationships, Imagination, Conversations and Consciousness. It is also suggested that, if looking to explore a process whereby all the themes are engaged with at once, the user should start with those strategies that are by nature linked to multiple themes.

Using the framework at different points of the product development process

During the testing stages, described in Chapters 4 and 6, and the knowledge exchanges sessions with Philips Lighting, it was observed that there are three stages within new product development where the tool could be used. The tool was originally developed to be applied at the Design stage of new product development, when features are embedded into new products. Yet, during the knowledge exchange sessions, it was suggested that there were other stages, such as the Value Engineering and Marketing stages, where the use of the framework could

positively affect the framing of the product, increasing the likelihood of embedded features ending up in the final product.

Value Engineering is a process which most products go through when newly conceived or between generations and was recognised as one of the stages in which design features might be modified or trimmed. Identified as a recurrent issue within Philips Lighting, in order to try and mitigate this the 'Value Engineering' worksheet, shown in figure 7.6, was conceived as a way to inform developers at other stages of NPD of the designer's intent, allowing for specific features to be retained into the final product.

It was also suggested that the framework could be useful in Marketing. Even though it occurs much later in NPD, often when the product has already been developed, marketing offers the opportunity to highlight emotionally engaging elements of the design, influencing the way the product is perceived by the user. It is suggested that marketers could highlight engagement features in products by considering the themes and strategies of the toolkit. A marketing campaign, for example, could focus on the NARRATIVE of a product, and contemplate what features of the product could be emphasised to convey this perspective.

Approach and perceptions of the framework

As shown in Chapter 6, it was observed that the framing of the tool might affect the way themes and strategies are interpreted. To guide users of the tool as to its overall intent, a description and the envisioned outcome of adopting Emotionally Durable Design approach was added. It is emphasised in the toolkit that the general aim of the tool is to improve the product's longevity, which could be achieved through the development of more emotionally engaging product experiences.

In summary, all of the resources presented in this section make up the final toolkit which can be used to engage with Emotional Durability and emotional longevity concepts. This final pack of materials was presented at the close of the research and 8 boxes distributed to several Philips Lighting new product developers which included designers, product managers and research scientists. In one of the final hand over meetings, the toolkit was used by a group of designers in a design session on their current projects which the primary research observed. The insights and implications of this last session will be discussed in more detail in the next section.

7.2 Discussion

In Chapter 1, it was suggested that emotional obsolescence is one of the key drivers for why the lifespan of products is decreasing over time. The approach Emotionally Durable Design was identified as possible remedy, however it was argued there was yet to be an adequate tool of method that facilitates the integration of this thinking into new product development. This led to the elaboration of a central research question: *Which principles of Emotionally Durable Design are relevant to the extension of the lifetime of a product and how can these be translated into an effective method for new product developers?*

Depicted through the process in Chapters 4, this thesis has already addressed the issue of which concepts and principles are relevant to the extension of the lifetime of products and the results of this process are shown in the framework in Chapter 5. Regarding the effectiveness of the method, as defined in Chapter 6, it is considered here in terms of its ability to allow developers to engage with the concepts of Emotional Durability and to facilitate the creation of emotionally engaging product propositions. In addition to these characterisations, if deliberating the research question as a whole, effectiveness could also be understood in relation to its ability to positively influence the lifetime of a product. Therefore, considering these perspectives on effectiveness, the outcomes of the research will be discussed below in relation to whether or not the toolkit is effective at:

- **Facilitating engagement with Emotional Durability concepts and the creation of emotionally engaging product propositions**, considering:
 - Enhanced understanding of designing with/for Emotional Durability
 - The operational nature of the tools and methods outlined
 - Did the toolkit meet the needs of Philips Lighting
 - The challenge of integrating the tool into an organisation

- **Positively affecting the overall lifetime of a product**, which relates to:
 - The ‘sustainability’ of the toolkit and the concepts
 - Advanced understanding of emotional longevity and existing sustainability strategies

7.2.2 Facilitating engagement with Emotional Durability concepts and the creation of emotionally engaging product propositions

Enhanced understanding of designing with/for Emotional Durability

As previously stated, it is impossible to predict that embedding particular design features will definitively ensure that a product will become emotionally important to a user over time. Still, many researchers have demonstrated that particular factors are associated with the formation with emotional connection, care, and attachment between people and products, which in turn result in a longer product lifetime (Mugge 2007; Page 2014; Chapman 2008; Russo 2010; Maclachlan, 2011). However, in terms of how to facilitate this in practice, authors have argued that Emotional Durability is hard to control and predict due to it relying on user context specific situations for these emotional connections to be formed (Den Hollander, Bakker & Hultink, 2017; Arguin, 2010). However, as demonstrated in Chapter 4 and 6, it is the notion of '*emotional and physical engagement*', that could offer clearer insight for designing with and for Emotional Durability.

Identified in the literature as a factor of Heirloom Status, Slow Design and Emotional Durability, '*engagement*' is defined as the extent to which the object invites physical interaction (Odom et al., 2009); the result of a creative interaction such as DIY or personalisation of the product (Grosse-Hering, 2012; Mugge, Schoormans and Schifferstein, 2008); and the outcome of an inspiring, intriguing interaction (Van Krieken, 2012). Engagement can also be motivated by emotional experiences (i.e. one has with a loved or cherished object), and is driven by different types of aesthetic (visual, tactile) and meaningful (memory associations, metaphors) experiences or engagements with the product (Desmet & Hekkert, 2007).

