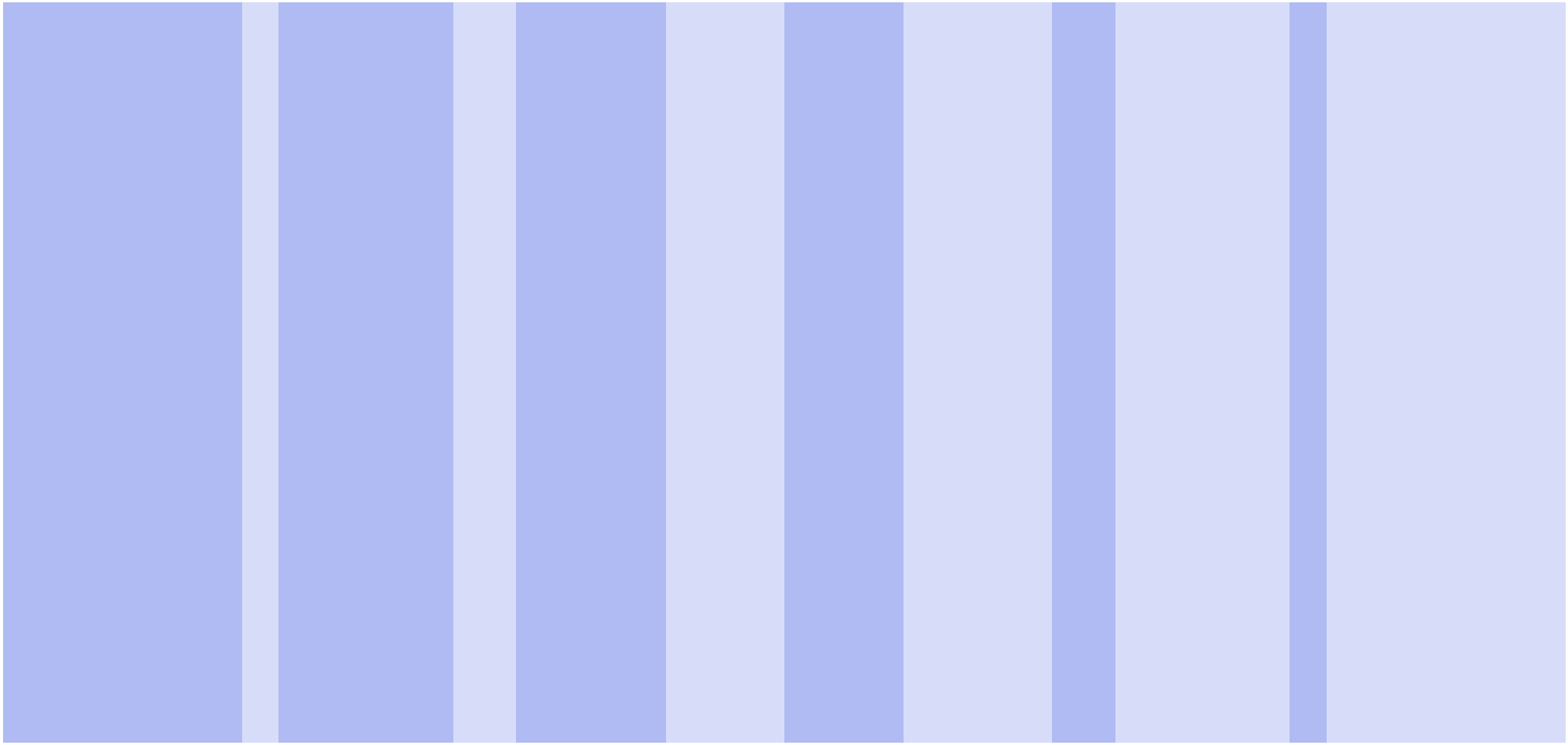
Emotional Durability through Interaction Design

Product Attachment in Personal Audio Devices

Alfonso Martín Mateo
TU Delft - MSc Design for Interaction



Emotional Durability through Interaction Design: Product Attachment in Personal Audio Devices

Master Graduation Thesis
MSc Design for Interaction

Author
Alfonso Martín Mateo

Chair
Prof. dr. ir. R. Mugge

Mentor
PhD. O. Bariş Zafer

Department of Design, Organisation & Strategy
Responsible Marketing and Consumer Behavior

January 2025

Faculty of Industrial Design Engineering
Delft University of Technology

TU Delft

Acknowledgements

These are the first paragraphs that will be read when exploring the project, and yet they are the last ones I have written. I have always thought that this type of content should go at the end of the document, along with my reflections, but now I am glad to have them here.

Although it has been an individual project, there are several people who have accompanied me during these months, helping me to move forward. And just as the author is at the beginning of the project, they also deserve to be recognised before the reading starts.

Firstly, I cannot be more grateful to my supervisors. Always attentive, their guidance felt honest and interested, even though sometimes we left the project aside and just talked about how fascinating our topic of research is.

To my friends, in Delft and from afar. Thank you for lending me a hand with the project, or just to distract me when it took up too much space in my head.

To my family, for supporting my decisions and welcoming me with open arms whenever I come home. There is no other place where I recharge my batteries more than at a table filled with my loved ones.

To the one who is already part of the two previous groups, my partner. Thank you for listening to me and giving me your advice, even when I did not know what the problem was, you were there to give me the perspective I needed. You have made being away not seem like a bad thing, but a way to celebrate when we get together.

And finally, to Layla, our always little dog. Thank you for teaching me so many things in your own way, thank you for letting me join you on your walks. I hope I have given you at least half of all that you gave me in the time we were together.

I hope you enjoy the following read and it does not feel heavy. Emotional Durability is a fascinating topic that, although it receives less of the attention it deserves, I am sure many will have an -ah!- moment, resonating with some of the examples or thinking about those products that are of great value to us.

Alfonso

Abstract

This thesis explores the application of Emotional Durability to Personal Audio Devices (PADs), specifically focusing on speakers, with the aim of fostering irreplaceable emotional bonds between owner and product. In response to the environmental challenges posed by excessive and premature e-waste generation, the project combines strategies from emotional product attachment with interaction design to engage users and devices, strengthening their relationship.

Following a user-centered research phase aimed at understanding what made the interaction with analog music players meaningful, as well as how the experience of using modern speakers unfolds, key strategies of Design for Emotional Durability were identified. Two main directions emerges: *self-expression through visualisation* and *participation to elevate the ritual,* which were conceptualised into two proposals through a participatory design approach.

The final concept, LEVELS OF INSTANTS, builds on a real-case model and introduces a serie of interventions aligned with both directions. Through the user's direct involvement, the speaker visually reflects their listening habits, evolving and adapting throughout their journey together. Validation with users demonstrates its potential for implementation, and opens the door to considering the role of hybrid user experiences in cultivating long-lasting attachment with physical devices.

Table of content

1. Introduction 07

1.1 The influence of production on consumer behaviour 08
1.2 Towards a circular economy 10
1.3 Project overview 12

discover

2. Literature review 14

2.1 Sustaining the value of products 15
2.2 Emotional product attachment 16
2.3 Typology of Personal Audio Devices 19
2.4 Reflections among different PADs 21
2.5 Conclusions 27

3. User research 30

3.1 Defining the elements of the user research 31
3.2 RA1 - dicussions with record player owners 36
3.3 RA2 - contextmapping with eco-consumers 40
3.4 Implications for the project 50
3.5 Conclusions 54

define

4. Project focus 56

4.1 Articulating the design directions 57
4.2 Refining the target user 59
4.3 Context of application 61
4.4 Product domain 63

5. Design brief 67

5.1 Design Goal 68
5.2 Interaction Vision 69
5.3 Design Criteria 70

develop

6. Co-creation workshops 72

6.1 Introducing the co-creation sessions 73
6.2 Session activities 74
6.3 Results 76
6.4 Discussion 80
6.5 Design opportunities and challenges 85
6.6 Conclusions 86

7. Concepts development 87

7.1 Introducing the concepts 88
7.2 Concept 1 - FRAMING LEVELS 89
7.3 Concept 2 - LEVELS OF HABITS 99
7.4 Comparing the concepts 109
7.5 Conclusions 112

8. Concepts evaluation 113

8.1 Evaluation methods 114
8.2 Unifying the concepts 119
8.3 Conclusions 122

deliver

9. Final concept 124

9.1 Introduction 126
9.2 Vision & functions 127
9.3 Evaluation review 135
9.4 User validation 137
9.5 Conclusions 144

10. Project discussion 145

10.1 Contribution 146
10.2 Limitations 147
10.3 Recommendations 148
10.4 Personal reflection 149

11. References 150

1

introduction

content

1.1 The influence of production on consumer behaviour 08

1.2 Towards a circular economy 10

1.3 Project overview 12

1.1 The influence of production on consumer behaviour

Industrial production has dramatically increased, reaching levels up to 20 times higher than those at the beginning of the 20th century, as reflected by data from The Federal Reserve (2024). While this signifies social prosperity, the negative impacts have been profound. Environmental degradation, resource depletion, and an unprecedented increase in material waste have placed us in a very critical sustainable crisis (Hou et al., 2020; Guillard et al., 2023).

The increasing affordability of domestic electronic products (DEPs) is 'democratising consumption', making people more inclined to replace them rather than extend the lifespan (Linstead et al., 2003). In addition, competitive markets and constant technological advancements have accustomed us to expect more rich experiences (Maclachlan & Woods, 2013), where society's pursuit of exceptional solutions turns adoration into disdain for items now deemed obsolete (Chapman, 2009). **Devices have evolved from merely fulfilling tasks to offering experiences,** as our demands do in response to what the market can offer.

Nes & Cramer (2005) argue about this trend, noting that products are being replaced while still functional, as our desire for new stimuli seems never to be satisfied. This notion provokes that most people do not consider their belongings as lasting items, but as replaceable means to achieve something. Moreover, it is particularly acute with electronic devices, which have become indispensable yet are often discarded due to their easy replaceability (Cooper, 2004). It is not just discarding the item itself, but all the internal components that conform it (see Figure 1).

Mugge (2017) criticises that consumer durables usually follow a linear "Take, Make, Dispose" journey, which may contribute to a more apathetic relationship with objects. Such an issue presents additional challenges for the environmental and resource management crises we are currently facing (Norman, 2004; Ortiz, 2014).

These consequences highlight the urgent need for sustainable practices and innovations, aimed at reducing such levels. However, it is evidenced that this matter extends beyond mere production; **it is deeply rooted in consumer behaviour** (Chapman, 2009).

Figure 1. Example of all components discarded when disposing a speaker

1.1.1 Perceptions of electronic products

Consumer goods, with their appeal often tied to functional features, are quickly becoming outdated (Mugge, 2017; Van Krieken, 2012). The "technology push" has transformed our perception of **products, which are no longer seen as durables but as consumables** (Cooper & Mayers, 2000). This trend is so pronounced that obsolete electrical/electronic devices, often categorised as e-waste, are the fastest-growing type of waste in the EU (Darby & Obara, 2005).

The lifespan of products have shortened over recent decades, leading people to gradually undermine their potential (Mulet et al., 2022). Even the expected durability of these items is not being met, further diminishing their longevity (Cooper, 2004). This contributes to the current market trend—constant consumption of easily accessible experiences—where sudden satiation accelerates product obsolescence (Hou et al., 2020).

The role of personal audio devices

The Consumer Technology Association illustrates how sound systems are one of the most prevalent consumer technologies in US homes (see Figure 2), yet they are often replaced prematurely (Cooper, 2004). They are especially vulnerable to the aforementioned tendencies, with 60 percent being discarded while still fully functional (Park, 2009). However, personal audio devices (PADs) are not the only consumer electronics contributing to high levels of waste or frequent replacements.

What distinguishes this group from regular DEPs **is the nature of our interaction with them.** PADs can be included in the category of products that operate in the background, serving their purpose without demanding constant intervention (e.g., TVs, washing machines, dishwashers, etc.) Yet, it is notable how sound devices tend to have a shorter lifespan compared to other items in this set (Cooper, 2004), suggesting a unique set of challenges that affect their consumption.

Audio systems seek hedonic pleasure with no need of active involvement, allowing us to focus solely on the content. **This detachment shifts the emphasis from the device to the experience it provides**, reducing it to a mere catalyst. As a consequence, the same service can easily be found in other, potentially superior alternatives. Adding to this their considerable affordability, the perception of PDAs is reinforced as easily replaceable equipment.

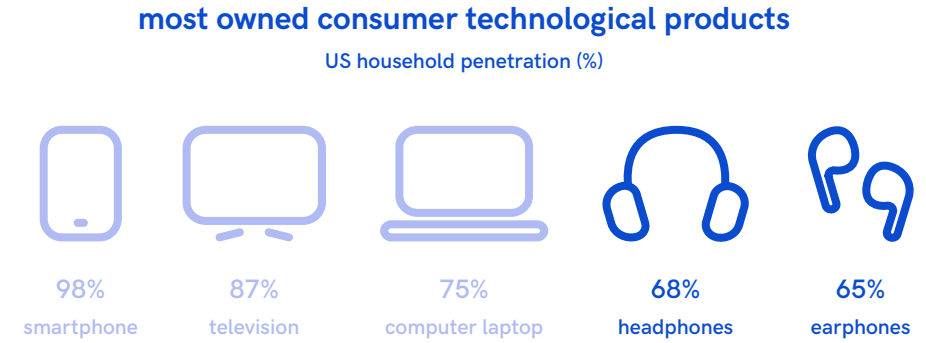


Figure 2. Audio devices have a significant presence (adapted from the CTA, 2023)

1.2 Towards a circular economy

In response to this undeniable crisis, design and manufacturing are aligning their principles in order to manage a more responsible approach to production (Wu et al., 2021). **The circular economy model**, as noted by the Ellen MacArthur Foundation (2013), stands as *"an industrial system that is restorative or regenerative by intention and design"*, aiming at reducing waste by keeping components in flow by closed-loops processes.

The Ellen MacArthur Foundation emphasises **the importance of focusing on the inner circles of the model,** as moving away from the outer ones results in less value being lost in the process (see Figure 3). Therefore, while strategies like recycling, refurbishing, and reusing are necessary, actions still need to be aligned more closely with the first lifecycle, which is directly influenced by the user and their behaviour (Mugge, 2017).

A new approach for designers

Following this notion, designers are adapting their practices with the goal of extending the cycles closest to the consumer, where the product is either maintained or adapted (van Nes & Cramer, 2005; Lobos & Babbitt, 2013). This aims to increase and sustain product longetivity through various means of endurance, with the user playing an active role in the process. Facilitating repair and maintenance is key to making consumers willing to care for their goods with little cost and effort, and we are increasingly seeing initiatives that support this activity such as the *Right to Repair* movement, recently approved in 2024. However, products are often discarded while still functional, showing that designing for durability requires expanding the scope beyond the physical domain, or we risk continuing in this unsustainable spiral—***"is this durable product design, or simply the designing of durable waste?"*** (Chapman, 2009).

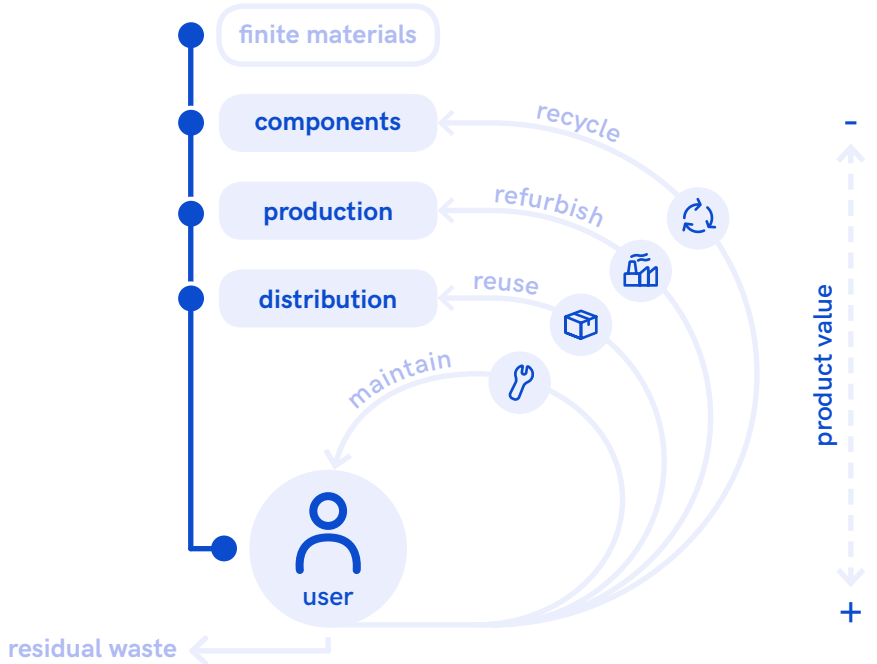


Figure 3. Product value across the thecnical cycles of the Butterfly diagram (adapted from the Ellen MacArthur Foundation, 2013)

1.2.1 The value of Design for Emotional Durability

Obsolescence seems to have shifted from being based on just functional features to more relative aspects (Cooper, 2004). Based on Granberg's (1997) work, the author identifies three conceptual categories that influence the perceived obsolescence of products:

- **Technological obsolescence** (matter)
- **Economic obsolescence** (money)
- **Psychological obsolescence** (mind)

These reasons, often dictating our consumption decisions, are based on extrinsic factors that originate from the user, not the product (Haug, 2019). Therefore, designers should focus on enhancing the person-product relationship. If a person forms an attachment to their item, it gains an additional source of attraction, and thus they are more likely to keep the product and delay its replacement (Mugge, 2017). Stimulating product attachment can then be viewed as another strategy to engage with the innermost circle of the circular economy.

The practice of Design for Emotional Durability stands as an approach of creating products that sustain a long-term connection with their users, by fostering meaningful bonds (Haines-Gadd et al., 2018). This underscores the importance of household goods being not only technically durable but also emotionally lasting (see Figure 4). Such a praxis not only extends the life of the artefact but also supports sustainable consumer behaviour, contributing to a more responsible consumption model.

Figure 4. *"Designed to take on the shape of impact, featuring the marks of a seasoned traveller"* - RIMOWA

1.3 Project overview

The current graduation project addresses the challenge of **enhancing the user experience with personal sound systems**, where the main point of interaction is separated from the device itself. By applying strategies of Design for Emotional Durability, the project aims to explore ways to strengthen the bonds between consumers and their audio equipment, thereby helping to reduce premature disposal. As outlined in the Project Brief (Appendix I), the main goal consists of:

> *Design a product interaction experience to develop irreplaceable emotional attachments between users and their personal audio devices.*

To achieve this, the project will employ a design-driven research approach, guided by the Double Diamond model (see figure 5). The first diamond will begin with an in-depth exploration of existing literature on emotional durability, product attachment, and the phenomenology surrounding audio devices. A qualitative user research will follow to uncover insights into how these factors affect the perception and interaction with PADs. During the second diamond, design interventions will be ideated, prototyped, and iteratively refined through a participatory design approach.

Working with actual users will significantly enrich the process, as well as facilitating the validation of the proposals achieved during the development of the project.

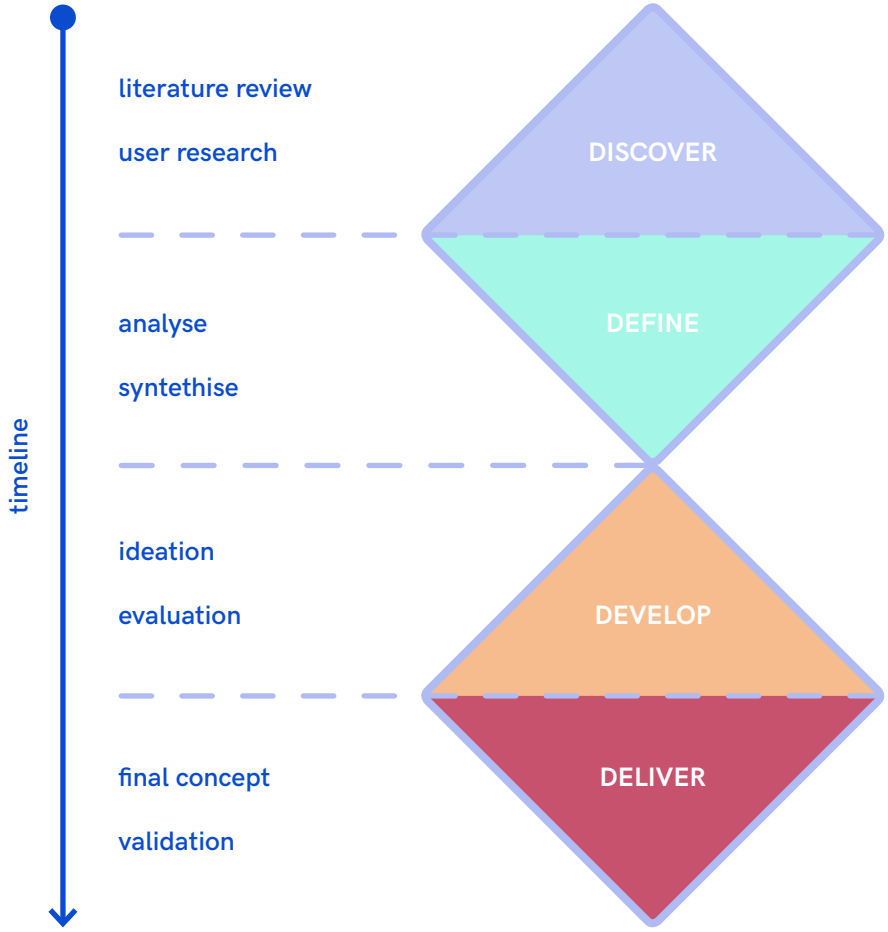


Figure 5. Graduation project planning

dis-cover

phase 1

This phase is about gathering insights, understanding the user-product space, and identifying promising opportunities. It involves extensive research, user analysis, and data collection to outline the context and needs. The phase will conclude with the key aspects of the interaction experience and potential direction(s) to explore.

2 literature review

content

2.1 Sustaining the value of products 15
2.2 Emotional product attachment 16
2.3 Typology of Personal Audio Devices 19
2.4 Reflections among different PADs 21
2.5 Conclusions 27

2.1 Sustaining the value of products

Designing for product lifetime extension is recognised as a key strategy for promoting sustainable production and consumption (Nes & Cramer, 2005). Consumers play a pivotal role in this process, as **the value of the device changes through the various use stages** and thus affecting our interaction with it (Mugge, 2017; Haug, 2019; Shi et al., 2021).

Zeithaml (1988) defines perceived value as *"the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given"*, and this statement highlights the core of our present issue. Currently, we are devaluing this relative worth, discouraging proper usage behaviour and therefore wasting potential durable solutions (Hou et al., 2020). This weakening complicates efforts to promote design for longevity, as changing consumer perceptions directly impact retention and usage behaviour (Haase & Sand, 2022).

Product perceived value, closely linked to relative obsolescence, can be divided into functional, social, and emotional dimensions (Sweeney & Soutar, 2001; Shi et al., 2021). These aspects shift from performance-based to more external and personal reasons, affecting our *'mental book value'* (Okada, 2001). Consequently, not only functional factors but also the broader societal and cultural contexts significantly influence our "throwaway culture," where **the actual lifespan of a product is determined by user decisions** rather than being a fixed design criterion (van Nes & Cramer, 2005).

Interestingly, such notions also play a critical role in influencing the psychological durability of products, as we can find them distributed across three interwoven categories introduced by Mimouni-Chaabane & Volle's (2010), as illustrated in Figure 6.

This interplay between factors reveals a duality: the attributes that contribute to a long-lasting interaction experience are also those people use to depreciate the product's value (Haug, 2019).

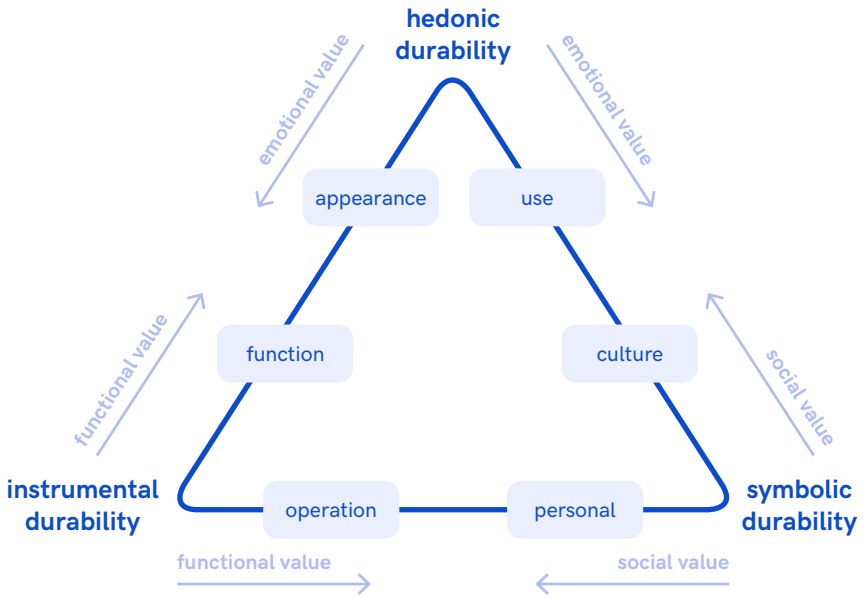


Figure 6. Correlation between psychological durability and perceived value (adapted from Mimouni-Chaabane & Volle, 2010; Haug, 2019)

2.2 Emotional product attachment

Product life extension can thus be seen as a combination of emotional attachment and technological adaptability (Lobos & Babbitt, 2013). In other words, consumers must feel a positive connection to their belongings to promote longevity and preserve their value.

Emotional durable design (EDD) is an emotion-driven consumption practice that **explores strategies for proposing products which sustain long-lasting and meaningful experiences** (Chapman, 2009, Haines-Gadd et al, 2018). Mugge (2017) highlights that devices offering benefits beyond their functional purpose often hold special significance for their owners. This distinctiveness enhances the item's value, motivating people to preserve it and therefore extend its lifecycle.

However, a key aspect of our current relationship with consumer devices is the dichotomy between the product itself and the services it offers (Giaccardi & Redström, 2019). In an increasingly digital era, it is common to find alternatives that conceptually separate these components: AR goggles from the metaverse, e-books from countless libraries, and of course, smart assistants, with which we interact through an 'invisible' agent (see Figure 7). Therefore, what motivation do people have to care for and maintain the physical product if the emotional connection can be transferred from one product to another?[1]

[1]It should be noted that this is not a call to technophobia or a boycott of the digital. Authors like Coşkun et al. (2022) have reflected on the great benefits of human-agent collaborations for our future.

The challenge then becomes to initiate and maintain an emotional bonding that is deeply intertwined with the product itself, in such a way that the device becomes unique and irreplaceable (Mugge, 2017). Building on the definition of product attachment by Schifferstein & Zwartkruis-Pelgrim (2008), the following nuance is added:

> *the strength of the emotional bond a consumer experiences with a (physical) durable product.*

Figure 7. Intangibility is resulting in products being relegated to the background

Several authors have delved into the phenomenology of product durability through diverse lenses, outlining the strategies that may contribute to its achievement. The following list, adapted from Wu et al. (2021), collects some examples of their work and contributions to sustainable practices, aiming at improving the conception of products:

Among all of them, it would be interesting to consider especially those that elevate the interaction between the item and the owner, facilitating the generation of an emotional reaction either in the short or long term. These strategies may positively nourish the perception of the product, strengthening their emotional bonding.

Figure 8. Theories on sustainable design (adapted from Wu et al., 2021)

THEORY	STRATEGIES
Sustainable Product Design	Repair and maintenance; Upgradability; Variability; Robustness; Reliability; Efficiency; Refurbished; Appearance; Material selection; Personalisation; Customisation; Product attachment; User experience; Flexible design
Emotionally Durable Design (EDD)	Surface; Enchantment; Attachment; Detachment; Consciousness; Narrative; Involvement; Rewarding; Animacy; Adapt to the user's identity; Evoke memories; Imagination; Integrity; Materiality; Evolvability; Conversations; Identity; Relationships
Product Attachment	Enjoyment for oneself and with others; Memories; Pleasure; Self-expression; Group affiliation; Experiencing physical contact; Individual's value and ideology; Aficionado-appeal; Rarity; Reliability; Usability; Adaptability
Product Metaphor, Symbolic Meaning & Slow Design	Reveal; Expand; Evolve; Participate; Reflect; Engage; Ritual; Pleasure; Intimacy; Aspiration; Self-image; Memory; Belonging; Environmental mastery; Autonomy; Self-acceptance; Personal growth; Positive relations with others; Purpose in life; Significant memories and associations; Increasing sensory variety; Aging well; Maintenance quality; Exclusivity; Pre-purchase personalisation; Making social connections

2.2.1 Emotional design across the processing levels

As the proposed strategies involve interventions that influence the areas of psychological value, it seems reasonable to consider them according to the different dimensions of the emotional experience within a product. Building upon Norman's distinction of the processing levels—namely visceral, behavioural, and reflective[2]—Wu et al. (2021) distributed the strategies introduced in the previous page across these three categories, under the design toolbox of emotionally sustainable design (ESD) (see Figure 9 & Appendix II). **Considering the emotional side at every level of product interaction can lead to a more meaningful user experience** (Norman, 2004).

It is considered that the reflective level is the one that may draw special value to the product the most, as it focuses on aspects of the interaction experience that go beyond its industrial purpose. However, visceral and behavioural strategies should not yet be disregarded, as these are essential aspects of the interaction experience (Van de Berge et al., 2020). The next task will involve identifying which principles are most promising for the present project on PDAs.

As Orth et al. (2018) argue that no single product will hold the same emotional value for all intended users, it is reasonable to assume that, eventually, focusing on a specific product category will be needed, in order to tailor a personalised experience effectively.

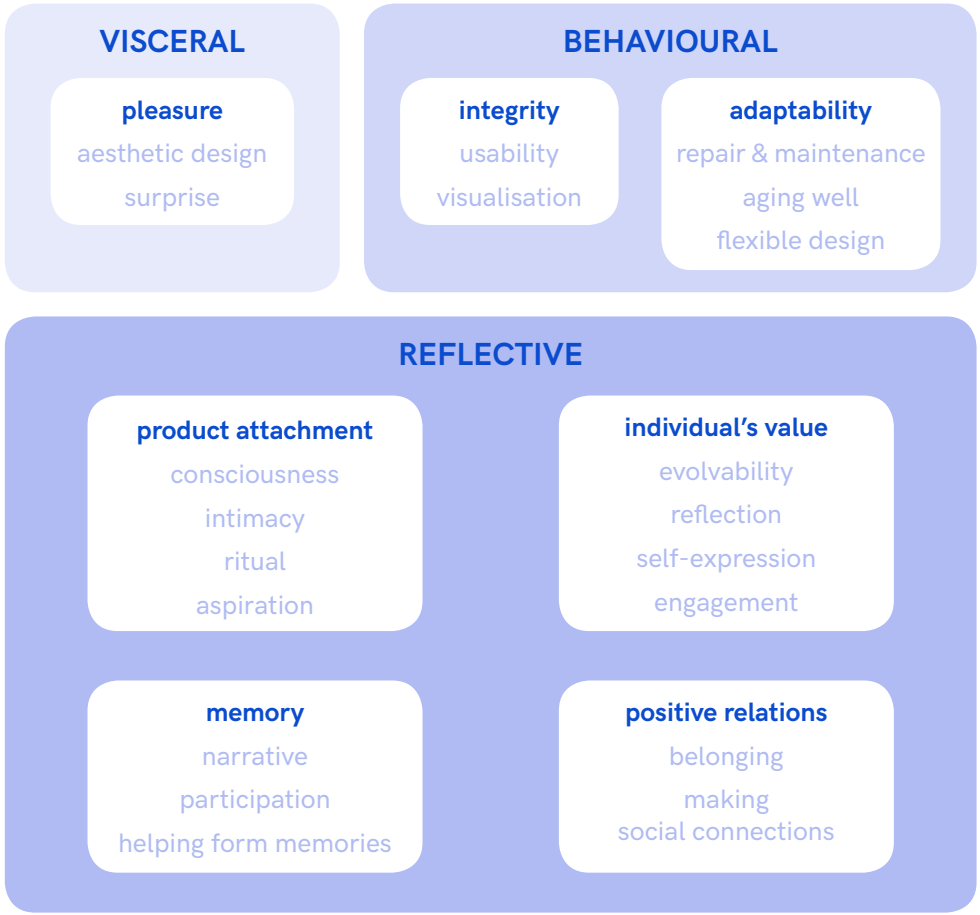


Figure 9. Design strategies across the three processing levels (adapted from Wu et al., 2021)

[2] *"Visceral design concerns itself with appearances. […] Behavioral design has to do with the pleasure and effectiveness of use. […] Finally, reflective design considers the rationalization and intellectualization of a product"* (Norman, 2004, p.5).

2.3 Typology of Personal Audio Devices

According to the European standard EN 50332-1 (CENELEC, 2013) and the European directive RED 2014/53/EU (European Parlament and Council of the European Union, 2014), audio devices can be considered as those equipment that present the following characteristics:

- Includes an audio-content system.
- Includes a body that reproduces the content.
- The device is intended for ordinary use (no work/health purposes).

Under these conditions, an additional criterion is added: the device **must have audio-casting as its primary function.** This notion excludes multifunctional products, as the other purposes could blur the key nuances of the interaction with pure PADs, potentially complicating the development of this project.

Although '*personal audio devices*' is not the term officially used by the EU, it has been chosen to refer to the two main categories of products that meet such characteristics:

- **Portable audio devices:** earphones, headphones, and similar items which can be body-worn (EN 50332-1).
- **Radio equipment:** radios, speakers, and similar items which can be portable or stationary (RED 2014/53/EU).

Figure 10. Portable and radio devices from the B&O catalog

2.3.1 Understanding the user experience

Following the classification of product types by Mugge et al. (2017), PADs are primarily characterised by their entertainment purpose **(hedonic)** and their susceptibility to constant technological advancements **(dynamic).** This combination makes them particularly prone to becoming outdated. As a consequence, it may lead to a consumption spiral where products in this scenario are replaced mainly when the owner deems it the right time to upgrade to a superior version (Heidenreich et al., 2022).

In this case, **the emphasis on hedonic and instrumental aspects often overlooks the symbolic dimension of PADs**, which forms the third corner of the psychological value triangle (Haug, 2019 - see Figure 11). While visceral and behavioural factors can foster attachment, they only address the experience at the moment of the interaction; it is the reflective level (where the symbolic value lies) that extends over time, ultimately contributing to emotional attachment (Norman, 2004).

Take-away: It would then be interesting to allow users developing their own emotional meaning towards the product through the interaction experience itself, where the instrumental and hedonic domains would align to enhance the encounter. This approach would make the product attachment unique and, therefore, extend its value over time and use.

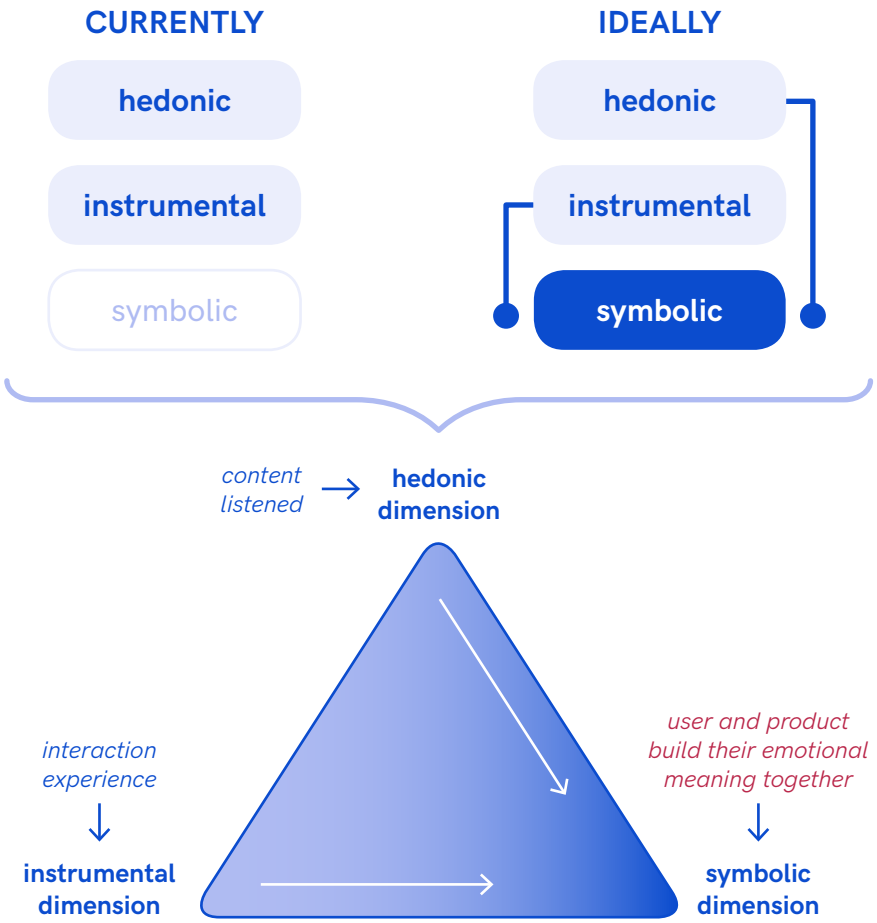


Figure 11. Current vs ideal nature of the interacion experience with PADs

[3] *This phenomenon, known as **consumer "leapfrogging" behaviour**, describes how users choose to postpone upgrading, waiting for significant technological improvements before making a new purchase (Heidenreich et al., 2022).*

2.4 Reflections among different PADs

In the present section, we will explore different types of relationships with PADs through personal examples. Although these devices share similar functional goals, **the experience varies significantly depending on the purpose and the context** in which they intervine. Thus, these reflections may render some insights into what notions contribute (or not) to emotional bonding. The cases are divided as follows in Figure 12, touching upon different PAD types as well as levels of irreplaceability[4].

This activity combines personal experiences with theoretical concepts, highlighting the nuances most relevant to shaping the present study. Finally, a substantial comparison with mobile phones will be presented, identifying the similarities and/or differences between the single-purposed PAD and one of the most well-known multi-purposed devices of the current era, yet disposed at an alarmingly premature rate (Makov & Fitzpatrick, 2021; Prabhu N & Majhi, 2022).

Figure 12. 3 product cases, 3 different interaction experiences

[4] ***The hierarchy of irreplaceability*** *(Mugge et al., 2008) is a conceptual framework that categorises products based on how difficult they are to replace, therefore influencing the degree of attachment in a user's life.*

2.4.1 Three personal case studies

case 1 - shared speaker

It is hard for me to remember if I have ever actually bought a speaker, even though it is a device I use almost daily (see Figure 14.1). We have a couple of them at home, which my siblings and I share constantly. I took one with me when I moved abroad, but I never bring it back as I know I can use another one there. This is due to my dynamics with speakers; I use them in specific routines, but the performance I expect from them is so general that any other device could fulfill that role. Mugge (2017) refers to this as ***"general product features"*** on the hierarchy of irreplaceability; they are easy to replace because many alternatives offer the same value. Additionally, since I can control them from my smartphone, I physically interact with them very little, with portability being the only technical requirement I ask for.

However, this last point also connects to an interesting aspect of my relationship with them: their social role in my life. Speakers allow me to enjoy music also when I am with others, and I have several anecdotes with beloved ones where a certain speaker was present. I also associate specific models with people; given that each design and start-up melody is so distinct, I tend to match the person with the product when I see them using it on a particular occasion.

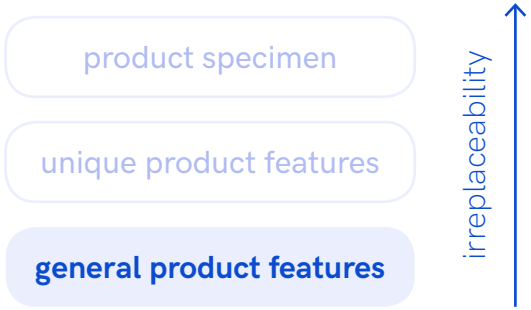


Figure 13.1. Case 1 placement in the hierarchy of product attachment (adapted from Mugge et al., 2008)

Figure 13. Product described during case 1 (ULTIMATE EARS WONDERBOOM)

case 2 - personal earphones

I have been using my current earphones for almost three years now (see Figure 14.2). Even though they are as good as the competitors' models, I chose them for some particular reasons; their aesthetics match my personal style, some specific features are a must for me, and they belong to a brand which I am very loyal to in terms of products ecosystem. This combination would make their replacement a considerable challenge, even a struggle for me, as not many devices meet all the conditions. Mugge (2017) includes these examples in the category of ***"unique product features"***; only those that present similar circumstances can eventually provide me with the same value.

Over the years, I have developed a certain attachment to them as they accompany me in almost all my individual activities (i.e. studying, cooking, traveling), making these tasks more enjoyable due to their quality and user-friendly interface. However, they are so integrated into my daily life that I cannot attach specific memories or events to them. More often, I recall the frustration and disappointment I felt when they unexpectedly run out of battery or when I forget them at home, making my day a bit more complicated as I have developed somewhat technological dependency on them.

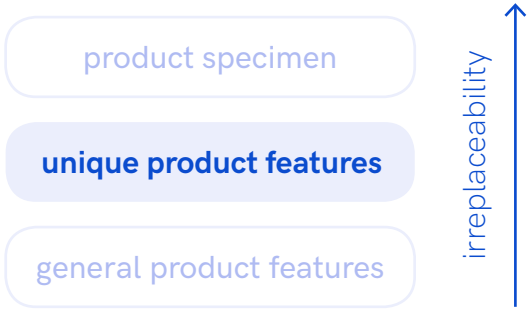


Figure 13.2. Case 2 placement in the hierarchy of product attachment (adapted from Mugge et al., 2008)

Figure 14. Product described during case 2 (Xiaomi Buds 3)

case 3 - my father's radio

I have spent my whole life watching my father use his radio, especially during his morning routine (see Figure 14.3). Recently, I asked him about the device, and he told me that my grandfather gave it to him when he no longer wanted it. That was almost 30 years ago, and he has been using it daily for nearly half of that time. I remember my father once left it at a relative's house after a trip, and during the following mornings, he seemed a bit lost, grumpy. *"It's not the same,"* —he would say when I suggested using his phone— *"I've gotten used to its simplicity, to carry it with me around the house while making breakfast."*

When he talks about the radio, he mostly mentions its technical aspects: easy tuning, reliable quality from its generation, batteries that last over six months, etc. But it is clear that even though other models share these features, he still prefers his—the one his father gave to him. Mugge (2017) would classify this as a ***"product specimen"*** case; even an identical product would not hold the same value for him. Once, he was even gifted a new, supposedly better, radio that he really liked. However, instead of replacing the old one, he now uses both depending on where or what he is doing, as he does not want to lose the original one.