Therefore, based on the evidence throughout this thesis it is argued that emotional experiences facilitated through different forms of engagement with products, could help to facilitate Emotional Durability. Instead of aiming directly for Emotional Durability, which is context specific and hard to define, it might be more productive and effective to be striving to increase the levels of '*physical and emotional engagements*' facilitated by a product. Moreover, defining the facilitation of engagement as the aim of the framework could also help clarify its main intent, dissolving the challenge of working with/for Emotional Durability.

The product propositions designed using the framework in Chapter 6 further support this assertion, since by using the framework and concepts of Emotional Durability, all designers created new physical, cognitive and aesthetic forms of product engagements within the context of lighting. Although at this time it cannot be determined whether embedding engagement

features will encourage users to keep products for longer, they have the potential to help users to re-engage and reconnect with their own objects, which Walker (2006) argued could help to ease the strain of consumerism.

The key themes of the framework proposed also develop our understanding for how to design with/for Emotional Durability. The concepts from Chapman's (2005; 2008) texts provide the backbone for the research and influence the majority of the thinking. However, by including concepts from other areas, such as Product Attachment, Slow Design and Product Replacement, this research expands the possibilities for developing an Emotional Durability perspective within NPD.

Firstly, through the adaptation of existing themes. The renaming of the themes 'Fiction' and 'Surface' as IMAGINATION and MATERIALITY respectively, provides more clarity as to the meaning of these themes, while also adds to their definition by including drivers from Product Attachment. Secondly, through the addition of new themes. For example, the themes EVOLVABILITY, RELATIONSHIP and INTEGRITY emphasise the overall intent and objectives of an Emotional Durability approach more comprehensively, while the theme IDENTITY highlights the tension of how personal perspectives of oneself effect consumption and enjoyment of products. In addition to these, the theme CONVERSATIONS highlighting the nuanced experiential factors of the product-user interactions. Together through the different functions they perform, these themes deliver an enhanced accessibility and comprehension of traditionally intangible concepts, providing an exhaustive perspective for understanding Emotional Durability as an approach to design.

Operational nature of the tools and methods outlined

It was proposed in the literature that integrating emotional longevity concepts in practice can often be a challenge for designers (Maclachlan, 2011; Arguin, 2010; Love, 2009). Thus, one of the central intentions of this research was to develop a tool that allowed NP developers to easily engage with the concepts of Emotional Durability.

As noted in Chapter 6, the toolkit developed by this research was well received by the participants, most of which found the framework card set simple to understand and the process of interacting with the materials fun and engaging. Therefore, it could be argued that research has successfully met its aim to facilitate the engagement with the concepts and their use by designers. However, from an operational perspective, it was noted in the final hand over session

of the materials, that the success and quality of the outcomes relied on the NP developer's ability to think laterally and abstractly, taking the strategies as examples and not absolutes. On reflection, this could be both a hindrance and benefit for the ease and manner in which the tool is used and understood. It has been observed that the mindset of the developers dictates whether the value of the tool can be easily understood, as shown through the two different responses from the sets of designers at Philips Lighting. When presented with the same iteration of the tool, two different sets of designers reacted in opposing ways: one group was sceptical as whether the tool was applicable enough to lighting, whereas the second expressed that it was very adaptable and flexible, seeing this feature as a benefit. This disparity of opinion could be due to the fact that the first set of designers did not use the tool during the feedback session, and thus were unable to directly see how it works. Therefore, one factor that might dictate the level of engagement, is a willingness to conceptually explore the ideas within the toolkit.

Contemplating the structure of the framework, it was designed so it could be interacted with on different conceptual levels. This was to ensure the depth of the material could be preserved but also to allow for easier engagement with the concepts by developers. This feature of the tool was shown to be a successful measure, as participants expressed that while the themes were helpful for providing focus and intent, the strategy cards gave more direct design instructions. Participants also reacted favourably towards the physical features of the framework, such as colour coding and asymmetrical triangles, given that they facilitated physical and aesthetic engagement with the tool, making it a little bit fun to use as well.

Opportunities in the value engineering stages of NPD

Within NPD of large-scale producers, the design stage involves more actors than that of smaller counterparts. For Philips Lighting, creative control over the outcome of a product is dictated not only by the product designer, but also the product managers and the value engineers.

The role of the value engineer is to ensure that the bill of materials and manufacturing processes implemented allow for a sufficient profit-margin for development of newly conceived products. Existing product lines are also value engineered between generations, which can become an issue for design intent. For example, in the case of the Hue bulb, between the generations 1 and 3, several cosmetic styling changes were made to the outer casing material and to the shape of the lamp. Even though these changes might appear small and inconsequential, from an Emotionally Durable perspective these modifications might chip away the distinct '**Product Personality**' and '**IDENTITY**' created by the development team, which could also negatively

affect brand differentiation. This was identified as a recurrent scenario within Philips Lighting, which could also be a common amongst other large-scale product manufacturers. Therefore, if attempting to integrate new thinking into a product, it could be argued that a more holistic perspective is required. Rather than primarily considering the design stage as a beneficial moment to integrate sustainability concepts (WRAP, 2013; Stahel, 2010; Bakker et al., 2014b), the whole pipeline needs to be deliberated to ensure that emotion driven and/or sustainability design intent is retained throughout development stages, as well as in subsequent generations of the same product. While the tool shown in Figure 7.6 is a first attempt at alleviating this issue, further research with Value Engineers could provide a better understanding of their processes and explore other solutions available.

Opportunities in marketing

Marketing was also observed as a stage that could potentially affect the emotional longevity of the product, as predominantly it is a process that is concerned with how products are presented and perceived by the user. Stories are intrinsic to the way in which human mind processes and remembers data (Zak, 2013) and are embraced as part of the tactics used in branding and marketing spaces to invoke emotions in consumers (Gobe, 2009). While there are on-going discussion as to the role played by marketing in driving consumerism and materialism (Abela, 2006), marketing could be a positive resource to help influence consumer's perceptions of their products before and after they are purchased, if approached with a sense of 'INTEGRITY.' There is an emotionally engaging 'NARRATIVE' about 'IDENTITY' or 'INTEGRITY' that can be conveyed about any product, as long as these factors are realised, enhanced and expressed by the development team. The two marketing campaigns shown below demonstrate this more clearly (figures 7.8 and 7.9).



Figure 7.8 Innocent add campaign analysed through Emotional Durability

The first example is the marketing campaign by the brand Innocent. If considered in relation to the themes of the framework, the product and brand identity from this campaign could be viewed as built upon notions of ‘IMAGINATION’ and ‘INTEGRITY’. ‘IMAGINATION’ whereby the depictions of product have a sense of playfulness, fun and enjoyment. ‘INTEGRITY’ through ideas authenticity, honesty and transparency around the sourcing of the produce used in their products.



Figure 7.9 Patek Philippe ad campaign analysed through Emotional Durability

The second, is the Patek Philippe advertisements, discussed briefly in Chapter 5. This marketing campaign, which has been running since 1949, offers a very strong sense of ‘NARRATIVE’ and ‘EVOLVABILITY’ around their product. The ‘NARRATIVE’ appears through the sense of nostalgia, and the evoking memories and connection with family members. The ‘EVOLVABILITY’ of the product is shown through the possibility of it being passed down to multiple generations of users.

Moreover, platforms that review and promote goods which value longer product lifetimes, such as ‘Buy me once’ (buymeonce.com, 2019), demonstrate there is an emerging as a marketing and consumer value proposition regarding Product Longevity. Even though there are only a few brands that offer a life time guarantee, i.e. Polar Bottle, Eddie Baurer, Jansport, Patagonia, Cutco, Osprey, Zippo (Kuta, 2016), if EU regulations regarding product lifetime extension began to be enforced (European Parliament, 2017), there could be an opportunity for brands and companies to embrace durability and longevity as positive perspective for marketing, which could be facilitated by the Emotional Durability Design Nine framework.

Did the toolkit meet the needs of Philips Lighting

An objective of this project was to explore how Philips Lighting could ensure engagement with their customers over longer periods of time. It was concluded that to achieve this involves altering the perspective and mindset of the developers in the ways they consider the user in relation to their products.

Prompting developers to consider the user

An issue raised within knowledge exchange sessions was that the technology-led approach used by the organisation occasionally created situations that conflicted with the wants and needs of the user (Philips Lighting expert 1, 2015). For example, a firmware update occurred in December 2015 which locked out third-party bulbs from functioning through the Hue bridge system. This resulted in a negative consumer backlash, which prompted the company to reverse the decision in response (Crist, 2015).

This scenario is an example of how the organisation took a ‘technocentric’ (Chapman, 2005) approach towards the development of their products. In contrast after witnessing the framework presented to various Philips Lighting NP developers, one of central observations by the industry supervisors was how well the tool prompted these developers to re-engage with the notion that they are making products for people. Therefore, aside from providing a structure for building-in more engaging product experiences, this framework could also help to prevent NP developers from taking a purely ‘technocentric’ attitude to design and also take into account the emotional needs of the user. This could be beneficial not only to Philips Lighting, but to other technology-led organisations as well, providing a more user-centric perspective on how to approach design.

Furthermore, in the last feedback session the final group of designers expressed that they greatly enjoyed engaging with the concepts within the framework and found it to be a useful prompt for considering the users perspective within design scenarios, commenting that it was ‘Fantastic food for the brain’ (Philips Lighting Expert 18, 2018). It was also remarked by the industry supervisor that, he was impressed with the practicality of the toolkit and the outcomes of the research. Therefore, in terms of what Philips Lighting were looking for, which was a practical, easy to use method to help them consider and build emotional engagement between their products and their customers, it could be argued that the feedback from the final rounds of knowledge exchange sessions demonstrated that research had successfully met this aim.

The challenge of integrating the tool into organisations

Philips Lighting is a research-led company and most experts interviewed were open and receptive to new thinking which is born and developed in an educational research environment. Still, 'Design methods are like toothbrushes. Everyone uses them, but no one likes to use someone else's' - John Zimmerman (Harrison & Tartar, 2011) and so encouraging developers to adopt a new method, especially one that was still in development was a tricky prospect. This was a factor that became evident as the project progressed, and so securing and retaining buy-in from those involved was a central challenge, which was tackled in several different ways throughout the research project.