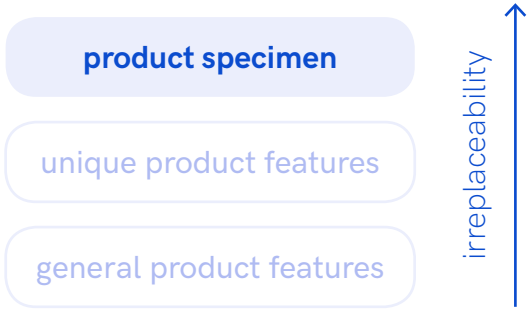


Figure 13.3. Case 3 placement in the hierarchy of product attachment (adapted from Mugge et al., 2008)

Figure 15. Product described during case 3 (SONY 2BAND RADIO ICF-390)

2.4.2 Key aspects for the project

This last example presented—**the product specimen—is the ideal case that may foster an irreplaceable long-lasting bonding with the device** and, therefore, the goal to be achieved in the present project. However, in most situations it is the user who elevates the product to such a category for unpredictable reasons, making designing for this a very challenging task. Yet, it is still possible to facilitate its development. As Hassenzahl (2004) states, **designers "can create possibilities but they cannot create certainties"** (p. 47).

The present section will highlight those aspects gathered from the previous three cases that could contribute to the future of the project.

Implications for self-identity

We develop attachment to products as they contribute to the conception of ourselves, as Orth et al. (2018) discuss in their review of various authors' work. Similar to these lines, Gover and Mugge (2004) argue that we tend to prefer adquiring those products that align closely with our personality. As Belk (1988) highlights: **"people seek, express, confirm, and ascertain a sense of being through what they have."**

The earphones are a good example; since so many people own and use them in public, they present a good opportunity to showcase personal preferences. One of the determining factors in my choice of earphones was their aesthetic appeal, which matches my design style.

take-away: allowing users to embed aspects of themselves into a product not only contributes to social distinction but also reinforces personal identity, enhancing the item's perceived value. It is worth noting that self-expression was identified as a strategy to infuse emotional meaning into the device.

The importance of tangibility

Physical contact is a fundamental aspect when establishing relationships, both with people and objects (Desmet & Fokkinga, 2020; Tejada et al., 2020). In a digital era where we consume more and more non-tangible experiences, the challenge of bonding with everyday goods seems even greater.

Opposite to earphones and radios, speakers are products with relatively low physical interaction. Moreover, thanks to the connectivity and the Internet of Things (IoT), people can enjoy its service even without noticing the speaker.

Take-away: redesign the interaction to focus more attention on the object, not just the listening experience, could foster more meaningful encounters with the PAD. Bringing the person closer to the product can unfold and feed other dimensions of the encounter that only occur during first-hand participation (Norman, 2013; Desmet & Hekkert, 2007).

Time as a bond stretcher

One aspect that has been consistent across all cases is the perception of the devices over time ,and the memories associated with them. T**he longer the user spends with the device, the greater the opportunity to create meaningful experiences.** This reinforces the idea that long-lasting items are more likely to form strong bonds with their owners, particularly when they are used regularly (Mulet et al., 2022).

The speaker example demonstrated a greater ability to evoke memories, as it was used during specific moments, often involving others.

Take-away: facilitating the formation of memories through presents then an interesting strategy for the project, where the factor of time would benefit the product's value due to the sentimental load it portrays.

Consequences of irreplaceability

Ideally, the user will develop such a strong emotional attachment that the product becomes irreplaceable. However, when this happens, it can lead to overprotective behaviours aimed at preserving it for as long as possible (Kowalski & Yoon, 2022). This may result in the product being underused to prevent deterioration, or replaced by others that serve the same function while the original enters a "hibernation" phase after its life cycle ends (Shi et al., 2022). One alternative could be designing products to remain an appealing proposal for constant use.

Authors like van Nes & Cramer (2005) suggest using the term lifetime "optimisation" rather than "extension", arguing that merely extending a product's lifespan does not necessarily result in environmental benefits.

This can be seen in the case of the radio, where several products with the same purpose coexist, as the original one makes its disposal difficult.

Take-away: the product should offer reasons for its retention as well as for using it, thereby optimising its lifespan instead of merely extending it.

Challenges for emotional bonding with smartphones

Even though smartphones share similar contexts and goals with PADs, it is difficult to consider them as candidates for close user-product bonding. Beyond the current trend of smartphones overconsumption (Prabhu N & Majhi, 2022), certain aspects of their user experience may be hindering emotional attachment.

One key factor may be their multifunctionality. Research has shown that most products that are preserved are single-purpose items (Becker et al., 2022). Additionally, the fact that smartphones accompany us for all situations may diminish their uniqueness, as we do not attribute to them a representative role. Furthermore, their minimalist design leaves little room for personalisation, making the product feel neither special nor distinctive. All these factors may challenge creating an empathetic relationship with them, often leading to premature disposal.

2.5 Conclusions

This literature review has explored the complex notions behind emotional durability and product attachment, particularly within the context of PADs. These notions make it possible to outline the key aspects for the following stages of the project, with the goal of identifying a favourable direction for designing emotionally durable audio devices.

2.5.1 Choosing a PAD category

Given that modern consumer behaviour is constantly evolving, the next step requires analysing the current user and the dynamics around their experience with PADs. It would be advisable then to identify which PAD category holds the most promise for developing a practical case for emotional attachment.

Furthermore, several authors have discussed how **not all items are suitable for developing attachment**, and that it is unlikely to form emotional bonds with all of our possessions (Cooper, 2005; van Nes et al., 2005). This suggests that design should consider each product category in its context of use, in order to implement the interventions that best adapt to its phenomenology.

Therefore, this section advocates for which of the previously introduced PAD categories aligns best with the project's objectives, arguing based on the information gathered from theory and the case examples discussed.

Radio equipment over portable devices

Previously, it was discussed how products frequently exposed to the user's daily life may lead to dependency rather than selfless attachment. This is especially the case with commonly called wearable devices, that literally accompany the user throughout their activities. In contrast, the more situational usage of stationary equipment works in their favour for this case, where **their more occasional use can confer a greater distinction in the user's routine.**

Moreover, while portable PADs are devices that are often adapted to communicate personal tastes due to their frequent display to others (e.g., customisation, personalisation), radio equipment naturally allows for use in social contexts, offering an opportunity to also exploit the line of self-expression. Additionally, their bigger size provides a greater design flexibility, creating a richer ground for exploring alternatives. These notions make radio devices a more compelling option than "wearables" for the present project (see Figure 16).

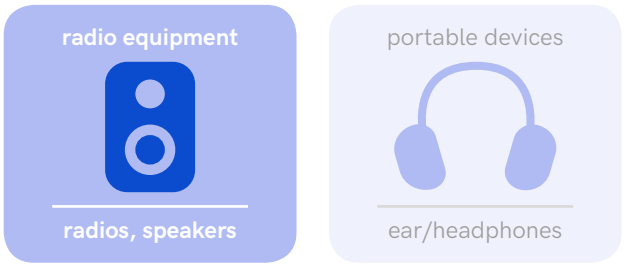


Figure 16. Selection of radio devices over "wearables"

These reasons primarily support a focus on radio equipment over portable PADs, in the context of fostering emotional attachment.

Speakers over radios

While both play audio similarly, radios have become more limited devices by only broadcasting over frequencies, whereas modern speakers and many other products offer more formats. This illustrates a clear example of products outpaced by technological advancements, though radio programs still hold cultural significance.

Although radios were once promising products for fostering emotional attachment, the target demographic of this study belongs to a generation where radio consumption was not popular anymore (later discussed on section 3.1.1 - Target Profile). This limits the likelihood of users who have already developed strong emotional bonds over time. In contrast, **speakers are more present in modern society, where their versatility for both individual and group enjoyment presents compelling aspects to consider in this project** (see Figure 17)**.**

Figure 17. Speakers may be promising candidates for emotional attachment

2.5.2 The strategy to apply

On page 18, various topics and strategies for sustainable design were presented, highlighting the reflective level as the most relevant for this project. However, it later became evident that PADs primarily underscore their instrumental and hedonic value (see page 20), leaving the symbolic dimension in the background.

Therefore, it is proposed to reconsider the distribution by not only prioritising the reflective area, but also enhancing it through the visceral and behavioural levels (hedonic and instrumental). Figure 18.1 illustrates this reorganisation of concepts. This will allow both user and product to develop their own value together, foster a unique bond. To determine which strategies are most relevant, a user research study will follow, focusing on the corresponding category of PADs.

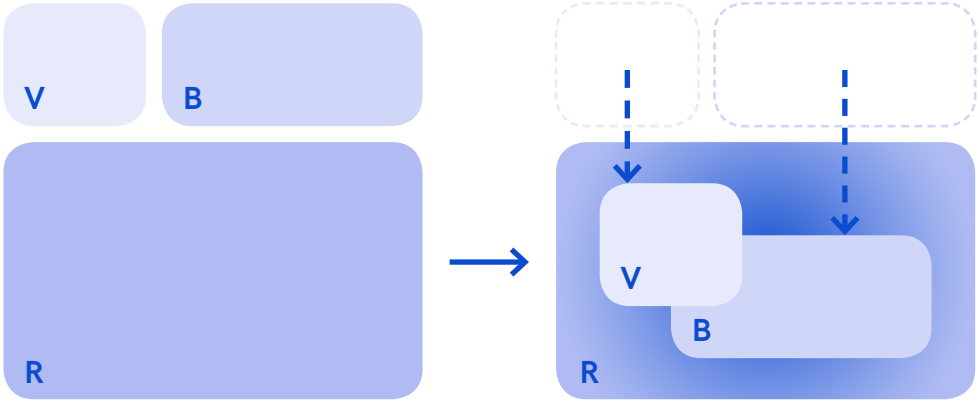


Figure 18.1. The visceral and behavioral levels as catalysts for the reflective level

2.5.3 Main takeaways

Figure 18.2 gathers the most relevant insights from this chapter on Literature Review, serving as an overview for the remainder phases of the present thesis.

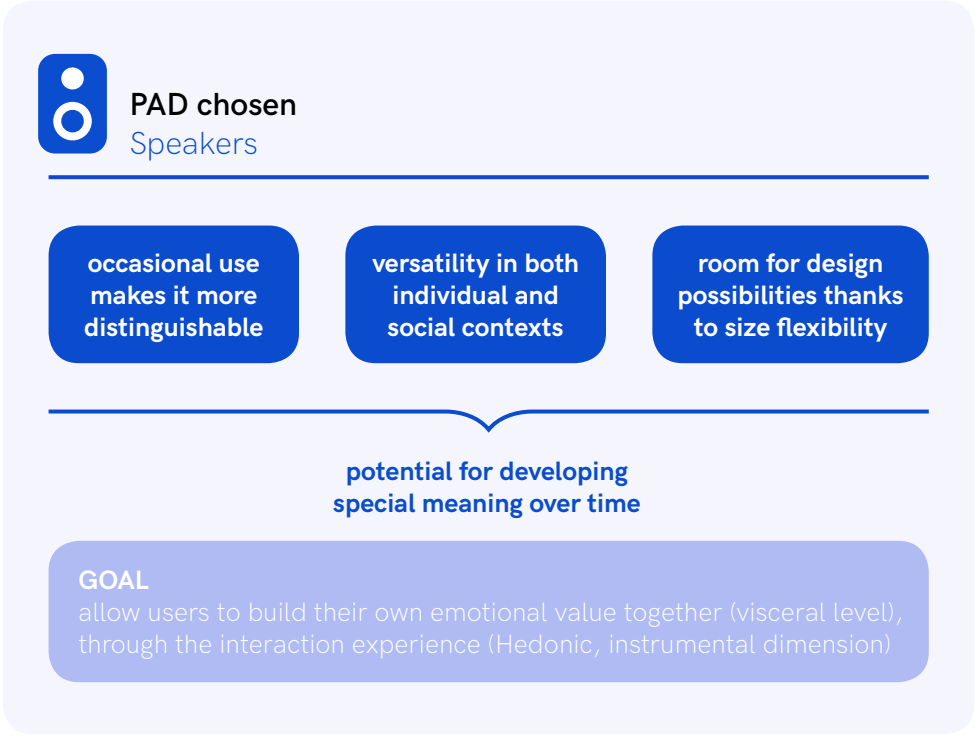


Figure 18.2. Main insights from the Literature Review chapter

3 user research

content

3.1 Defining the elements of the user research 31
3.2 RA1 - dicussions with record player owners 36
3.3 RA2 - contextmapping with eco-consumers 40
3.4 Implications for the project 50
3.5 Conclusions 54

3.1 Defining the elements of the user research

Previously, speakers were considered as the promising candidates for designing for emotional durability, given their particular usage experience. Understanding the interaction and users' perceptions of them can provide valuable insights for the development of this project (see Figure 19). Therefore, this chapter aims to gather information about the type of relationship that exists between users and their PADs, through a user-centered research approach where owners will share their perspectives via research activities.

The present section introduces the components required to successfully conduct this research phase. It covers everything from the selection of participants and the activities they will undertake, to the methods for processing the gathered information and its relevance to the project.

Figure 19. Studying the user will provide feedback on their interaction experience that would otherwise have gone unnoticed

3.1.1 Target Profile

In all communication, considering the recipient as the starting point optimises how we prepare and transmit the message. Thus, defining the target user is the first step in designing efficiently, as each segment has unique characteristics that shape their interaction experience.

Eco-consumerist users

According to Guillard et al. (2023), eco-consumers are a type of users characterised by:

- **A love for novelty.**
- **Products are important to them.**
- **Major concern for environmental impact.**
- **Care for others' opinions.**

This category is particularly interesting because, in their study of household devices, it was evidenced that these users are the most likely to replace their items in the shortest period once they deem them obsolete. Eco-consumers also seem to be among the most active market segments, as their high levels of materialism could lead to a considerably high consumption rate.

To effectively identify potential users within this demographic, the age range has been narrowed to those between 18 and 35 years. While reaching 18 implies a social transition to adult life, which brings greater responsibilities that can reflect on how products are consumed, the 35-year threshold is motivated by Cooper's work (2004), which highlights that users under this age tend to be more dissatisfied with the lifespan of their devices (see Figure 20). This, therefore, presents an opportunity to meet their demands by proposing a speaker that can motivate their retention in the long term, thus extending its lifetime.

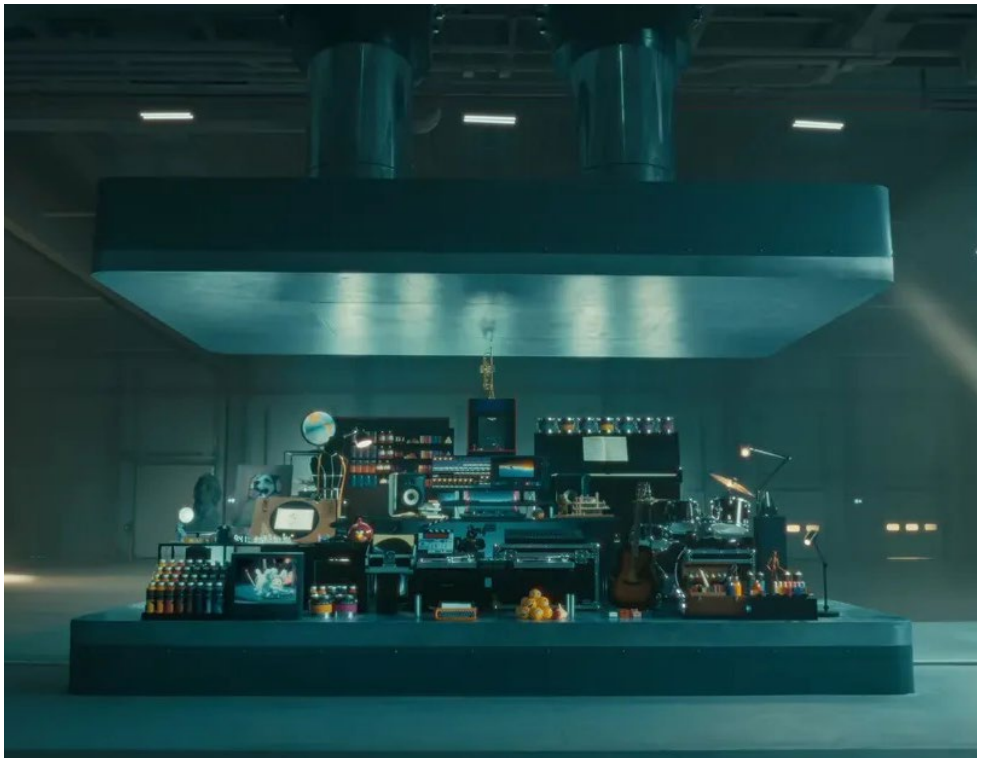


Figure 20. Example of social dissatisfaction: campaign showing crushed products to highlight technical versatility, wich was not well-received by the community

3.1.2 Research goals

To structure the user research activities accordingly, it is crucial to understand the specific aspects aimed to uncover during the process. For this purpose, several research questions (RQs) have been articulated to guide both the preparation and the execution of the sessions.

These questions will help focus the research on meaningful areas that can directly influence design decisions and the future product development, ensuring that each session is productive and aligned with the overall goals. Figure 21 presents the RQs and their intentions.

RESEARCH QUESTIONS	RESEARCH PURPOSES
RQ1. What is the context of use with speakers?	*Aim to understand the scenario in which the experience happens*
RQ2. Which strategies from the literature are currently evident in the relationship between user and speaker?	*Identify the concepts that define the user-product interaction*
RQ3. What is the current perception of speakers among their owners regarding their level of irreplaceability?	*Outline the degree of attachment towards the product itself*
RQ4. Which strategies from the literature are most promising for establishing an emotional attachment between user and speaker?	*Envision the most favourable directions for emotional durability*

Figure 21. Research questions and their respective research purpose

3.1.3 Research activities

Previously, the audio speaker was established as the case study for this project. However, understanding the relationship with products that are more likely to generate emotional attachment would be a very insightful addition, as it is the case of record player enthusiasts (see Figure 22).

Thus, **two research activities (RAs) have been considered.** Each of them focuses on a specific PAD, with the objective of comparing the results from both to draw further conclusions. Figure 23 summarises the RAs and their research purposes.

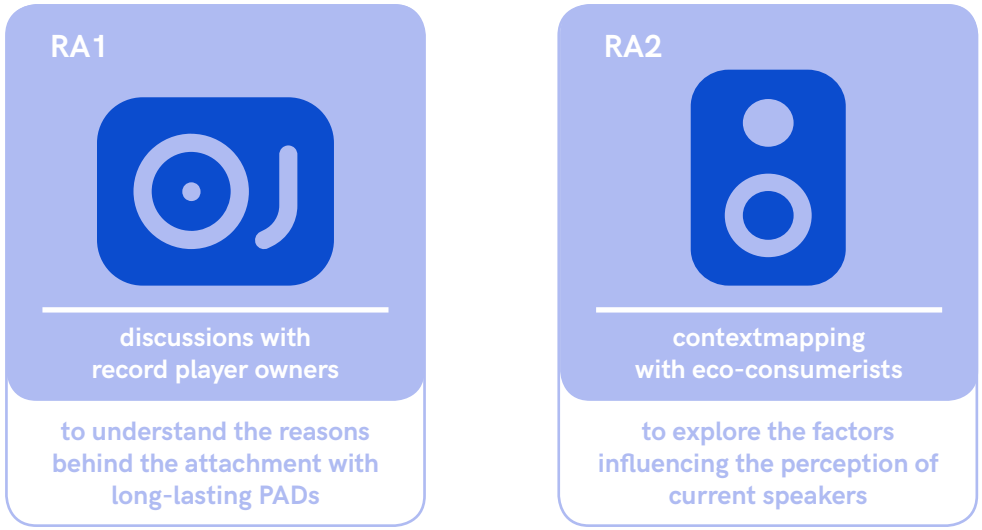


Figure 22. Research activities and their purposes for the project

Figure 23. Picture taken during the research phase, showing different models of audio devices

3.1.4 Analysis planning

Figure 24 provides an overview of how the data will be extracted and analysed in both research activities. Each RA will conclude with the generation of content that captures the main insights from the sessions. Furthermore, they will be audio-recorded to enrich the outcomes, as some aspects shared during the exercises might not be captured in the deliverables, potentially losing valuable information.

The data will then be organised in Excel tables and later expanded with those concepts not presented in the deliverables but captured through the audio, providing a complete picture of the results achieved.

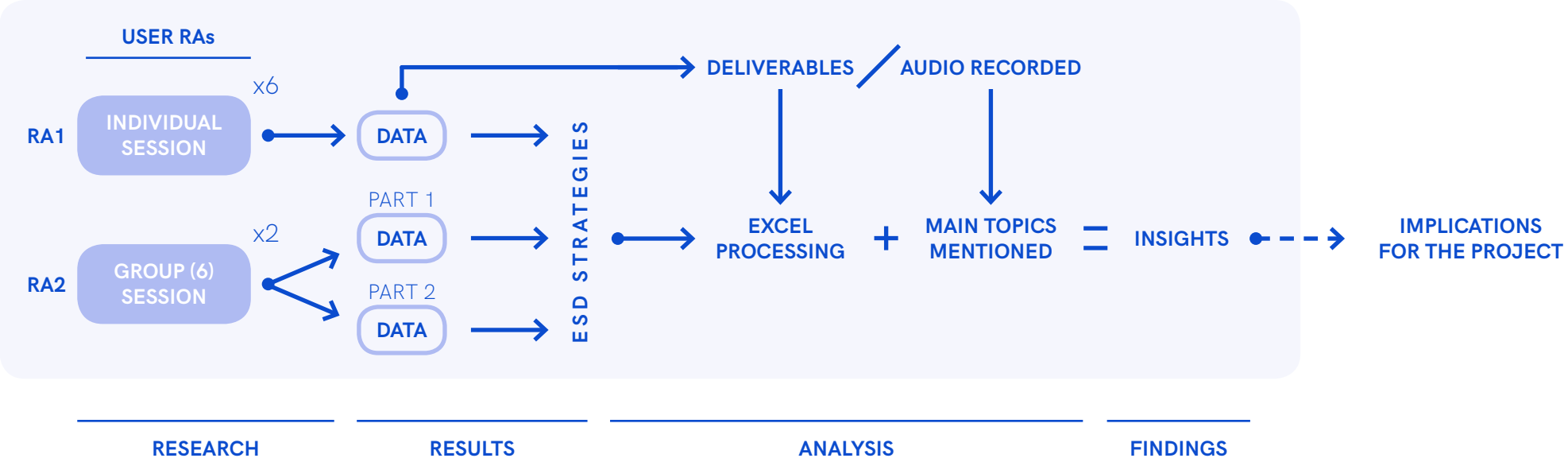


Figure 24. Data analysis planning for the research activities

3.2 RA1 - discussions with record player owners

Record players, despite technological advances greatly optimising audio reproduction since their introduction, **continue to maintain a presence in modern society.** In fact, they have experienced a resurgence in recent decades due to the popular movement of "vintage revival", being considered as niche products now.

It is well-known that record players often hold considerable emotional value, with nostalgia playing a significant role. Therefore, they are an ideal candidate for the present study, as understanding the interaction experience with a product prone to establishing emotional bonding could identify aspects to be applied to modern audio speakers.

Participants

For this activity, **six respondents (Rs) were interviewed.** Participants were selected through the corresponding researcher's network and by visiting specialised audio equipment centers. In the former case, the interview took place in an environment familiar to the volunteer (e.g., home, university), while in the latter, owners and employees of these stores were interviewed in their workplace.

Although the main requirement was that they owned a record player, an effort was made to balance the number of long-term users with those who had recently acquired one, in order to consider different attachment levels. Figure 25 shows the distribution of respondents.

Respondent	years of use
R1	±12
R4	±10
R5	±45
	EXPERT USERS

Respondent	years of use
R2	±3
R3	±5
R6	±40
	CASUAL USERS

Figure 25. Respondents codes and their time of usage, as well as their expertise

Development of the sessions

Sessions consist of two parts; an initial casual conversation addressing key aspects to trigger discussion, followed by a final activity to map out the particular characteristics of their record players. The first part aims to gradually explore the most significant aspects of the usage experience, encouraging respondents to reflect on their emotional journey with the product. For the second part, the ESD Toolbox will be used to identify those valuable attributes presented in the person-product encounter.

As expected, **respondents' perception of their record player is quite positive,** with comments improving among those who have been using it for more than a decade. Although the "expert users" handle technical aspects much better than the "casual users", both groups agree that using the device and their collection of records give them a value not possible to achieve through the digital.

3.2.1 Results

Since the conversations aimed to discuss the theme of emotional attachment rather than eliciting close-ended answers, here are presented general aspects mentioned by several of the respondents:

All six participants confirm that the record player offers a distinct listening experience not found in other audio devices, **emphasising its use in scenarios driven by personal moods and rituals rather than just functional needs.** Those with over ten years of experience with their devices (R1, R4, R5, R6) have developed deep emotional connections to their record players, which consistently trigger cherished memories. Furthermore, veteran users view aspects of the process that extend beyond listening—such as setup and maintenance—as integral and positive, contrasting with some newer users (R2, R3), who find these factors demanding and problematic.

Additionally, the **record collection itself is a central part of the interaction** for many users (R2, R3, R5, R6), fostering a strong attachment to these items. This connection is so profound that half of the participants see their record players and collection as irreplaceable. The underlying reasons range from personal ties, such as gifts from loved ones and nostalgic memories (R1, R6), to the distinctive sound qualities that develop through wear and tear (R4), highlighting a unique and evolving nature of their auditory experience.

Figure 26 illustrates the distribution of the results across the processing levels, and Appendix III presents the original template to be fulfilled.

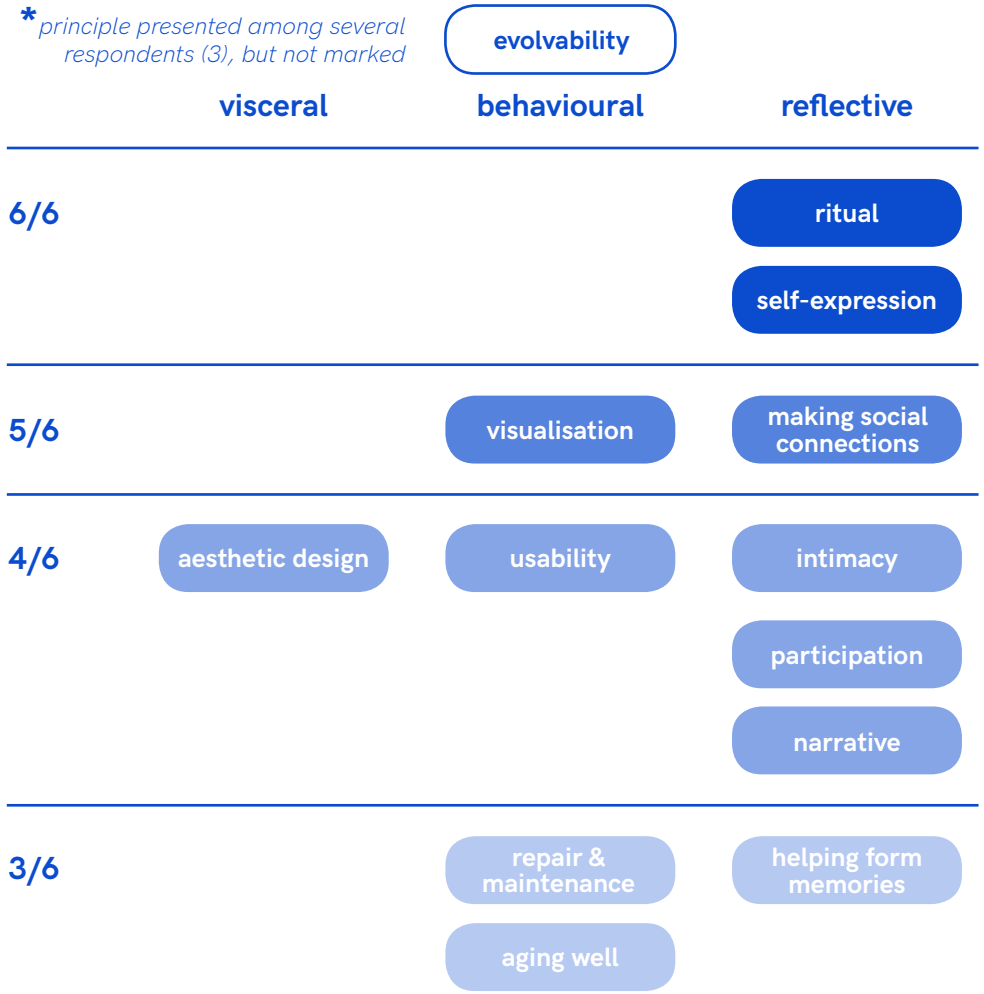


Figure 26. Strategies repeated across the 6 respondents in RA1

3.2.2 Discussion

Although the sample studied is insufficient to draw statistically significant conclusions, certain behaviours that are very present among the majority of the interviewees can be distinguished.

The role of the ritual

Rituals can transform ordinary actions into meaningful experiences by finding the proper moment of usage, thereby deepening the connection with a product. When users engage in repetitive, purposeful interactions, they create a sense of intimacy and familiarity with the device.

- **(R2)** *I sit down and I take the ones [records] I have; which one I'm going to listen to now?*
- **(R6)** *moving the needle to where I liked the song before lowering it, chaning records, cleaning—this was all part of "listening to music."*

Expressing oneself through the record collection

Participants not only commented on their attachment to the physical product; **music itself (i.e., vinyl records) was a significant topic in the discussions** (see Figure 27). They strongly emphasised the stories and narratives attached to their personal collections, which required time, dedication, and space in their lives. This fosters a sense of ownership, leading some respondents to perceive them as irreplaceable.

- **(R5)** *you collect pieces of music that are close to your heart.*
- **(R6)** *what I really want is to listen to my records. I don't intend to give them away; it's a personal collection of records I love.*

Figure 27. Records collection from R2, explaining to the corresponding researcher the story behind each of them

Something to share

All memories commented **were attached to events with family and friends.** This was not only in cases where the product was passed from one loved one to another (R1, R6), but also thanks to the ability of record players to broadcast audio for everyone (R5). This facilitates social connections that may trigger valuable shared experiences.

- **(R1)** *it belonged to my dad [...] it's an emotional piece of hardware.*
- **(R5)** *I immediately have to think of my 30th birthday party. It was such a great moment which I will never forget. It [the record player] is a part of that core memory.*

Evolving through participation

After reflecting on respondents' feedback, certain behaviours suggest that both the user and the product have progressed during their time together. Whether it is the former becoming familiar with the process (as most of the steps are carried out by the user themselves), or the latter as the sound itself changes due to use and wear (see Figure 28), these notions **provoke both parties to evolve hand by hand,** consolidating their relationship along the years.

- **(R2)** *[using to the record player] has improved my way of critically thinking or listening to music.*
- **(R4)** *if you get used to it, you stick to that sound. You can pick a similar instrument, but probably it sounds a little different.*

Figure 28. R4 and their 70s turntable, detailing how to operate and take care of it

Implications for the RQs

- **The moment of use of record players is an experience in itself**, as they require attention and dedication (ritual, evolvability, participation).
- The product, in combination with the vinyl collection, make the owner **perceive and value their musical identity over time, awakening emotions** (self-expression, narrative, visualisation).
- Having the product for a long period **allows it to be enjoyed with more people and form memories** (social connections, making memories).

3.3 RA2 - contextmapping with eco-consumers

Emotionally durable goods require more than just understanding the interaction experience; comprehending how users perceive their speakers and the role they play in their lives may be also important. This means that quantitative-focused approaches might not capture more tacit factors, excluding key notions of the emotional relationship between person and product.

For this reason, **contextmapping sessions have been chosen** to gather insights about the relationship between owners and their speakers. This generative approach is considered beneficial for the project, as it aims to articulate more latent segments of information, which are often complex to express but may contain insightful details of the encounter (Sanders and Stappers, 2012).

Understanding the past, present, and future of the user's experiences are key steps in this ***path of expression***[5], reflecting realities that would otherwise have gone unnoticed. And as was done during RA1, this articulation of emotional and personal elements will allow for a better identification of key strategies from the ESD Toolbox.

[5]***The path of expression*** *connects both backward to past experiences and forward to future experiences. Thus, people's memories of past experiences influence how they behave and feel in the moment (Sanders and Stappers, 2012, p.55).*

Recruiting

12 speaker users included in the target profile participated in the research activity, split into 2 sessions with 6 members each (see Figure 29). Since the demographic profile does not distinguish by gender, recruitment was evenly balanced, ensuring beforehand that the users fit the specifications discussed in section 3.1.1. Participants were gathered directly by the corresponding researcher, of whom 7 are current students from TU Delft (5 different faculties in total) compared to 5 non-students, all residing in The Netherlands. There was a total of 7 different nationalities, with ages ranging from 23 to 33 years.

SESSION 1	SESSION 2
participants from P1 to P6	participants from P7 to P12
3 males, 3 females	3 males, 3 females
5 different nationalities	4 different nationalities

Figure 29. Participants codes and the distribution for the session

The limitations in recruiting a more extensive sample are recognised, but do not hinder the development of the project. As this approach implies a deep focus on individual perspectives, the variety in backgrounds provides a considerable grasp through different lenses. Moreover, this type of generative activities with smaller sample sizes is often acceptable, as the goal is to gain deep insights into user experiences rather than achieve statistical data.

Development of the sessions

Days before the contextmapping session, participants were asked to complete a sensitising activity using the digital board program, Miro. This task helped not only to identify the products needed for the session but also to subtly introduce participants to the concept of emotional attachment, preparing them for the upcoming activities.

Throughout different methods, participants were invited to share their experiences and perceptions of their speakers. They expressed how they value their PADs through "saying" "doing" and "making" activities, materialising their insights in individual and collaborative collages.

The session consisted of two main activities focused on speakers, preceded by an introductory exercise (see Figure 30). Participants began by reflecting on what makes a cherished object emotionally appealing (different from the speaker), followed by identifying the aspects that best define their current speakers. This laid the foundation for recognising which strategies from the ESD Toolbox were present in their relationship with the product. Finally, they worked in pairs to visualise the ideal speaker's strategies for fostering emotional attachment.

Appendix IV provides the materials used for the sessions.

0. PRE-SESSION sensitising activity → Miro // **collect a cherished object and the speaker for the session**

1. PADs SESSION

WARMING-UP	ACTIVITY 1	ACTIVITY 2
focused on the cherished object	focused on the speaker	focused on the speaker and the cherished object
understand how users have developed attachment to certain products	*understand the speaker and its context of use*	*envision the speaker to foster emotional attachment*
participants discuss the sensitising activities with everybody	participants define the features of the PAD using the material, then discuss it in pairs and share thoughts with everybody	in pairs, participants consider the factors that are missing to conceive the ideal speaker for emotional bonding

Figure 30. Overview of the contextmapping session, detailing each activity and their objectives

3.3.1 Results

The results from the two main activities focusing on speakers will be discussed in this section. After presenting the inputs gathered, the upcoming section will detailing their implications for the project. These activities are divided as follows:

- **Activity 1: Perception on current speakers.**
- **Activity 2: Envisioning the ideal speaker for emotional attachment.**

Activity 1 - Perception on current speakers

Participants began the session by reflecting on their context of use with their speaker, which was expressed through three categories: frequency of use, parties involved, and type of activity conducted. **This task aims to address the RQ1,** serving as a trigger to initiate discussions and place the user in their specific context. Figure 31 displays the inputs from the 12 participants.

Figure 31. Interaction context results

From the results, it was notable that users who utilise their speakers daily, both individually and in company, for tasks that do not require excessive concentration, where the three entries that meet or exceed half of the cases (see Figure 32). **The versatility of the PAD was emphasised**, being used in various contexts according to individual needs, usually covering different tasks or environments of the house (e.g., cooking-kitchen, showering-bathroom, gatherings-livingroom) and sometimes outdoor activities (e.g., picnics).

Figure 32. Participants working on the Activity 1; defining their context of use

In conjunction with the context labels, participants delved into the factors characterising their speakers through the ESD Toolbox, with the option to justify their choices and add new inputs if deemed appropriate. **This activity was selected to address RQ2,** aiming to understand the elements that define the current user-product relationship.

Behavioural reasons led this aspect. All participants own a portable speaker (*flexible design**), where *usability* was noted in 9 out of the 12 samples collected. Participants attributed great importance to the -ease of use-, receiving more comments than the product's quality itself. **The visceral component was also very prominent**, with 7 out of the 12 participants describing their speaker as aesthetically pleasing (*aesthetic design*). Following that, *ritual* was the most notable reflective attribute (6/12). Participants view their PAD as a device very present in their daily lives, easing the tasks they have to perform.

The next most mentioned reflective strategies—*narrative, making social connections,* and *reflection*—**were mainly directed at the role of music, not the speaker.** Music reminded them of past experiences, invited them to reflect on their lives, and facilitated social gatherings. This circumstance was predictable since, at the level of interaction experience, event and product go hand in hand.

The rest of the entries are illustrated in Figure 33 (strategies not repeated among participants were excluded, showing only those present among at least two respondents).

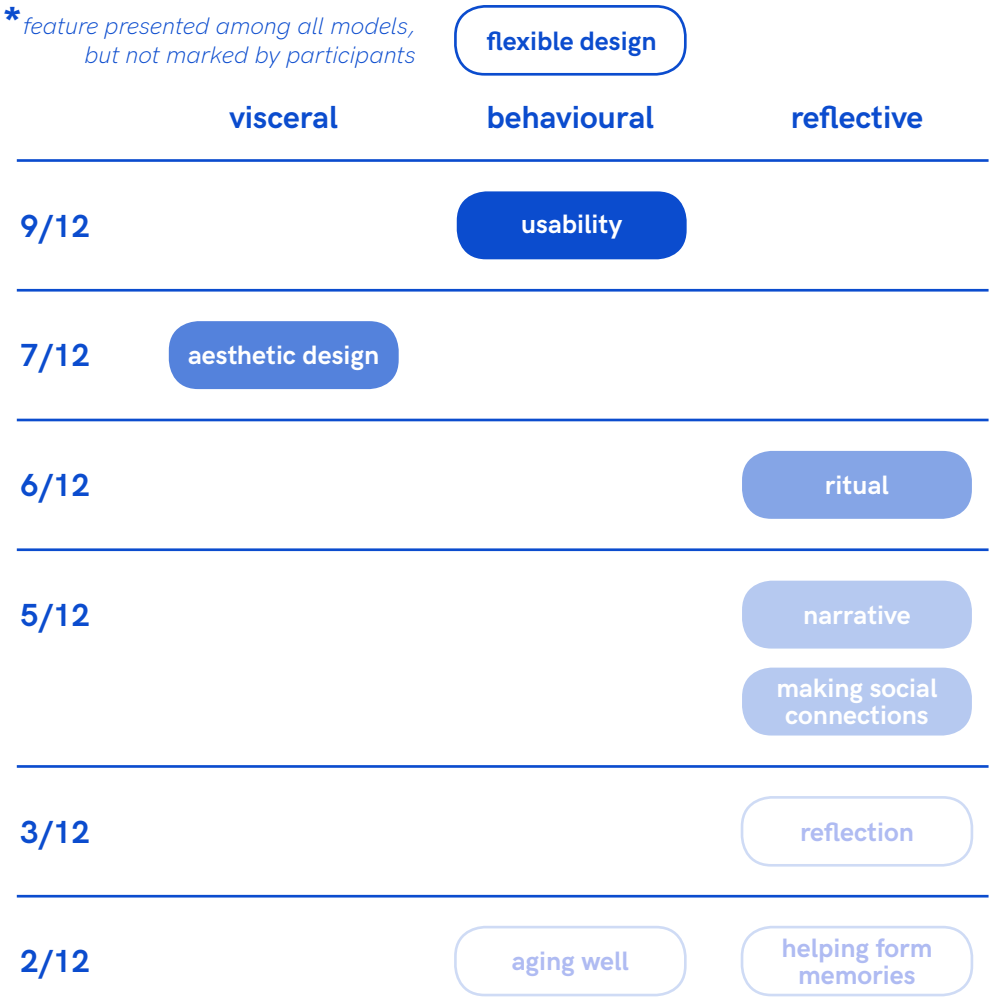
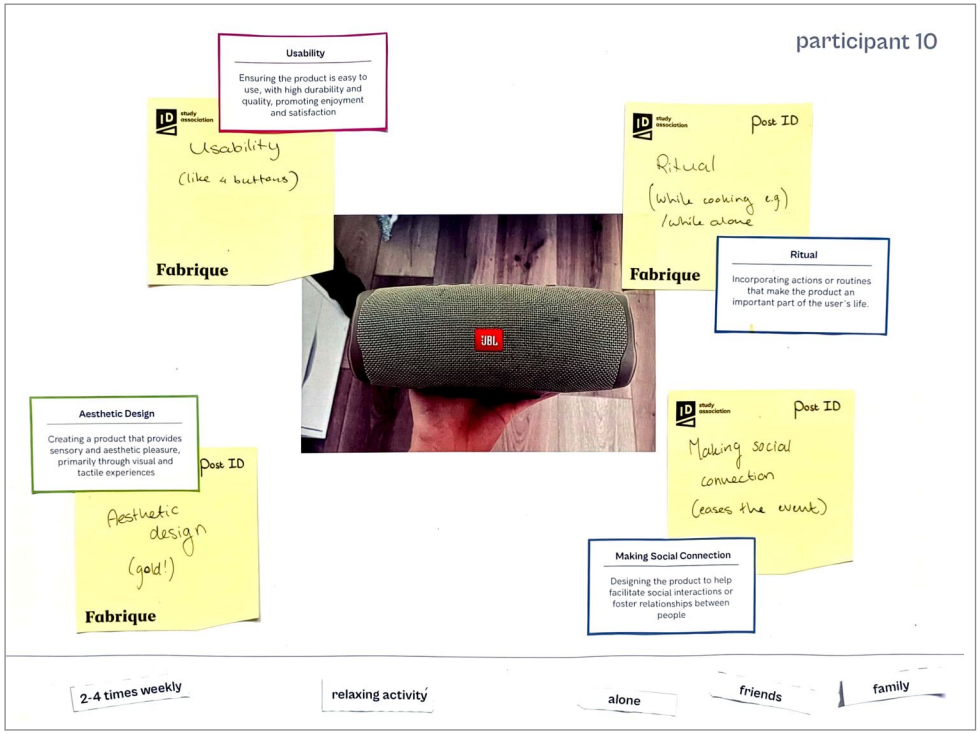


Figure 33. Strategies repeated across the 12 participants in RA2 - Activity 1

Figure 34. Collage made by P10 for activity 1 in the RA1



On the left, Figure 34 shows an example of the Activity 1 conducted, sharing the collage made by P10.