The first was through the knowledge exchange sessions. Throughout the research, although most Philips Lighting participants were happy to engage with the project, it was observed that over time, sessions focused on mutual sharing of information, and when seen as an 'exchange', rather than data gathering, were more effective at securing interest and retaining buy-in. Therefore, those participants receiving data on the interim findings, as well as sharing knowledge and insight, were kept more fully engaged with the process.

Secondly, it was observed how important it was to re-engage with the same people over time. The participants that were interviewed at every site visit, witnessed the full development of the model and outcomes over the three years. As a result, these developers expressed a higher level of interest and greater understanding of how the project might materialise within the company than those who engaged with only once or twice.

Yet, with each trip there were new Philips Lighting developers who had been identified by the industry supervisory team. When presented with the research, most expressed an interest in understanding how the models might assist them within their day to day work practice, showing how the ideas continued to have applicability to the company. But it is important to note, that although many Philip lighting NP developers were engaged with numerous versions of the tool there is no guarantee that this method will be used or adopted. Therefore, reflecting on this and the research as a whole, several insights were observed regarding the challenges to gaining overall acceptance and integration of the tool.

Champions

To drive and sustain change inside organisations, champions as well as strategic plans and new procedures are required (Pathak, 2010). This project was only a success because of the constant support and guidance given by the industry supervisory team, driving the topic and project within various areas of the company. Because, 'without dedicated champions, ideas for product

innovations may remain dormant for future development and implementation' (Frost & Egri, 1990, p. 270). Typically, to drive change the characteristics and behaviours needed from champions relies on three factors: passion and confidence in the potential success of the innovation, selecting the right people to get involved and determination in the face of adversity (Howell & Shea, 2006). The Philips Lighting industry advisors displayed all three of these characteristics throughout the project. Firstly, by always presenting the framework and Emotional Durability as a mode of thinking which would benefit the company. Secondly, by selecting the appropriate specialists (Philips Lighting experts) to engage with who were diverse in their roles, hierarchy and location within the company. Thirdly, they were very persistent and consistent in their participation and enthusiasm for pushing the project and framework forward within the organisation. This kept the research alive within the company and helped to persuade the participants of the benefits of the project even when there were setbacks.

Product designed outcomes – evidence of success

A reoccurring barrier to engagement of the framework and Emotional Durability by Philips Lighting was an uncertainty of the output the tool might provide. While the product propositions developed and presented in Chapter 6 contributed towards remedying this, it was those that were adopted for further development that provided the strongest evidence. Since the research has concluded it is uncertain whether this has improved the uptake of the tool, it does however further demonstrate and validate the value of the framework. The creation of case studies to show the process and outcomes would benefit of the framework and could assist the overall adoption of the tool. This could be beneficial for both Philips Lighting and other organisations who might be considering implementing this approach.

7.2.2 Effective in positively affecting the overall lifetime of a product

Due to the time constraints of a PhD research project, it is difficult for this research to definitely demonstrate that products designed using this framework will have a longer lifespan.

However, the framework was developed from factors observed by previous researchers (Chapman, 2005 & 2008; Mugge, 2007; Van Nes & Cramer, 2005; Page, 2014; Odom et al., 2009; Bakker et al., 2014a) which positively contribute to the construction of longer product lifetimes. Moreover, the findings from the cherished object stories assisted in the selection and refinement of the choice of concepts included in the framework. Thus, it is argued that it is likely that if these concepts were to be successfully integrated into products, they could improve the lifespan.

The ‘sustainability’ of the toolkit and concepts

Irrespective of the physical and emotional longevity of the product, there are aspects of the design that could affect the overall sustainability of the product such as: choices of materials or the surrounding business model. Within the designed outcomes these were featured in a small way or not at all. While it is hard to ask one model to cover everything, it would be counter-productive to the overall sustainability agenda if the tool did not consider these factors. This is why the strategies such as ‘*use time and eco appropriate materials*’, were added to the framework, however it featured minimally in the designed outcomes.

Regarding business models, initial explorations were carried out of the synergies between the framework and product services systems, however due to time constraints these were not able to be developed further. But, there is an argument that a sustainability approach is more complex than just material choices and business models. As Chapman & Gant (2007) argue, practicing Sustainable Design is also useful as a prompt for debate and critical thinking. It can challenge designers to be forward looking and embrace the possibility that sustainable perspectives are facilitators of creative sustenance, meaning and integrity that goes beyond the obvious ecological benefits. Considering that sustainable approaches are becoming more strategically important to organisations (Lagerstedt et al., 2003), designers are being hailed as the key players for the successful adoption of these methods within product development (Lagerstedt et al., 2003; Lindahl, 2005; Vallet et al., 2013). Thus, if armed with methods that provoke critical and reflective thought, they could inspire and guide producers to ‘design things right’ and know what are ‘the right things to design’, (Fulton-Suri, 2004, p.14). This is where the power of this framework lies for sustainability, in its ability to provide an alternative, more mindful, subtle, human perspectives on what sustainability means for design and production.

Furthermore, strategies such as ‘*be authentic and honest*’, ‘*think open and transparent*’, ‘*promote reflection of use*’, ‘*promote self-discovery*’ and ‘*celebrate imperfection*’, can influence not only the way in which developers create their products but also end-users as well. When applied with the product they could prompt users to contemplate of their own behaviour of how they engage and perceive products, thus facilitating a reconnection, and a re-engagement with the material world.

Advanced understanding of emotional longevity and existing sustainability strategies

As a result of reflecting on the sustainability dimensions of the toolkit, a broader understanding of the synergies between Emotional Durability and existing sustainability strategies was realised.

Upgradeability and adaptability

Maclachlan (2011, p.310) argued that upgradability, while being a mechanism for product longevity, is also a vehicle for self-expression and personalisation. However, it could also be utilised to elicit feelings of satisfaction, '*surprise*' or enchantment from discovering that a product can adapt to new needs, or be a driver of '*building anticipation*' from knowing that there are elements that can be upgraded. Alternatively, if parts of a product were modular, much like a charm bracelet, this could allow the user to collect stories, memories and '*Show progression*' of the user's journey with it, resulting in '*multi-layered narrative*'. All of which could be a process facilitated by producers through aftersales servicing, customisation or digital products.

Maintenance and repair

The Ifixit (n.d) repair manifesto states, that repair reconnects us with our stuff, that is it an act of freedom and independence, 'if you can't fix it you don't own it'. From an Emotional Durability perspective, it is a mechanism for '*ensuring active material participation*' which in turn could develop into a '*ritual or habit*' providing security in hectic society. Repair also allows the user to get inside the product and fully comprehend it. This is a factor that Fairfone encourages by writing on their product 'Yours to open yours to keep', thereby liberating their consumer from the paralysis that warranties can create. While Chapman (2005) originally suggested 'Design for Dependency' as a mechanism for continued engagement between the product and the user, if this was considered through the lens of INTEGRITY and RELATIONSHIP, it might encourage consumers to consider repair and maintenance an act of love, care, appreciation, and awareness, rather than a chore. Much like the satisfaction that some people feel after polishing their shoes or watering their plants.

Durability and longevity

Within an ever faster, ever-changing world, some products like Le Creuset pans or Dr. Martens shoes while sold with a lifetime guarantee, can also create a sense of stability and reliability. These products deliver the same material and functional experience with each use, allowing the

consumer to feel a sense of 'confidence' in the product, never faltering in quality or utility, realising fully the emotional benefits this strategy can provide.

Cascading materials – upcycling

Within a Circular Economy cascading materials are described as 'the unwanted waste of one system that can be recaptured and reused by another'. Within sustainable design context this could also be described as Upcycling. Predominantly a practice of craft, there are many successful business cases that operate on this premise, such as Elvis and Kresse and Freitag. However, these ideas are also examples of **'using objects or artefacts that have existing stories'**. By viewing these materials and components as having more than just material value, their story and provenance could be highlighted as benefit, while also demonstrating the **'Multiple Lifetimes'** that are possible.

In summary, what these examples have demonstrated, is a new comprehension of the emotional longevity perspective that can be realised within existing sustainability strategies. This validates the original intent to integrate concepts from neighbouring fields of practice in Chapter 2, while also further supporting that notion that Emotional Durability as an approach can positively affect the overall longevity of the object.

Emotional Durability and end-of-life

In Chapter 4, it was observed that there were several cherished items that no longer functioned but were being kept and stored by the user because of memory associations. This suggests that there is a perspective related to the Emotional Durability and end-of-life that could be explored. While the theme EVOLVABILITY and the strategies **'consider the multiple lifetimes'** and **'how can the product transform'** were included to potentially address this, the framework does not directly consider procedures of how to 'Detach' from a product if it no longer functions or needs to be returned. While this might seem counter intuitive considering the overall objective of the framework, if users were to retain every product they felt emotionally bonded to (regardless if they functioned or were used), this would not deliver a positive message for the consumption of goods. Therefore, it could be argued that designers should be striving to create more 'healthy' RELATIONSHIPS between people and products. Relationships that not only allow for longer term emotional engagements, but also allow for the opportunity to let go or divest at end-of-life. So they can be either re-used, refurbished, or recycled with a sense of respect, care and responsibility.

7.2.3 Value, impact and influence of the tool

Alternative approach for companies to consider sustainability thinking

Although Philips Lighting have committed to engaging with Circular processes, research is ongoing on how these will be implemented. This is because many require significant infrastructure adjustments for them to be realised, which is a greater challenge for larger organisations.

However, methods such as this framework potentially offer an alternative perspective for engaging with circular and sustainability thinking, by recommending the re-prioritisation of the emotional and physical lifespan of their products. This approach is not only more incremental and simpler to devise and implement, but it also could act as pathway for the servitisation of products in the future. Lastly, this approach is also entirely consumer centric in what it explores, which could be a more attractive prospect for corporations who design and develop consumer products.

Framework as an educational tool

The framework was presented in various educational environments throughout the project. Several lecturers teaching both design and sustainability related undergraduate and master level courses requested copies for their students to engage with. The value of introducing these concepts to aspiring designers and developers is immeasurable, as Andrews (2015) argues that before designers can lead the shift towards more circular product systems, and influence the behaviours of consumers and business of the lifetime and perceived value of products, a change in their practice and thinking needs to occur. Therefore, this framework could contribute to this shift to more circular models and offer an alternative method for newly trained NP developers to engage with sustainability and circular product longevity thinking.