On the right, Figure 35 and 36 (top and bottom) depict different moments of discussion between pairs, explaining why they chose some particular attributes to define their speakers.

Top - Figure 35. Bottom - Figure 36.
Participants discussing about their perception on speakers

Finally, participants were asked two questions about their relationship with their speaker: whether they believe they have a good bond with them, and if they consider it irreplaceable, providing reasons if possible. **This part of the contextmapping session was directed towards RQ3,** aiming to understand the current perceptions of eco-consumerist users regarding their PADs as indispensable items in their lives. Figure 37 illustrates an overview of the answers given.

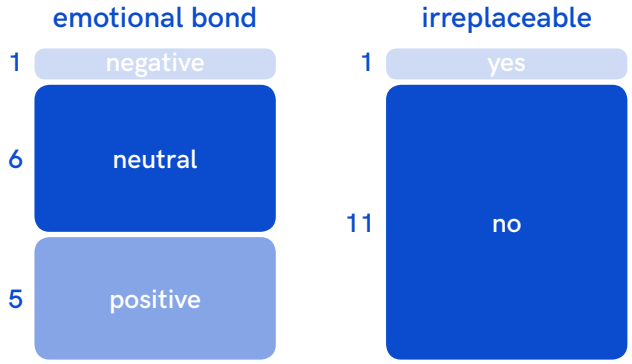


Figure 37. Degree of emotional bond and irreplaceability among current speakers

The reasons justifying their emotional connection were fairly mixed. 6 out of 12 indicated that they do not feel a strong positive bond with their speaker, perceiving their PAD neutrally. They justified this by stating that **the product serves an utilitarian purpose,** relying on its functionality rather than on more emotional aspects (P10, P7). On the other hand, 5 participants reported feeling a positive bond with their speakers, with reasons tied to aesthetic factors (P6, P9) and the speakers' ability to enhance their enjoyment of music (P4, P12), which is not technically attached to the device itself. Only P5, who had personalised their speaker, argued that this aspect motivated the desire to use the product for as long as possible.

Conversely, all participants except P2 agree that **they do not perceive their speaker as irreplaceable.** Better options on the market, gradual deterioration, and purely utilitarian purposes were the reasons cited for their willingness to replace it. Even P5 shared that the time to replace it would eventually come, and P6 specifies that would simply replace their beloved speaker with the same model, when the current one became obsolete. Only P2 displayed a high degree of emotional attachment, leading to perceiving the product as irreplaceable as it had taken part in personally challenging moments, becoming integrated into their identity over the years. Apart from the last two cases mentioned, the examples studied would fall under the category of ***"general product features",*** being the most susceptible to replacement (see Figure 38).

Figure 38. Cases studied distributed across the hierarchy of product attachment (adapted from Mugge et al., 2008)

Activity 2 - Envisioning the ideal speaker for emotional attachment

The second activity focused on identifying which attributes an ideal speaker should possess to foster emotional attachment. Again, the ESD toolbox in combination with participants' suggestions were applied. **This final activity is intended to address RQ4,** taking into account the target users' perspectives on which aspects they consider most important in their experience to generate value.

During the activity, the notion of irreplaceability was introduced to be considered during their concept development. It was decided not to make it a mandatory aspect in order to avoid the proposals focusing mainly on changing the physical appearance of the device. Instead, the intention was to explore how emotional aspects could lead to a product being considered irreplaceable. Figure 39 displays the collaboration between one of the pairs, discussing strategies and modifying the design of the template.

Figure 39. Participants P1 and P5 working together during Activity 2 of the RA2

The final concepts highlighted the significance of reflective attributes, which not only were more mentioned but also carried more weight. *Making social connections* was identified as the most valued strategy to foster emotional attachment, appearing in 5 of the 6 concepts. *Social gatherings* were claimed as a key context to create strong memories with people.

Behavioural aspects remained important, with adaptability and portability (*flexible design*) recognised as the most desirable factors in this category. Furthermore, **visceral strategies are again considerable** factors, featured in at least half of the proposed concepts. Participants agree on an attractive design that could be personalised (*asthetic design, self-expression*), as well as using sensorial resources to expand the listening experience (*surprise*), such as light, textures, or even complementary melodies.

Figure 40 illustrated the results of Activity 2 organised by processing levels and grouped by how many pairs included each strategy (in this case, strategies presented in only one concept have been reflected, as it implies that two participants—both members of the pairs—perceive them as important).

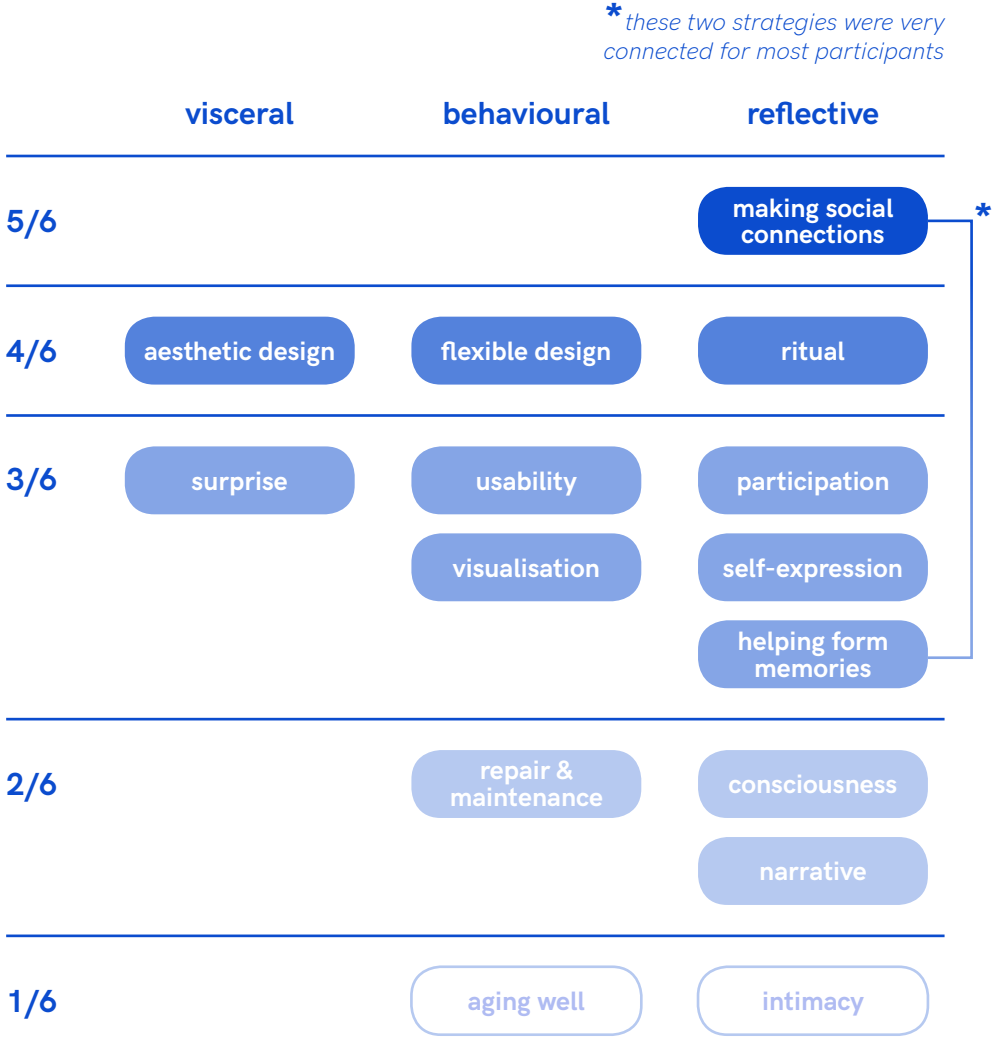


Figure 40. Strategies repeated across the 6 pairs in RA2 - Activity 2

3.3.2 Discussion

Similar to RA1, very interesting conclusions can be drawn from this research activity, although the participant sample was not considerably extensive. The notions extracted after comparing both parts of RA2 will be outlined below.

Music as the emotional trigger

It is clear that the role of music plays a decisive part in the interaction with speakers. Its capacity to evoke emotions and memories significantly influences the usage experience, where several factors recognised as positive were attributed to the music.

- **(P7 on activity 1)** *by playing music, it helps reflect on my life.*
- **(P11 on activity 1)** *music is very much linked with past emotions.*

However, the dichotomy discussed in previous chapters where the physical product is separated from the service was again emphasised, allowing the same emotion to be transferred to another speaker (*general product features*). In response, **various concepts explore ways to materialise the music through the product,** such as the transparent speaker from the concept of P2P4, or the image display system of the concept from P7P12.

The ritual of the routine

As previously discussed, the context of use for current speakers has adapted to contemporary needs. Since most eco-consumers consider listening to music as a frequent part of their daily routine, the majority of concepts include versatility as an indispensable attribute of the speaker. **It is interesting how users place significant importance on their daily routines, referring to these frequent activities as "rituals."** However, the actual meaning of rituals trascends to something truly meaningful and indispensable, expressing the important role of music in their lives.

- **(P7 on activity 1)** *I need to use it for almost all home activities or I can't start [...] like a green light.*
- **(P9P11 on activity 2)** *making it [the speaker] part of my routine can definitely add emotional value!*

The importance of social gatherings

New technology has enabled society to be much more connected than ever before. The accessibility for listening to music though streaming platforms, along with the ease speakers offer in producing it for an audience, aligns with the social needs of the user studied.

- **(P10 on Activity 1)** *[listening to music] eases the event.*
- **(P5 on activity 1)** *social gatherings with new people are always easier with some music in the background.*

Given that music is a trigger for emotions, it creates the perfect setting to create memories with loved ones. The concept from P8P10 proposes ways to literally "capture" these moments, taking an spontaneous photo while music is being played (See Figure 41). With a different approach, the concept from P7P12 offers the possibility to combine several speakers in a joint session, encouraging collaboration among multiple people to enhance the group experience, facilitating the formation of connections and memories together.

The interaction fosters connection

Direct involvement is a powerful way to create positive moments between a person and their product, which is being lost due to technological digitisation. Moreover, depriving users of the chance to physically engage with the product eliminates opportunities for intimacy, participation, and even personalisation with the device, what may lead to an apathetic and easily replaceable relationship.

In response, several presented concepts addressing this issue by enhancing the interaction experience with the speaker itself, like those from P1P5 with their aetshetic and personalisation (see Figure 42), or the concept from P9P11, that suggests strategies to generate attachtment through physical engaging maintenance.

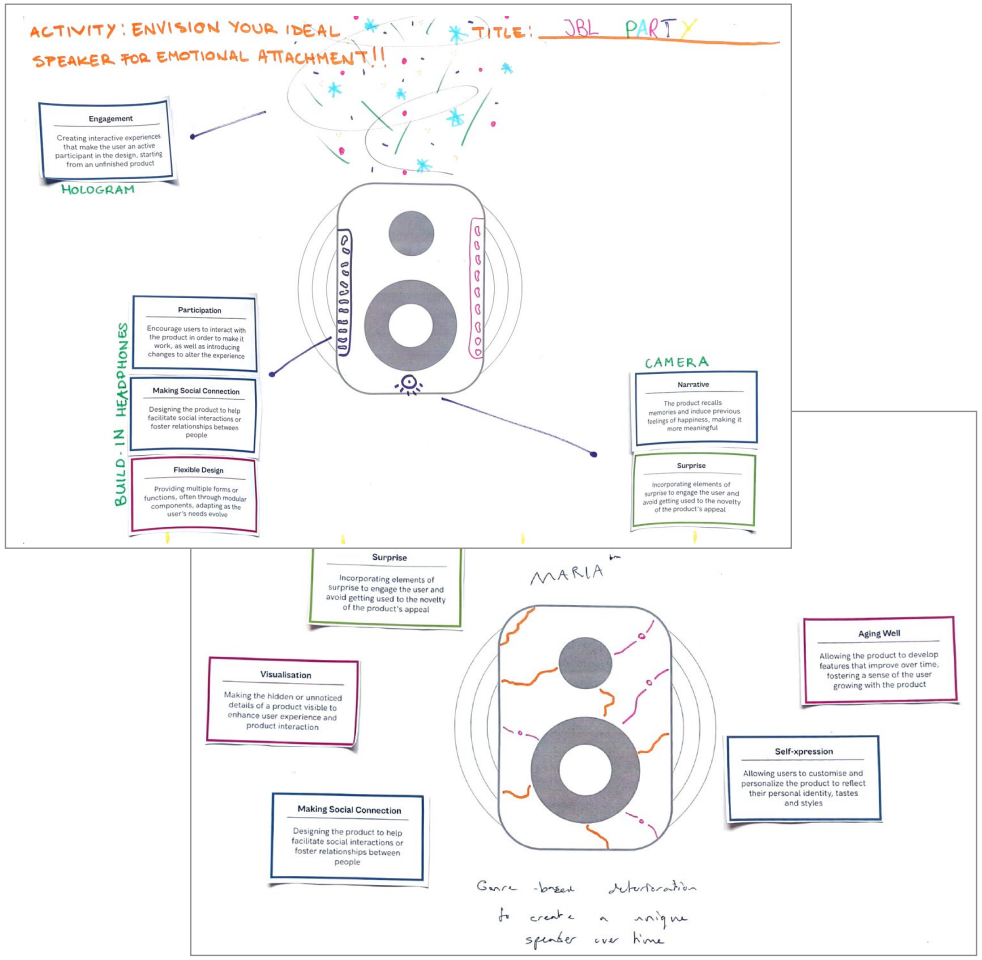


Figure 41. Top: collage made by P8P10 / Figure 42. Bottom: collage made by P1P5

3.4 Implications for the project

This section considers the insights gathered during the user research phase and discusses the implications for the present study on emotional durability in audio speakers. Through the appointed research questions, the findings from the different research activities will be compared to enhance the understanding of the project's objectives.

RQ1. *What is the context of use with the speaker?*

The user profile under study demonstrates active and dynamic usage patterns. The speaker is integrated into daily routines, where the models showcased by participants cope due to their versatile and adaptable design (compact, easy to carry, wireless). Thanks to technological progress, enjoying music has become a highly accessible and recurrent aspect of the current user's life.

Previously, it was noted how devices that are heavily present in our lives (e.g., smartphones) may transform attachment into functional dependence, complicating the act of attributing distinct moments or extraordinary factors due to continuous exposure. This could mean that speakers might also struggle to form meaningful attachments rather than merely serving utilitarian purposes, though their case may not be as pronounced as with other individual PADs (earphones, headphones).

It is intriguing that this scenario, vastly different from that of record players—static and used occasionally—has not prevented them from becoming PADs inclined towards emotional attachment. Additional factors must play a role, but perhaps this perception of the product as not just having a moment of use but also a place of existence helps prevent emotional wear and solidifies its presence in our lives, both physical and cognitively.

RQ2. *Which strategies from the ESD Toolbox are currently evident in the relationship between the target user and their speaker?*

Building upon the results already commented, the difference in the number of positive attributes valued between the two studied PADs is striking, where only 8 strategies from the ESD were repeated among the 12 speaker users, compared to the 12 strategies from the 6 users of record players. **It appears that the target profile value those attributes that enhance their in-the-moment experience,** focusing on functionality (*usability, flexible design*) and sensory experience (*aesthetic design*). A highly competitive and affordable market may have conditioned us to notice characteristics that are most trending in society.

Therefore, we see how the most acclaimed reflective attribute was only present in half of the participants (*ritual*), and most of the less frequently mentioned ones were related to the role of music, not the device itself (*narrative, reflection*).

However, it is particularly interesting how the technical quality of speakers was never discussed during the sessions neither for good nor bad (beyond meeting basic standards), which is common in many technological products like other types of PADs. This suggests that, even though there may be better alternatives on the market, their replacement is not triggered by poor technical performance but rather by the allure of novelty. In other words, technical issues that undermine their value are not usually a negative factor when evaluating speakers.

RQ3. *What is the current perception of audio speakers regarding their level of irreplaceability?*

Following the feedback of what has been gathered so far, it makes sense that **almost all participants perceive their speaker as easily replaceable,** except for the case highlighted at the end of section 3.3.1.

A key observation occurs when comparing holistically the ESD strategies that define both type of PADs. Reflecting on record players, a predominance of reflective aspects can be outlined, followed by behavioural and a minor participation of the visceral level. This division supports the perception of these audio devices as products with significant emotional attachment, where even the functional and aesthetic aspects elicit a positive affective response.

Interestingly, this proportion of one dominant element, a supportive second, and a third for emphasis, follows a trend commonly applied in fields when aiming for focus and balance (e.g., lighting, architecture), **suggesting that record players have adopted an organic and balanced distribution favouring their emotional appeal.** Figure 43 reflects this distribution based on the results from RA1.

Figure 43. Processing levels distribution among record players in the RA1

Although this proportions only extends to the limited analysis conducted in this research activity, it is worth considering how the studied cases could support the idea that this combination facilitates attachment and positive bonding, making it easier to elevate the item to the status of a product specimen.

This same exercise was conducted with the inputs from the first part of RA2, collecting the current perception of speakers through the most mentioned attributes (strategies present in at least half of the cases). As expected, the distribution notably changes, where the behavioural level takes the lead, followed by the visceral, and finally the reflective. Figure 44 illustrates the percentage of each processing level.

It makes sense that, being a device whose main quality lies in the functional aspect, the emotional bond has shifted to a technological dependency, which can be easily replaced since many other products offer the same service. As has been mentioned on several occasions, items with general product features are those most likely to be replaced.

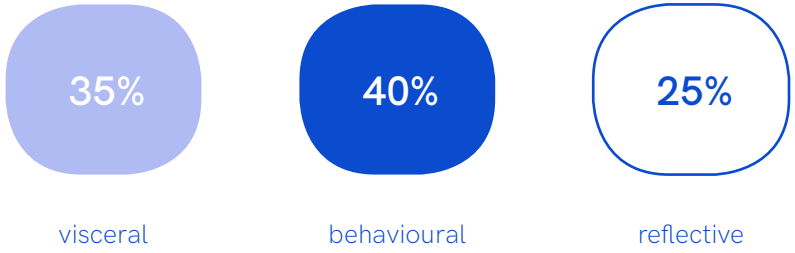


Figure 44. Processing levels distribution among current speakers in Activity 1 of RA2

However, it is revealing to study the proportion of processing levels in speakers when they were adjusted to foster emotional attachment. As reflected in Figure 45, their distribution closely resembles that of record players, where not only does the reflective predominate (which was the goal), but the behavioural and visceral also reflect the same trend.

This could imply that the roles of predominant, support, and accent present in the study of record players might also function effectively with current speakers, fostering meaningful attachment in the long term and facilitating the conception of the product as irreplaceable.

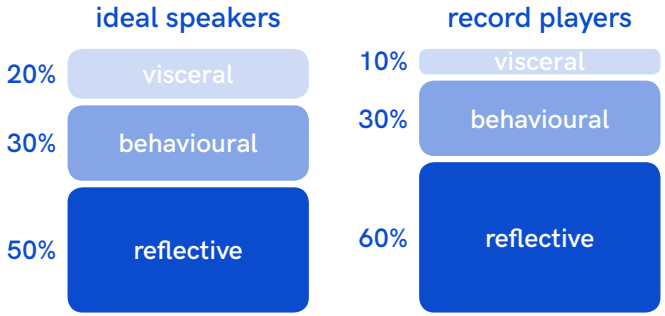


Figure 45. Comparison between the distribution of processing levels among ideal speakers (left - Activity 2 of RA2) and record players (right - RA1)

RQ4. *Which strategies from the ESD Toolbox are most promising for establishing an emotional attachment between user and speaker?*

Based on the findings from previous sections, certain notions have emerged. Here are presented those strategies that show the most synergy among themselves and seem to be most promising at fostering a strong emotional bond that is directly connected with the PAD itself.

Participation to elevate the ritual

ritual | participation | usability

Turning the act of listening into a meaningful process adds a layer of depth to the experience, making each session feel intentional and significant. **Rather than the speaker being just a passive component of the routine, the setup and engagement with the it become something to anticipate, like a small ceremony.** This approach allows users to interact in a thoughtful, purposeful way, making it more than just a device—it becomes a part of the listening experience. Rituals have the power to foster deep attachment, and over time, this participation elevates the speaker's role from a functional object to a cherished, indispensable part of the process. Replacing it would mean losing the emotional weight of those moments, making the bond with the speaker hard to substitute.

Self-expression through visualisation

self-expression | visualisation | narrative

By allowing the speaker to become a reflection of the user's identity, **it transforms from a neutral object into a mirror of personal meaning.** Every time the user sees the speaker, they see a part of themselves reflected in it, reinforcing the feeling that this speaker is truly theirs. This form of self-expression cultivates a bond where the speaker feels like an extension of ourselves, making it difficult to replace, as no other speaker portraits the same visual narrative of our musical journey.

Making memories in social gatherings

helping form memories | making social connections

Music has a natural way of bringing people together, and when friends and loved ones gather around, the speaker facilitates these cherished encounters. This creates the ideal scenario to capture those moments, and preserve them beyond mere memory. As users recall these meaningful gatherings, the speaker becomes a tangible reminder of such moments. This could provide the device with a layer of sentimental value that cannot be transferred to a new unit. It then becomes irreplaceable—not just because of what it can do, but because of the memories it holds and the emotional resonance it carries.

3.5 Conclusions

This chapter presented a series of activities with a user-centered approach, in order to understand what are the key factors in our interaction with both modern speakers and those (PADs) popularly recognised for facilitating the formation of lasting emotional bonding (see Figure 46).

Analysis of the results revealed potential strategies for emotional attachment on modern speakers, which show a significant alignment between them:

- **Self-expression through visualisation:** the speaker becomes a "reflection" of the user's musical identity, where every time the user looks at it, they will see part of themselves reflected in the device.
- **Participation to elevate the ritual:** frequent process without meaning is just a routine. Giving importance to those moments with the speaker that anticipate the listening experience could uncover a new perspective on the device.
- **Making memories on social gatherings:** music eases the mood when your loved ones come over, and much of the memories we make together stay only in the anecdotes we remember. This creates the ideal scenario for the speaker to capture those moments, and preserve them beyond mere memory.

The subsequent chapters will define the design directions the project intends to take, for then exploring concept proposals that aim to incorporate the discussed strategies.

Figure 46. Summary of the main takeaways from the user research phase

de-fine

phase 2

This phase elaborates on the research findings to articulate a clear and actionable design plan, identifying the key components that intervene in the user-product domain. This will be done by introducing the project's scope and focus, establishing a robust foundation upon which to explore possible design solutions.

4 project focus

content

4.1 Articulating the design directions 57

4.2 Refining the target user 59

4.3 Context of application 61

4.4 Product domain 63

4.1 Articulating the design directions

The Discover phase concludes with the identification of the most promising ESD Toolbox strategies to foster emotional bonding with speakers, specifically for eco-consumers. These strategies synergise, distinguishing three sections as depicted in Figure 47. Thus, they will serve as references during the exploration of concepts, generating design opportunities aligned with their principles.

Figure 47. Strategies selected from the ESD Toolbox, grouped by their potential

Nevertheless, while these strategies could intervene to motivate product attachment, **their impact on the experience varies**, as the insights from the user research suggest. This is due to the different focuses between the pairs "self-expression / visualisation" and "participation / ritual" versus **"making social connections / helping form memories".**

The former suggest design streams directly related to the product and the interactions with it, possibly addressed through actionable design interventions. In contrast, the latter seem to occur as a consequence of the listening experience when appropriate circumstances arise. This could happen in various ways, instead of offering a specific plan to achieve it.

Additionally, **the social side and memory formation are scenarios already present among current speakers**, as the ability to share music easily facilitates these moments. Several participants commented on this during the context mapping session and emphasised that it is an aspect they wanted to maintain and enhance. On the other hand, the other streams inspire a new set of possibilities for intervention in modern speakers.

This means that, rather than considering this category as its own line to explore, it will be introduced as a series of implications in the remaining two directions (D1 and D2). This will allow the development of concepts through both directions while considering frequent scenarios that could elevate the whole user experience (see Figure 48).

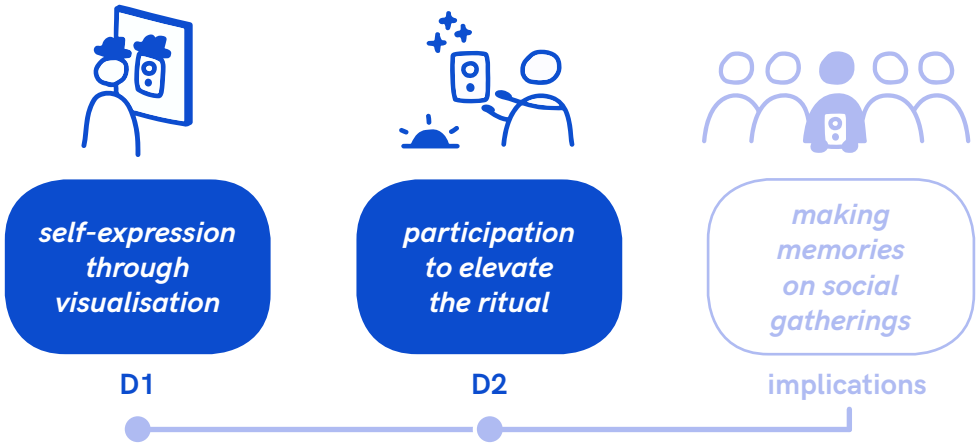


Figure 48. Directions and scenarios to explore during the design exploration

4.1.1 An emotional product personalisation

It has been emphasised how the selected strategies resonate for emotional attachment, but ***how can this relationship be transformed into something personal and potentially irreplaceable?*** To address this issue, two models of emotional bonding through product interaction have been considered, based on the work of Blom (2000) and Mugge et al. (2009).

Mugge and scholars suggest that our emotional bonds with products are **directly related to the extent they express our identity, and indirectly affected by the effort invested to reflect it.** A tandem between physical and mental effort is generated, where both are necessary for attachment to occur in such a balance way that avoid an excessive demand.

This is reflected in the chosen directions, where each pair of strategies complements its partner. Self-expression, the more subjective part, must be balanced with an interaction that allows it to be communicated plausibly and visually. Meanwhile, in the other combination, the physical implication that involves participation must be reconsidered to elevate the ordinary routine into something truly meaningful.

In combination with this, each direction resembles one of the motivations that Blom (2000) states as key to personalising a product or service. **Expressing the user's identity for direction D1, and accommodating the user experience for D2.** Additionally, both pursue another of Bloom's main motivations, eliciting emotional responses, which is essential to motivate contact between person and product (see Figure 49).

This approach aims to make the usage experience with the speaker unique, adapting to each individual's peculiarities and, consequently, culminating in a one-of-a-kind and personal product.

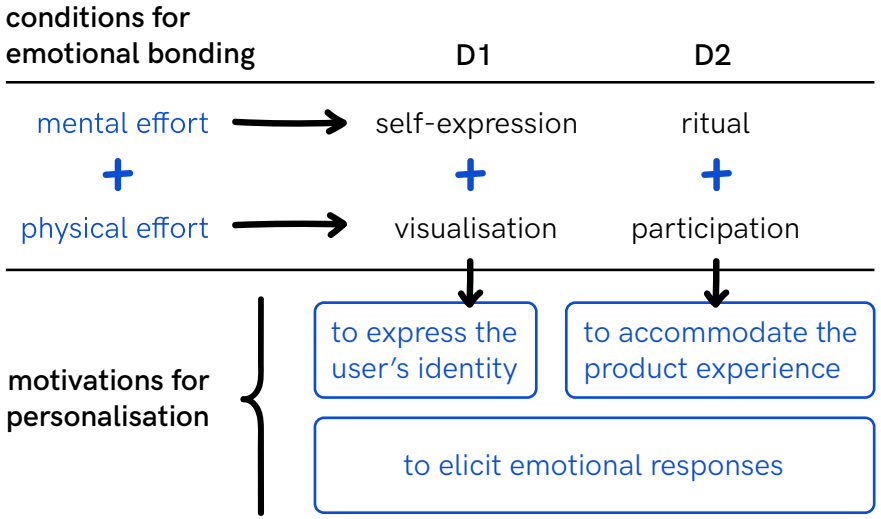


Figure 49. Relationship of the design directions following the models of Blom (2000) and Mugge et al. (2009)

4.2 Refining the target user

The previously introduced eco-consumerist user has been considered for the project's development (see more on page 32). The reasons behind their consumption habits align well with the interests of the present design case, given their internal conflict between a desire for novelty and a strong concern for their environmental impact. This dilemma presents an opportunity, as their more deliberate purchases offer a chance to cement product attachment by providing products that can develop value beyond technical attributes.

The user might be more predisposed to form such relationships with their possessions compared to other profiles with more apathetic usage patterns, aligning better with the goal of designing for emotional durability. In other terms, it is not just about the product offering the potential for bonding. The individual is one of the parties involved in this interaction, and **must also contribute to developing the relationship.** Additionally, the selected segment is part of the most active ones of society (young & middle adults), whose impact on mass-produced items will have a significant influence on the market compared to a more discreet profile.

The user Persona

To better define the motivations and needs of the target profile, a user Persona has been developed for the upcoming design exploration phases. Personas consist of fictional characters, an analytical resource widely used in user-centered design processes, to better understand and empathise (in this case) with the individuals behind the eco-consumerist label. **By articulating a practical case, it will lead to decisions that directly respond to real-life situations.**

Figure 50 in the following page portrays the example that will be used during the upcoming design exploration, and it is evident how the attributes that caracterises the eco-consumerist users define the chosen Persona.

Figure 50. Motivations and needs of the generated Persona

Ella, 29-year-old architect

Background

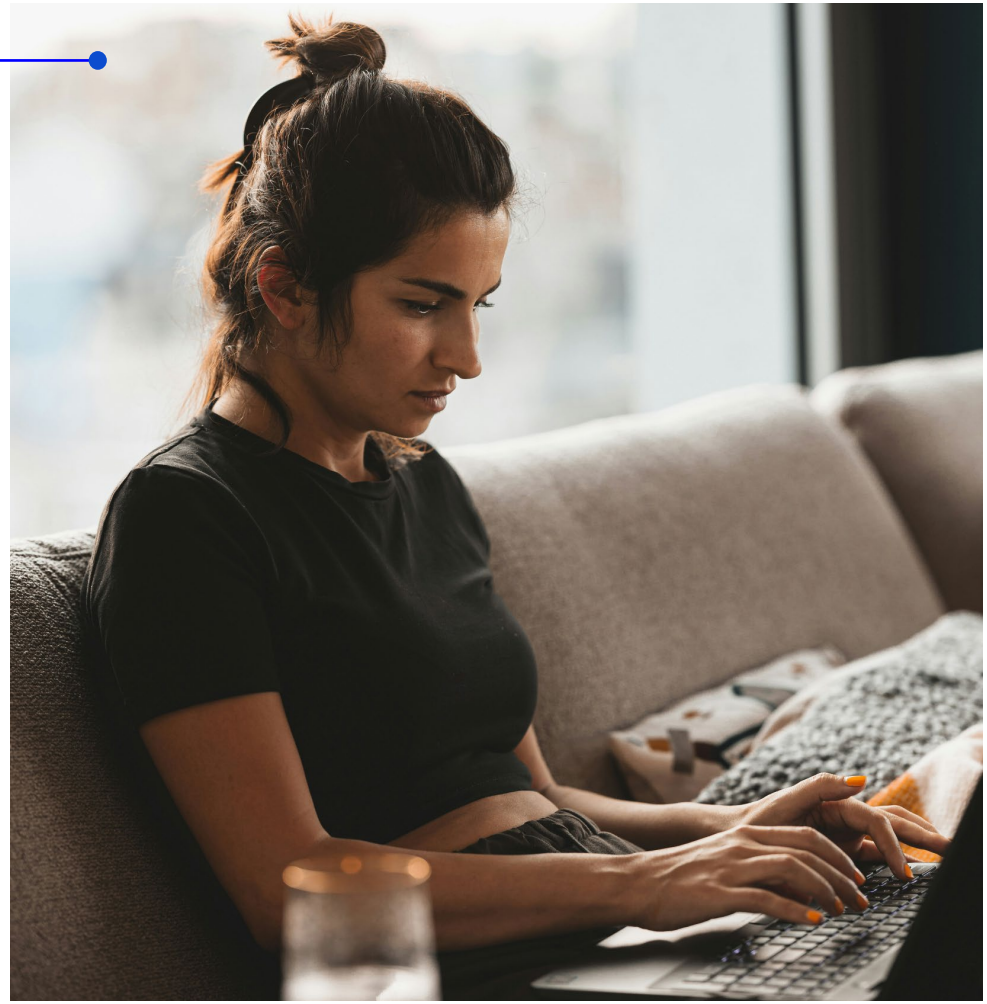
Ella is a 29-year-old architect who has been living in Rotterdam for the past 3 years, where she works remotely part of the week. She is **very active on social media, where she draws inspiration** on how to upgrade her place with products that enhance her daily life, reflecting it in her home decor. In addition, growing up in a modern generation aware of environmental issues, **Ella and her friends strive to reduce their consumption by acquiring pieces that are both durable and technically appealing,** proudly discussing their possessions whenever they get the chance.

Personality

Ella prefers quality over quantity, carefully researching each purchase. Since she spends much of the week at home, she values **items that seamlessly integrate into her daily life,** looking for products that align with her identity and her space. However, **if they fall short of her expectations, she eventually replaces them.** This behaviour challenges her commitment to sustainability, creating an **internal conflict between her desire for novelty and her eco-conscious values.**

eco-soncumser attributes

a love for novelty / products are important to them /
major concern for environmental impact / care for others' opinions



4.3 Context of application

Every interaction between person and product is unique, as the conditions under which they occur are seldom repeated in exactly the same way. Hekkert and Desmet (2007) discuss **how the approach to an event, rather than the event itself, is what elicits emotion.** This notion has led to a focus on the environment where the user-product contact occurs, as understanding the conditions that define a particular setting is advantageous for developing products that truly fit an specific case.

Insights from user research illustrate that the eco-consumer is an active character for whom music plays a fundamental role in their routine. This dynamism extends to their relationship with the speaker, which accompanies them as their day unfolds through the activities and tasks demanded by their life.

The home ecosystem

This has sparked an interest in the primary space where the interaction occurs—the home. A home is an entity composed of several parts but conceived as a single unit. Each room has a character, a different purpose to which one adapts accordingly. ***How does the medium affect the speaker?*** Considering the environment will allow for an understanding of nuances that contribute to the experience, and what better than one of the main stages where life unfolds.

It is worth to note that the modern speaker, present among current users (and therefore among eco-consumers), often offers portability and flexibility that allows its use in various contexts beyond just homes. However, **few places offer the same intimacy as our own space, both physically and socially** (See Figure 51). It becomes a comfort zone to express oneself truly. Such an environment provides a sensitivity ideal for developing emotional bonding, as it happens between people.

Therefore, this makes it the perfect domain to strive for emotional attachment but with our products. The connection one has with their home could be channeled through the device, therefore contributing to the formation of a long-lasting relationship with the item.

Figure 51. The home is a safe place for forming personal connections

4.3.1 The period of intervention

The home then becomes the place of interaction. The user will develop their everyday life, where their relationship with the speaker will form over time. Therefore, the interest of this project lies in that period of use, when the most interactions between both take place.

Shi et al. (2022) discuss the stages in the lifespan of any product. As the product changes, a series of factors characterise this period, from its acquisition to its disposal. For this case, **attention focuses on those intermediate stages where the relationship with the speaker begins**, as the intention is to strengthen it as early as possible and benefit from time.

By reconsidering the interactions for emotional durability, it would **encourage the care of the device and prolong its useful life**, delaying as long as possible the last stages of use. This would be one of the main objectives in the challenge to reduce the high number of waste generated, and therefore an aspect to consider tackling.

Figure 52 illustrates the stages to intervene, as well as the long-term intentions this pursues.

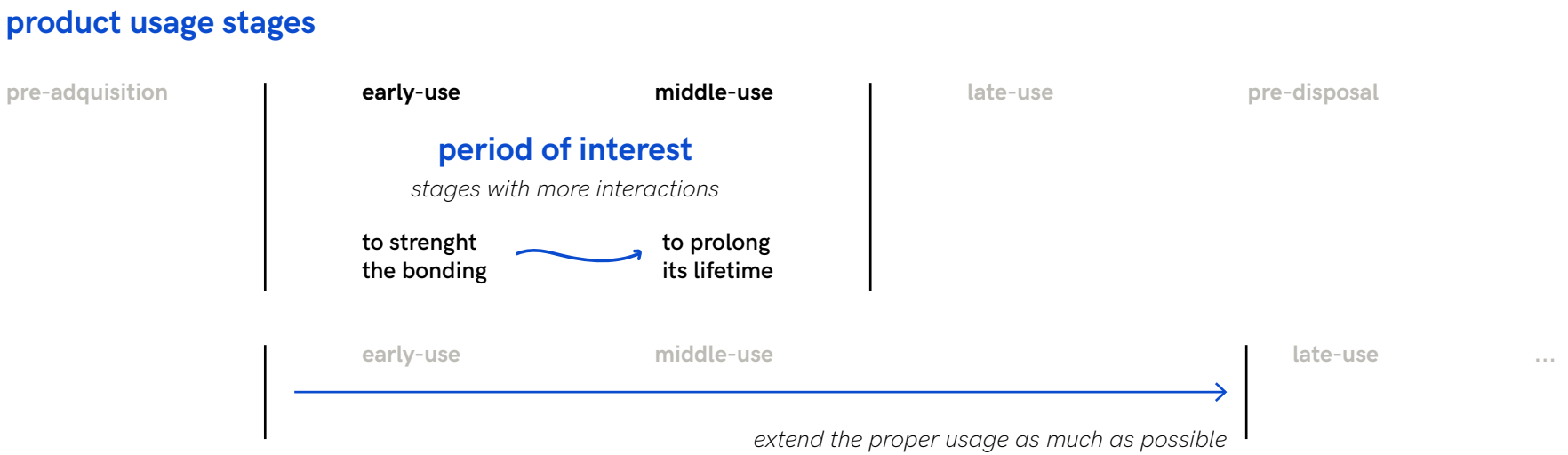


Figure 52. Usage period of interest for the project, adapted form Shi et al. (2022)

4.4 Product domain

In order to apply the chosen design directions in a practical case, it is necessary to intervene upon a real product. Rather than conceiving a device from scratch, it is considered more beneficial for this study to work on an existing model for the following reasons:

- Developing a new speaker involves technical and functional specifications that are beyond the scope of the graduation project, both in terms of content and duration.
- Creating a product mainly based on the symbolic domain, neglecting instrumental and hedonic value (see Figure 11 on page 20), could result in a purely exploratory concept that is difficult to apply in a real-world setting. The need to propose design solutions that challenge how we regard our belongings has been evidenced, hence actionable ideas are crucial.

Therefore, **acting on a current market model represents a practical gateway to promote emotional attachment.** By accommodating the interactions it offers (and introducing new ones), conditions can be facilitated for developing a unique experience with the user.

The company, Bang & Olufsen

The excellence of B&O speakers both functionally and aesthetically takes the listening experience to another level, arousing emotions in people only possible with superior qualities (see Figure 53). This enhances their perception, valuing it not only for what allows us to

Figure 53. Bang & Olufsen legacy

do, but also feel. Not satisfied just with this, B&O also demonstrates a strong commitment to design for longevity, allowing owners to enjoy their products in the long term, becoming lifetime investments.

All this facilitates developing a strong attachment to the product, as exceptional products always deliver something extraordinary on us. **However, *is that bonding irreplaceable?*** For an item to be perceived as so, it must possess a unique, non-transferable value that elevates it above even other units of the same model. Digital and physical customisation is one way to differentiate products, tailoring them to our preferences beforehand. However, the notions that make something truly personal cannot be designed in advance.

Figure 54. User intervention for making the product a unique concept

An opportunity arises upon which to intervene; **infusing this special meaning by actually interacting with the device**, thereby providing an emotional value that is only achievable when we are active participants, enhancing its perception over time. Therefore, the intention is to embed the speaker with the user's identity through use, so that it eventually becomes unique and personalised (see Figure 54).

It not only promotes a long-lasting bond but also leverages this to make it special. If B&O speakers are already design pieces that do not go unnoticed in our lives, they also hold the potential to adapt to us.

The category, resting speakers

During the user research activities, current speaker models with record players were compared, noting that the latter often facilitated stronger emotional attachments. This is not necessarily due to the inherent qualities of record players, but rather a **drawback of modern speakers; their discreet presence in the home.**

Thanks to technological advancements, current speaker units can be enjoyed in various environments due to their portability. The absence of cables makes these models versatile and adaptable. However, this scenario echoes the issues discussed regarding mobile phones (see page 26), where excessive convenience makes it hard to attribute a specific purpose to the device, thus diminishing their uniqueness. In contrast, classic record players are literally anchored in our homes,

usually occupying a specific spot (Bang & Olufsen, 2024). This not only assigns them a permanent place but also grants them both a physical and perceptual permanence, merging with the identity of the space they inhabit.

Nonetheless, focusing solely on a completely static speaker model would overlook important aspects previously discussed, as it would not meet the demands of the eco-consumer (active, routine, demanding). Therefore, a middle ground between portable speakers and stationed equipment is considered, in a category coined as resting speakers.

These units are a hybrid between the two extremes. **Resting speakers are models that are easily relocated around the house but are intended to "rest" in a specific spot** (see Figure 55)**.** These bases are not only used for basic functions like charging stations but also allow the device to adapt and interact with the environment when performing its functions, as they are designed to remain in spaces.

They provide the owner with flexibility of use, able to keep up with their pace of life, **as well as with stability,** acting as a passive yet significant presence in the living space.

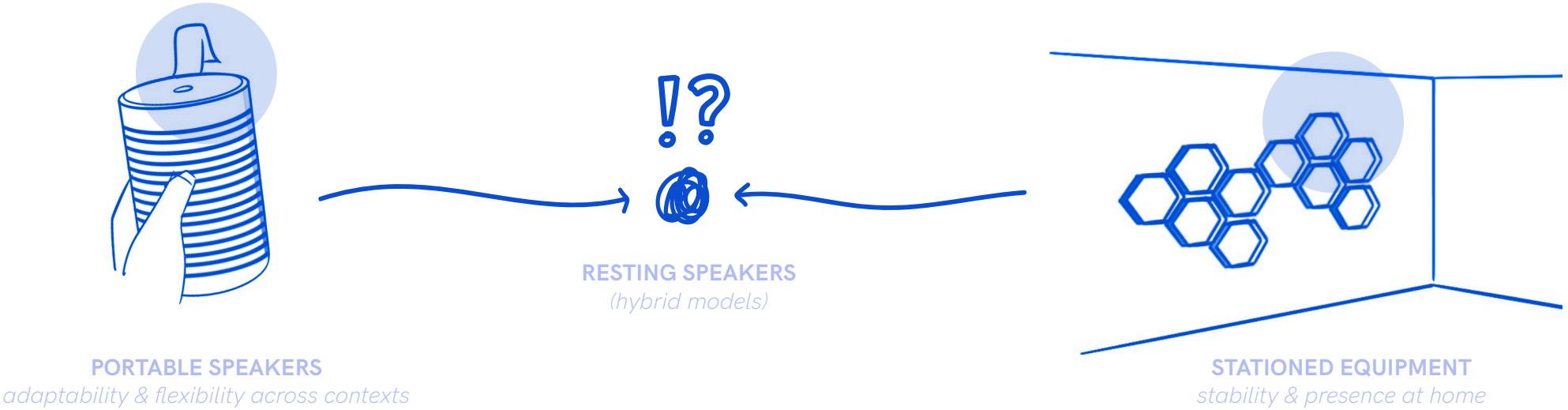


Figure 55. The extremes between which the resting speakers are positioned

The product, BEOSOUND LEVEL

This model from B&O's catalogue is a promising candidate that genuinely embodies the main notions of the resting speaker category (see Figures 56, 57 and 58). Designed to stay within the home, **BEOSOUND LEVEL aligns with the strategies of emotional durability considered so far**, offering opportunities for *self-expression through visualisation,* and *participation to elevate the ritual*:

- D1: a visible "canvas" that does not go unnoticed at home.
- D2: a cycle that starts and ends when the products returns to its base, prompting the user to physically interact with the device.

Figure 56 & 57. User interactions to accommodate the speaker around the house (1 & 2)

Figure 58. BEOSOUND LEVEL, a resting speaker that blends seamlessly into the home

5 design brief

content

5.1 Design Goal 68

5.2 Interaction Vision 69

5.3 Design Criteria 70

5.1 Design Goal

To set a clear objective for the upcoming phases, where ideas to articulate the design directions in the chosen product case will be explored, a Design Goal (DG) has been stated that summarises the main motif of the project:

> *personalise the user's journey with the speaker through their interactions during the listening routine*

This statement **emphasises the need to examine not just isolated the interplay between user and product, but also the continuity of the listening experience.** By addressing the routine as a whole, it considers how this relationship will develop over time, pointing towards design interventions that take advantage of it.

From the DG, four key elements has been highlighted:

personalise

Accommodate the device to oneself according to their identity: unique, one-of-a-kind. The owner's actions contribute to shaping this uniqueness, which will manifest gradually over time.

journey

Make their contacts meaningful. The owner should be aware of the moments invested with the device, recognising and valuing it during moments of use.

interactions

The relationship between user and product is dynamic, evolving. As one changes as they navigate their life, so will their interaction with the speaker. The product should be designed to adapt over the long term.

routine

As music plays a significant role in the user's life, the product should be integrated into it seamlessly. By approaching the listening experience as a whole, opportunities arise to elevate those ordinary moments into something truly exceptional.

5.2 Interaction Vision

The DG is supported by a metaphor that represents the desired type of interaction with the product (see Figure 59). This example serves not just as a requirement for the project but as a supportive tool for conceptualising how the user experience should unfold:

the interaction with the concept should be like
shaping a bonsai over time

Figure 59. Interaction Vision that aligns with the project focus

The Interaction Vision (IV) breaks down into attributes that should be reflected when the user engages with the developed concept, acting as qualities both the image and interaction should share:

unique

no pair of bonsais are identical, as each one reflects what its owner wishes to express. Different individuals will manifest a personal usage pattern, and the speaker should be capable of communicating this.

intentional

The interactions are not casual; the user acts deliberately. Similar to guiding the branches of a bonsai in specific directions, the user will gradually align the listening experience with their interests.

adaptable

Like a bonsai enduring various forms that literally shape it, the speaker must be flexible enough to embrace the evolving identity of the owner.

5.3 Design Criteria

In line with the previous design resources commented, a set of criteria has been articulated that will serve as a metric to evaluate the future concepts developed.

Figure 60 displays these specifications alongside the characteristics that define them, being distributed according to their degree of implication for the project.

must	*THE SPEAKER CAN BE PERSONALISED THROUGH USE*	It reflects the user's identity The user perceives how their intervention shapes a unique product Aspect and functions adapt over time to convey their evolving usage
should	*THE SPEAKER ENCOURAGES DIRECT INTERACTION*	It triggers collaboration between device and user to accommodate the whole listening process The physical experience of interacting builds a sense of partnership It elevates an ordinary event into something remarkable
should	*THE SPEAKER ADAPTS TO BOTH INDIVIDUAL AND SOCIAL CONTEXTS*	It allows multiple users to intervene in the listening experience It offers a balance between individual user control and group participation during social scenarios
could	*THE USER CAN CAPTURE SIGNIFICANT MOMENTS THROUGH THE DEVICE*	It enables the storage and sharing of memories

Figure 60. Design Criteria set for evaluating future concepts

de-velop

phase 3

The current phase explores design possibilities aligned with the directions of emotional durability identified during earlier phases. By combining individual and group dynamics, a series of concepts are proposed that aim to address the introduced problem through a real product, that will serve as a practical case for the present project.

6 co-creation workshops

content

6.1 Introducing the co-creation sessions 73
6.2 Session activities 74
6.3 Results 76
6.4 Discussion 80
6.5 Design opportunities and challenges 85
6.6 Conclusions 86

6.1 Introducing the co-creation sessions

With the intention of exploring the directions identified as promising during the Define phase, **two co-creation workshops will be conducted in order to explore possible design solutions.**

These generative sessions consist of a set of activities structured for introducing, understanding and tackling a problem domain to a group of participants through creative techniques. In this case, designers are prompted with the project's streams of Design for Emotional Durability, and they are guided to elaborate on options that fulfill each direction (see Figure 61).

It is worth noting that these activities, far from being the main medium through which the final solutions will be decided, **represent a very useful resource for exploring the problem domain from the perspective of other design practitioners.** This is because collaboration among several experts allows for reformulating the problem from angles that may have been overlooked, enhancing the quality and originality of idea generation (Mumford et al., 1994).

Figure 61. Participants during the IDEATE stage of the workshop

6.2 Session activities

The two workshops were planned following the same structure, but adapting the content of the activities according to the corresponding direction (se Appendix V). Each of them is then oriented towards one of the two mentioned streams:

- Workshop 1 (W1): *self-expression through visualisation*
- Workshop 2 (W2): *participation to elevate the ritual*

The sessions combine two well-established approaches. The main structure follows **the five stages of Design Thinking** by the D. School of Stanford University, a methodology that facilitates both the generation of ideas and their materialisation, making it ideal for envisioning practical applications in the actual product. For the activities, **techniques from the Integrated Creative Problem Solving (iCPS) framework** were chosen. iCPS allows for constructing creative group sessions by supporting diverging, reverging, and converging means, as required by each stage's act (Heijne & Van der Meer, 2019).

Both workshops starts by presenting the problem domain and the topic of Design for Emotional Durability to the designers. The following activities are dedicated to understand the goals and needs of the selected target group (the eco-consumers), where participants reflect on the possible reasons that hinder a positive product attachment with traditional speakers. Next, each direction is introduced, after which **participants collaborate to redefine the session's goals based on their perception of the problem.**

An ideation phase follows, where the case product is given (the BEOSOUND LEVEL speaker). **Designers move from basic to more novel proposals**, by conducting activities that trigger new scenarios. Most interesting options are selected and rearranged, by confronting their feasibility and originality. **Finally, participants work in pairs to materialise their 2-3 preferred interventions in a low-fidelity physical prototype** made up of spare parts, which they have to present to the rest of the members.

This final activity, far from just focusing on materialisation, aimed to explore how a limited set of interventions could be coordinated in a single model without loosing track of the corresponding direction, highlighting those ideas that hold synergy between them. Figure 62 in the following page shows an overview of how the sessions were organised.

Participants selection

12 design Master students from the faculty of Industrial Design of TU Delft were selected for the ideation workshops. Members from each of the different design tracks were invited, in order to provide distinct backgrounds and perspectives. Again, groups were balanced in terms of gender, including a total of 7 nationalities with all participants being in their twenties.

Furthermore, all of them have either owned or used a speaker during a certain period of time, thereby enriching the quality of their contributions.

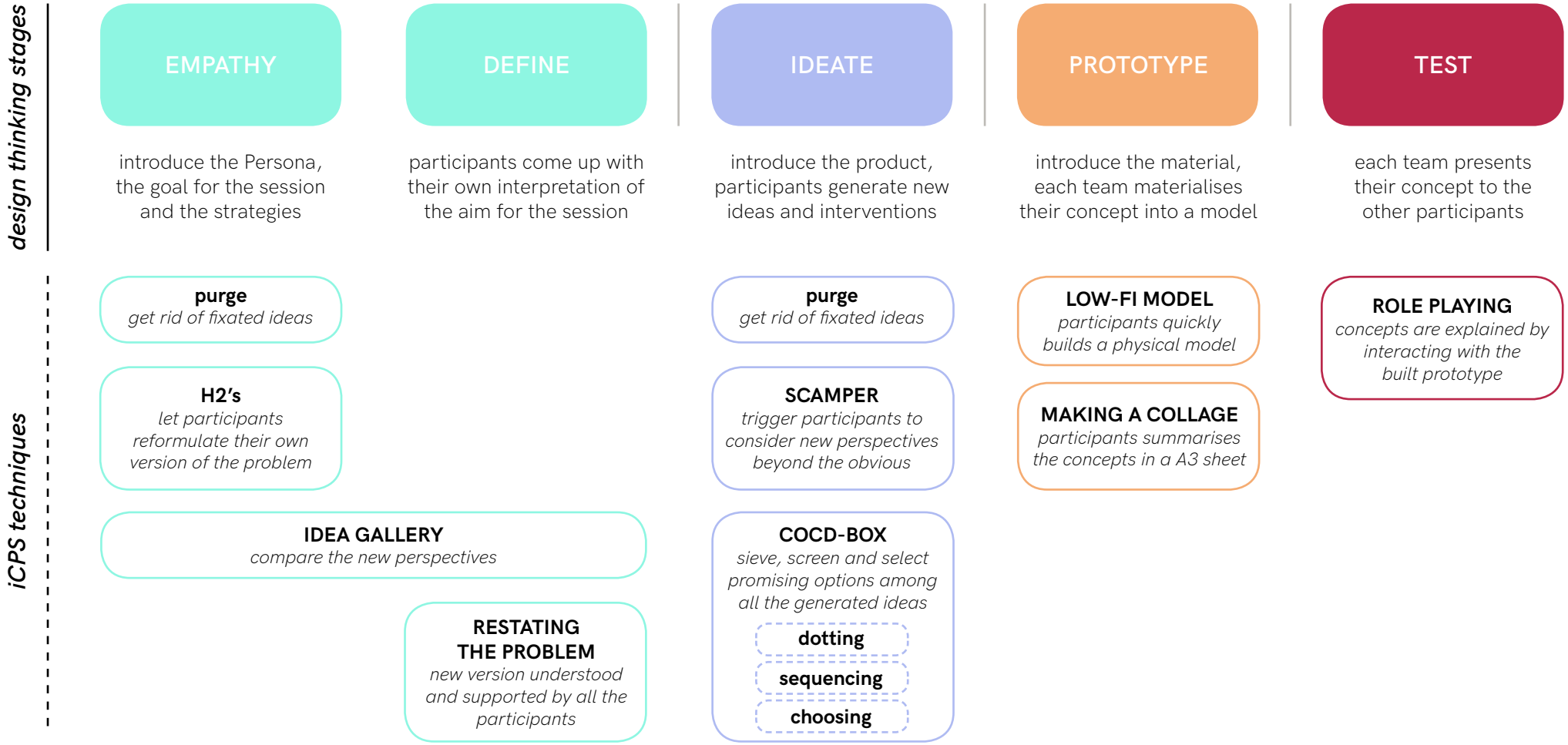


Figure 62. Planification of the co-creation workshops

6.3 Results

6.3.1 Workshop 1.

Self-expression through visualisation

This direction explores how the target user may express her identity through the speaker, where the product feels like an extension of themselves. By portraying a unique visual narrative, the device becomes more interesting and personal, rendering it as difficult to replace.

Participants started by considering how the corresponding researcher examines the problem; ***how can the user physically adapt the speaker to her preferences, making it a statement piece that feels unique to her?*** After team discussions, the group reformulated the question as they perceive the actual problem:

> *how can the speaker keep up with the user's identity throughout different contexts?*

This revision, although more product-centered, placed the speaker with a more active role, aiming to adapt to the user along the different scenarios of their dynamic life. It also expanded the identity embodiment, not limiting the generation of ideas to just physical interventions.

All this set a common ground for the ideation phase, where designers provided possible solutions aligned with the new statement. Figure 63 provides an overview of the most promising design ideas, grouped by the three categories preestablished by the SCAMPER tachnique:

- **NOW ideas:** those common, practical ones that could be implemented immediately or are already existing.
- **WOW! ideas:** those that are both innovative and feasible, offering alternatives that can be implemented without significant obstacles.
- **HOW? ideas:** those that, while promising, are challenging to implement with current resources or technology.

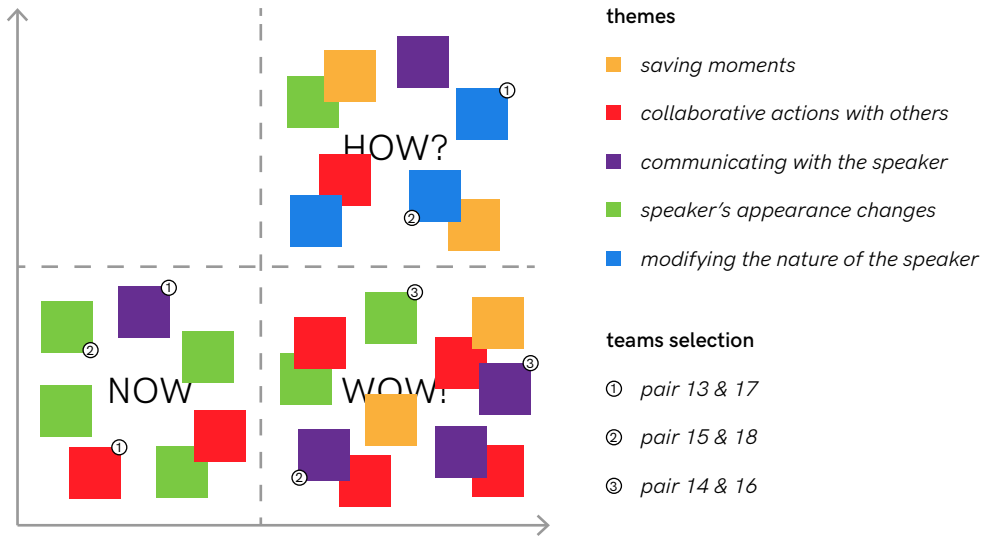


Figure 63. Representation of the results from D1, sorted by themes and selections

Previously grouped in pairs, each team selected 2-3 options that were translated into a physical model. The following part presents some of the final concepts developed during the session.

Figure 64 shows the concept made by participants 15 and 18. Their speaker takes benefit from the listening session to embed a physical representation on the front panel, portraying the musical preferences of either an individual or a group. By the end of the streaming, an album cover has been made through smart materials that works as a memento of the event. As a result, the speaker transitions from being an empty canvas to a statement piece that blends into the home.

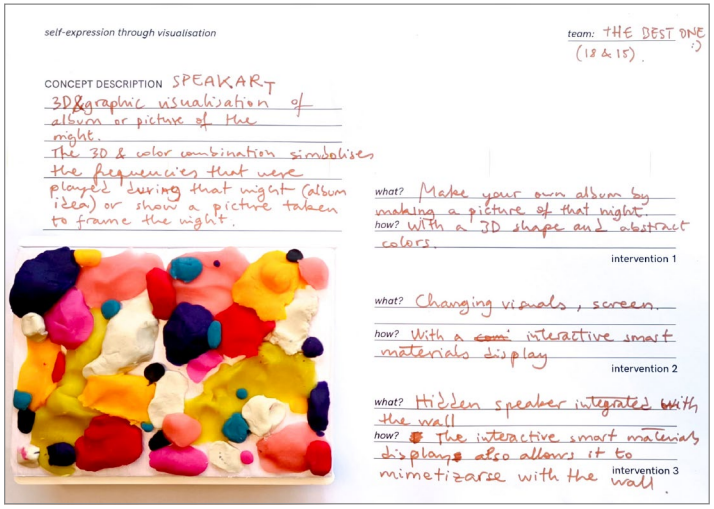


Figure 64. Concept elaborated by participants 15 & 18

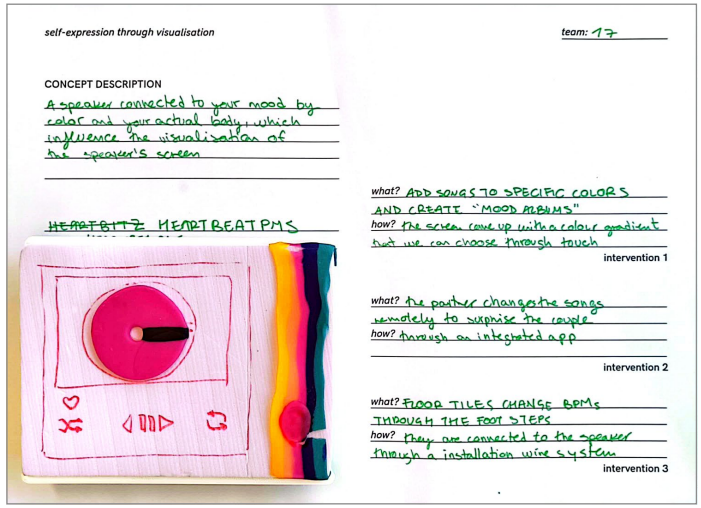


Figure 65. Concept elaborated by participants 13 & 17

Figure 65 shows the concept made by participants 13 and 17. By merging physical interaction with digital representation, the user can save songs to "mood playlists" and access to them by touching the corresponding colour in the screen. In addition, the speaker reacts to your body, playing music according to the ambient beat of the room as it is connected to floor sensors.

It also allows partners and close friends to surprise the user by modifying the playlists remotely through a phone app, making it a medium through which loved ones can stay connected.

6.3.2 Workshop 2.

Participation to elevate the ritual

This direction explores how to elevate the mundane interactions the user have with the speaker, in order to encourage a first-hand engagement that renders the device as an important component of the experience.

For this direction, the corresponding researcher considered the following problem framing: ***how can the user enhance the frequent interactions with the speaker, making her daily routine a meaningful process?*** Again, participants restated the problem as they conceived the notion to be tackled:

> *how to make the user perceive the interaction with the speaker more fulfilling?*

This time, beyond just focusing on the moment of contact between person-product, a great emphasis was placed in how the experience is perceived. The user takes a central stage, and the goal now leans more towards how satisfied they could be when interacting with the speaker over time.

As in W1, the ideas generated where reaganged in the feasability/ originality matrix, and pairs selected those options to be incorporated in their final prototype.

Figure 66 can be found below with the distribution of proposals, and the next page contains some of the results from this second session.

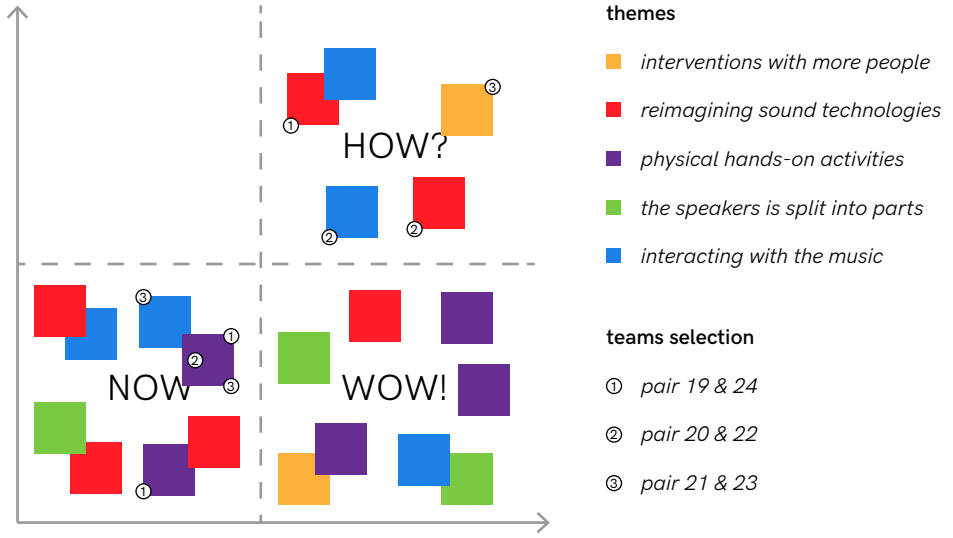


Figure 66. Representation of the results from D2, sorted by themes and selections

Figure 67 shows the concept made by participants 19 and 24. Different speaker modules are connected to an interactive panel that allows the user to direct audio to specific areas of the room. This requires the user to think about their activities and the spaces they will use, adjusting the speaker settings accordingly.

Over time, it will reveal the most frequented areas of the home, as the selection of the target space is made by physically marking on the interactive panel. This usage creates a unique patina that evolves with each interaction.

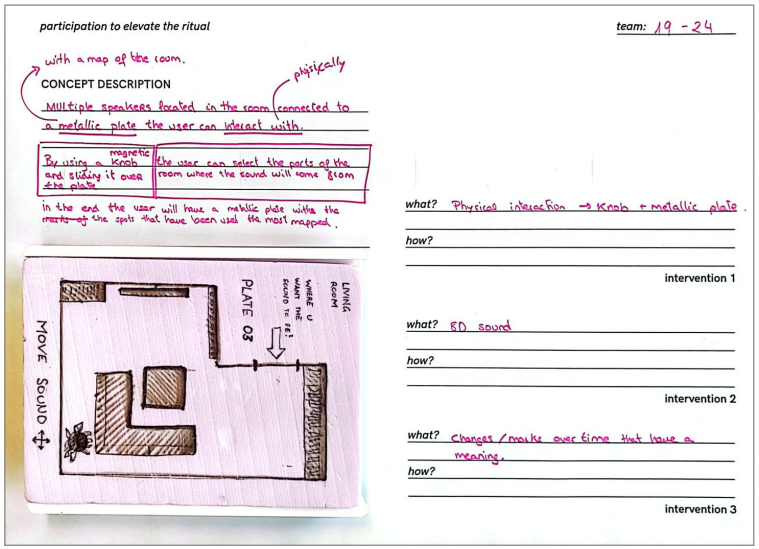


Figure 67. Concept elaborated by participants 19 & 24

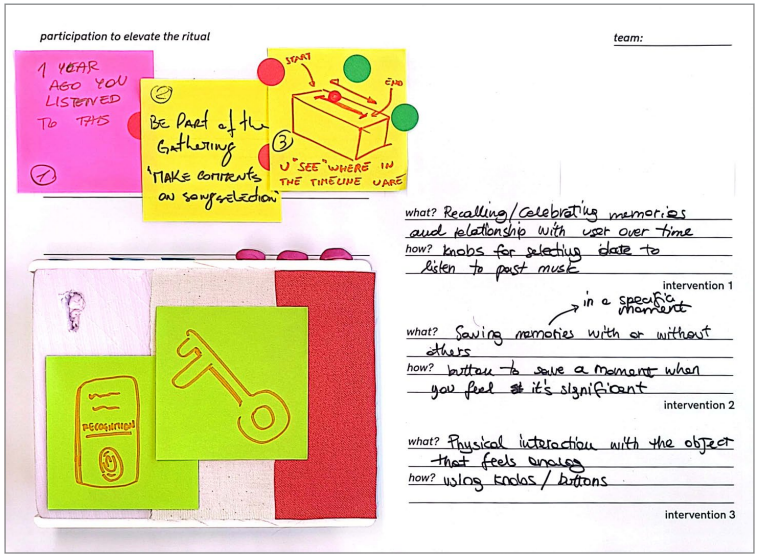


Figure 68. Concept elaborated by participants 21 & 23

Figure 68 shows the concept made by participants 21 and 23. They advocate for a personalised interactive experience with the speaker. From selecting changeable attachments that meet their preferences to adapting the audio according to the audience or the space itself. Furthermore, the speaker requires a smart key to be activated, which only the owner and a limited number of people will have access to.

These features add a layer of exclusivity to the process, seeking a listening experience tailored to oneself.

6.4 Discussion

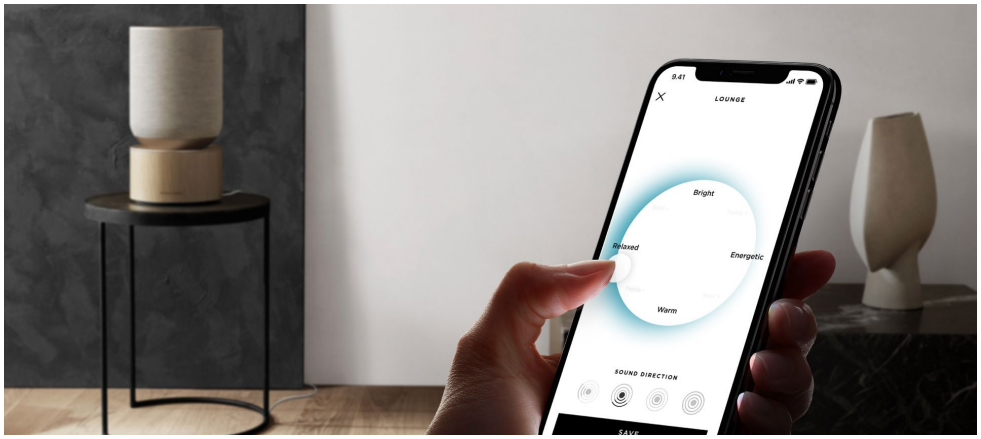
After reviewing the material from the sessions, several themes were touched upon that are intriguing for the project's development. The discussed ideas not only inspire possible articulations of the two presented directions, but also approach the problem from different angles, offering perspectives that spark new possibilities.

However, only those lines that most resonate with the project's main approach, Design for Emotional Durability, will be highlighted. As the ultimate goal is to foster product attachment, the following revisions have been considered for their potential to develop a unique personal bond over time. **This involves adapting the most promising content and discarding those elements that lean towards purely instrumental or hedonic concerns.**

Personalisation as the mean, not the goal

Both workshops aimed to infuse the user's personal preferences into the speaker, whether to express one's identity or to tailor the usage experience. W2 is a clear example of it, and how engaging the user to adapt the interaction to their preferences could improve the listening process. Some of the proposed ideas aligned with already existing technology from B&O, such as the BEOSONIC feature, which allows users to create sound profiles based on moods, sensations, etc. (see Figure 69).

Figure 69. B&O *app* uses profile personalisation for improving the listening session



However, W1 approached personalisation as the primary goal to achieve, and since music is a powerful medium of self-expression, the initial challenge was to explore ways to manifest musical taste through the device's appearance.

As a result, many of the ideas were motivated by the perception of the speaker as an actual "canvas" to showcase music-related metaphors; through colours, textures or lights, often aimed to portray the product as a piece of art (e.g. modular components that form a pattern when combined). However, as the workshop progressed, the attractiveness of such ideas diminished among designers as they considered the long-term relevance of the product and its role within the overall product experience. **Interventions aimed at personalising the device shifted from simply "how to express one's identity" to "why express one's identity?"**

Focusing purely on personalisation may lead to potential disadvantages such as losing interest once a satisfactory setting was reached, or disconnecting appearance from functionality, causing the speaker's symbolic value to be added in isolation without integrating with the device's own features. If the user perceives the personalisation as a demanding activity to be fulfilled, it could overwhelm them with responsibilities, potentially leading to decision fatigue or frustration if the result is not satisfactory.

This issue was later addressed during W1, where **most of the voted interventions implied self-expression as the mean to achieve a complementary objective.** The concepts presented in page 77 are a good example of how one's musical identity can contribute to the listening experience. The shaping is deliberate, active, as the user chooses what to express.

Yet, this process is not the primary goal of the interactive experience but a consequence of it. **Actions driven by disinterest often develop organically and meaningfully, which would lose its charm if forced.** The interaction vision presented (shaping a bonsai, see page 69) reminds us not to control every aspect of growth, but rather to guide it towards a broader purpose.

Design implications

The main lecture that could be extracted from the previous reflection is to consider **how the user may interact with the product *through* personalisation, rather than *for* personalisation**, and one of the most organic means presented during the workshops to achieve so is by **accumulative processes**. Many of the ideas commented advocate for a gradual practice of personalisation, as if music were the erosive element that wear and tear the speaker.

This aspect, in combination with the actual parts of the BEOSOUND LEVEL, **render the front panel as the most promising component to take such responsibility**, as the perception of it as a canvas to be fulfilled was strongly perceived. This approach requires that the durability of materials must support an appealing wear-and-tear aesthetic without compromising functionality, as well as being positively embraced by the user.

Additionally, for intangible personalisation, such as that offered by digital resources, consideration must be given to how it complements the speaker, since many proposed ideas involve actions provided by streaming services, e.g., Spotify, rather than the product itself. This could lead to the previously discussed disadvantage where personalisation could be transferred from one model to another, causing the device to lose its uniqueness.

The space as a mean of interaction

A very interesting aspect discussed during W2, was **the role of the spaces during the listening experience.** Before conducting these activities, the focus was merely considering how person and product interact through music, in order to elevate the ordinary routine into something greater. But ***what about the other elements of the process? How does the environment react and interviene?*** The duality of the BEOSOUND LEVEL as a flexible but stable speaker that could be integrated into the home was previously introduced, but the potential of the home itself was being overlooked (see Figure 70).

Following this line, some ideas explored the integration of spaces as a medium for accommodating the process, such as how different rooms could trigger different sound profiles, how to divide the speaker in modules along the house for an immersive sound experience, and so on. This type of ideas motivates the user to consider the space they are at the moment, with who and for what, tailoring the speaker features to respond accordingly. As a result, **a connection may happen not only between user and product, but with our home as well.**

As a consequence, the attachment strengthens, as the speaker is would be considered as part of the home's identity, and replacing it would mean losing part of that integrity.

This collaboration between person, device and environment also suppose a constant reflection on the routine being performed, with the challenge of how to accommodate it for a better experience. In addition, letting the user intervene in the experience renders their participation as useful, considering themselves as an indispensable part of the process.

Figure 70. Products can interact both with the user and the medium they are in

Design implications

All this suggest the need to properly assign the role of each party involved to achieve a balanced interaction. The user manipulates the speaker, which coordinates with the medium to improve the interaction through each other. **In essence, the user begins to craft the listening experience, not just the product.**

To achieve this, **will be considered those interventions that include the use of the space in the collaboration with the speaker.** Moving the device from one place to another in the house will have an effect, going beyond merely accompanying the user in their routine.

On the other hand, it is crucial to carefully consider the amount of responsibility assigned to users. Too many steps can be overwhelming and time-consuming, and if adjusting the settings requires a significant level of technical understanding, it might lead to abandonment of the process if found too challenging. Additionally, investing considerably in a product that demands a lot from us could be negatively received, as technology is intended to make our lives easier.

The social dimension as a supportive component

One idea introduced during the workshops was to consider social contexts as a frequent scenario when using speakers. ***How to consider them along the process? Could they play any passive or active role?*** Participants approached these notions and brought ideas to discussion. Interestingly, it resulted in seamless implementations for both directions.

Partners, relatives and friends were provided with complimentary tasks during the listening experience. For W1, interventions include allowing loved ones to leave their mark on the speaker as part of one's identity, expanding the personalisation possibilities, as well as enhancing social gatherings by creating lasting memories of the events.

For W2, proposals focused on distributing the steps usually taken by a single user among multiple people, such as dividing the sound attributes in multiple modules, resulting in a more elaborate collaborative session.

Design implications

Including new parties in the interaction with the speaker involves either adding or sharing roles during the process. This could be translated into what do people bring to the session, and how they can benefit the overall experience.

Starting from the two established directions, it seems reasonable that the one aimed at reflecting our identity should embrace contributions from others, since one also builds themselves through the people that intervene in our lives. In contrast, distributing the load could be more beneficial when it comes to accommodating the listening process, as **engaging more people in a collaborative experience might strengthen group ownership and the recognition of each member involved in the activity** (see Figure 71).

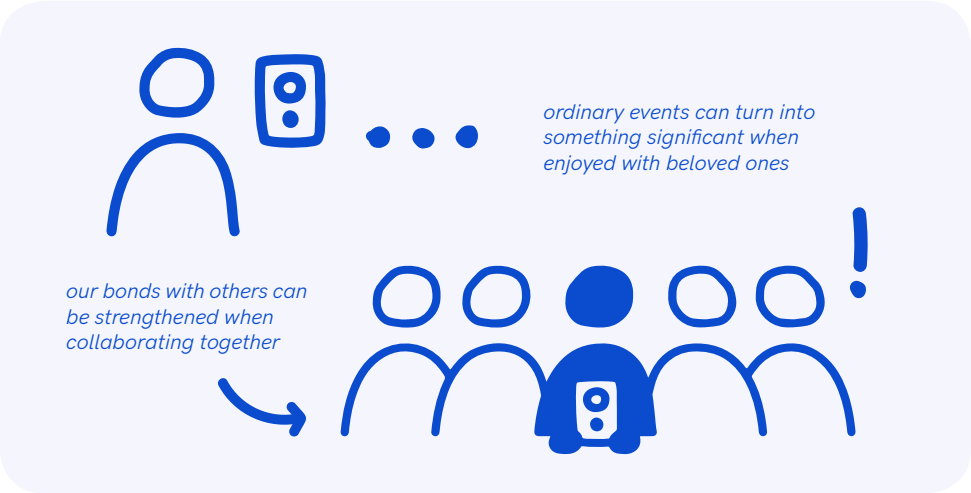


Figure 71. Social contexts are a frequent scenario when using speakers, so they should be considered

Special attention should be made to the level of agency between main user and extra participants. If the contributions of others could be easily compensated by a single user, there would be no value in their support. Conversely, if optimal performance could only be achieved during social gatherings, the usual routine of the owner would be incomplete. Moreover, the cooperation should not be too demanding, in order to be accessible to everybody.

The goal, therefore, is to **benefit from and appreciate what others can offer, realising the importance of staying connected.**

6.5 Design opportunities and challenges

Figure 72 below summarises the key points discussed in this chapter, based on the results and elaborations made. While these implications broaden the design possibilities through more concrete action lines, each brings challenges that must be carefully considered during the concept development phase.

a gradual process

Through the accumulation of interactions, the user could turn the speaker into a more personal unit. Moreover, the personalisation may occur physically, digitally, or as a combination of both

- A balance between personalisation and functionality is required so that the process feels purposeful without becoming a burden

- Materials and technology used must support and facilitate the changing demands of the user, especially over the long term

- Relying too much on digital platforms for personalisation risks transferring the unique aspects of the product to the service, reducing the speaker's identity

benefit from spaces

The environment has the potential to act as a mediator, participating in the listening routine. It could be considered as an active component in both the personalisation and the interaction with the product

- The user should be aware of how the space affects their experience, in order to use it to their advantage

- Handling the speaker in various spaces of the home should enhance the experience without becoming tedious or impractical

social enhancement

Adapting the listening experience when more people are involved could facilitate the formation of connections and lasting memories

- It will be crucial to determine the right level of involvement for new participants to ensure the session unfolds smoothly

Figure 72. Opportunities and challenges discussed during the chapter

6.6 Conclusions

The reported co-creation workshops served as a fruitful practice for exploring the potential of the two established directions—*self-expression through visualisation* and *participation to elevate the ritual.* By engaging design practitioners in structured, generative sessions, diverse and innovative ideas emerged, offering fresh perspectives on how speakers could foster emotional durability (see Figure 73).

Particularly, **personalisation was reconsidered as a manifestation of the user iteraction, rather than a static goal**, with insights highlighting the importance of gradual, meaningful actions to maintain long-term user engagement. Similarly, **the exploration of the routine emphasised the interplay between the user, product, and environment,** suggesting the need for balanced roles in crafting a rich listening experience. The integration of social dimensions provided an additional layer of depth, showcasing how collaborative interactions could add or share responsibilities to enhance both identity and participation.

These notions will be taken into account during the next concept exploration phase, aiming to articulate design solutions that foster emotional durability through product interaction. As outlined in the design criteria (see page 70), not all the discussed areas hold the same significance for the project, which means that applying all requirements is not guaranteed. Yet, t**he aim is to integrate them in such a way that eases the way for users to develop a unique story with their speaker.**

Figure 73. The corresponding researcher analysing the material from the sessions

7 concepts development

content

7.1 Introducing the concepts 88
7.2 Concept 1 - FRAMING LEVELS 89
7.3 Concept 2 - LEVELS OF HABITS 99
7.4 Comparing the concepts 109
7.5 Conclusions 112

7.1 Introducing the concepts

This chapter compiles the design proposals developed, following the two directions identified in previous phases: *self-expression through visualisation* and *participation to elevate the ritual.*

Two concepts have been explored, each tackling one of the mentioned pathways. Their interventions in the selected reference device aim to provide an interaction experience that, over time, offers the user the opportunity to develop an attachment to the speaker, fostering an emotional bond tied to the device itself.

As a connecting thread, the current name of the case product, BEOSOUND -LEVEL-, has been dissected to frame the titles of the concepts. Following this idea, the term "level" is used to exemplify that a specific facet of the user experience is enhanced (leveled up). This approach then ties back both proposals to the original speaker (see Figure 74).

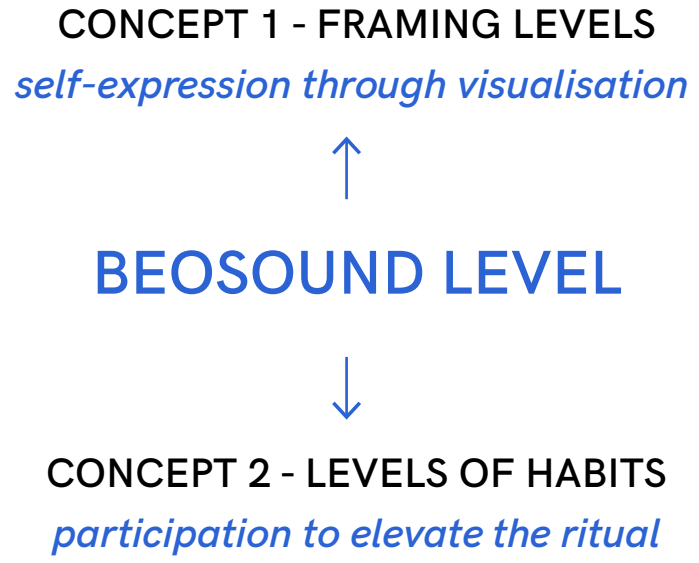
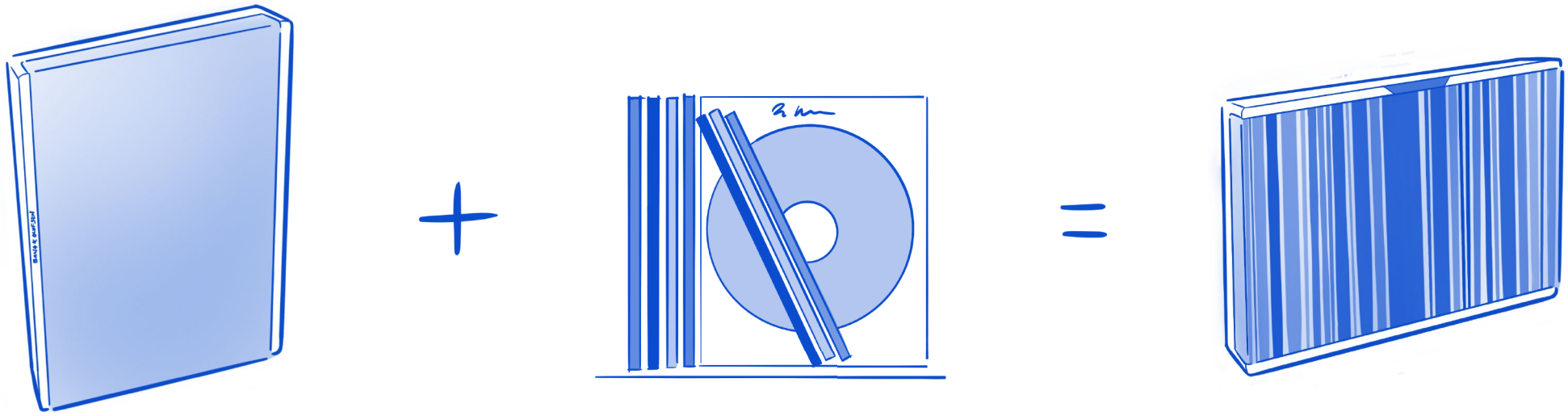


Figure 74. Concepts naming in relation with the original product

7.2 Concept 1 - FRAMING LEVELS

7.2.1 Concept introduction

FRAMING LEVELS **seeks to express those perceptive attributes** that characterised dealing with physical tracks (see Figure 75). It aims to enhance the listening session by adding a deeper visual dimension to the interaction with music. Moreover, **it leverages the factor of time** to accumulate our musical experiences through the speaker, creating a dynamic history of one's musical journey visually represented on the device itself.



empty canvas **musical collection** **FRAMING LEVELS**

self-expression through visualisation

Figure 75. Key notions that represent Concept 1

Narrative

This concept draws inspiration from the time when music occupied a **physical space in our lives.** Acquiring and accumulating vinyl records, CDs, and tapes required time and dedication, which not only shaped our personal libraries but also expressed our identity through the way we enjoy listening to them. Additionally, **flipping through these physical items often revived emotions and memories** associated with them, fostering a sense of pride and ownership (see Figure 76).