Framework used a tool within Internet of Things products

One novel contribution this research has made is to explore Emotional Durability within the context of digital design p.165, not only within the context of App design but also with regard to IOT products as well.

Hue Lighting was adopted as the central case study with which to explore this synergy and the outputs designed in Chapter 6 showcases initial ideas of what is possible within this space. However, this thinking could be elaborated and made applicable to other IOT products as well. The enhanced connectivity of smart products, essentially expands the ecosystem and the environment that these products inhabit, increasing their ability to be dynamic, intuitive and evolve over time. Which could not only change the way we view these products but also how

we interact with them as well. Themes such as NARRATIVES, CONSCIOUSNESS, CONVERSATIONS, IMAGINATION and EVOLVABILITY lend themselves to these types ideas and could provide new insight and inspiration for how connected products are designed in the future.

Contributions to knowledge

This research uncovered several findings that contribute to the concepts and practice of Emotionally Durable Design and product lifetimes research. The points below summarise the significant contributions this research has made:

- Identified, consolidated and refined concepts from Emotion Centred Design and Product Lifetimes research that are the most suitable for NPD
- Located the concepts of Emotional Durability amongst other fields of research
- Created a **new tool** that:
 - o translates the concepts of Emotionally Durable Design into a more accessible method for designers and producers to use
 - o can be used within new product development to help developers create more emotionally engaging product experiences
- Developed 12 Emotionally Durable Design lighting propositions using the framework
- Explored the synergies between Emotional Durability and App development which is an entirely new line of enquiry for both fields
- Uncovered that value engineering can be a point of interference for design intent, which affects both new products and those re-developed between generations.
- Identified the points within NPD (design, value engineering, and marketing) that need to be targeted to integrate new methods
- Identified and highlighted the links between existing sustainability strategies and Emotionally Durable Design

Implications for each field and stakeholder

In addition to the contributions to knowledge, the research was also mindful of the key implications for the various stakeholders, namely:

For producers – this tool can assist developers increase the levels of emotional engagement between themselves, their customer and their product which in turn could not only help in delivering more emotional product experiences, but also potentially build in brand loyalty and bonding over time.

For Product Longevity research – this framework provides a more comprehensive perspective on facilitating emotional longevity within new product development and provides a clear taxonomy and road map for how these concepts relate to one another.

For Circular Economy – this tool comprehensively considers the user’s perspective when contemplating product longevity, potentially providing an alternative entry point for pursuing circular economy and sustainability thinking, which could help to increase implementation and adoption of more circular systems.

Emotion Centred Design – the literature review that was conducted not only located the various strategies of Emotionally Durable Design within the wider theoretical landscape of Emotion Centred Design, but it has also explored the synergies that exist with Circular Design, which could serve as inspiration for future research.

Limitations of the study

There are three main limitations to this study. The first is that the research was only conducted with one organisation (Philips Lighting) and using only one product category (lighting). Although the research strived to create a tool applicable to a variety of product scenarios, it was still developed in response to data gathered from new product developers that worked solely on producing lighting products. The framework was also only tested using lighting products as the case study, and so further research would need to be conducted to understand fully how it applies to other product categories. The second, is that although the tool was used and tested by the primary researcher, it was primarily tested using product designer students to produce the product design outcomes. Thus, to understand more comprehensively how it might be used inside a company, a study with an industry based designer/developer would need to be conducted. Lastly, the thinking of this tool kit was based on literature and data gathered mainly from a US American and western European perspective. It is not known as to whether these themes and strategies are culturally relevant outside of these spaces, therefore further studies could be conducted using similar processes to uncover whether these concepts are globally applicable.

Future research

Emotional Durability and Hue Accessories - The Hue product line is quite a hands-off system, with very little physical material engagement occurring within the experience journey. The user primarily interacts with the App interface, the motion sensors or the two switches shown below.



Figure 7.10 – Gamet, (2017) Philips Hue Smart switches

Within the Emotional Durability framework, the theme MATERIALITY plays a central role in encouraging material engagement while also describing how these systems can age over time. This has yet to be explored within these contexts. If this were investigated in relation to the accessories product line of the system, this could be the vehicle for exploring the richer tactile, experiential elements of Emotional Durability and provide new and exciting methods of controlling the lighting system.

Value Engineering - As presented earlier in this chapter, value engineering was identified as a point whereby product features might get trimmed. Although a new tool was developed and presented in Figure 7.7, the research was unable to test and explore this line of enquiry much further. Hence, a longer study which investigates how emotional longevity design intent can be maintained along the development process could be carried out.

Conduct longitudinal studies using the tool - Thus far, most research which examines emotional longevity has only been able to gather data retrospectively. For this to be thoroughly investigated, a study would need to be conducted whereby the tool is employed to develop products, and then these are tested by users over several years to uncover whether the design intent had any effect on the overall lifetime.

Conduct workshop with other organisations using the tool - This research has only been carried out using one product line and one organisation. For this tool to be more comprehensively validated, further workshops and case studies with other companies and product categories should also be undertaken.