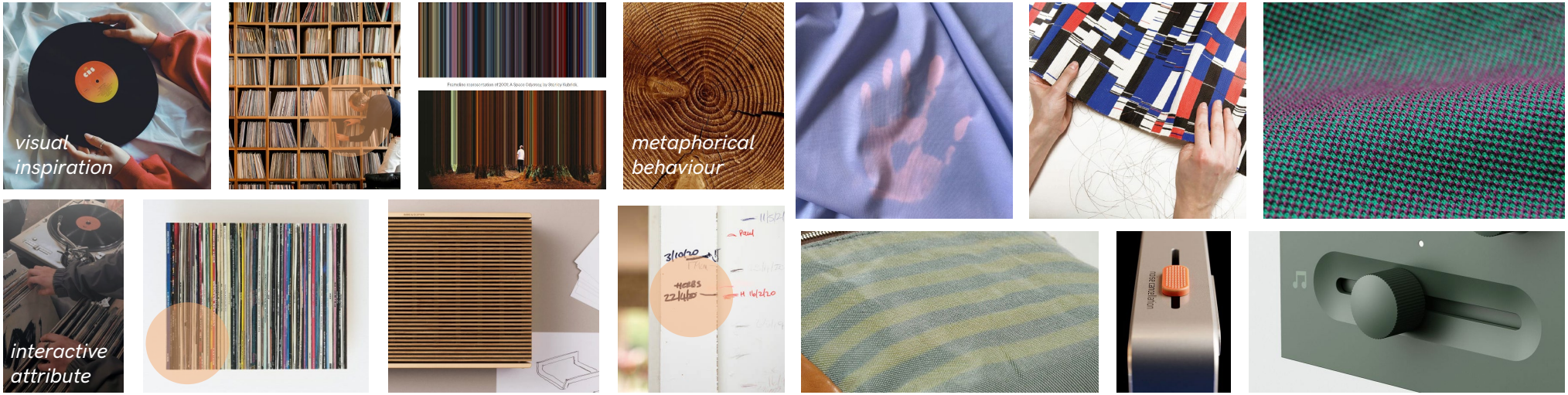


Figure 76. Moodboard references for Concept 1

7.2.2 Design interventions

The present section discusses the design modifications, distinguishing between product-redesign features and experience-redesign features:

Product redesign features

Illustrated by Figure 77, three design interventions are introduced:

- Responsive color-changing e-textile in the front panel's cover.
- Information display in the speaker's frame.
- The standard orientation is now horizontal.

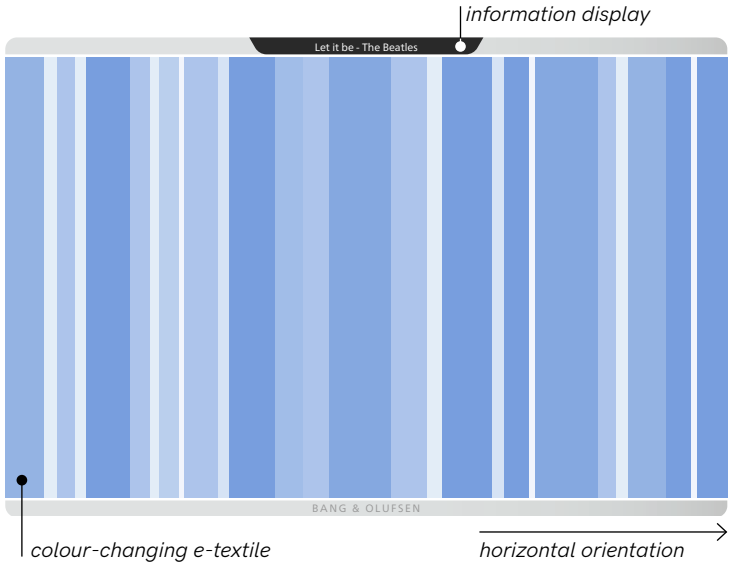


Figure 77. Representation of the product redesign features of Concept 1

Colour-changing e-textile

This implementation is grounded on the field of smart materials. For this case, the Chromorphous© technology has been chosen (University of Central Florida, 2018). This innovative textile incorporates a conductive micro-wire, so when an electrical current passes through, the fiber activates its color-changing pigment (see Figure 78). The material can be cut, sewn, washed, and ironed, and It has already been tested in industrial production. It only needs to be connected to the battery, and the speaker's system would control its activity.

By using a fabric that can change its appearance, **it enables the creation of on-demand stripe patterns,** in up to four different colours. This notion offers a wide range of possibilities, and constitutes the main feature of the concept.

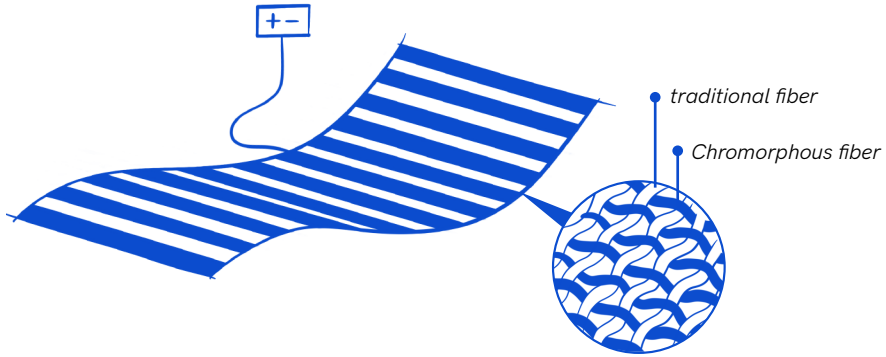


Figure 78. Illustration explaining the composition of the Chromorphous e-textile

Information display

This function has been considered to enhance the content conveyed by the speaker. Since the concept aims to visualise and communicate different types of information, **complementing them with readable text will improve understanding, making it easier for the user.** Whether displaying the title of a song, playlist, or radio station, it will now be much clearer to identify without needing to check the mobile phone.

Its location at the top of the device's frame is intended to integrate with the touch surface, where control functions are housed (see Figure 79). This decision was made to blend seamlessly with the current structure of the product.

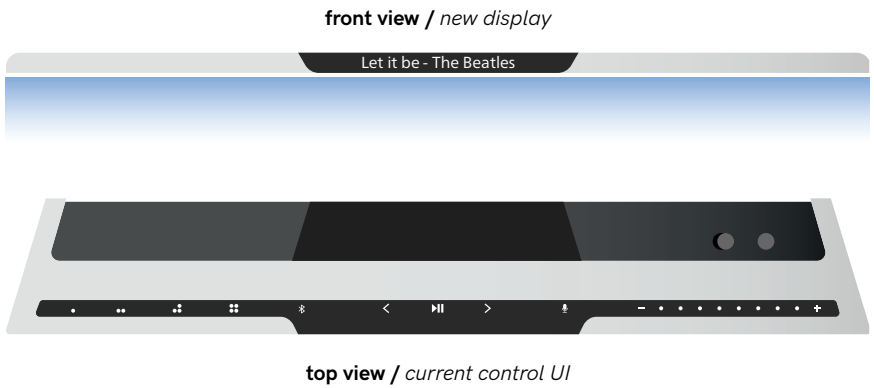


Figure 79. Detailing the aspects of the information display

Horizontal orientation

While the speaker can still be used vertically or horizontally (as well as mounted on a wall or placed on a surface), **the interactive experience with the speaker is primarily considered in a horizontal layout.** This alignment not only resonates better with the visual metaphor of record vinyls on a shelf, but also aligns with the usual perception of other factors involved in the interaction, such as the passage of time (which in Western cultures is typically represented as moving from left to right).

Thus, the concept's narrative is reinforced through a simple reorientation of the product, which mainly affects the position of the rear cavity used for mounting on the wall (see Figure 80).

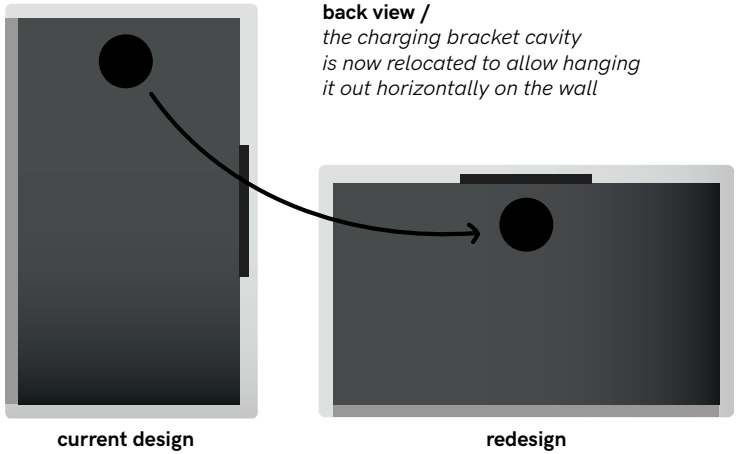


Figure 80. Illustrating the redistribution of the charging braket cavity

Experience redesign features

This section outlines the modifications and changes in the way the user interacts with the speaker, through the product features already existing and those introduced in the previous section:

- User experience & interface (UX/UI) feedback.
- Music interaction enhancement.

UX/UI feedback

The current control system of the BEOSOUND LEVEL (buttons, slider, voice recognition) **are coordinated with the responsive panel to visually reinforce the commands executed by the user** (see Figure 81). From an animation that welcomes you when turning it on, to communicating parameters like volume level or battery life. The owner perceives a more dynamic reaction to their actions, typically invisible in smart devices.

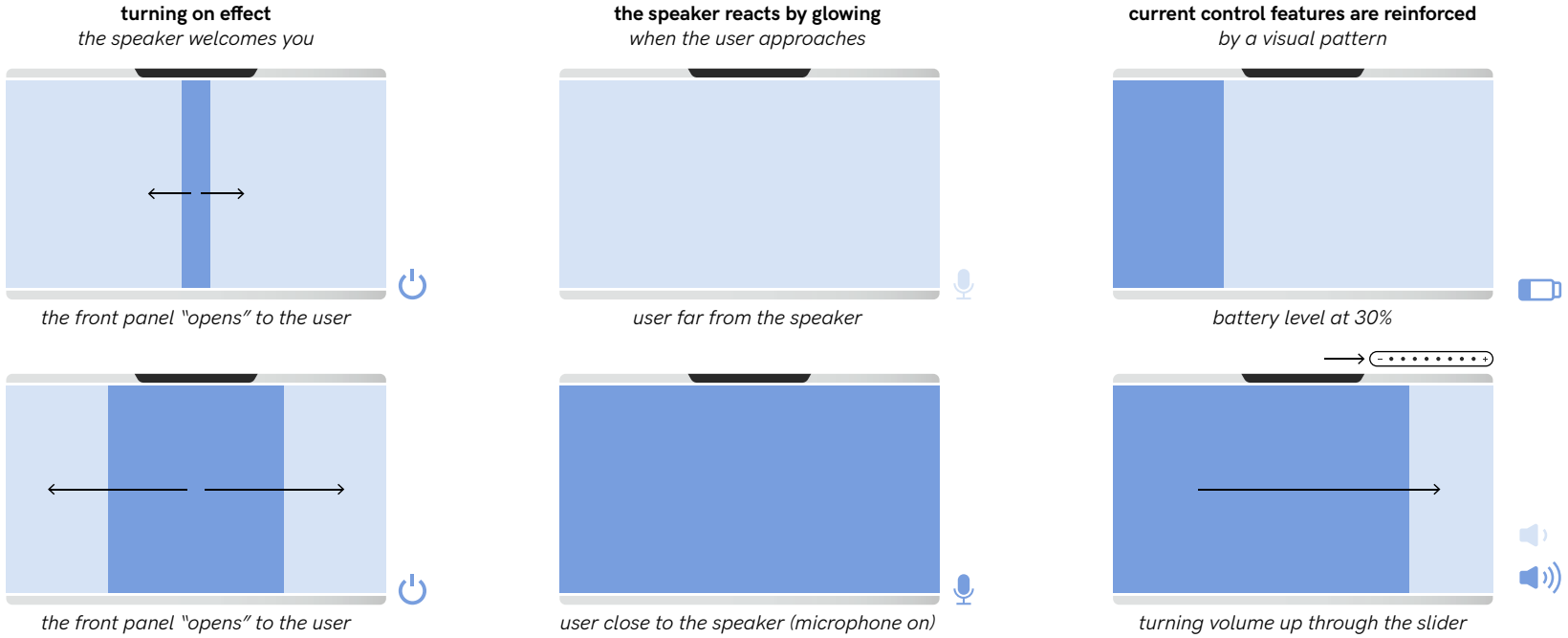


Figure 81. Different applications of the e-textile for reinforcing features' feedback

Music interaction

The introduced feature also offer possibilities for accommodating the music session which, combined with other functions already present in the speaker, could further personalise the experience of use:

Firstly, the different stripes can be organised to represent what would be the different audio tracks, **giving the user the ability to browse through them as if they were flipping through their personal collection,** using the smart slider located on the frame of the speaker (see Figure 82). Also, on the side, the device offers the possibility to save up to 4 favorite presets on a series of smart buttons, whether for playlists, radio stations, etc.

In combination with this, the user could select the category they desire, and then explore the content within them (e.g., playlist 1 → search for a specific song).

Visual recreation

Additionally, **the multiple combinations of stripes can be used to visually represent the music while being played**, for example by offering a dynamic effect of glowing and dimming lines that accompanies the beat of the song, or a progress bar that displays the duration of the track (see Figure 83). This provides a visual spectacle that enhances an experience normally only enjoyed through our ears.

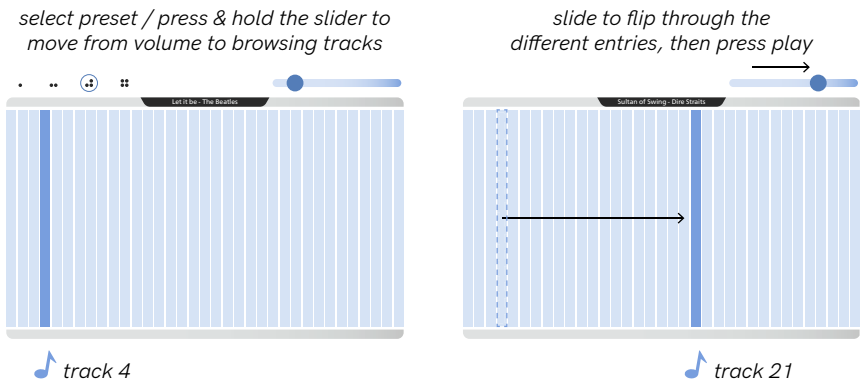


Figure 82. Steps for browsing through the different audio tracks

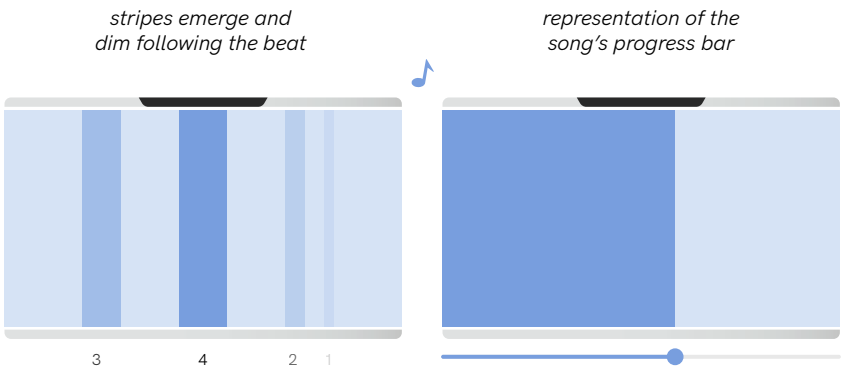


Figure 83. Examples of how to visualise music while being played

Social interventions

These resources also offer the possibility to **intervene during social acts, helping to generate moments together that can be immortalised and shared.** During the event, a "session timeline" can be started through the speaker via the B&O app, and the device will record the songs that are played in regard to the ambient noise (see Figure 84). At the end of the session, the speaker will display a timeline of the event with a pattern of lines of greater and lesser intensity, reflecting those moments where there was more activity and dynamism in the room.

Through the slider, **the user can go through each stripe to remember what happened, connecting special moments through the songs** that sounded at that time. The content can be also reviewed through the B&O digital app, where each track will additionally show the cover of the song, providing a more enriching visual experience.

Both the pattern and the song list will be saved in the owner's profile in the B&O app, which can be shared with the friends and family who attended the event.

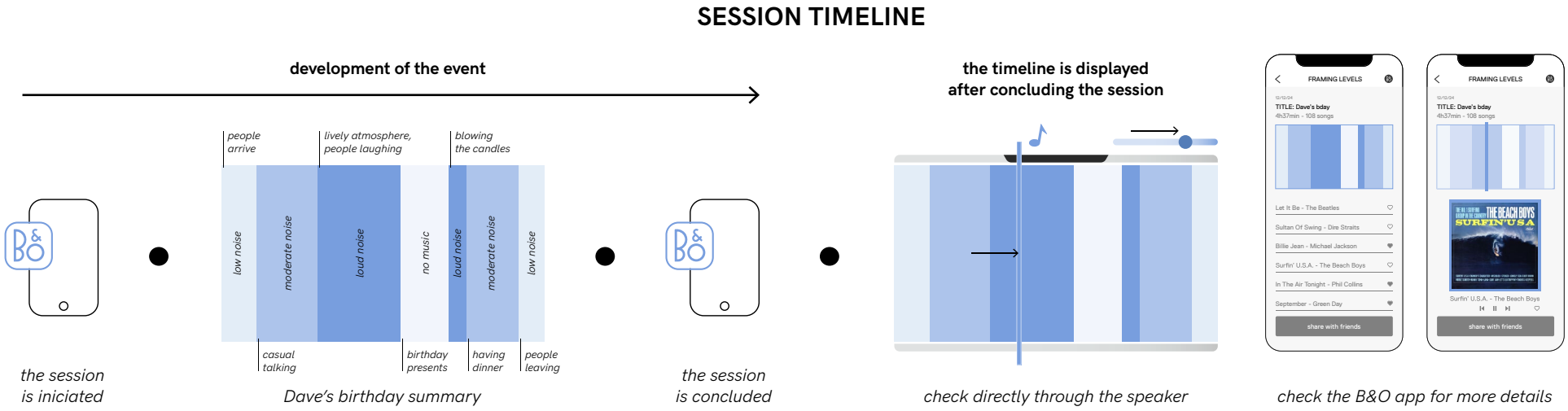


Figure 84. A summary of the process of creating a "timeline session"

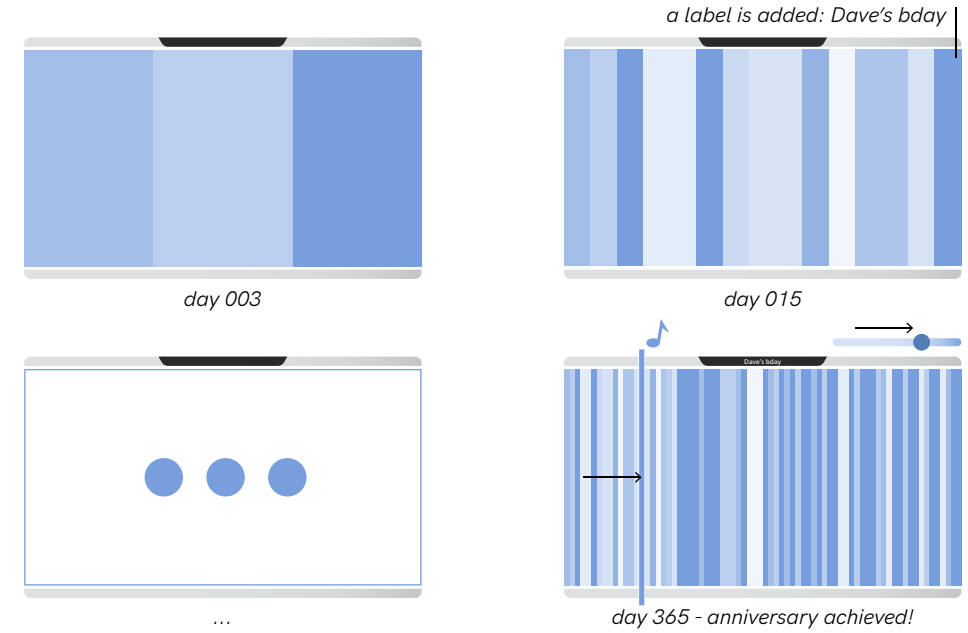
Accumulating time

Lastly, the concept aims to benefit from the factor of time to express all those occasions when the user enjoyed music through the speaker. **Each day, the device will accumulate an entry whose intensity summarises how much music was listened.** A very light line will indicate that the product was barely used, but those more marked will show the days with greater participation. Its width will vary to cover the front panel, offering an evolving appearance that changes day by day (see Figure 85).

After a year, the speaker will display a unique pattern based on how much the speaker was used, inviting reflection and remembering those more notable days by exploring the music that sounded at that time. The user is even offered the possibility to write a small description for those most distinctive days, as a kind of diary, to remember what made them so special. So, when the owner brows each entry, the information display will show the label associated to that particular date.

The pattern restarts after each anniversary, and the musical journey with the speaker begins anew. Likewise, these patterns will be saved in the B&O digital app, so that they can be revisited in the future. When the speaker is on its charging base, not being used, it will have the option to display this pattern continuously, as if it were a piece of decoration, but proudly displaying the journey of one with the product.

Figure 85. Each session is visually accumulated in the front panel



7.2.3 Addressing the strategies of Emotional Durability

This concept seeks to connect with the user by **strongly emphasising the principle of visualisation** (see Figure 86). In the digital era with streaming services, the value of the physical aspect has diminished; we no longer feel a sense of "ownership" over the music we listen to, and countless hours are stored in the invisible cloud.

FRAMING LEVELS approaches this notion by metaphorically embeding the content in the device. The user feels as they were browsing through their favorite tracks, in an hybrid interaction between digital and physical. Additionally, music acts as a form of diary to recall moments and events, **addressing the strategies that advocate for creating unique memories both individually and in collaboration with others.**

It not only expresses the user's experiences through the music they have listened to, **directly connected to the principle of self-expression, but it also accumulates.** Every day counts, making the passage of time visible through the unique use of the device itself. Anniversaries are celebrated, where the achieved outcome has its **own narrative that invites reflection** on what has been lived, touching upon notions from the reflective level. Products with which we connect emotionally often provide us with personal meaning that surpasses the functional.

Each year the journey restarts; does it make the product irreplaceable? Physically it is not, but **the special value of the speaker is only possible to achieve when a long relationship with it is maintained**, and the passage of time itself is irreplaceable.

Figure 86. Concept 1 casts a strong visual pressence

7.2.4 Concept vulnerabilities

The concept depends on the use of a specific technology, the colour-changing e-textile. **This reliance could be problematic if the technology's performance does not meet expectations,** potentially undermining the concept. Additionally, the current limitations of the technology have been considered, which constrains the design in the following ways:

- Limitation to 4 colours. Ideally, the user should be able to customise as many colors as they desire.
- Limitation on patterns. Currently, it only allows for displaying complete strips, whereas other configurations could benefit the concept more.

At the experience level, the concept faces certain challenges. The visual metaphor (stacked vinyl records) must be perceptible to the user, or else the narrative loses much of its value. Additionally, memories are created during social gatherings, but their participation is passive; it would be ideal to involve them so that they feel part of the achieved outcome, where their involvement has been necessary.

While the daily accumulation does not require user participation to occur, the user needs to be motivated to anticipate and reflect on the journey formed over time. **Without this, one of the main avenues through which the concept could foster emotional product attachment would not be fully exploited.** Leveraging features such as the app could facilitate this activity, through a narrative recognisable to the user.

Figure 87 illustrates the mentioned challenges of Concept 1.

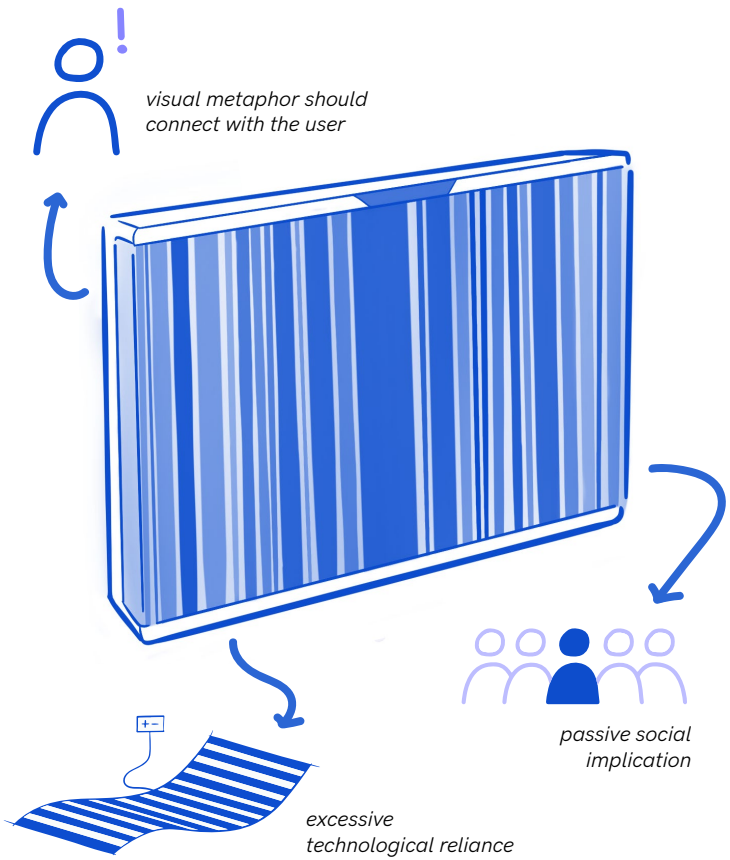


Figure 87. Summary of the main challenges of Concept 1

7.3 Concept 2 - LEVELS OF HABITS

7.3.1 Concept introduction

This concept explores the user's routine through a **shared personalisation between the speaker and the home itself, the digital and the physical.** By emphasising the steps that precede the listening experience, it invites users to consider not only what they do but also how they do it. Music then connects to gestures, places, and moments that trigger different responses, resulting in a routine that aims to become an intentional moment (see Figure 88). In turn, the speaker learns and reacts, intervening in the user experience. Both parties play an active role in the process, where their collaboration will greatly enrich the listening session and the routine itself. Over time, **their communication evolves, through an own language.**

listening habits **routine habits** **LEVELS OF HABITS**

participation to elevate the ritual

Figure 88. Key notions that represent Concept 2

Narrative

LEVELS OF HABITS aims to integrate into the user's routine, allowing them to **become their own conductor**, enhancing through music the details of their day that usually go unnoticed (see Figure 89). On one hand, it strengthens those moments that characterise our daily life, giving meaning to those small actions. On the other hand, it creates a routine with the speaker, where one learns from the other, **personalising the listening experience throughout the home.**

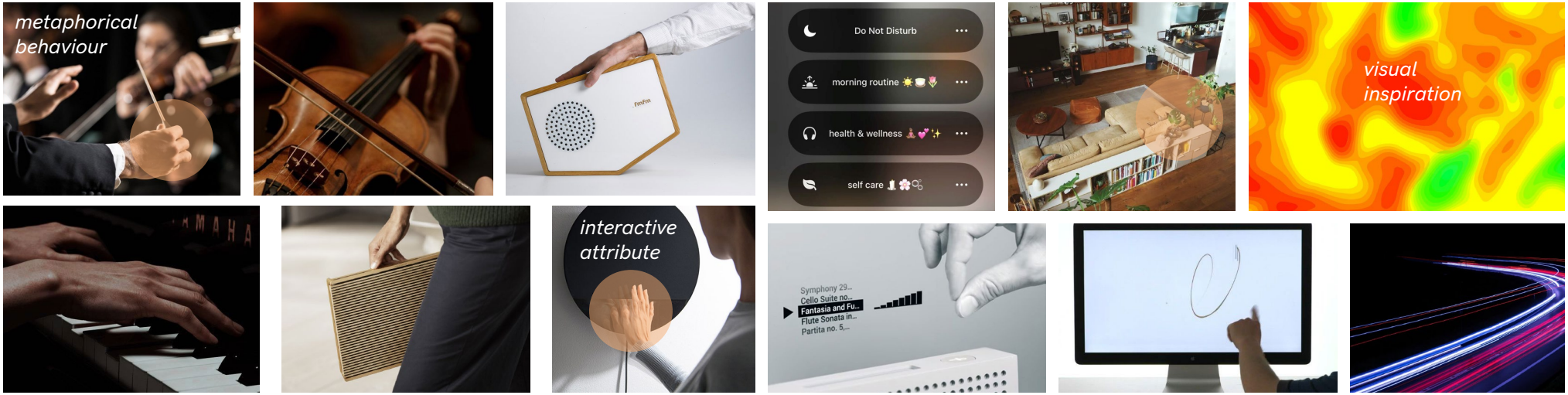


Figure 89. Moodboard references for Concept 2

7.3.2 Design interventions

The present section discusses the design modifications, distinguishing between product-redesign features and experience-redesign features:

Product redesign features

The physical interventions **focus on the touch surface of the speaker.** For this, a series of modifications have been proposed that align with the purpose of the concept, expanding one of the features already present in the speaker. This aims to integrate with the structure already offered by the BEOSOUND LEVEL, rather than introducing other alternatives that would require reconsidering the core anatomy of the device.

Expanded touch surface

The responsive bar is increased to cover nearly the entire available space on the frame, maintaining two sections from the current model; the playback functions and the volume control area (center and right), and introduces a new interaction zone (left) for user-created shortcuts.

The tactile button icons are removed, providing an interface that does not require visual attention to operate correctly (see Figure 90). The playback controls and volume slider retain the essence of the original model, and the custom patterns area introduces a new dynamic of communication, which will be further explained in subsequent sections.

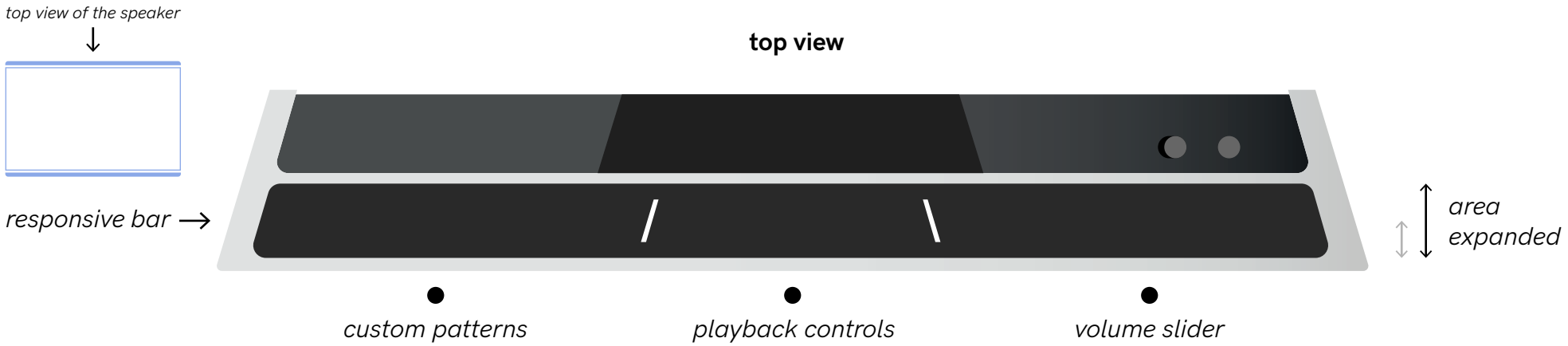


Figure 90. Redesign of the touch surface, along with the role of each area

Experience redesign features

As it was structured in the concept 1 description, this section explains the interaction possibilities derived from the proposed redesign. Again, they are divided in the following two categories:

- User experience & interface (UX/UI) feedback.
- Routine personalisation.

UX/UI feedback

Turning ON / OFF

The concept starts by addressing an essential step of the interaction: turning on the device. This action is designed to set the tone for the listening session, providing a brief yet meaningful moment of pause that readies ourselves for the experience. To power on the speaker, the user performs a simple gesture along the touch surface, accompanied by a startup melody. However, this action only activates if performed slowly, matching the melody's pace. The Figure 91 illustrates this gesture, where the shutdown command is the inverse of the same gesture.

Rituals are characterised by a strict manner of execution, and this subtle yet remarkable method allows to unlock the process without being overly burdensome. Moreover, this gesture does not interfere with other commands on the responsive bar, as it is the only one that crosses all three interaction areas.

For this feature, a type of melody has been considered for this function, as well as for other auditory feedback options. The BEOSOUND LEVEL is a premium product, noted not only for its aesthetic quality but also for its acoustic excellence. Therefore, melodies reminiscent of an orchestra have been chosen for the auditory cues, aligning high-quality instruments with high-end devices. This choice enhances the premium nature of the speaker by using sound cues that evoke a sense of sophistication and luxury, suitable for a device of this caliber.

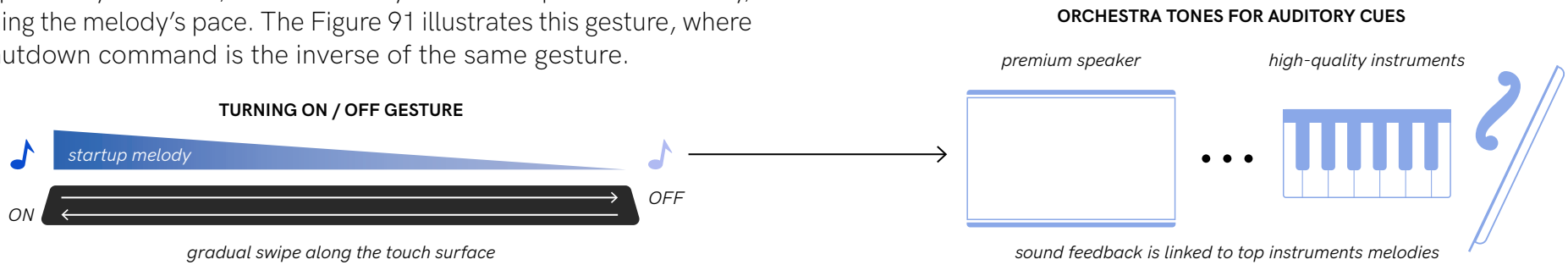


Figure 91. The turning-on process in Concept 2 requires of both a specific gesture and tempo

Playback controls & volume slider

These functions retain the essence of the original interface but with **slight modifications to fit the new responsive bar.** Without reference icons, each zone allows the command to be registered at any point within its area, requiring less precision (see Figure 92).

This means that users need to memorise the gestures during the first interactions, as there are no visual cues. However, these are based on patterns already present in interfaces among similar devices, resulting in intuitive and logical commands to execute and remember.

Custom patterns

This interactive area **represents the main physical feature that will aid users in personalising their listening routine.** Users can register gesture patterns that are entirely elaborated by themselves, where each command will trigger a different playlist, radio station, or even audio settings (see Figure 92). Additionally, each action triggers a selected ringtone, signaling to the user that it has been executed correctly.

The original interface allowed saving up to four different presets, each embedded in a responsive button. This new format not only increases the number of possibilities but also allows to curate your own language with the speaker.

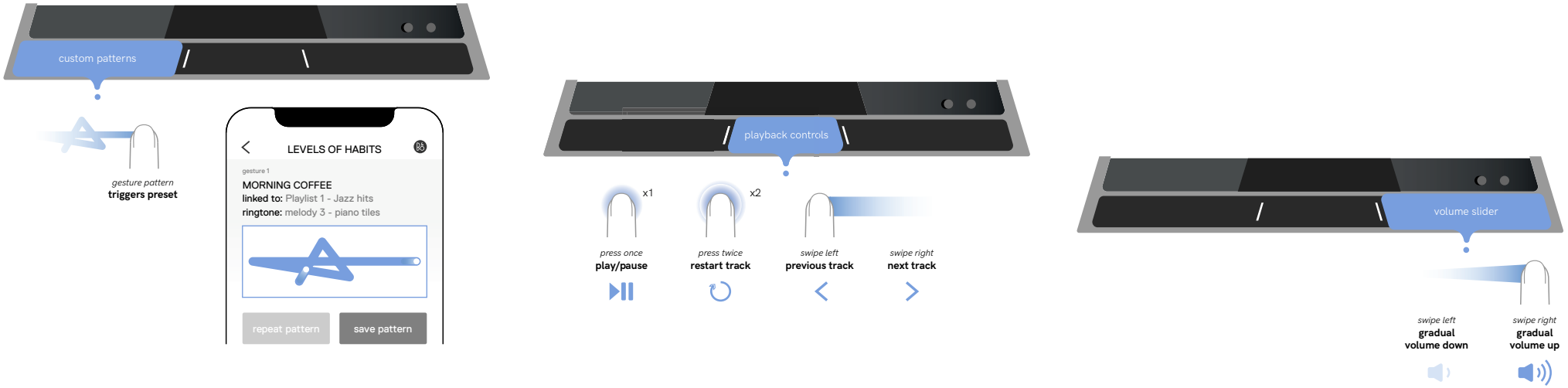


Figure 92. Each area in the touch surface allows for specific actions

Routine personalisation

The user needs to follow a series of specific steps to start the session, diverging from the conventional way of *turning on and go* of traditional speakers. These actions include a particular activation, moving the device to the desired location, and, optionally, commanding the appropriate preset (see Figure 93). Although these gestures become more familiar over time, they require our attention for correct execution, creating a significant moment where our participation is crucial.

Furthermore, **another key component introduced in this customisation is the location.** Currently, B&O allows for exceptional audio profile personalisation via the digital app, creating diverse settings for different rooms and moods. Whether you are cooking with a softly playing podcast or watching a movie in cinema mode, these setups are managed via mobile, necessitating manual activation for each situation. Or alternatively, perform the corresponding pattern on the speaker's responsive bar.

Figure 93. Steps involved when preparing the listening session with Concept 2

The concept offers a blend of digital personalisation and physical interaction. Like people, products find their rightful place in the home. Typically, the routine involves positioning the device in frequent spots, wheter or not placed on a wall mount. Thus, it introduces the feature where the speaker's placement activates specific sound profiles. Triangulated through the charging stations, a wall knob might provide a standard living room setup, but placing it under the TV sets cinema mode, as it optimises sound projection for the sofa (see Figure 94).

Whether to activate one of the gestures presets or a completely new one created through placing, a specific ringtone will sound to communicate that the mode has been selected. Besides, the user will always have the option to prevent these changes from being made. Holding down the playback controls area will cancel the preset, or from the app, it can be disabled from being activated automatically.

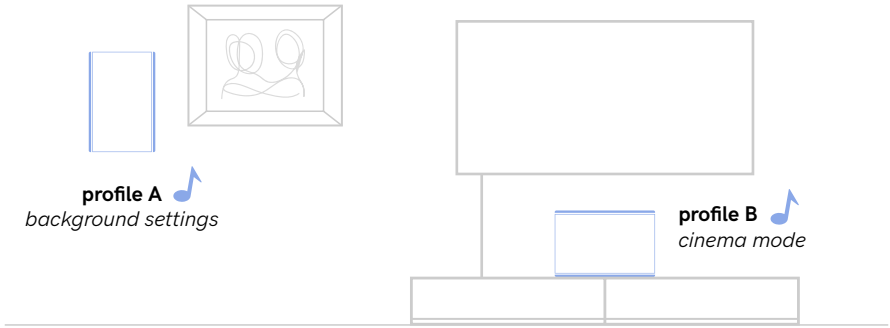


Figure 94. Different locations will trigger different audio profiles

Learns & suggests

This design customises the listening experience digitally while also being manually executed through spatial interaction, where each home presents unique possibilities.

However, this process is considered and executed by the user themselves, and the speaker responds accordingly. LEVELS OF HABITS also introduces a new dynamic, where **the device itself prompts the personalisation of the listening experience.** Over time, the speaker learns from its owner's routine and takes it into account to recommend new profiles (see Figure 95). It not only suggests based on what the owner listens to but also the places and times where it happens.

- Lately you have played this playlist a lot, would you like to create a gesture for quicker access?

- You usually listen to the news in the early afternoon, should we schedule them to play at a specific time?

These suggestions will come through notifications in the B&O app, where the user can decide whether to register them and how to configure them.

This is because **we are often not aware of what defines our daily life**, nor the conditions in which it takes place. In response, the speaker takes agency and aims to elevate those ordinary moments through the content we listen, transforming unplanned actions into something meaningful.