Reflection on the process of research

Reflections on the academic industrial collaboration for research through design

Undertaking a *Research Through Design* academic project with an industrial partner was a truly beneficial experience but also challenging at times. Reflections on this process are offered in the section below, concluding with recommendations for future researchers.

Challenges for industrial collaborations

Non-Disclosure Agreement - The primary researcher was required to sign Non-Disclosure Agreement, which affected the research in two ways: the manner in which the data was collected, and also which outputs and insights could be published in the thesis.

Regarding data collection, some meetings and conversations could not be voice recorded, photographed or video recorded. This required the researcher to rely on handwritten notes to gather insights and impressions from participants. The primary researcher endeavoured to be as thorough and precise in their note taking, but also relied on other forms of data gathering techniques, such as narrative based enquiry, literature reviews, design charrette workshops and object analysis.

In regards to publishing, due issue of Intellectual Property permission was not given to include the designed outputs that were created in close collaboration with the partner in the results section. This meant only impressions of these outputs were evidenced, rather than the outputs themselves. The primary researcher was also wary of directly quoting participants in the text, as many were still working at Philips Lighting and they did not want this research outputs to potentially affect their relationship with the company. Lastly, care was taken regarding the overall observations that were shared about the company as this could potentially impact the position of the project's industry supervisors.

Remaining faithful to the research process without negatively affecting the partnership -

The role of a researcher is to objectively gather data from participants, analyse outputs and draw conclusions. However, this can become a complex task when the participant's organisation is a

key stakeholder in the research. While seeking to maintain the integrity of the research process by faithfully noting observations, care was taken throughout to as to what reflections were shared, and consideration placed on how these might be received by the company and industry supervisors.

Fitting in with timescales of the organisation - PhD research projects have defined stages that need to be completed within particular timescales. This is true of industry processes as well. Matching both schedules required research activities to be planned either very far in advance or to be constantly reassessed and revised in order to ensure research was always moving. Monthly meetings with the industry supervisors' team, independent from the academic team, helped to ensure this was possible.

Ensuring the research was carried out when external challenges arose - As stated in the introduction, Philips Lighting were in a state of transition in the interim of this project. This made them both an ideal but also unstable partner, as the company was subjected to significant changes over the four years from both strategy and personnel perspectives. Many different avenues of research were conceptualised and planned throughout, to ensure that if issues arose with one stream of research due to external issues, another could be picked up and developed.

Key benefit of industrial collaboration

Value of gaining access to target audience/user of the tool – The opportunity to work directly with an organisation was invaluable to the research process and for the outputs that were created. It enabled the research to be both more immersive and reflective with the constant feedback received from multiple sources regarding the validity of the concepts and how they might be implemented within a new product development scenario. This ultimately gave the findings and outputs more weight as to their suitability and applicability to design. Moreover, to be able to share and co-create sustainability-led design ideas with global manufacturer of products was a fantastic opportunity for progressing the sustainability agenda within consumer products.

Challenges of Research through design with industrial collaboration

Negotiating the role of reflective researcher and designer - Throughout the project the primary researcher was required to inhabit both a role as a researcher and a designer. While in some of the activities these two roles were complimentary as an integral part of the research

through design process, other times it was important to emphasise that the primary research was not an external contractor of the company, but an academic working independently and looking critically at the activities undertaken.

Expectations placed on the outputs – Philips Lighting were a very supportive collaborator and mindful of the varying outputs that a PhD project would produce. Even though they did not place any additional expectations on the research, the opportunity to work with the company and the knowledge that the outputs could potentially be adopted, created additional pressure to deliver quality, relevant outputs to the organisation.

Benefits of Research through Design with industrial collaboration

Enabling outputs more aligned with participants' knowledge base – Carrying out design as a research activity meant that the researcher and participants were able to reflect and analyse outputs they were very familiar with: product propositions. There was a common language, understanding of values and meaning between the researcher and participants, allowing for greater ability to share thoughts, co-create and receive feedback throughout the process.

Recommendations

Below are suggestions for how to navigate this type project, if PhD or masters students were to engage in research of the nature in the future:

Set up clear and frequent lines of communication with your industry partner - which allow each partner to be constantly aware of how the research is developing and ensure that there are no miscommunications about direction, timelines or participation in research activities.

Try to align key research outputs with industry outputs – using a research through design process can help to deliver outputs that are relevant to both parties and help alleviate any pressure regarding the delivery of value to your partner.

Be clear about expectations from the start – principally, this type project is about carrying out research. This should always be the anchor throughout and should be understood by the collaborating organisation from the start.

Don't be afraid to take ownership of the research – it can be tempting to allow the organisation to direct the research, but the primary researcher is the one directing the agenda and progress and, if necessary, boundaries should be established.

Be flexible and develop different strategies for the project – conceptualise many different options for how to carry out the research as you progress to ensure that, if external issues arise with your partner, the progress of the project will not be interrupted.

Be mindful of the roles you need to perform as both a researcher and designer - and how sometimes these can be in conflict.

7.3 Conclusions

Summary of thesis

At the start of this thesis a problem space was defined. It was highlighted that the lifetime of electrical products is on-going concern within sustainability research, and emotional obsolescence was identified as a major contributing factor. However, it was concluded that at present, tools and methods that facilitate this emotional longevity perspective, through approaches such as, Emotionally Durable Design, are limited within academic and industry practices and research.