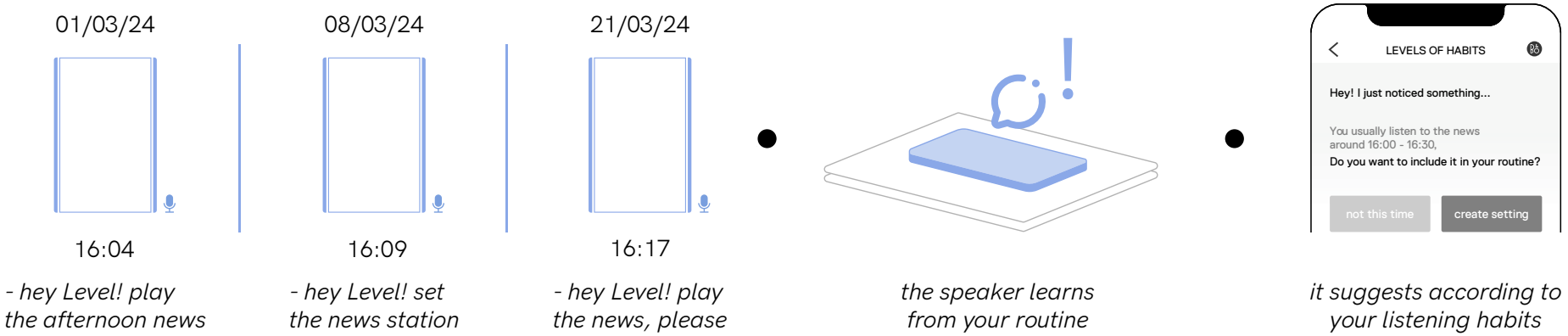


Figure 95. The speaker learns and suggests in regards to the listening habits

These features also allow others to get involved and enjoy what LEVELS OF HABITS offers. Whether it is the partner you share the speaker with, or loved ones who come by occasionally, each guest can create their own language and routine.

Do you hand over the music to your best friend when they visit? Let them create their own preset pattern. *Does your partner have a different routine than yours?* The speaker adapts to these situations, as it depends on the mobile device it is connected to via Bluetooth. **This encourages other people to participate in the experience** and appreciate the moments of using the speaker, as if it understands both the user and those around them, adapting to the different scenarios that define our days.

Following up your habits

The user and the speaker will gradually create a listening experience that involves the content, their habits, and the home, accommodating a unique interaction. **The device navigates through our routine, both physically and metaphorically**, and this intervention seeks to take advantage of this notion.

Over time, the user will have access to reviewing how their listening habits manifest through the speaker's usage. Thanks to data analysis, it allows for reviewing the usage dynamics from various lenses, such as distinguishing between the types of content we listen to, how each room has different auditory demands, when it is used by someone else, and so on. This information will be available through the B&O app, allowing users to reflect on their usage patterns and how these define the overall listening experience.

As if the speaker represents us, it is a reason to celebrate how small daily actions gradually contribute to our musical identity, manifesting not only through the content we enjoy but also through the corners and moments in which we do it.

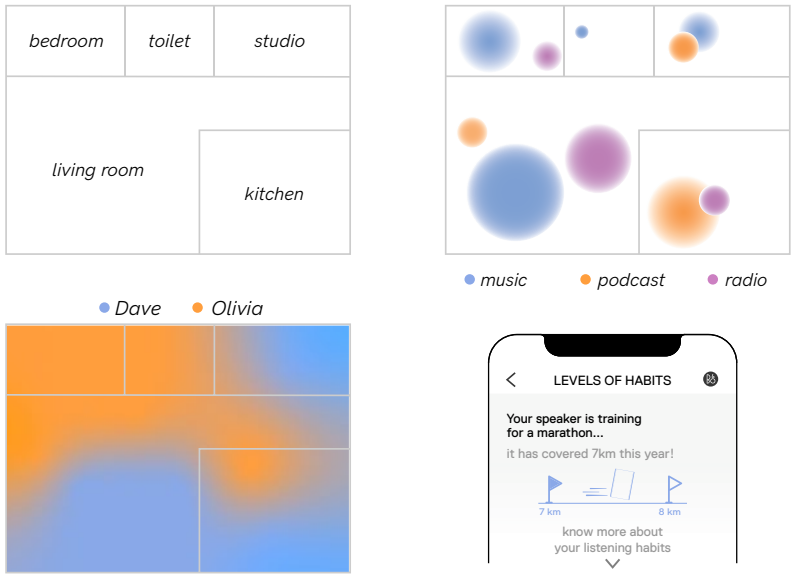


Figure 96. The speaker displays your listening habits in a graphic way

7.3.3 Addressing the strategies of Emotional Durability

This concept pairs the main strategies of the project—participation and ritual. It encourages users to engage in a shared interaction with the product, facilitating the creation of special moments through a reinvention in the way the speaker is used (see Figure 97).

The product appears to understand and adapt to us, fostering a relationship that is refined and solidified over time, touching on other principles such as intimacy and evolvability. This may evoke feelings of attachment to the product as it has been tailored to oneself through our constant intervention, potentially awakening emotions.

On the other hand, this is done with the intention of elevating our routine to something more. LEVELS OF HABITS gives pause and attention to the small details, **making us value more what we do and giving importance to each action, as if it were a ritual.**

A long relationship with the product not only enhances the interaction experience but is also rewarded. The option to review your habits is a way to **celebrate both our unique way of interacting with the speaker and encourages the user to keep experimenting throughout their listening routine.**

The product then portraits a set of attributes that make it difficult to replace, as it takes time and engagement to adapt it to oneself, what may transcend the digital and be expressed through attachment to the actual speaker that made it possible.

Figure 97. The speaker encourages to be used and relocated across the house

7.3.4 Concept vulnerabilities

The characteristics defining the interaction with LEVELS OF HABITS could lead to some drawbacks that might complicate establishing a positive bond between the product and the user (see Figure 98).

Firstly, the feature of creating gestures opens the possibility of generating **so many combinations that it could become challenging** to distinguish them, hindering the proper development of the experience and potentially causing frustration. A balanced use will be key to maximising the functions' potential.

On the opposite case, it is clear that the concept requires a certain level of involvement. If the user is neither motivated nor willing to leverage the potential of the speaker's functions, the means to generate personal attachment with the product would be underused. Therefore, it would be advisable for the aspects that make t**he interaction with the concept distinctive to occur during the usual usage sequence,** without requiring dynamics that are unfamiliar with this type of devices.

Additionally, many of the functions used by the speaker are based on data manipulation. Even though the concept does not deal with sensitive information, this might **raise concerns about how their personal information is handled** by third parties. Moreover, ceding control to the product can create uncertainty about the degree of agency of smart devices, and therefore, the user should have the option to deactivate this tool without significantly disrupting the overall experience.

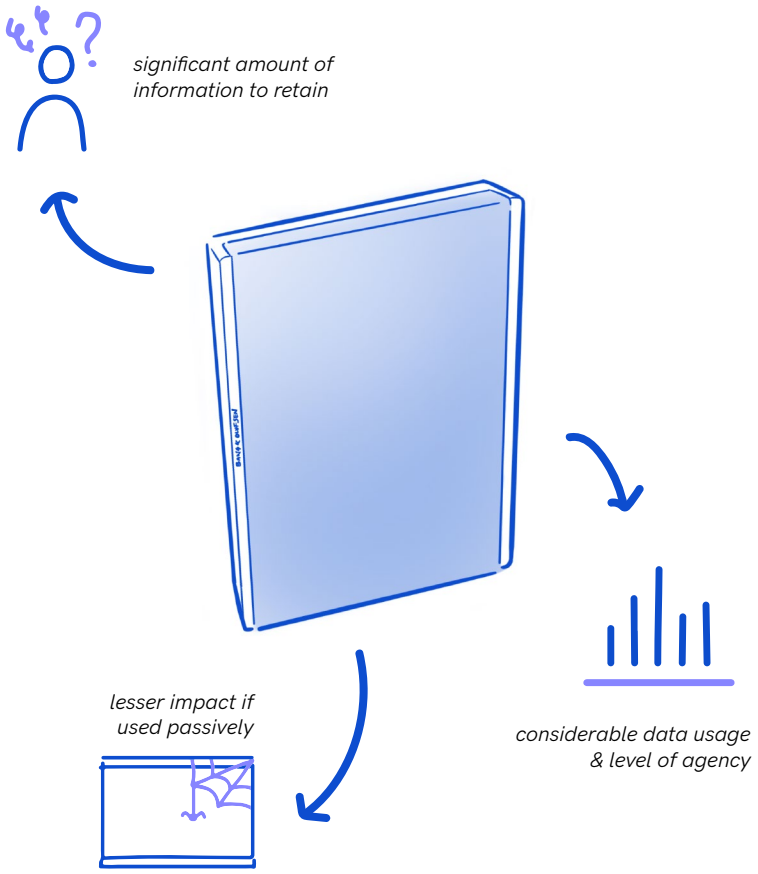


Figure 98. Summary of the main challenges of Concept 2

7.4 Comparing the concepts

7.4.1 Walk-through scenarios

This brief section compares both concepts through connecting some typical usage cases, illustrated in the Figure 99.

Figure 99. Each concept approaches the scenarios in their own way

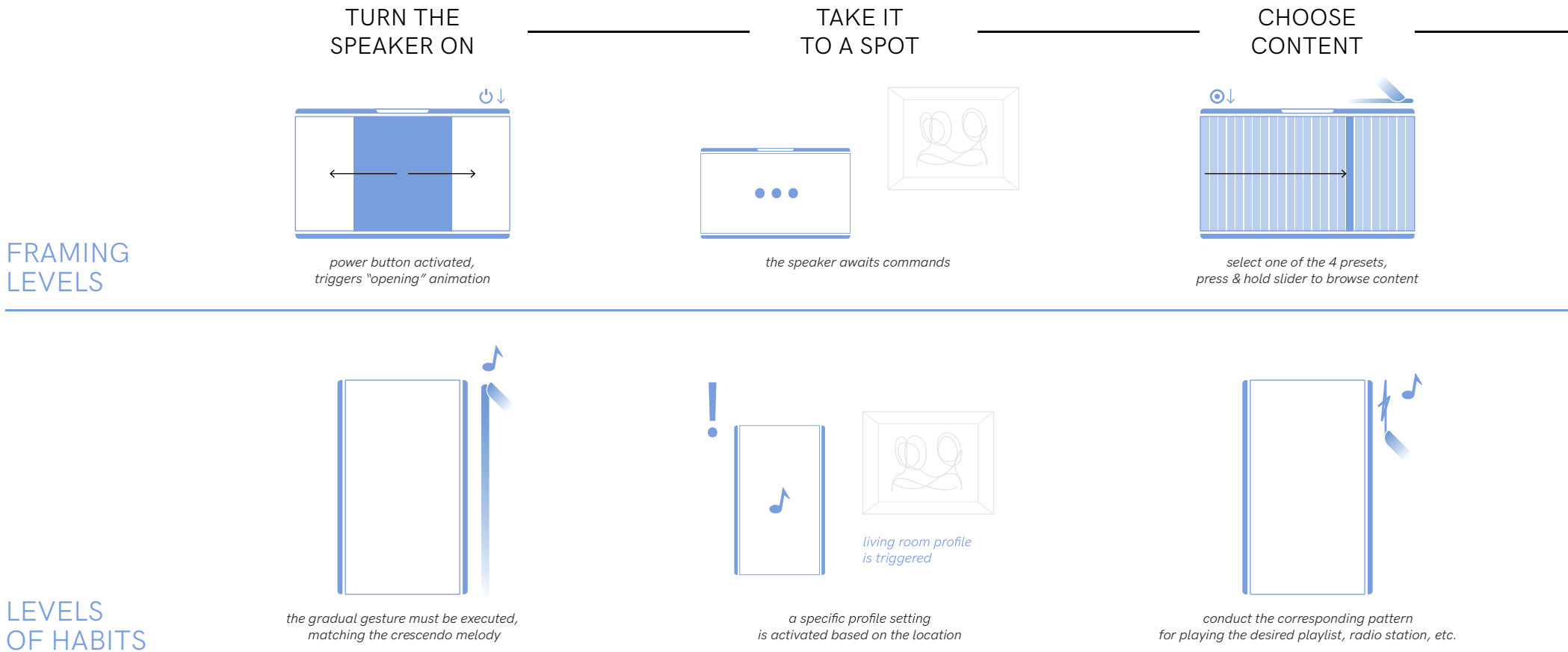
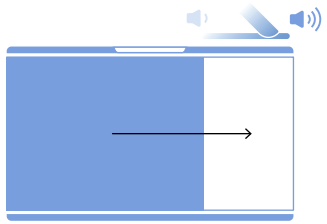


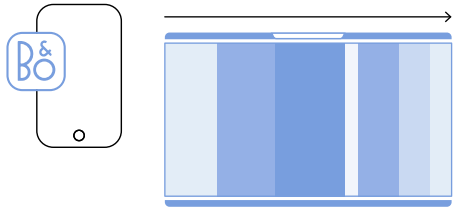
Figure 99. Each concept approaches the scenarios in their own way

ADJUST CONTENT



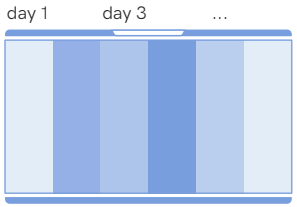
turning volume up with the slider accompanied by the animation

FRIENDS COME OVER



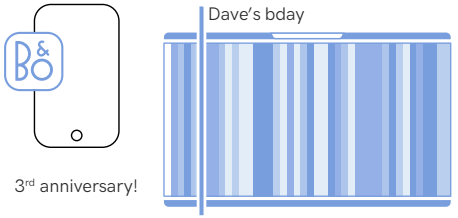
visual session timeline through music & ambient noise

SPEAKER NOT BEING USED



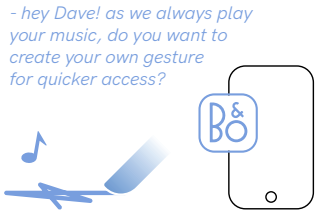
while charging, it can display a representation of how much it has been used each day

AFTER SOME TIME...

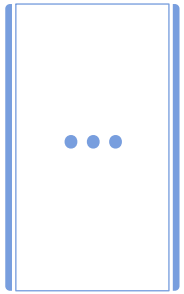


the daily accumulated visual resets after a year, the summary can be explored via the speaker and the app

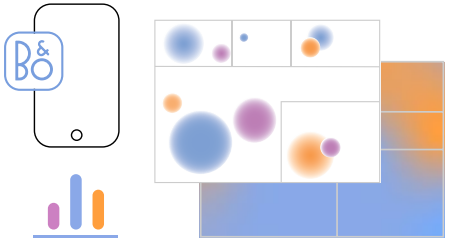
turning volume up with the slider



allows other people to customise their own patterns



the speaker awaits commands



listening habits can be constantly explored via the app

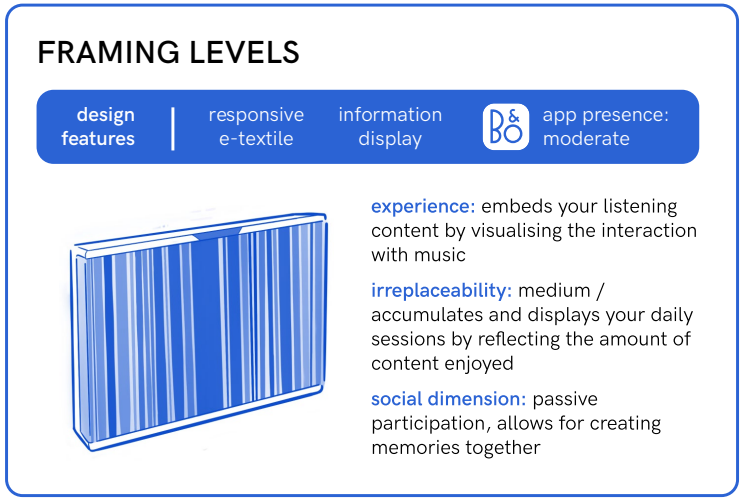
7.4.2 Concepts overview

The *walk-through* has provided us with an overview of the performance of each concept during frequent scenarios. Following that, figure 100 depicts the main attributes that define both proposals.

Although they share certain similarities due to the original structure of the speaker (similar touching actions, voice recognition, etc.), their consequences are very different. **Concept 1 aims to captivate us at the moment of interaction, enhancing each command, while Concept 2 benefits from how today's decisions will improve those of tomorrow.**

At first glance, it is evident that FRAMING LEVELS offers a much more visual and striking experience, while LEVELS OF HABITS focuses on gradually crafting the ideal routine for the different listening sessions that take place in our lives.

A common aspect, undoubtedly, is that **both concepts remain active over time.** Whether accumulating a bit from each session or reflecting details in our routine that usually go unnoticed, they make us appreciate each day spent with the speaker a little more.



self-expression through visualisation

participation to elevate the ritual

Figure 100. Summary of the characteristics of each concept

7.5 Conclusions

This chapter presents the two design proposals developed, after a process of exploring design alternatives that align with each direction (see Figure 101).

Each concept aims to strengthen the relationship between person and device through a series of interactions that rethink the traditional way we handle speakers. All this seeks to improve the user's perception of their product, not only because of the technical functions but also because of their narratives. **By contributing to forming a dynamic that benefits from the long term, it cements a listening experience tailored to oneself, either by reflecting our identity or enhancing our routine.**

While each direction has been explored and materialised separately, it is important to remember that both were identified as highly favourable to fostering a truly meaningful product attachment with the speaker. Therefore, c**onsidering their integration would aim for the ideal case**, enhancing the interaction experience through both scopes.

The next chapter will therefore analyse their potential based on the project criteria, with the goal of identifying not only which concept connects best with the introduced values but also which attributes can be transferred from one concept to another. **This notion aims to achieve a final version that embodies the best of both paths.**

Figure 101. The corresponding researcher exploring design possibilities

8 concepts evaluation

content

8.1 Evaluation methods 114

8.2 Unifying the concepts 119

8.3 Conclusions 122

8.1 Evaluation methods

The concepts discussed in the previous chapter explores the strategies defining each design direction, and proposes a series of interventions to enhance the listening experience with the reference speaker. Now, **how do these proposals respond to the criteria identified during earlier stages of the project?**

During the Design Brief, a set of metrics was introduced to further assess the appropriateness of the developed concepts (see Chapter 5). These requirements are intended to confirm whether the proposals align correctly with the design objectives for product attachment, using the following groundwork:

- **A Design Goal (DG)** as the main objective.
- **An Interaction Vision (IV)** to convey the essence of the experience.
- **A Design Criteria (DC)** to monitor if the mandatory, recommended, and suggested objectives have been met.

As noted in the previous section, the task now is to determine which concept is the most promising and, if possible, how to merge both under a single alternative that encompasses the two design directions. Consequently, the purpose of this section is to evaluate and compare them **using this criteria, in order to decide which path to take in establishing the final concept.**

8.1.1 The lens of the Design Goal

This section briefly discusses how each concept addresses the DG, which mandates ***personalising the user's journey with the speaker through interactions during the listening routine.*** As illustrated in Figure 102, both concepts reflect this goal from different approaches:

FRAMING LEVELS excels by **systematically accumulating evidence of our interactions after each session**, personalising the product in a visible way by leaving a graphic record of our listening journey over time.

LEVELS OF HABITS, in contrast, **internalises this personalisation by enhancing the experience during product use.** The speaker learns and adapts, allowing the user to shape their listening experience both actively and passively, at moments they choose.

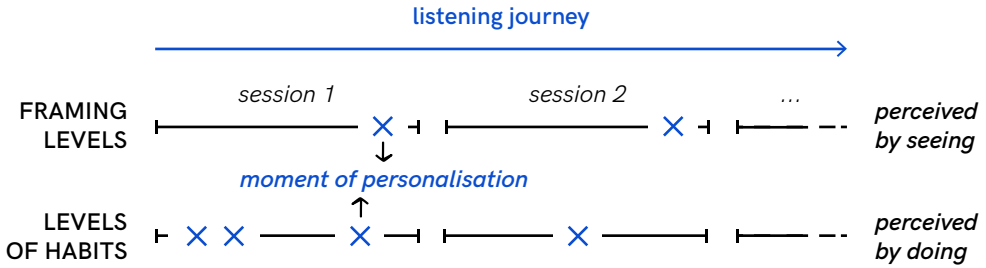


Figure 102. How both concepts address the objective of the DG

Takeaway

We can draw notions from each type of approach. A personalisation that can be easily perceived by the user, where just by looking at it one can see a bit of our identity in them, **conveys a stronger idea of having a unique product based on ourselves**, as is the case with Concept 1.

On the other hand, allowing the user to directly modify the product intentionally, as with Concept 2, **makes them more involved and aware of how their engagement contributes to this**, combining that mental and physical effort that is key when forming an emotional bond.

8.1.2 The lens of the Interaction Vision

The IV presents a clear image: ***shaping a bonsai over time through a unique, intentional, and adaptable interaction experience.*** Both concepts meet these requirements to varying levels, and this section uses the interactive attributes to assess the degree of fulfillment of each, as shown in Figures 103 and 104.

The figure on the right highlights how **FRAMING LEVELS performs well in terms of uniqueness and adaptability.** Even when the main theme of this concept is to visualise our interaction with music, a particular record is generated at the end of the day, representing how much music we have engaged with. This process embeds a part of one's identity into the speaker, which is capable of understanding these changes and materialising them accordingly, adjusting to our listening rhythms. Just as each bonsai shows the intentions of its owner, the daily interactions shape its appearance, displaying a unique visual. The only impediment would be that the pattern resets after a year, so their uniqueness is enjoyed until then and the cycle of accumulation begins anew.

However, the user has limited control over this result. While they could purposely alter their usage behaviour to change the outcome, the experience is designed to occur naturally, indicating that the aspect of intentionality is not as well defined as the others.

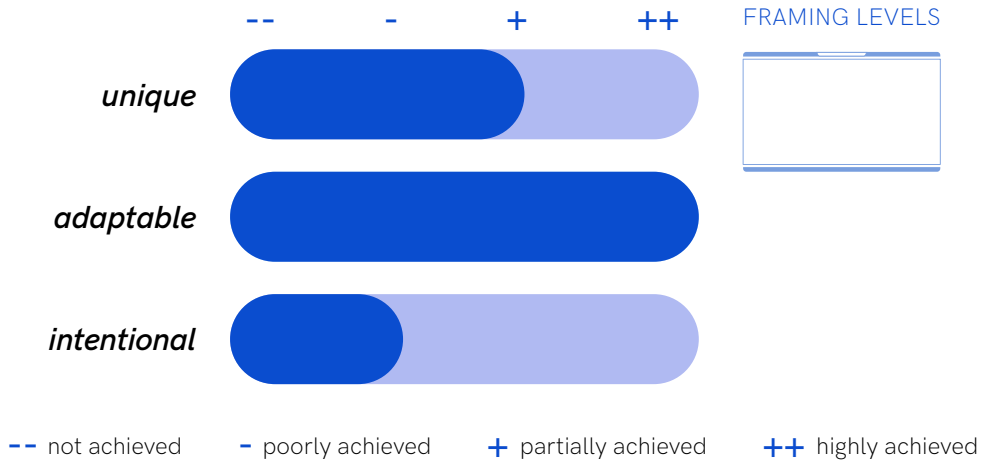


Figure 103. Evaluation of Concept 1 based on the attributes of the IV

On the other hand, **LEVELS OF HABITS stands out for its adaptability and intentionality**, as Figure 105 illustrates. The concept relies on building your own listening routine, requiring personal dedication and product flexibility. The speaker adapts to unique demands, enhancing everyday moments with music. As routines unfold differently in each home, the interaction experience will be particular to each case. However, this configuration is not entirely one-of-a-kind.

The concept benefits from the long-term to offer a listening experience tailored to oneself, but then it 'only' requires time to be replicable. Even for ourselves, we could practically achieve the same setting with a new model of the speaker just by accomodating our listening routine as we usually do, though it would require time and dedication. This means that the quality of uniqueness does not excel completely within Concept 2.

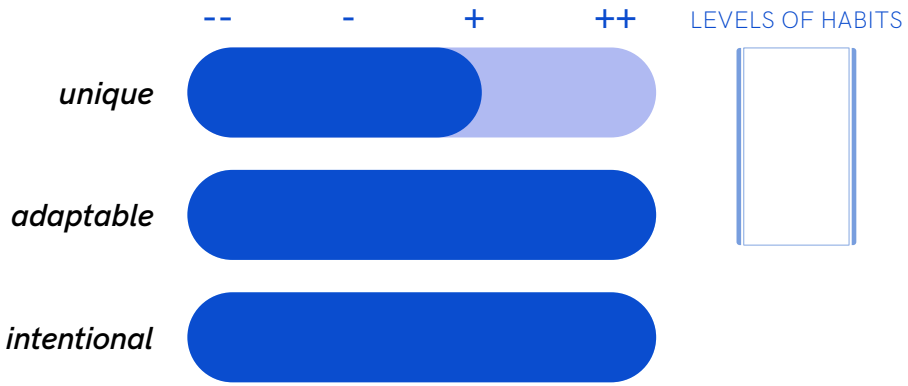


Figure 104. Evaluation of Concept 2 based on the attributes of the IV

Takeaway

The act of deliberate 'shaping' during the interaction experience, as occurs with LEVELS OF HABITS, aligns better with the Interaction Vision. Much like bending each branch of a bonsai, **every gesture with Concept 2 leaves that feeling of directing the product where one wants.**

However, the way FRAMING LEVELS physically differentiates the product makes it more interesting, as it not only appears more disntinctive but also **transforms an aspect of the listening interaction into a visual story, encapsulating a subtle narrative that proudly talks about oneself.**

8.1.3 The lens of the Design Criteria

This method provides guidelines to evaluate the concepts through more specific requirements. The DC is composed of four sections, ranging from the most indispensable aspects to recommendations that enrich the experience, each with its respective specifications (see page 70).

For this, **a comparison matrix will be used to assess each concept** based on the corresponding criteria, as shown in Figure 105. They will be evaluated based on the degree of fulfilment for each section, distinguishing between low, medium, or high completion (*none, partial,* and *full*, respectively).

It can be observed how the concepts perform differently, where almost all criteria are met to some extent. **FRAMING LEVELS is notable for positively fulfilling all four cases**. It underscores both in motivating direct interaction, as it elevates simple control actions through visual feedback (e.g. the sensation of flipping through your tracks), and in capturing significant moments, thanks to the *"session timeline"* function that allows generating a visual playlist during a period of time while enjoying your content alone or with others.

On the other hand, personalising the speaker through use, a crucial criterion, is partially fulfilled. This is because the only function that genuinely shapes the speaker is not a deliberate action, but rather a summary of their usage, as previously mentioned with the accumulation of stripes that express the speaker's demand on each day. Similarly, the social aspect is present but also passively, again thanks to the *"session timeline"* function that allows generating a memory when loved ones come home, although they do not have to participate directly in it.

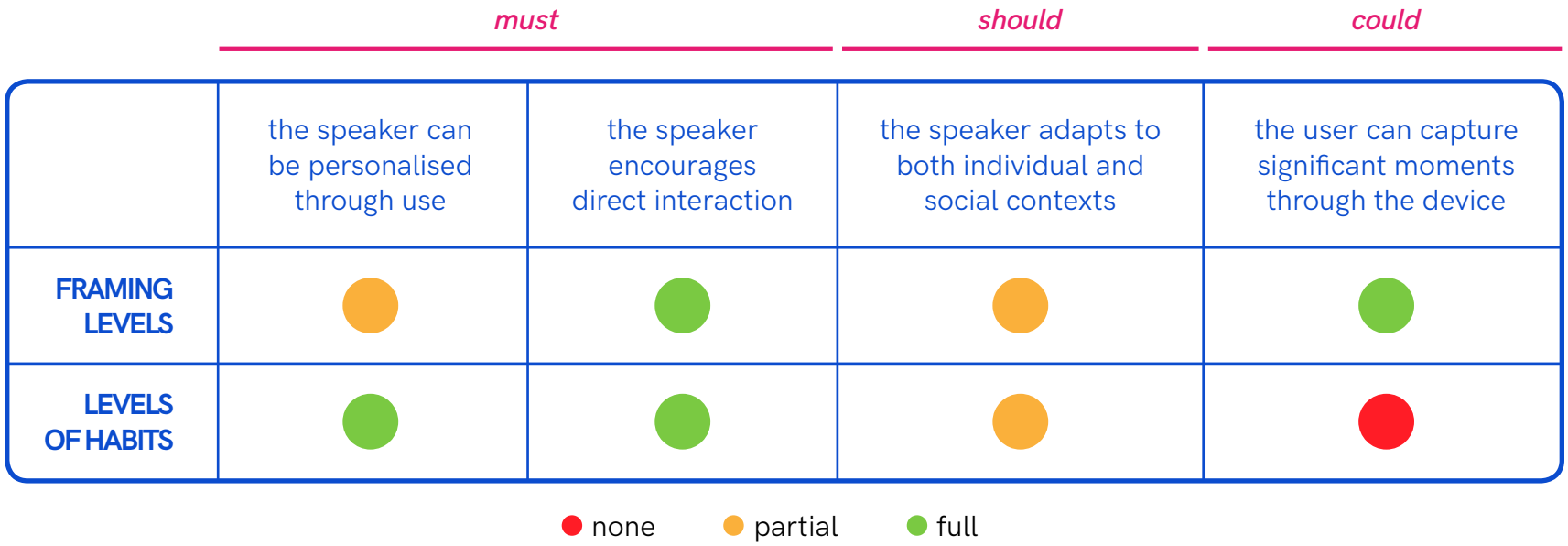


Figure 105. Assessment of both concepts according to the points of the DC

The profile presented by LEVELS OF HABITS is more uneven, but it **performs best in the criteria that are most crucial for the experience.** Concept 2 can be greatly personalised through use, as one adapts their listening habits to seamlessly integrate them into the routine. In turn, it invites direct interaction with the product to make this happen, **leveraging spaces and gestures that can only be triggered through physical engagement with the speaker itself.**

Besides, the social aspect is slightly present by allowing others to create their gestures and routines, but it is a feature that does not elevate the collective experience, rather it substitutes who has control over the product. Additionally, although Concept 2 can record our digital activity, these are not memories intentionally generated by us, nor does their significance transcend from the technical to the personal.

Takeaway

FRAMING LEVELS presents a much more compelling profile, performing adequately in various points of the DC. It will be interesting to consider its features in order to meet the different criteria. LEVELS OF HABITS, on the other hand, excels in the main topics thanks to a high degree of involvement between person and speaker, so **transferring the approach of Concept 2 would help reinforce the interaction experience with the final concept.**

8.1.4 Evaluation summary

Figure 106 below summarises the main insights gathered through the various evaluation methods. This activity allows for a better comparison of both concepts, with the aim of deciding how to unify the two design directions for the final proposal.

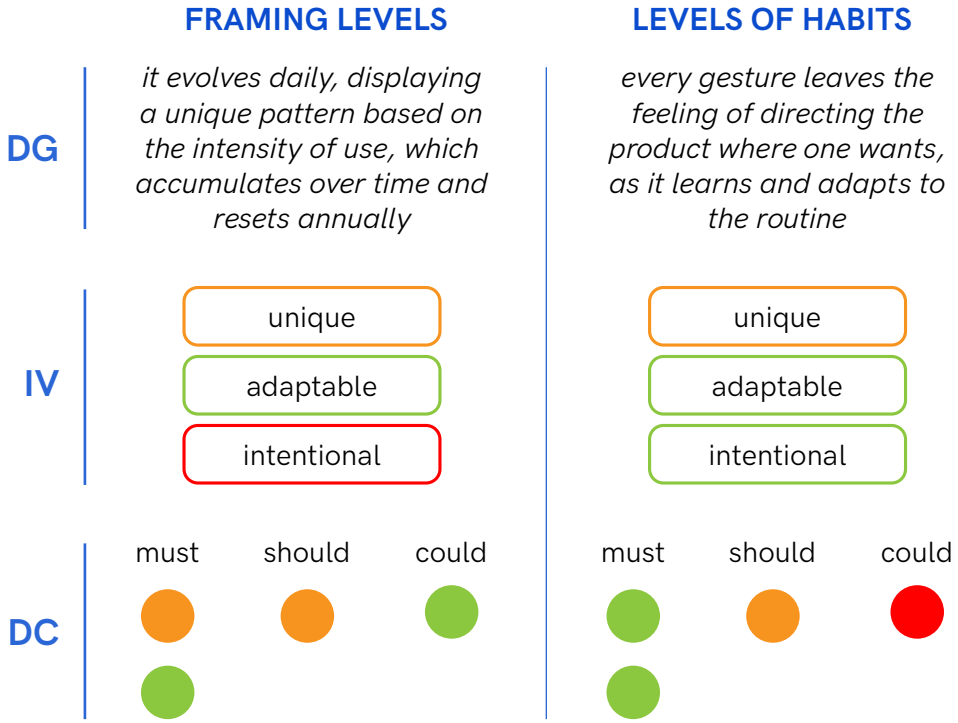


Figure 106. Comparison of the main insights from both concepts across the different evaluations

8.2 Unifying the concepts

The various assessments conducted have highlighted the strengths and weaknesses of both concepts. However, rather than being used to discard one of the proposals, **they have revealed the potential each presents in every evaluated area.** This presents the opportunity to combine both directions under a single design, extracting the best from each ideas. Thus, the particular flaws can be compensated, as in almost all criteria at least one of them performs notably.

After considering the evaluations, it is proposed to unify both interventions using the following strategy: elevate Concept 1 through the approach of Concept 2, or in other words, **express visually the routine of listening to music.** In this section, will be discussed both why the concepts have been prioritised in this way, as well as the positive aspects and areas for improvement for the final design.

This decision is motivated by several reasons. **FRAMING LEVELS performs more acceptably across the different Design Criteria requirements**, which is the most actionable method to measure the performance of the proposals. Quality of use can be expressed (i.e., daily stripe accumulation), resulting in a visual narrative with a much more recognisable identity, which is key for perceiving the product as "different", "ours". Additionally, its particularities are based on the physical features of the concept, making its functions more difficult to transfer to another proposal.

Opposite to that, it is true that LEVELS OF HABITS performs notably on the several evaluation methods, but its particularities lie more in how one interacts with the concept, rather than in the functions themselves. Purposeful personalisation through use, greater emphasis on the listening routine at home, etc. **This makes its approach easier to transfer to another design, as it does not depend on specific features but on how the experience is lived** (see Figure 107).

Both proposals adequately address the objective of the Design Goal. Now, combining the concepts in such a way that the speaker is not only intentionally personalised through use (Concept 2) but also externalised uniquely (Concept 1), would align better with the intention behind the Interaction Vision.

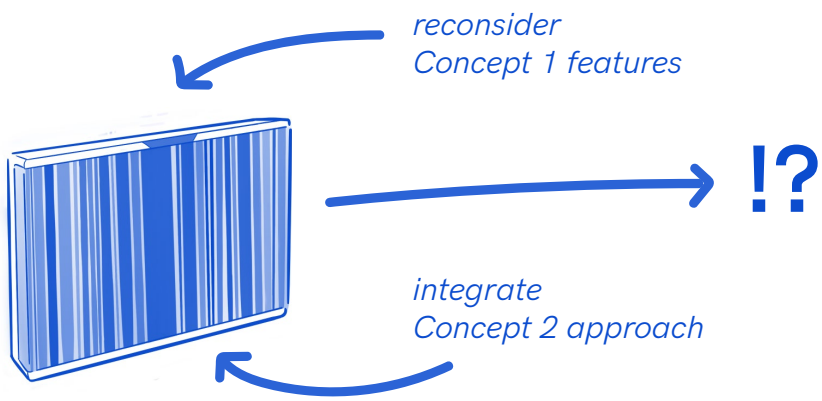


Figure 107. Concept 1 will be reformulated and expanded based on the approach of Concept 2

8.2.1 Discussing main features

FRAMING LEVELS offers an experience that enhances the moment of interacting with the speaker, leveraging it into something else. It will be important to **maintain the responsive feedback provided by the e-textiles in combination with the control functions** and music playback. These kinds of actions elicit direct interaction with the device, as the physical experience offers more resources than the digital one.

Concept 2 approach: **combine the smart fabric with the "ritual" of listening to music.** This enhances the iconic steps that have been lost with modern devices and were emblematic among analogue devices (e.g., emphasis on track selection, content visualisation, etc.), captivating the user through engaging interactions.

In FRAMING LEVELS, the intensity of use personalises its appearance, generating a stripes pattern based on daily demand. However, **this personalisation does not fulfill a higher purpose nor does it enhance the listening session on a practical level.** Besides, this embedding is not intentional, nor does it express a personal aspect of the owner's musical identity. Instead, it just reflects usability alone.

Concept 2 approach: **the user builds a meaningful personalisation that reflects their musical identity.** In LEVELS OF HABITS, the collaboration between user and speaker allows the experience to be tailored to oneself, rewarding us when we invest time and dedication in accommodating it.

Implications

This encourages greater attention to the process that anticipate the session, fostering those small moments where user and product collaborate to prepare the listening experience, strengthening their bond through shared participation.

If the way the owner adapts the use of the speaker to their musical preferences also serves to shape the speaker's appearance, it would achieve a unique, intentional, and adaptable personalisation that aligns with the intention reflected in the Interaction Vision.

This makes the experience not only more personal but also improves it on a functional level (e.g., anticipating settings, selecting the type of content we want to listen to at specific moments, etc.).

8.2.2 Discussing secondary features

Concept 1 offers a very interesting feature that considers memory creation through the "session timeline," which can be enjoyed alone and with others. However, their participation is passive, and **ideally, they should be involved in a way that makes them feel their active contribution has shaped the resulting memory.**

Modification: combine the collective session with memory creation. Allow people to not only actively participate in the listening session, but also leave a part of their identity in the creation of the memory. This could be achieved through the popular shared playlists, where everyone contributes their songs. Materialising it would result in a unique outcome that reflects the contribution of each participant.

An aspect not specified during the evaluation but affecting the experience is the reliance on digital resources such as the B&O app. **The potential for generating product attachment could be diminished if significant interactions are transferred to the digital realm**, as these would not be motivating the user to maintain a relationship with the speaker but with a function easily transferable between units.

Connotation: FRAMING LEVELS uses it in certain complementary functions (e.g., the "session timeline" feature). Therefore, its role in the final concept **should be to accompany the functions offered by the speaker,** never replacing them but rather complementing them.

Implications

Creations made collaboratively reinforce collective bonding, manifesting in a tangible memory. We provide the mental effort, while the execution of that effort is conducted by the speaker. In this way, its perception could shift from being a simple music device to a memory generator, enhancing our appreciation of it, much like what happens with cameras.

The great utility that digital functions bring to electronic devices today is undeniable. Relying on them to lead the entire user experience would be a mistake in our pursuit of fostering attachment with physical products, but not making good use of them in our benefit would mean wasting their potential.

It will be necessary to properly balance their contribution and the degree of involvement in the overall user-product interaction.

8.3 Conclusions

This section has evaluated and discussed the strengths and weaknesses of the two presented concepts and justified that the final concept will be **a reformulation of the FRAMING LEVELS proposal, incorporating the holistic qualities of LEVELS OF HABITS.**

Figure 108 below summarises the elements currently present and those that will need to be introduced into the final proposal. The next phase will present the resulting design proposal, which will be tested and discussed based on the project's objectives.

EXISTING

Visual interaction

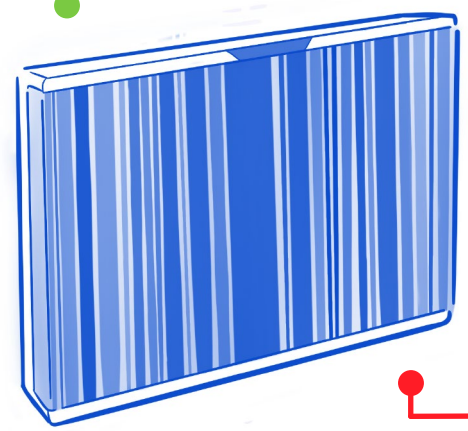
The responsive feedback reveals content that typically goes unnoticed with current devices

Accumulates time

It reflects a visual narrative that showcases the time spent together with the speaker

Captures moments with others

Creates memories during special occasions that can be shared and retrieved



Ritualistic steps

It must be intentional and functional, enabling the user to tailor the listening experience

Purposeful personalisation

It has to elevate the process through actions that demand attention and active participation

Reflects musical identity

Personalisation is meant to be shaped using music as the embeding instrument

MISSING

considerations

The concept should enable others to actively contribute to the listening experience

Digital resources via the app should complement the speaker's functions, never replace them

Figure 108. Key aspects to consider for the redesign of the FRAMING LEVELS concept

de-liver

phase 4

This last part of the project presents the final design proposal, along with its validation and discussion based on the feedback obtained. The phase concludes with general reflections on both the concept and the work completed so far, commenting on the limitations and possible recommendations that may follow for future development.

9 final concept

content

9.1 Introduction 126
9.2 Vision & functions 127
9.3 Evaluation review 135
9.4 User validation 137
9.5 Conclusions 144

| what is the ***instant*** for?

LEVELS OF INSTANTS celebrates those moments when we listen to our favorite content, giving each occasion the attention it deserves (Figure 109).

Figure 109. Render of the final concept

9.1 Introduction

This chapter shares the narrative and functionality of the final project concept, LEVELS OF INSTANTS. After a deep theoretical and user research, and evaluating two design possibilities, this proposal combines the most significant points to cultivate a product attachment that aims to be emotionally irreplaceable.

LEVELS OF INSTANTS celebrates those moments when we listen to our favorite content, giving each occasion the attention it deserves. It offers a personalised visual experience during the preparation of the listening session, where the user does not simply access audio libraries but the soundtrack of their daily life.

On one hand, it presents the visual feedback from Concept 1, providing a distinctive and engaging interaction as each command is elevated. On the other hand, it infuses these actions with meaning, enriching them in such a way that the user can build their own listening ritual, as pursued by Concept 2. Together, it allows for enjoying the content both individually and with the participation of your loved ones, all within a product that evolves gradually.