Moreover, due to technology developments within the lighting industry relating to the increased lifespan of light products, manufacturers such as Philips Lighting have been prompted to consider approaches that help them deliberate how they might prolong engagement between the company and their customers, through their products. Therefore, it was decided to approach this issue at an industry level and a central research question was defined: *Which principles of Emotionally Durable Design are relevant to the extension of the lifetime of a product and how can these be translated into an effective method for new product developers?*

To address the first half of the research question, a literature review in Chapter 2 was carried out to uncover existing strategies and principles which relate to the extension of the emotional lifetime of a product. Concepts from not only Emotionally Durable Design but also other similar areas of practice, Product Attachment and Slow Design, were found to be pertinent and were consolidated to build the new tool. To further support and validate concepts uncovered, strategies from neighbouring fields of Product Lifetimes, Emotion Centred Design and Experience Design were also examined. Subsequently, concepts from Circular Design, Product Replacement, Product Experience, and Symbolic Meaning were utilised as well.

To devise a process for carrying out the research, a methodology review was conducted shown in Chapter 3. After determining that a *Research through Design* approach would be employed,

the other methods and techniques that were selected to collect the data, were outlined and their procedures for implementation presented.

In Chapter 4, the research consolidated the concepts presented at the close of Chapter 2 and distilled these principles into concepts cards. Using design-based methods '*Affinity Diagrams*' and '*Concept Mapping*' these concepts were clustered and classified into a new framework for Emotional Durability. This tool was then iteratively developed, tested and refined through seven workshops with Philips Lighting experts and other NPD professionals, utilising the methods narrative inquiry, concept sorting and facilitated feedback.

After analysing the data gathered of the objects' stories, interviews and observations, the final iteration of the tool was conceived and nine central themes of Emotional Durability were proposed: Relationships, Narratives, Identity, Imagination, Conversations, Consciousness, Integrity, Materiality and Evolvability. These themes are also supported by 38 strategies that assist in the development of more emotionally engaging product experiences which were presented and discussed in Chapter 5.

In Chapter 6 the second half of the research question was addressed more comprehensively through employing workshops and design practice, testing the framework in product design and digital design scenarios. This activity not only uncovered the issues and opportunities of how the tool operates in practice, but also resulted in the development of 40+ concepts that showcase how Emotional Durability thinking materialises within lighting design propositions.

It was concluded in Chapter 6 that most participants found the framework, themes and strategies easy to understand, and use, as prompts for design. The main criticism received was that as a whole, the scale of it was seen to be intimidating, especially for those engaging with it for the first time. Attempts were made to uncover significant groupings amongst the strategies in order to produce more specific outcomes, however as shown this was not to be the case. As a result of this final testing process it was observed that additional resources were required for the user to be able to navigate the framework with ease. Consequently, a more comprehensive toolkit of materials was conceived which encapsulates the key findings and outputs of the research. This is found at the beginning of Chapter 7.

Chapter 7 presents the final results of the study and the key findings and conclusions drawn throughout the project. It analyses the outcomes of the study in relation to the research question

and discusses the effectiveness the toolkit showing how it: facilitates engagement with Emotional Durability concepts, creates emotionally engaging product propositions, and how it positively affects the overall lifetime of a product.

It was proposed that through an enhanced understanding of designing with/for Emotional Durability that, producers should be striving to create more emotionally and physically engaging product experiences. This is potentially a more attainable goal for creating a sense of reconnection between people and products.

Regarding the operational nature of the toolkit and methods outlined, it was suggested that the structure and content of the toolkit successfully facilitates engagement with Emotional Durability concepts. Furthermore, it can be applied to influence the way the product is designed and perceived in both the design and the marketing stages. Value Engineering phase must also be included for these features to be retained. Moreover, if product longevity were to develop as a consumer value proposition, the framework could also facilitate the development of this perspective.

In terms of whether it met the needs of the research partner, it was indicated that the toolkit positively assisted them in considering the user's emotional perspective more thoroughly while designing. This arguably is integral for preventing the company from taking a 'technocentric' approach to design and would assist them in prolonging the emotional engagement between their product and their customer.

Regarding how it might be accepted and integrated into an organisation particular factors were identified. Internal champions to promote and drive its use inside a company and evidence of success of the outcomes it might offer. Lastly, while it is impossible to state that this toolkit can positively affect the overall lifespan of the product, as it was developed with concepts and factors which assist in the formation of longer product lifetimes, it is likely that it could increase the lifespan of products it helps to conceive.

In conclusion, this thesis proposes that 'Emotional Durability Design Nine' toolkit is a pragmatic, comprehensive and accessible guide for designers and developers to explore the integration of Emotional Durability into products.

As an approach, it not only offers an alternative perspective for organisations to engage with sustainability thinking, but also a more holistic viewpoint for extending the emotional lifetime of the product. Through the themes proposed, it provides pathways for developers to

contemplate the ways in which users emotionally engage with products while also potentially prompting them to be mindful and reflective of the products they produce. This in turn, could potentially result in products that challenge and alleviate consumption and replacement conventions that are resulting in negative environmental issues.

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