Figure 110 illustrates the redesign, and the next sections detail the various features it presents along with the experience of use they convey. This is followed by a user validation to check the acceptance of the concept, as well as the corresponding conclusions from the feedback received.

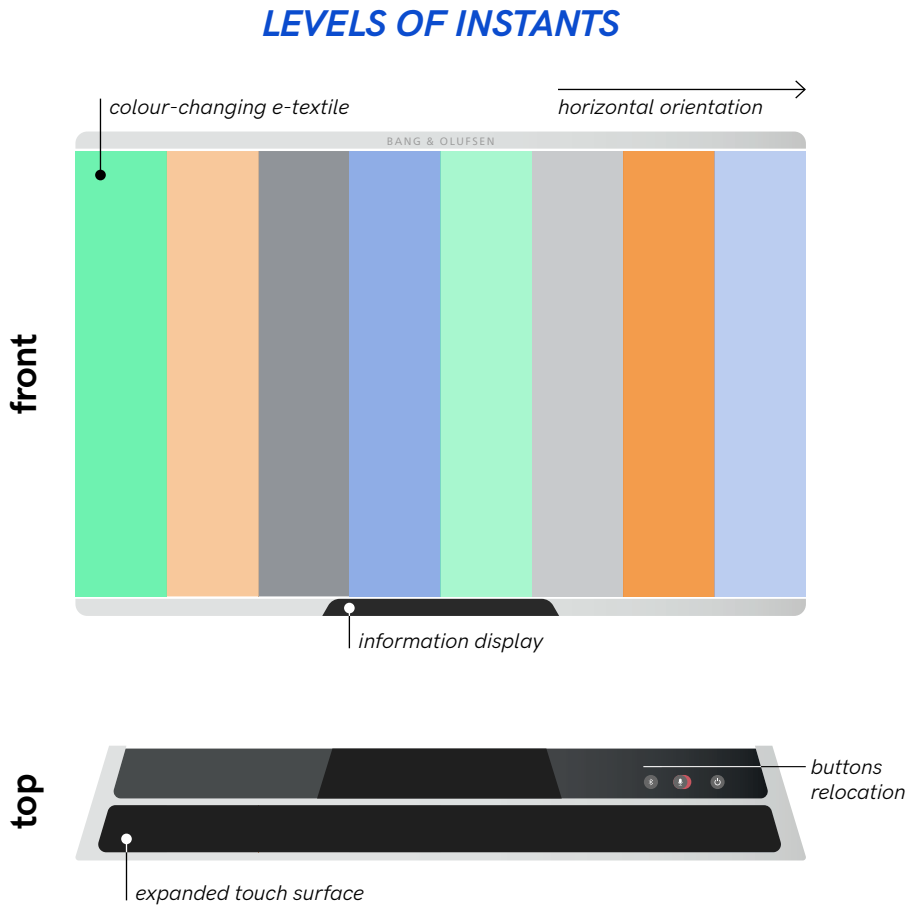


Figure 110. Components of the final concepts

9.2 Vision & functions

9.2.1 Framing instants

The concept encourages organising the content through the moments that define your routine. The user is prompted to think about what they are about to do, in which room, why, or as the speaker phrases it: *"what is the INSTANT for?"* (see Figure 111). With this in mind, they add to each colour stripe the music, frequencies, or commands that fit the occasion the best.

This encourages reflection on the activity we are about to engage in while listening to music, whether it requires concentration or is just for relaxation, setting the stage a bit better for the experience. Moreover, the selection process is entirely conducted through the speaker via an interactive experience, which captivates the user with simple yet remarkable steps.

The combination of these small actions carry personal significance, and aims to turn something as ordinary as playing your content into a subtle yet noticeable ritual. **By giving meaning to each entry beyond its objective function, the speaker acquires a value** that makes it more aligned with ourselves, as it is not the music the special aspect in the listening session, but the moment that unfolds.

Gradually, the user adapts the usability of the speaker to their specific case, which is framed in the product's own appearance through the colour bands. **This purposeful personalisation is then visually reflected, making it even more distinctive.**

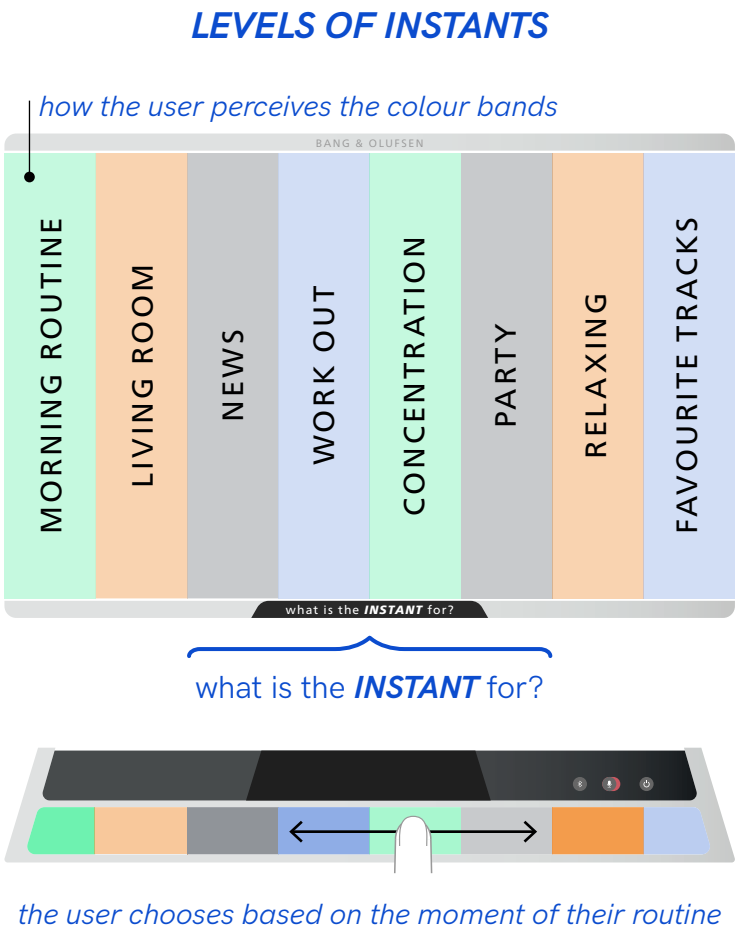


Figure 111. The concept encourages creating personal moments through music

Ritualistic steps

The speaker can be used as a regular media player. However, to listen to a particular "instant", the process goes as shown in Figure 112:

To activate it, an "opening" gesture must be performed, which turns the interface on and progressively displays the color stripes on the front panel. This action is designed to be done with both hands, which has a purpose; **it encourages the user to pause and consider what they are about to do,** paying attention to the speaker and the occasion, creating a deliberated moment.

Unknowingly, **this begins to weave what would be the start of the listening ritual.** What is the *INSTANT* for? Once decided, the device is placed in the appropriate location (if needed) and the desired content is selected. As shown in Figure 112, simple tactile gestures on the touch surface allow the user to navigate and flip through different media, receiving feedback with each action.

These interactive commands, far from being tedious, provide a hybrid experience between digital and analog, making it physically and visually engaging. The "reverse" gesture literally closes the session, marking the end of the listening ritual.

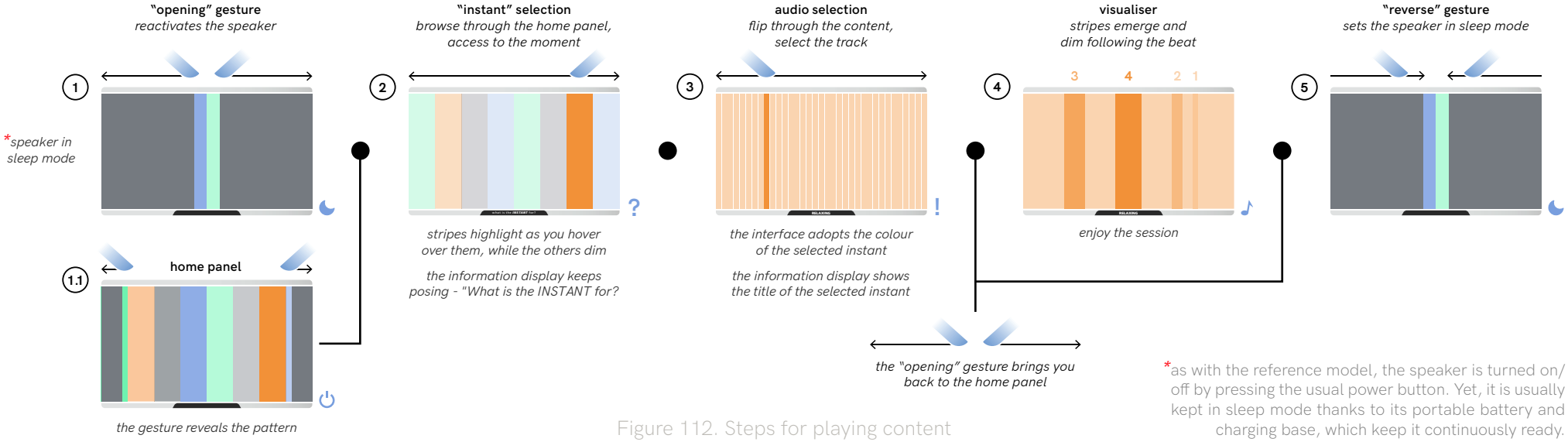


Figure 112. Steps for playing content

*as with the reference model, the speaker is turned on/off by pressing the usual power button. Yet, it is usually kept in sleep mode thanks to its portable battery and charging base, which keep it continuously ready.

All the visual feedback displayed on the front panel is controlled by the touch surface located on the top of the speaker, as shown in Figure 113. In fact, the e-textile projects the interactions that occur on the responsive bar, but some others happen only on this feature.

For instance, the opening/ending gestures, as well as the selection of "instants" and tracks, occur similarly but with added information. Once the content is being played, the touch surface transforms into the usual playback panel.

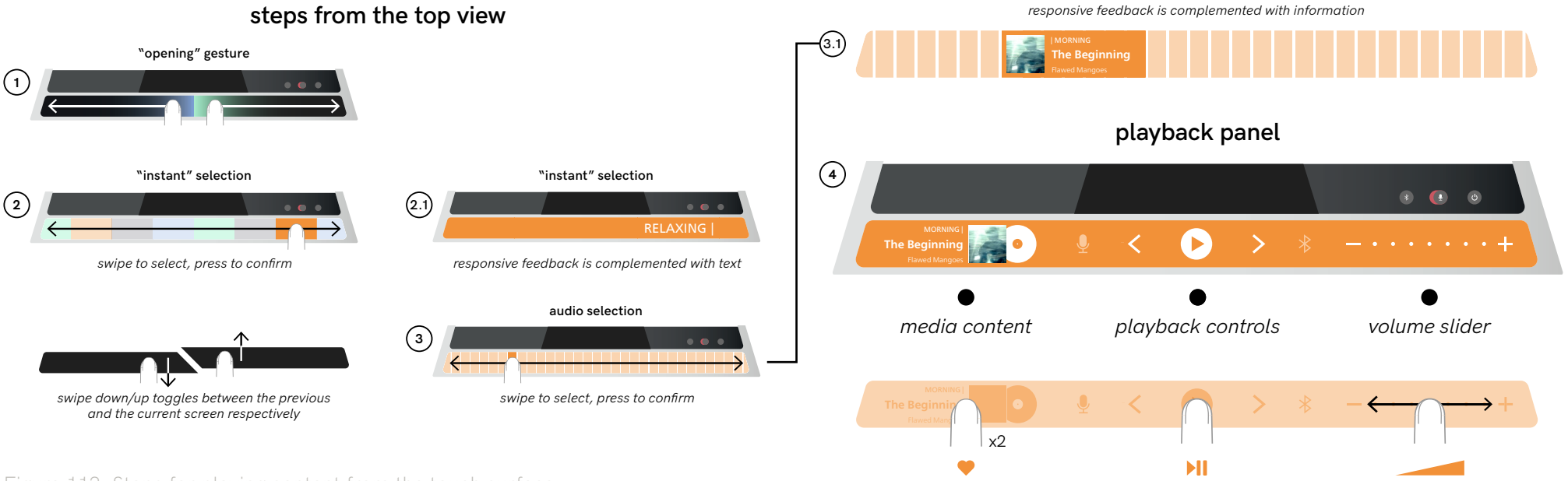


Figure 113. Steps for playing content from the touch surface

This setup allows for executing typical control functions and volume, as well as displaying the current playing track and the options to save them in your favourite band. The spacing between areas is generous enough to be operated without having to look directly at it.

The intention behind this configuration is for controlling the speaker without needing to constantly check on the digital screen. It is when we search for additional information that we can look at the top of the speaker's frame.

Creating the colour stripes

The previous section outlined the steps for navigating and playing content from our "instants," but **how are these entries created?** This process requires both the speaker and the mobile app. The most inviting moment to create these framed moments occurs when we are on the home panel, prompted by the question -what is the *INSTANT* for? Figure 114 illustrates the gestures and steps to follow, and **the process is designed to be conducted through the device as much as possible.**

This encourages more contact between the user and the speaker, as bonding is reinforced through meaningful physical interactions.

The involvement of the app is necessary during some stages, as managing content would be overly complicated through the touch surface alone. Since we need to include third-party media, using the app simplifies the task by allowing linking and adding content from our most-used music platforms. The app lets managing and editing all entries made so far, complementing the physical product with digital convenience.

*What **INSTANT** do you want to create?*

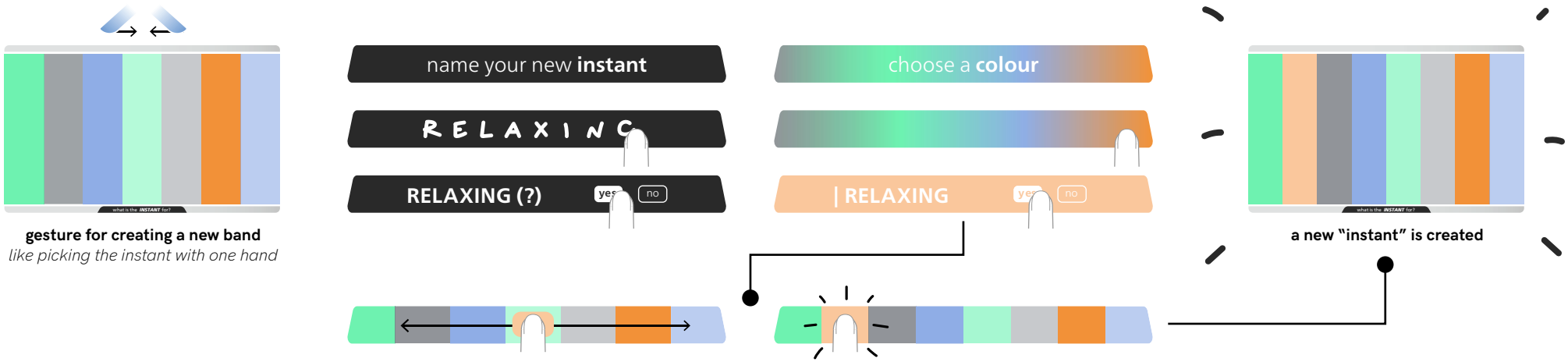


Figure 114. Steps in the speaker for creating a new "instant"

Figure 115 summarises the rest of the process executed through the app. The idea is that **the more we use the speaker, the less we need to employ the app.** With our moments-bands already created, its access to the internet allows the device to be ready for use without having to go through the phone, thanks to its ability to connect to Wi-Fi. It is only at specific times when it really benefits us to do so, such as for creating new bands or on other occasions as we will see in the next pages.

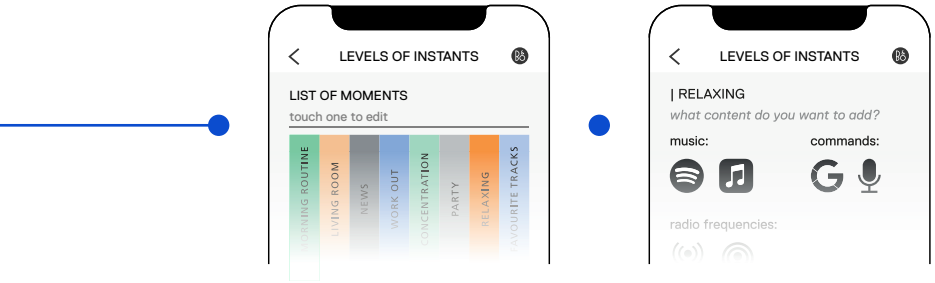


Figure 115. Features in the app for managing the moments-bands

It encourages to be creative in the way you arrange it, and more mindful of what to include on the home panel, as it is displayed both to you and others.

We can accumulate and accumulate stripes, but just like when acquiring material items, one tends to be more selective with what occupies our perceived space. In LEVELS OF INSTANTS, the bands pile in the same spot, and although the limit is very high (each individual thread that composes the e-textile), it depends on us how we use it.

Turning limitations into distinctions

As seen in the colour selection in Figure 114, a reduced palette is displayed, and when an option is selected, the result projected is a less intense tone. This is due to certain reasons.

Currently, Chromorphous e-textiles support a change between up to 4 different colours. **The product personalisation then starts even before using it,** as the owner can customise their preferred chromatic palette during pre-purchase.

Moreover, the colour chosen during the creation of the "instant" is not the one we get at the moment, but the one we aspire to achieve (see Figure 116). Gradually, the tone intensifies according to the use given to each entry, **revealing which moments we have experienced more during our time with the speaker** (more on page 134).

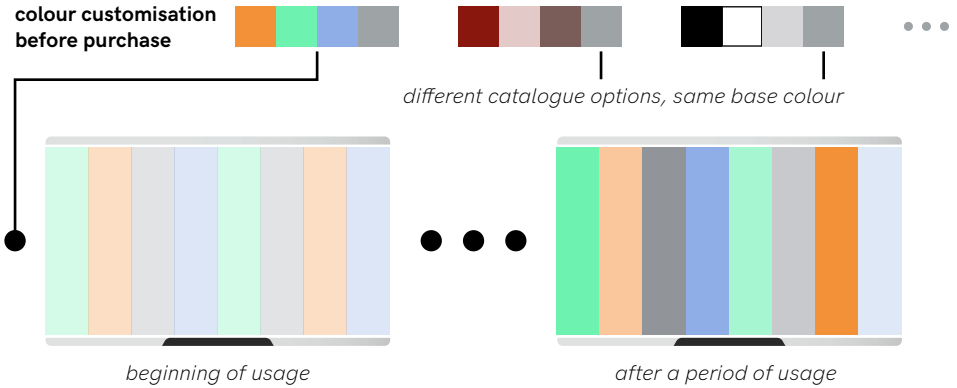


Figure 116. The speakers eventually reflects a unique pattern

the speaker participates too

The approach so far shows how the user creates their specific occasions and includes them in their repertoire. However, we often are not aware of our own habits, as they are so ingrained that we take them for granted.

Similar to Concept 2 (see page 99), the speaker uses machine learning to analyse our listening patterns and recommend based on them. Over time, **it will detect significant changes and offer us the option to create (or remove) instants from the home panel.** These recommendations will appear on the device itself upon reactivation after a period of non-use, ensuring they do not interrupt during a listening session (see Figure 117).

- You have been saving a lot of songs to favorites recently, do you want to create a color band that integrates them?

- You haven't listened to the "NEWS" for 3 weeks, do you want to remove its band from the home panel?

Gradually, the user and the product come to understand each other better, refining the listening routine so that it feels increasingly tailored to oneself. Thanks to advances in data analysis, the more the speaker is used the better the recommendations it can make, again motivating a long and active relationship.

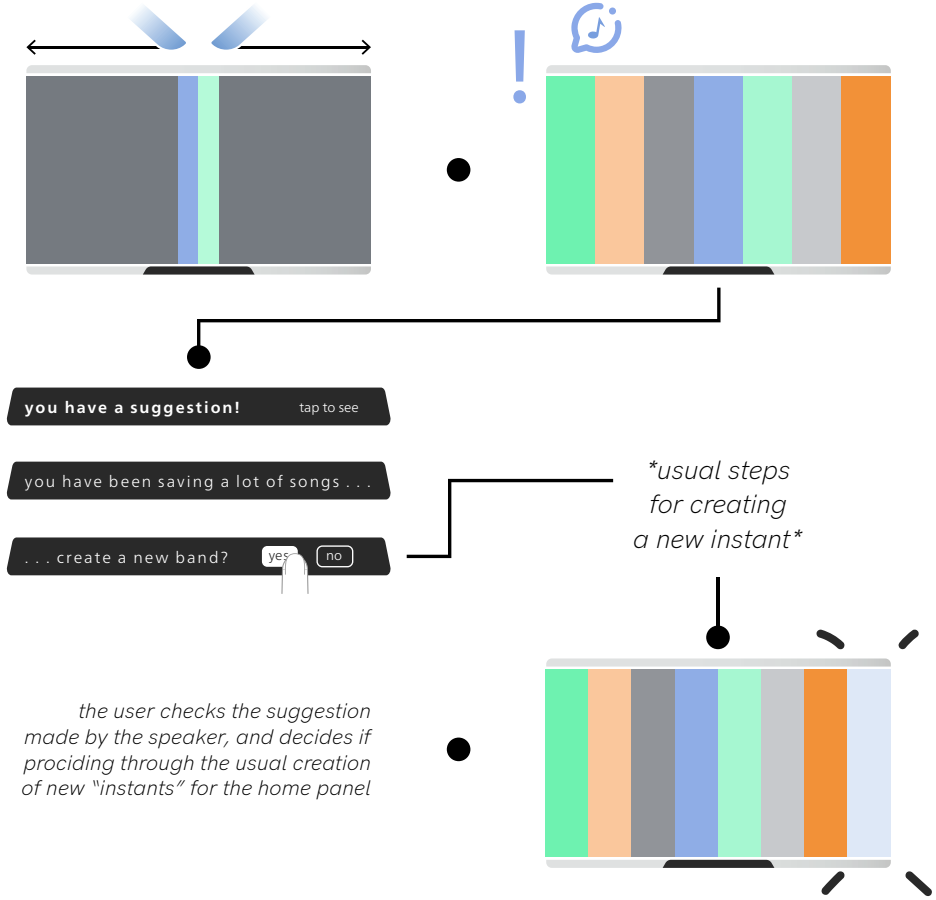


Figure 117. The speaker learns from our habits and suggests new possibilities

9.2.2 A visual collaboration

During social gatherings, it is common to create shared playlists where everyone can add their music, allowing each participant to contribute to the event (e.g., Spotify's jam sessions). This forms a great example of a collaborative experience, yet the contribution of each person goes unnoticed unless the playlist itself is constantly checked through the app.

Inspired by the "session timeline" feature from Concept 2, LEVELS OF INSTANTS **acknowledges each individual's addition through the visual resources of the speaker, which are not only displayed but also interactive.** Now, this feature serves to project on the front panel the contributions made by each participant in the shared playlist, via the colour bands.

Attendees connect to the speaker's network and are assigned a colour and intensity from the palette. Together, **this forms a chronological pattern that allows us to detect and anticipate each person's addition,** as the speaker reflects through the stripes which track belongs to whom.

The pattern generated during the event is saved once the "session timeline" concludes. All participants receives a copy of the visual as well as the content played during that time, creating a memory of the event. Furthermore, the owner will have the option to add this playlist to the home panel, embeding the created playlist in one of the colour bands. Figure 118 illustrates more details from this function.

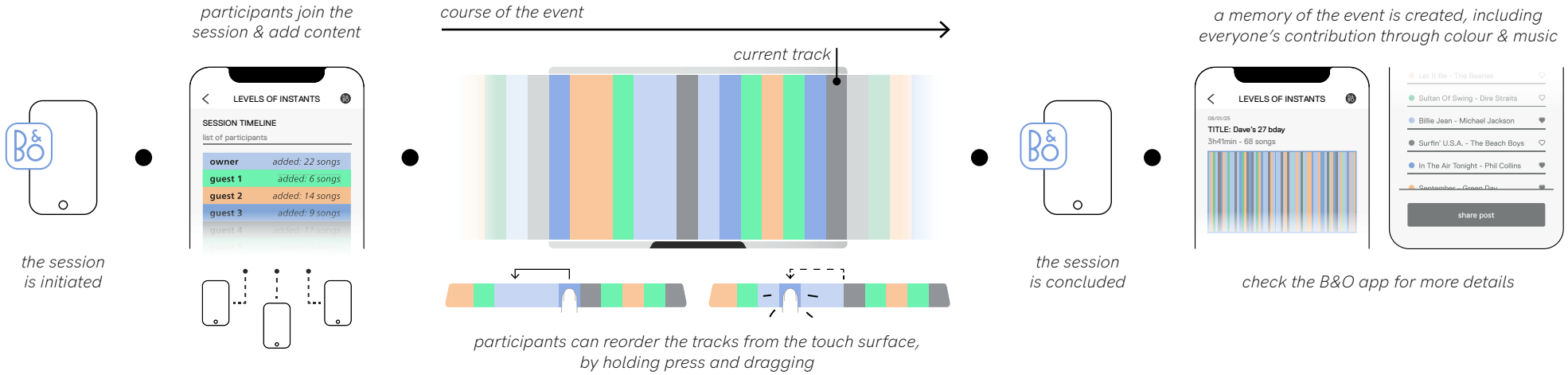


Figure 118. Explanation of the feature "session timeline"

9.2.3 An evolving reflection

The act of framing instants serves a dual purpose; it accommodates the listening experience by facilitating access to the most demanded content, and it creates a unique pattern that personalises the appearance of the device. The front panel then shows which moments of our routine we accompany more with music, and which have been fading away.

Besides, as the speaker is hung and showcased in the home, it will be as if **we were creating a changing piece of art that speaks about us.** The information display, situated in the lower frame, evokes the titles seen beneath paintings, with the name of the "instant" taking that role.

The intensity of each band, introduced on page 131, gives us a clue. A very marked band implies constant use. However, if over time it stops being listened to, its intensity will again decrease (see Figure 119). **The intention behind this is for the speaker to serve as a mirror of our current routine, showing what defines us today and not in the past.** This may motivate people to revisit those forgotten moments, or replace them with ones that fit their new dynamics.

In the B&O app, the owner will have access to more details about their usage patterns. Although we are not listening to content at every moment of the day, presenting the data with the narrative of our routine (beyond just providing isolated information), serves as a metaphor to understand better our habits.

The product transcends its functional value and embodies the personal, making it truly feel like our own. Combined with the time it takes to align with us, this makes it emotionally difficult to replace.

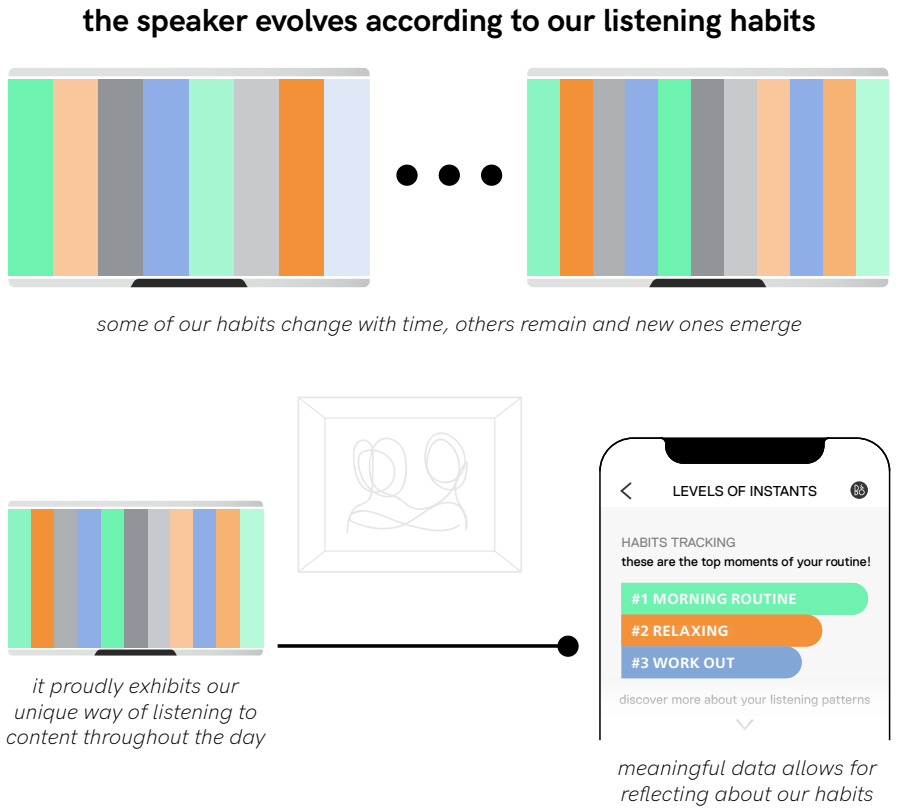


Figure 119. The speaker evolves with us, and we can review these changes

9.3 Evaluation review

9.3.1 Criteria overview

As reflected in Figures 120 and 121, **LEVELS OF INSTANTS aligns better with the requirements established during the Design Brief** than the explorative concepts FRAMING LEVELS and LEVELS OF HABITS, as shown through the attributes of the Interaction Vision (IV) and the Design Criteria (DC).

The only aspect not fully met is the "unique" quality of the Interaction Vision. This is because **the concept explores the theme of uniqueness through interactive and digital personalisation**, visually projected on the speaker. The product becomes one-of-a-kind and molds over time, but it differs from more conventional methods where the product becomes physically unique. However, this should not make it feel less personal or more replaceable.

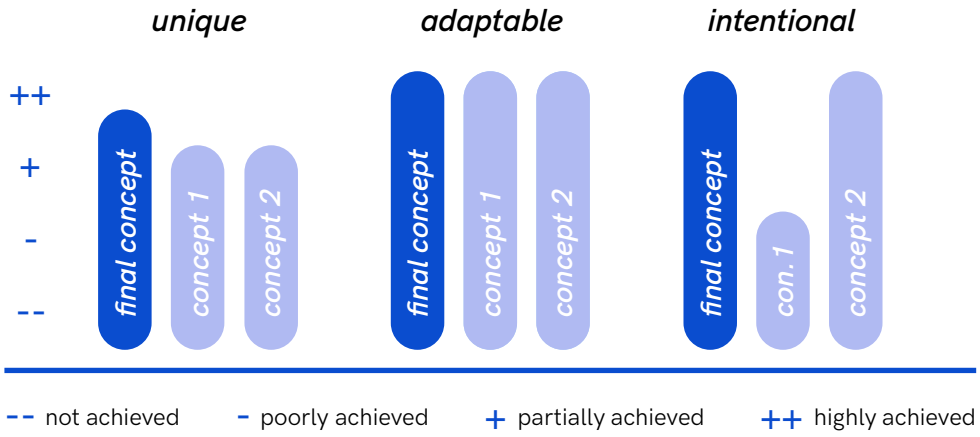


Figure 120. IV attributes across the explorative concepts and the final proposal

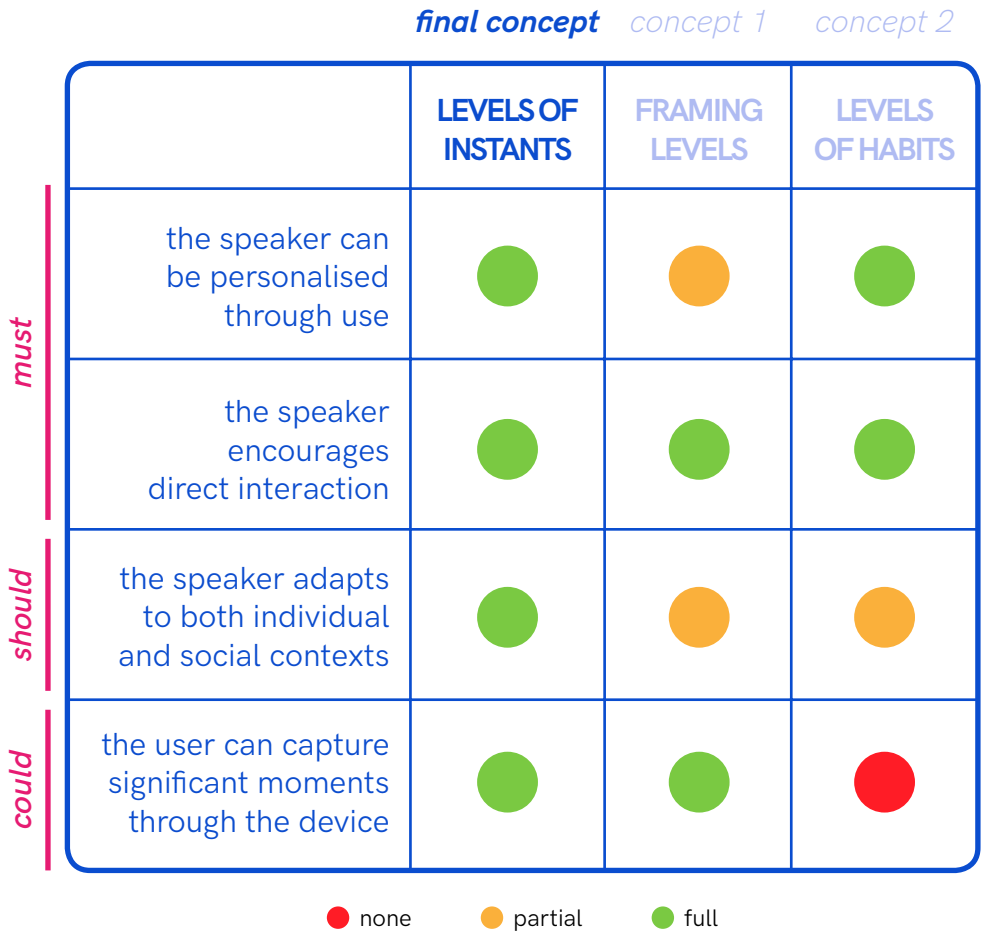


Figure 121. DC across the explorative concepts and the final proposal

9.3.2 Addressing the strategies of Emotional Durability

The final concept draws from the two main directions of the project—*self-expression through visualisation* and *participation to elevate the ritual*—to offer a hybrid that respects the essence of both ideas.

Now, playlists reflect our routine through those meaningful instants, giving them a time and reason to be listened to. Along with this, the steps that conform the initiation of the music require pause and attention, predisposing us better for the experience. Gradually, a positive perception of the product is cemented that, **beyond focusing on functionality, promotes what makes our routine special, paving the way for emotional value.**

As anticipated, the social factor is not only considered but also participates in the listening session. **Engaging others in the experience adds a layer of meaning that elevates the product,** as it allows us to celebrate and reaffirm our bonds with others, which can be transmitted to the device itself. And, combined with the memories it allows us to create, it lets us retrieve the emotions of those special occasions.

Moreover, the colours allow us to express and differenciate the various facets of our habits, reflecting part of one's identity. They are not just an aesthetic component but speak about us, as they adapt to our particular way of enjoying content. Since each day will change according to our usage oatterns, **no two speakers will be the same, which is key to perceiving the product as irreplaceable.**

Function and appearance evolve together, allowing us to reflect on our habits over time. This helps to perceive the product as both an observer and participant in our personal journey, strengthening the bond that unites them.

At the beginning of the project, it was discussed that the ideal scenario would be for the instrumental dimension (provided by the interactive experience) together with the hedonic side (where music lies), to enhance a symbolic value that would be developed by the user in collaboration with the speaker, aiming to create an emotional bond (see Figure 122). With this concept, it has been argued that **an appropriate context for cultivating an emotional attachment has been predisposed.**

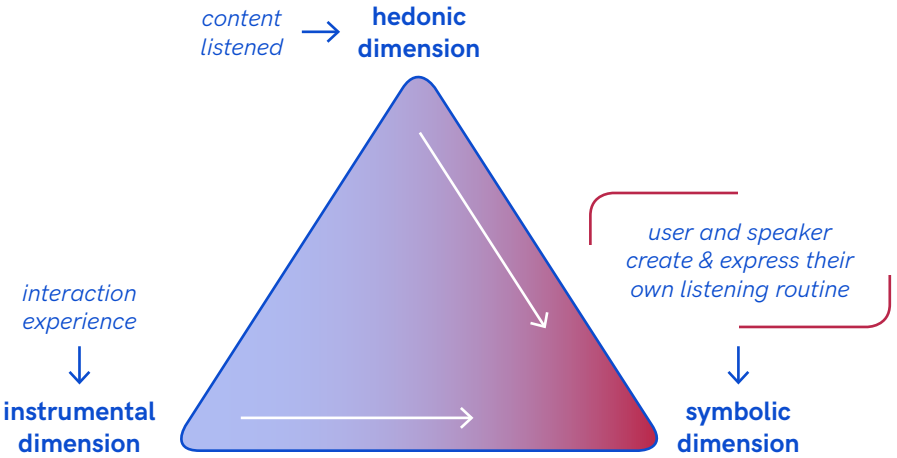


Figure 122. Ideal and current user experience aligns

9.4 User validation

In order to test the potential of the final proposal among actual users, LEVELS OF INSTANTS was introduced individually to a series of participants with the aim of validating its narrative and features.

Beyond the performance on paper, **testing its acceptance in a simulated scenario can provide more honest and practical feedback**, aimed at considering its future development as a durable good.

9.4.1 Vision & functions walk-through

Once the concept and topic of the project are introduced, participants explore the different facets of the final concept, using low and mid-fidelity prototypes. After gaining a clear overview, a short interview follows, focusing on the next Validation Questions (VQs):

VALIDATION QUESTIONS

VQ1. How does the narrative of the concept connect with the user?

VQ2. What potential do the vision and functions have to foster an emotional bond with the user?

VQ3. How strong is the concept in being perceived as irreplaceable by the user?

Ultimately, **the main objective is to determine if the approach taken during the project aligns with the goals of Emotional Durable Design (EDD). Therefore, the VQs have a bigger emphasis towards this theme,** instead of using the criteria that served to evaluate the concepts in the previous chapter.

Moreover, given that the initial focus of the current graduation project was to perform a case study on the potential of audio devices in the realm of EED, rather than to develop a technically functional model, the user testing should not be directed at specific design issues but rather at the sensations the concept conveys. Therefore, it was decided to conduct the validation through a semi-structured interview, with the intention of obtaining qualitative feedback over quantitative.

Participants

Again, this type of activities does not require large samples, so a reduced number of members was recruited, using the researcher network. 5 recently graduated Master's students from TU Delft with experience using speakers were selected. They come from diverse backgrounds and are between the ages of 25 and 33. Their current situation aligns with the profile of the target user for the project, the eco-consumers, making the feedback potentially reflective of a future owner.

Sessions took place at the facilities of TU Delft Faculty of Industrial Design Engineering, and lasted between 40-60 mins.

It is also worth mentioning that the main limitation this activity faces is that the feedback shared by users will be based on estimations and assessments made in the moment, when the potential for Emotional Durability lies in the long-term. Therefore, the answers should be considered as possibilities, not certainities.

Structure

Figure 123 below details the plan followed for this validity test, as well as the aim for each part of the activity. On the next page, Figure 124 illustrates some of the materials used during the sessions, and more details can be found in Appendix VI.

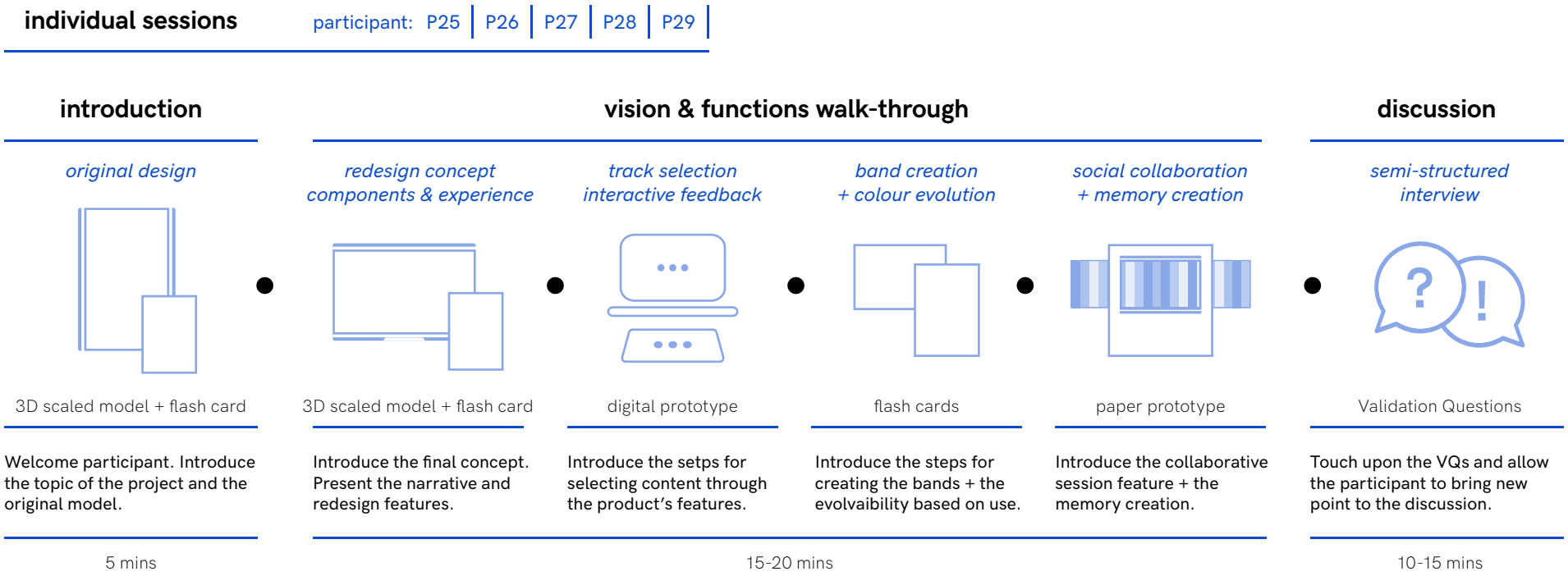
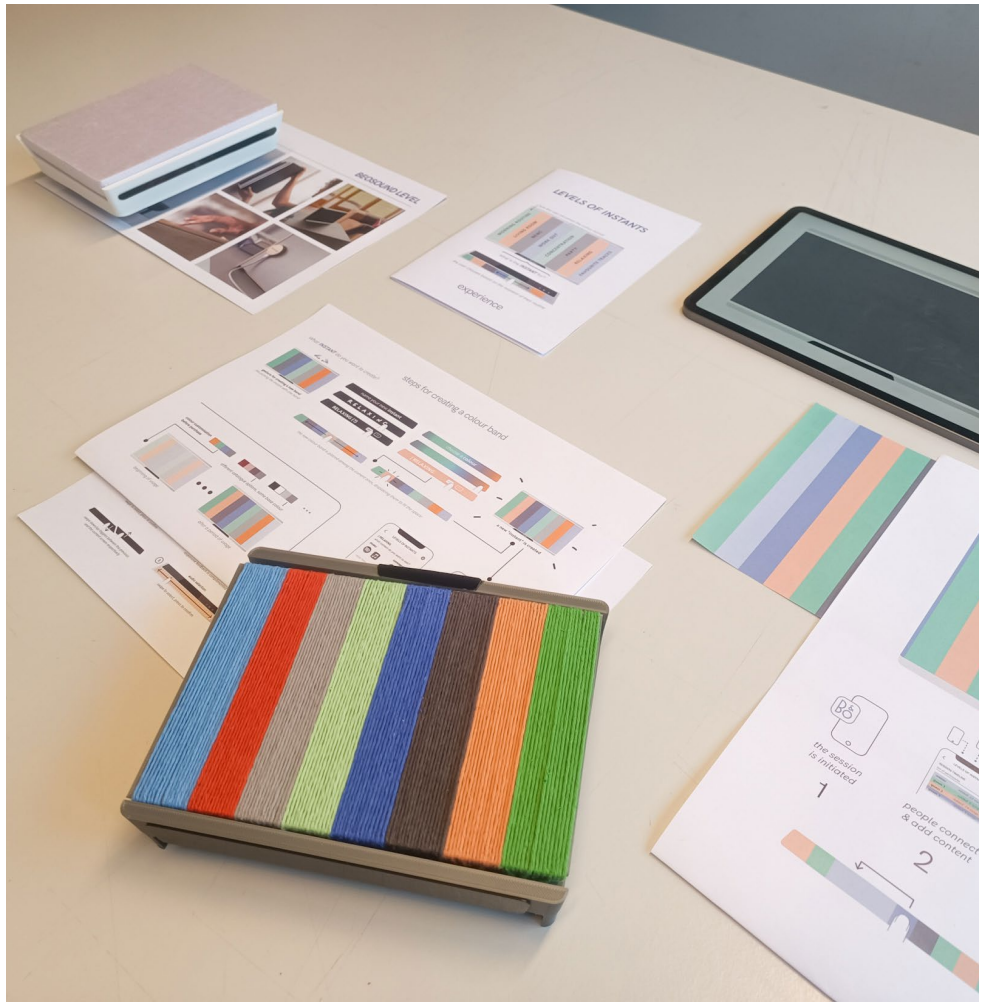


Figure 123. Planification of the user validation

Figure 124. Material used during the validation sessions



9.4.2 Discussing the Validation feedback

This section gathers insights extracted from the individual sessions conducted during the user validation activity. During the short interviews, aspects regarding the current functions of the redesign were discussed, as well as the concept's potential to foster an emotional attachment that could render it irreplaceable.

Overall, **the feedback received was quite positive.** Participants connected with the concept, perceiving the user experience as attractive and engaging without being tedious or mentally burdensome. **The new proposal was considered to offer a listening experience that elevates the original concept**, complementing it and providing an opportunity for integration.

In the following pages, the Validation Questions (VQs) will be commented in depth, sharing the most revealing aspects of the conversations with the participants (see Figure 125).

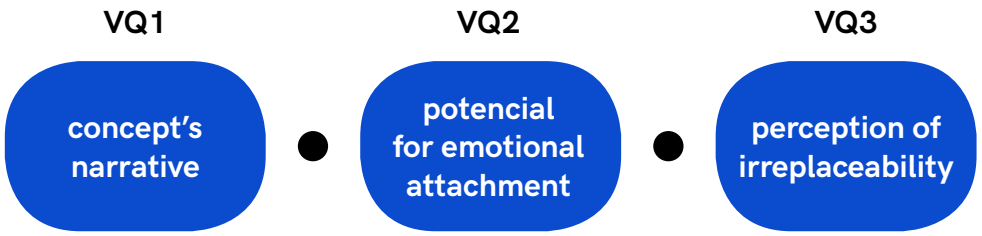


Figure 125. Topics to be discussed during the validation interview

VQ1. *How does the narrative of the concept connect with the user?*

Participants agreed that both design directions—*self-expression through visualisation* and *participation to elevate the ritual*—**are not only reflected in the concept but also complement each other.** The use of colour was considered very effective, holding significant weight in the uniqueness of the concept. Furthermore, this interplay of colours has a purpose, a practicality that adds meaning to the experience. It projects your listening habits, and it is through our interaction with the speaker that we make it possible (see Figure 126).

- **(P27)** *It's like creating an artwork; when some else is looking at it, they see how I'm expressing music on my life style. I can engage with my own patterns.*

Besides, the idea of reflecting music through the moments that define your routine aligns well with popular trends in organising music, reinforcing the acceptance of the concept (P26 talks about mood playlists, P27 notes how examples from the test match with their personal presets).

The ritualistic part is considered to fit the nature of the product, where participants like P28 used the example of record players where the setting-up is also part of the experience. They appreciated the metaphor of using gestures to start/end the ritual, reminding them of other contexts where music intervenes (P25 talks about orchestra conductors, and P29 about theater curtains).

A very insightful comment was introduced by P25; **engaging with a material as traditional and tactile as fabric aligns better with the traditional idea of a ritual,** making the experience more distinctive than just interacting with a screen.

- **(P25)** *the idea of having textile is a really nice choice. Because we are used to have a lot of screens, and I would have a hard time having a ritual with something digital.*

Figure 126. Participant visualising the effects of the ritualistic steps

VQ2. *What potential do the vision and functions have to foster an emotional bond with the user?*

Participants agree on how the concept of personalisation over time enhances the product's perception, which is reflected through the use of color and "instants". P29 notes that **starting from a product with very neutral geometry and tones, it makes the individual interventions shine more, emphasising our involvement.**

- **(P27)** *my perception of it would change over time. Much like how worn-out clothes are the ones you use the most; they are also the most special to me.*
- **(P28)** *I would perceive it with more value after time using it, compared to an object that doesn't change.*

Personal additions such as music, defining the moments and colour customisation result in the product being perceived as more unique, as these records are visually apparent. This could even influence our behaviour, as the case of P27 who suggests it might improve their routine:

- **(P26)** *I have a playlist full of sad songs, and if I see it is very bright, maybe it would make me change my mood to something more positive. It would help me to break my routine.*

In addition, several times it was mentioned that **having to interact directly with the speaker could eventually result in developing affection,** with feelings of sadness and loss if it were damaged (P25, P28, P29).

Takeaway

In the present case study, it could be considered then that the factors strengthening the bond between user and product are primarily due to **how personalisation manifests over time through changes in the colour bands, which are influenced by the user's ongoing engagement during the listening routine.** Figure 127 below summarises this idea.

All this feedback received confirms that the concept offers possibilities to cultivate an emotional attachment with the speaker, benefiting from its long-term use and its predominant visual narrative.

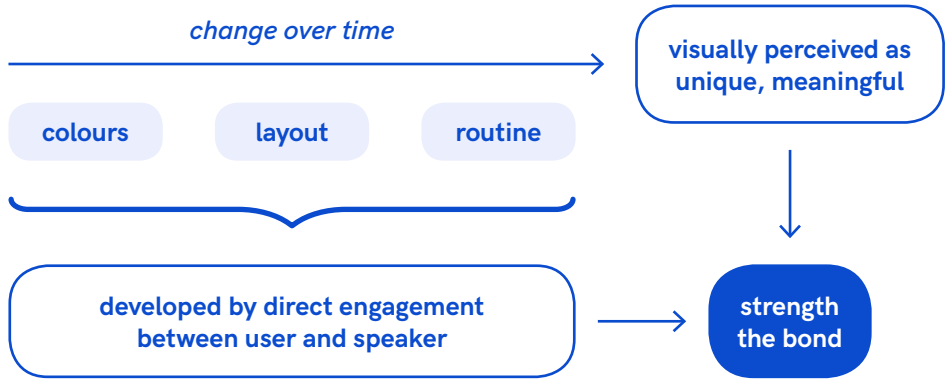


Figure 127. Aspects among the concept that ease the way for product attachment

VQ3. *How strong is the concept in being perceived as irreplaceable by the user?*

The feedback received offers a fascinating insight into the notion of irreplaceability. Participants perceive the concept's potential for fostering attachment, coupled with the original product's easy repairability, **prompt a desire to preserve it as long as possible.**

One participant expressed that replacing the speaker would lose the sense of reflection it holds (P26), while another extended its importance to how the speaker becomes part of the home identity, suggesting that it may become irreplaceable after integrating it into the space one is creating over the years (P27).

On the other hand, participants agreed that the "magic" of the interaction lies in the engagement with what we listen to—the intangible experience woven through the routine, which the speaker simply visualises. In our digital era, the ability to transfer content between devices is feasible. The concept records our progress through computational processing, so theoretically, nothing stops one from transferring this content between units. P27 reflected it in the following way:

- **(P27)** *what I have created, the experience, that is irreplaceable, rather than product itself. My data bubble, my hard work, that's detached from the hardware.*

This presents a dilema: whether it is better to ensure that the experience is tied uniquely to the physical product, promoting its exclusiveness at the risk of losing it all once its lifetime ends, or to allow for the core value of the concept to be transferred, renouncing to physical irreplaceability but extending the personalised experience for a longer period.

reflection on irreplaceability with smart devices

The notion of physical irreplaceability is a key factor in generating product attachment, but **emotional irreplaceability can be developed with products that are physically substitutable,** such as inherited items or those tied to memories.

- **(P28)** *I would be okay with transferring my info into a new model, but I would keep the current unit as long as possible, Maybe I become too attached to the product that I wouldn't even want to get a new one.*

Perhaps it is the result of how this notion materialises in today's cases, as a hybrid user experience between the digital and the physical was not possible during past analog eras. Therefore, it would be counterproductive for the concept not to take advantage of current resources to preserve what makes it unique. As P29 rightly reflects, **being able to transfer your content does not make the product seem more replaceable, but rather adds a layer of reliability in case of a mishap.**

Additional notions discussed

During the sessions, **certain topics arose that were not directly related to the Validation Questions (VQs), but which are worth mentioning** for the concept. It is important to remember that this activity focused on the acceptance of the proposal, rather than testing technical aspects. Still, usability is a crucial factor when engaging with products, especially when much of the narrative is based on the interactive experience.

Therefore, this section addresses two notions that, beyond being considered as potential modifications, represent design opportunities aimed at enhancing the holistic idea of the concept.

The speaker as a shared device

During the sessions, the social dimension was introduced as a complementary feature to the two main design directions. This triggered discussions about the role the speaker would play if shared, for example, when living together with more people:

- **(P25)** *if for example I move with my boyfriend, it could become part of the relationship. [...] because when you share things, it is okay to accept someone else's style.*

This reflects a broader aspect of the context of use; **as a product integrated into the home, more individuals can interact with it, presenting an opportunity to enrich the experience.** Should each of them have their own profile, should the front panel be shared? This opens the possibility for the concept to reflect a key facet of human nature—our relationships with others, which also defines our identity. A product that not only connects with us but also facilitates connections with others may add an additional layer of emotional value.

The risk of participation

The idea of a ritual immerses the user in a process that requires pause and attention, better predisposing us for the routine through detailed steps. However, during the interviews, it was also discussed that in reality, **people are not always ready to face such a deep experience. Would the concept still work?**

Engaging with these types of experiences sometimes requires us to invest more than just time, and this should not be underestimated. P27 talked about the cost of involvement, and how it could negatively affect:

- **(P27)** *the opening ritual may be a problem if I have an object in my hands. I get the point of the metaphor, but what is the cost of involvement? It could kill my mood sometimes.*

The concept must offer possibilities, and it is the user's right to decide. The intention behind LEVELS OF INSTANTS is to offer an experience that elevates the usual way of interacting with the speaker, but that does not mean sacrificing the comfort and accessibility that current models already offer. **When the right circumstances align, that is when the concept will shine, elevating the ordinary to the extraordinary.**

9.5 Conclusions

LEVELS OF INSTANTS has proven to be a proposal that unifies the defined design directions—*self-expression through visualisation* and *participation to elevate the ritual*, **elevating the typical way we enjoy our audio content by projecting it onto the speaker through our home routine** (see Figure 128).

Through the interplay between the use of colour bands and their impact on the "instants" that define our habits, our listening journey evolves over time, which is visually reflected in the device. It also considers the social contexts so common in the use of the speaker, allowing for the enhancement of the listening session through a collaborative experience. All of this is achieved through interactive engagement that is intended to be perceived as ritualistic.

The different evaluation and validation methods have demonstrated the potential of the concept to cultivate an emotional attachment between the user and the speaker, aligning with the goals of Design for Emotional Durability set at the beginning of the project. However, expecting the user to always be predisposed to a deeply immersive listening experience would not be realistic, just as rituals do not happen disinterestedly. Therefore, **LEVELS OF INSTANTS must grant the owner with options, and it will be in their choice to decide which path to take.**

Figure 128. The concept does not go unnotice at home

10 project discussion

10.1 Contribution 146
10.2 Limitations 147
10.3 Recommendations 148
10.4 Personal reflection 149

10.1 Contribution

This graduation thesis provided an opportunity to explore the potential of home audio speakers through the lens of emotional durability and product attachment. A key focus of this project is on **addressing the dynamics of Design for Emotional Durability in an era where connecting with our items is increasingly challenging.**

In the case of audio devices, despite music being an excellent carrier of emotions and memories, its value is progressively detached from the product that enables us to enjoy it. The research conducted highlighted how the digital era has reevaluated the role of materiality and ownership, often leading to the perception of what once occupied a physical space in our lives as less personal now.

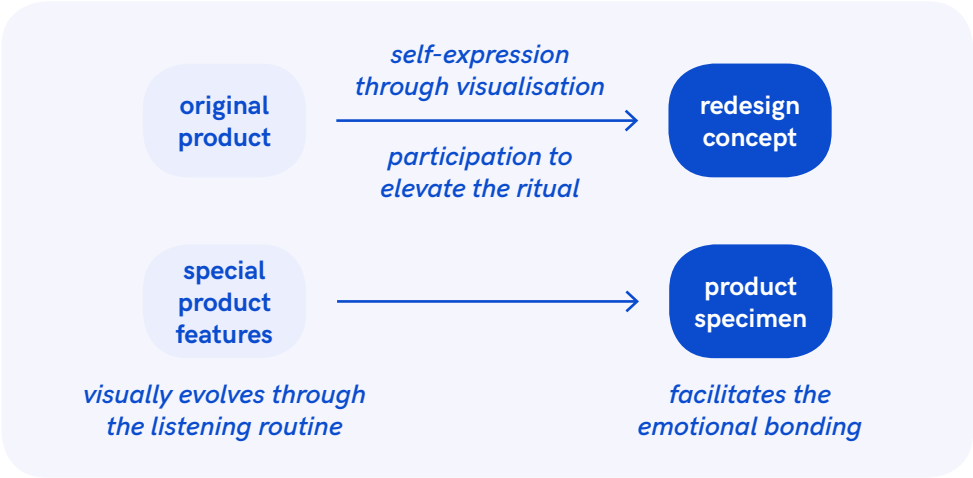


Figure 129. Perception on the product over the user experience

the role of hybrid user experiences when fostering attachment

Following this line, **the design proposal developed draws on certain attributes that make the listening experience unique to the device itself,** attempting to reclaim its prominence through a personalised and evolving engagement. It is inspired by the analog qualities that made such interactions iconic, translating them through current resources to preserve their value.

This resulted in a hybrid experience that adapts to and meets the needs of the modern user, rethinking the concept of emotional irreplaceability as a way to preserve what makes our unique way of interacting so special, expressed through the speaker.

Thus, this combination of physical and digital factors could be said that places the concept in the category of "special product features," but it is actually **by shaping the listening routine together with the speaker that the user may elevate it to the category of "product specimen."** As Figure 129 shows, being able to perceive the progress that occurs during the user-product journey facilitates the formation of an emotional connection, and it is the positive change in the perception of the speaker that can make it psychologically irreplaceable.

10.2 Limitations

There have been a series of constraints that affected to the development of the activities, and therefore the outcome achieved must be considered taking into account their implications. This section covers these notions, as well as their impact on the present project:

Project timefrime constraints

The duration of the graduation activity posed significant challenges for the scope and focus, hindered the potential for a deeper exploration during the design process. Besides, **while the project successfully defined a design concept, it lacked the time and resources to fully develop an integral product proposal.** This prevented the opportunity to uncover practical insights and validate the design on an actual industrial level.

Lack of external collaboration

Conducting the project independently meant that **the final outcome was limited by the constraints of the corresponding researcher, who would have benefited from expert assistance,** especially during the concept development stage. Furthermore, without the direct collaboration with the case study company, the project missed valuable access to technical resources, advice, and strategic insights that could have enhanced the final design outcome.

Incomplete validation for Emotional Durability

The short-term nature of the validation process was a significant constraint. **Emotional durability is inherently a long-term phenomenon.** Evaluating the concept within a short timeframe meant relying on user estimations rather than tangible, time-based feedback. This limitation reduces the reliability of the findings regarding the concept's potential to foster lasting attachment.

Reduced amount of participants intervention

Although the majority of activities carried out did not require a minimum number of participants, **a broader and more varied participant pool would have enriched the data collected,** offering a wider range of perspectives and enhancing the scope of the design process. This limitation may have restricted the project's outcomes, hindering other promising alternatives.

10.3 Recommendations

Given that the project has culminated in the proposal reached but there are still opportunities and paths to explore, this section includes a series of recommendations in case of continuing with the development of the final concept.

Explore alternatives for the front panel material

The current reference technology has several technical limitations that constrain the concept's potential, such as the reduced number of colours that can be alternated. Exploring other resources to overcome these aspects **could offer the user better opportunities during the listening experience.** Alternatively, collaborating with the same company could align the interests for a better tailored material.

Consider the speaker within its active context

The selected case product introduces the home as the usage scenario. As discussed during the project, **considering and acknowledging the different agents and individuals interacting with the device presents a promising design opportunity.** Moreover, as noted with the second exploratory concept (LEVELS OF HABITS), the home itself also has the potential to become an active member in defining the listening journey, opening the door to new interaction possibilities.

Expand the focus to other target groups

The user profile, the eco-consumer, was introduced as the type of individual to design for. However, the original product is mass-produced for all users who wish to access to it, meaning that other profiles might interact with the developed proposal. **Validating how the vision and functions of the concept respond to different types of users would offer the opportunity to accommodate the listening experience** to these new demands.

Verify the compatibility of the proposal with the original product

The reached proposal offers a series of features and interventions that modify the original product. **It would be necessary to validate whether its implementation is feasible on the original product,** as its design has a series of very competent and carefully selected specifications aligned with Circular Economy. Breaking with this initiative would detract from the original speaker's value.

10.4 Personal reflection

Throughout this project, I have often introduced the narrative in a formal tone, appropriate for this type of document. But in this last section, I want to take a more personal approach, as it concludes more than just the graduation project.

I really value the vision that the final concept has taken, especially when comparing it with my initial sketches and notes, which deviate quite a bit from my original approach. I love interacting with products, but I found the emotional and "fun" part the most challenging to integrate. Developing an idea that combines both of these realities makes me appreciate the design process even more, as without iteration, participant involvement, and my supervisors' guidance, LEVELS OF INSTANTS would never have happened.

I admit that the development could have taken many different paths, but it is hard for me to imagine another ending making me as proud as I am of the current one. The final concept, far from perfect, is a solution that has taken shape, with its promising benefits and its arguable drawbacks. In a field like Emotional Durability, with its various strategies, and even in the world of design itself, solutions do not have just one shape.

And this is an aspect that has always been challenging for me as a design practitioner, making decisions. What is the best alternative? Can it still be improved? During the ideation part, I struggled so much with how to define the concepts that days would pass, and I was unable to make progress. Again, trusting the process (and advice) bore fruit. Furthermore, having the opportunity to work in the field of Emotional Durability has sometimes transcended the project, as it is one of the design areas which I cherish the most both as a designer and a consumer. Sometimes it did not feel like an obligation, enjoying every reading, but it also made me value its practice even more, knowing how challenging it is to be implemented at an industrial level. I hope my professional future crosses paths again with the fascinating world of Design for Emotional Durability.

This project not only culminates my studies at TU Delft but also marks the end of my student phase as I knew it, stepping into a new chapter. And although we never stop learning, especially as designers, everything I have taken from my bachelor's, my Master's (and especially outside the academy) will now be put to the test. I am concerned and excited about the uncertainty that lies ahead, but I trust in the skills I have gathered over these years, with this project being a clear reflection of what I can offer.

11

references

References

B

Bang & Olufsen. (2024). Speakers. Retrieved January 17, 2025, from https://www.bang-olufsen.com/en/nl/speakers

Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research, 15*(2), 139–168

Blom, J. (2000). Personalization: A taxonomy. In CHI *'00 Extended Abstracts on Human Factors in Computing Systems* (pp. 313–314). Association for Computing Machinery. https://doi.org/10.1145/633292.633483

Board of Governors of the Federal Reserve System (US). (2024). *Industrial Production: Total Index [INDPRO].* FRED, Federal Reserve Bank of St. Louis. Retrieved January 17, 2025, from https://fred.stlouisfed.org/series/INDPRO

C

Chapman, J. (2009). Design for (emotional) durability. *Design Issues, 25*(4), 29–35. https://doi.org/10.1162/desi.2009.25.4.29

Cooper, T. (2004). Inadequate life? Evidence of consumer attitudes to product obsolescence. *Journal of Consumer Policy, 27*(4), 421–449

Cooper, T. (2005). Slower consumption: Reflections on product life spans and the "throwaway society." *Journal of Industrial Ecology, 9*(1–2), 51–67.

Cooper, T., & Mayers, K. (2000). *Prospects for household appliances*. Halifax: Urban Mines Ltd

Coşkun, A., & Karahanoglu, A. (2022). Data sensemaking in self-tracking: Towards a new generation of self-tracking tools. *International Journal of Human-Computer Interaction*, 1–22.

D

Darby, L., & Obara, L. (2005). Household recycling behaviour and attitudes towards the disposal of small electrical and electronic equipment. *Resources, Conservation and Recycling, 44*(1), 17–35. https://doi.org/10.1016/j.resconrec.2004.09.002

Desmet, P., & Fokkinga, S. (2020). Beyond Maslow's pyramid: Introducing a typology of thirteen fundamental needs for human-centered design. *Multimodal Technologies and Interaction, 4*(3), 38. https://doi.org/10.3390/mti4030038

Desmet, P., & Hekkert, P. (2007). Framework of product experience. *International Journal of Design, 1*(1), 57–66.

E

Ellen MacArthur Foundation. (2013). *Towards the circular economy Vol. 2: Opportunities for the consumer goods sector*

European Committee for Electrotechnical Standardization (CENELEC) (2013). EN 50332-1: *Sound system equipment: Headphones and earphones associated with personal music players – Maximum sound pressure level measurement methodology – Part 1: General method for "one package equipment."* Brussels

European Parliament and Council of the European Union (2014). Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC. *Official Journal of the European Union, L153*, 62–106. Retrieved January 17, 2025, from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0053

F

Frahm, L. B., Laursen, L. N., & Tollestrup, C. (2022). Categories and design properties of inherited long-lasting products. *Sustainability, 14*(7). https://doi.org/10.3390/su14073835

G

Giaccardi, E., & Redström, J. (2020). Technology and more-than-human design. *Design Issues, 36*(4), 33–44. https://doi.org/10.1162/desi_a_00612

Govers, P. C. M., & Mugge, R. (2004). "I love my Jeep, because it's tough like me": The effect of product-personality congruence on product attachment. In A. Kurtgözü (Ed.), *Proceedings of the Fourth International Conference on Design and Emotion.* Retrieved from http://www.pascallegovers.nl/uploads/1/2/3/9/12391484/govers_and_mugge_de2004.pdf

Granberg, B. (1997). *The quality re-evaluation process: Product obsolescence in a consumer-producer interaction framework.* Stockholm: University of Stockholm, Department of Economic History.

Guillard, V., Le Nagard, E., & de Campos Ribeiro, G. (2023). A typology of consumers regarding perceived obsolescence: The paradox of eco-conscious consumers. *Journal of Cleaner Production, 412*. https://doi.org/10.1016/j.jclepro.2023.13720

H

Haase, L. M., & Lythje, L. S. (2022). User strategies for prolonging product lifetimes: A new starting point for circular conceptual design. *Sustainability, 14*(22). https://doi.org/10.3390/su142215133

Haines-Gadd, M., Chapman, J., Lloyd, P., Mason, J., & Aliakseyeu, D. (2018). Emotional durability design nine—A tool for product longevity. *Sustainability, 10*(6). https://doi.org/10.3390/su10061948

Hassenzahl, M. (2004). Emotions can be quite ephemeral; we cannot design them. *Interactions, 11*(5), 46–48.

Haug, A. (2019). Psychologically durable design—Definitions and approaches. *The Design Journal, 22*(2), 143-167. https://doi.org/10.1080/14606925.2019.1569316

Heatley Tejada, A., Dunbar, R. I. M., & Montero, M. (2020). Physical Contact and Loneliness: Being Touched Reduces Perceptions of Loneliness. *Adaptive human behavior and physiology, 6*(3), 292-306. https://doi.org/10.1007/s40750-020-00138-0

Heidenreich, S., Killmer, J. F., & Millemann, J. A. (2022). If at first you don't adopt: Investigating determinants of new product leapfrogging behavior. *Technological Forecasting and Social Change, 176*. https://doi.org/10.1016/j.techfore.2021.121437

Heijne, K. G., & van der Meer, H. (2019). *Road map for creative problem solving techniques: Organizing and facilitating group sessions*. Boom Uitgevers.

Hou, C., Jo, M.-S., & Sarigöllü, E. (2020). Feelings of satiation as a mediator between a product's perceived value and replacement intentions. *Journal of Cleaner Production, 258*. https://doi.org/10.1016/j.jclepro.2020.120637

K

Kowalski, M. C., & Yoon, J. (2022). I love it, I'll never use it: Exploring factors of product attachment and their effects on sustainable product usage behaviors. *International Journal of Design, 16*(3), 37-57. https://doi.org/10.57698/v16i3.03

L

Linstead, C., Gervais, C., & Ekins, P. (2003). *Mass balance: An essential tool for understanding resource flows.* A report on the Biffaward Programme of Mass Balance Projects. Forum for the Future.

Lobos, A., & Babbitt, C. (2013). Integrating emotional attachment and sustainability in electronic product design. *Challenges, 4*(1), 19-33. https://doi.org/10.3390/challe4010019

M

Maclachlan, M., & Wood, B. (2013). Experience design tool: Encouraging designers to consider different design and emotion strategies. In *Proceedings of the International Conference on Engineering and Product Design Education* (pp. 686-691). Dublin, Ireland: Dublin Institute of Technology.

Makov, T., & Fitzpatrick, C. (2021). Is repairability enough? Big data insights into smartphone obsolescence and consumer interest in repair. *Journal of Cleaner Production, 313*. https://doi.org/10.1016/j.jclepro.2021.127562

Mimouni-Chaabane, A., & Volle, P. (2010). Perceived benefits of loyalty programs: Scale development and implications for relational strategies. *Journal of Business Research, 63*(1), 32-37. https://doi.org/10.1016/j.jbusres.2009.01.008

Mugge, R. (2017). A consumer's perspective on the circular economy. In J. Chapman (Ed.), *Handbook of sustainable product design* (1st ed., pp. 374–390). Routledge. https://doi.org/10.4324/9781315693309-31

Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2008). Product attachment: Design strategies to stimulate the emotional bonding to products. In *Product Experience* (pp. 425–440). Elsevier. https://doi.org/10.1016/B978-008045089-6.50020-4

Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2009). Emotional bonding with personalised products. Journal of Engineering Design, 20(5), 467–476. https://doi.org/10.1080/09544820802698550

Mulet, E., Chulvi, V., & Royo, M. (2022). Analysis of attachment factors in small household EEE: An opportunity toward the circular economy. *Journal of Industrial Ecology, 26*, 1364–1377. https://doi.org/10.1111/jiec.13267

Mumford, M. D., Reiter-Palmon, R., & Redmond, M. R. (1994). Problem construction and cognition: Applying problem representations in ill-defined domains. In M. A. Runco (Ed.), *Problem finding, problem solving, and creativity* (pp. 3–39). Ablex Publishing.

N

Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things.* Basic Books.

Norman, D. A. (2013). *The design of everyday things.* MIT Press.

O

Okada, E. M. (2001). Trade-ins, mental accounting, and product replacement decisions. *Journal of Consumer Research, 27*(4), 433–446. https://doi.org/10.1086/319619

Orth, D., Thurgood, C., & van den Hoven, E. (2018). Designing objects with meaningful associations. *International Journal of Design, 12*(2), 91–104.

Ortiz, N. J. (2014). Qué es la experiencia del usuario en el diseño de producto. In *Diseño, experiencia, usuario.* Conference conducted at Universidad Autónoma Metropolitana, Ciudad de México.

P

Park, M. B. (2009). P*roduct life: Designing for longer lifespans* (PhD thesis). Kingston University. https://eprints.kingston.ac.uk/id/eprint/20226

Prabhu, N. S., & Majhi, R. (2023). Disposal of obsolete mobile phones: A review on replacement, disposal methods, in-use lifespan, reuse, and recycling. *Waste Management & Research, 4*1(1), 18–36. https://doi.org/10.1177/0734242X221105429

S

Sanders, E. B.-N., & Stappers, P. J. (2012). *Convivial toolbox: Generative research for the front end of design.* BIS Publishers.

Schifferstein, R., & Zwartkruis-Pelgrim, E. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design, 2*(3), 1–13.

Shi, T., Huang, R., & Sarigöllü, E. (2022). Consumer product use behavior throughout the product lifespan: A literature review and research agenda. *Journal of Environmental Management, 302*(Part B). https://doi.org/10.1016/j.jenvman.2021.114114

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple-item scale. *Journal of Retailing, 77*(2), 203–220. https://doi.org/10.1016/S0022-4359(01)00041-0

U

University of Central Florida (UCF) (2018). ChroMorphous: A new fabric experience. Retrieved January 17, 2025, from http://wft.mariosmaselli.com/

V

van den Berge, R., Magnier, L., & Mugge, R. (2021). Too good to go? Consumers' replacement behaviour and potential strategies for stimulating product retention. *Current Opinion in Psychology, 39*, 66–71. https://doi.org/10.1016/j.copsyc.2020.07.014

van Krieken, B., Desmet, P. M. A., Aliakseyeu, D., & Mason, J. (2012). A sneaky kettle: Emotionally durable design explored in practice. In P*roceedings of the 8th International Conference on Design and Emotion.* London, UK.

van Nes, N., & Cramer, J. (2005). Influencing product lifetime through product design. *Business Strategy and the Environment, 14*(5), 286–299. https://doi.org/10.1002/bse.491

W

Wu, J., Jin, C., Zhang, L., Zhang, L., Li, M., & Dong, X. (2021). Emotionally sustainable design toolbox: A card-based design tool for designing products with an extended life based on the user's emotional needs. *Sustainability, 13*(18), 10152. https://doi.org/10.3390/su131810152

Z

Zeithaml, V. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing, 52*(3), 2–22. https://doi.org/10.1177/002224298805200302

appendices

content

Appendix I - Project Brief 157

Appendix II - Design strategies across the processing levels 161

Appendix III - Material for RA1 162

Appendix IV - Material for RA2 163

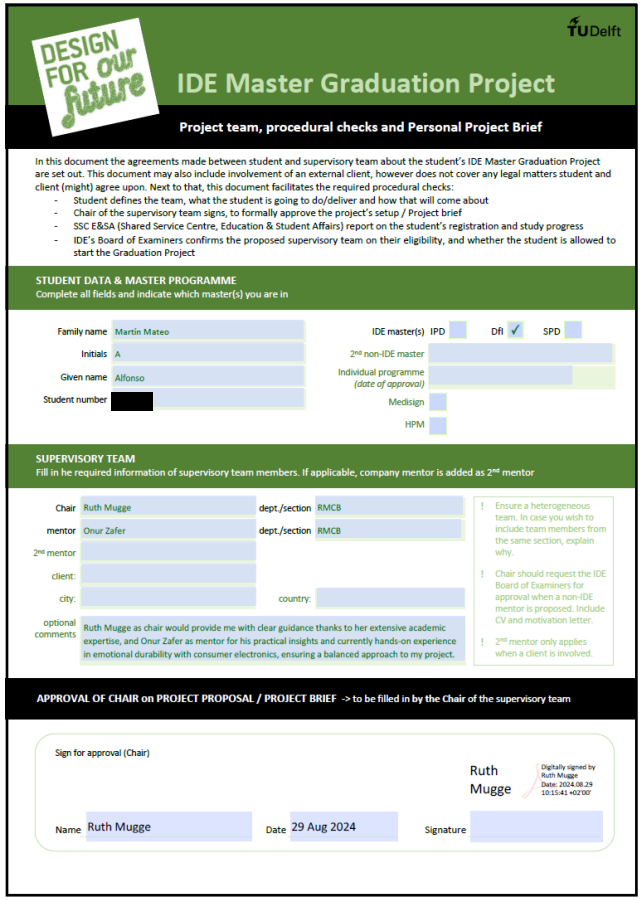
Appendix V - Material for co-creation workshops 164

Appendix VI - Material for user validation 167

Appendix I

Design Brief

Attached is the document of the Project Brief which officially start the graduation thesis, following its approval after the kick-off meeting.



DESIGN FOR our future

TU Delft

IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

In this document the agreements made between student and supervisory team about the student's IDE Master Graduation Project are set out. This document may also include involvement of an external client, however does not cover any legal matters student and client (might) agree upon. Next to that, this document facilitates the required procedural checks:

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME

Complete all fields and indicate which master(s) you are in

Family name: Martin Mateo
Initials: A
Given name: Alfonso
Student number: [redacted]

IDE master(s) IPD ☐ Dfi ✓ SPD ☐
2nd non-IDE master
Individual programme (date of approval)
Medisign ☐
HPM ☐

SUPERVISORY TEAM

Fill in he required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair	Ruth Mugge	dept./section	RMCB
mentor	Onur Zafer	dept./section	RMCB
2nd mentor			
client:			
city:		country:	

optional comments: Ruth Mugge as chair would provide me with clear guidance thanks to her extensive academic expertise, and Onur Zafer as mentor for his practical insights and currently hands-on experience in emotional durability with consumer electronics, ensuring a balanced approach to my project.

! Ensure a heterogeneous team. In case you wish to include team members from the same section, explain why.
! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.
! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in by the Chair of the supervisory team

Sign for approval (Chair)

Ruth Mugge — Digitally signed by Ruth Mugge Date: 2024.08.29 10:15:41 +02'00'

Name: Ruth Mugge Date: 29 Aug 2024 Signature:

CHECK ON STUDY PROGRESS

To be filled in by SSC E&SA (Shared Service Centre, Education & Student Affairs), after approval of the project brief by the chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: EC
Of which, taking conditional requirements into account, can be part of the exam programme: EC

☐	YES	all 1st year master courses passed
☐	NO	missing 1st year courses

Comments:

Sign for approval (SSC E&SA)

Name Date Signature

APPROVAL OF BOARD OF EXAMINERS IDE on SUPERVISORY TEAM -> to be checked and filled in by IDE's Board of Examiners

Does the composition of the Supervisory Team comply with regulations?

YES	☐	Supervisory Team approved
NO	☐	Supervisory Team not approved

Comments:

Based on study progress, students is ...

☐	ALLOWED to start the graduation project
☐	NOT allowed to start the graduation project

Comments:

Sign for approval (BoEx)

Name Date Signature

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student: Alfonso Martín Mateo

Student number: [redacted]

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title: Emotional Durability through Interaction Design: Product Attachment in Personal Audio Devices

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

The rapid pace of consumption in our society has led to unsustainable levels of overproduction (Chapman, 2009; Mugge, 2018). Products that were once tailored to individual needs are now mass-produced, offering countless affordable options which may be leading to a more apathetic relationship with objects. This is particularly acute with electronic devices, which have become indispensable yet are often discarded due to their easy replaceability. Such issue presents additional challenges for the environmental and the resource management crises we are currently facing (Norman, 2004; Ortiz, 2014).

In response, designers are focusing on enhancing both the physical and emotional durability of products, to support a more sustainable model of Circular Economy. While both are indispensable, the emotional domain is crucial as even physically enduring objects might be discarded if they lack personal significance for keeping them (see Figure 1). Consequently, the practice of Design for Emotional Durability stands as a method of creating products that sustain a long-term connection with their users, by fostering strong meaningful bonds (see Figure 2 - Haines-Gadd et al., 2018).

Personal audio devices are an ideal candidate for this approach. Despite being one of the most prevalent consumer technologies in homes, their lifespan has drastically decreased over the last decades (Park, 2019). This aligns with the behavior of the current market—constant consumption of experiences that are easily accessible—especially among young/middle-age profiles. Therefore, the benefits of applying the mentioned methodology would range from environmental to personal, potentially transforming how we interact with and value our electronic products.

➔ *space available for images / figures on next page*

introduction (continued): space for images

image / figure 1 product example with personal emotional meaning (daily routine for years) but low attachment (easily replaceable)

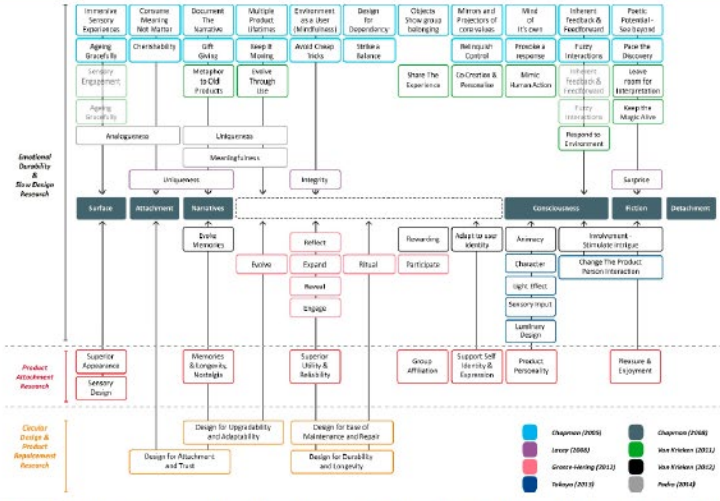


image / figure 2 Relationship between emotional durability, product attachment, and circular design (Haines-Gadd et al., 2018)

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

Objects often become cherished due to their connections with significant memories, people, values and different types of experiences (Orth et al., 2018), which require time and effort to establish. However, competitive markets and technological advancements disrupt these opportunities, as society's pursuit of exceptional solutions turns adoration into disdain for products now deemed obsolete (Chapman, 2009). Is it then possible to reconsider interactions that contribute to a continuous value proposition for the user?

Consumer electronics, with their emotional appeal often tied to functional features, are quickly becoming outdated (Mugge, 2017; Van Krieken, 2012). The focus often shifts from the product to the experiences it facilitates, making the device a replaceable catalyst. This project seeks to reshape the interaction experience, focusing on initiating and maintaining emotional value that is deeply intertwined with the product itself, thereby enhancing its longevity and reducing the tendency for premature replacement.

Focusing on personal audio devices, I will follow the Design for Emotional Durability approach to explore this phenomenon, particularly focusing on strategies that enhance product attachment (Mugge, 2017; Van den Berge et al., 2021). Given that the reflective level is highly variable among individuals (Norman, 2003), this challenge offers an opportunity for accommodating mass-produced goods to personal specifics. Furthermore, with scarce practical cases on this subject, involving users in the developing process is essential for tracing truly valuable propositions.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Design a product interaction experience to develop irreplaceable emotional attachments between users and their personal audio devices.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

To carry out this project, I will begin by gathering information on both the theoretical framework of emotional durability and the particularities behind audio electronics. Conducting a literature review, as well as analyzing strategies and practical cases, will help me identify key limitations and opportunities.
Following that, a user-centered phase will follow to understand the emotional triggers and potential attachment factors between people and products. A participatory design approach will be crucial, observing and evaluating their feedback through different collaborative sessions with models and actual devices.
I will then focus on establishing the vision and criteria for developing testable concepts that enhance engagement and provide meaningful experiences. It will involve an iterative design process, where prototypes and interventions are refined based on actual users interactions. This approach seeks that the proposals are grounded in user insights and validated through proper testing, ultimately aiming to foster strong emotional connections and product retention for personal audio devices.

Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting, mid-term evaluation meeting, green light meeting and graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	29 Aug 2024
Mid-term evaluation	25 Oct 2024
Green light meeting	20 Dec 2024
Graduation ceremony	27 Jan 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	
For how many project weeks	
Number of project days per week	

Comments:

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

This project represents a significant opportunity not only to prove what I have learned in my master's program but also to test my journey as a student in product design. I aim to evaluate whether I am capable of providing truly meaningful solutions through the products that surround us, which was my primary motivation for joining the Design for Interaction program. Additionally, my deep fascination with how items become extensions of ourselves, as well as how well-crafted experiences can elevate our perception of the mundane, have been key factors when choosing this topic. Along with these goals, there are certain learning objectives I wish to achieve during this period:

- Lead and develop a semi-professional project. Gain experience in management and decision-making, necessary to carry out the thesis independently.

- Engage with participatory and user-centered design methods. Expertise highly relevant for the designer our society demands, in which I am personally very interested in.

- Get familiarized with tech-products. Acquire hands-on experience through prototyping and testing, notions I would like to refine for my career.

These ambitions reflect my desire to not only apply my academic knowledge but also to grow as a professional, equipping myself with essential skills for the future.

GRADUATION PROJECT PLAN

Alfonso Martín Mateo 5901774

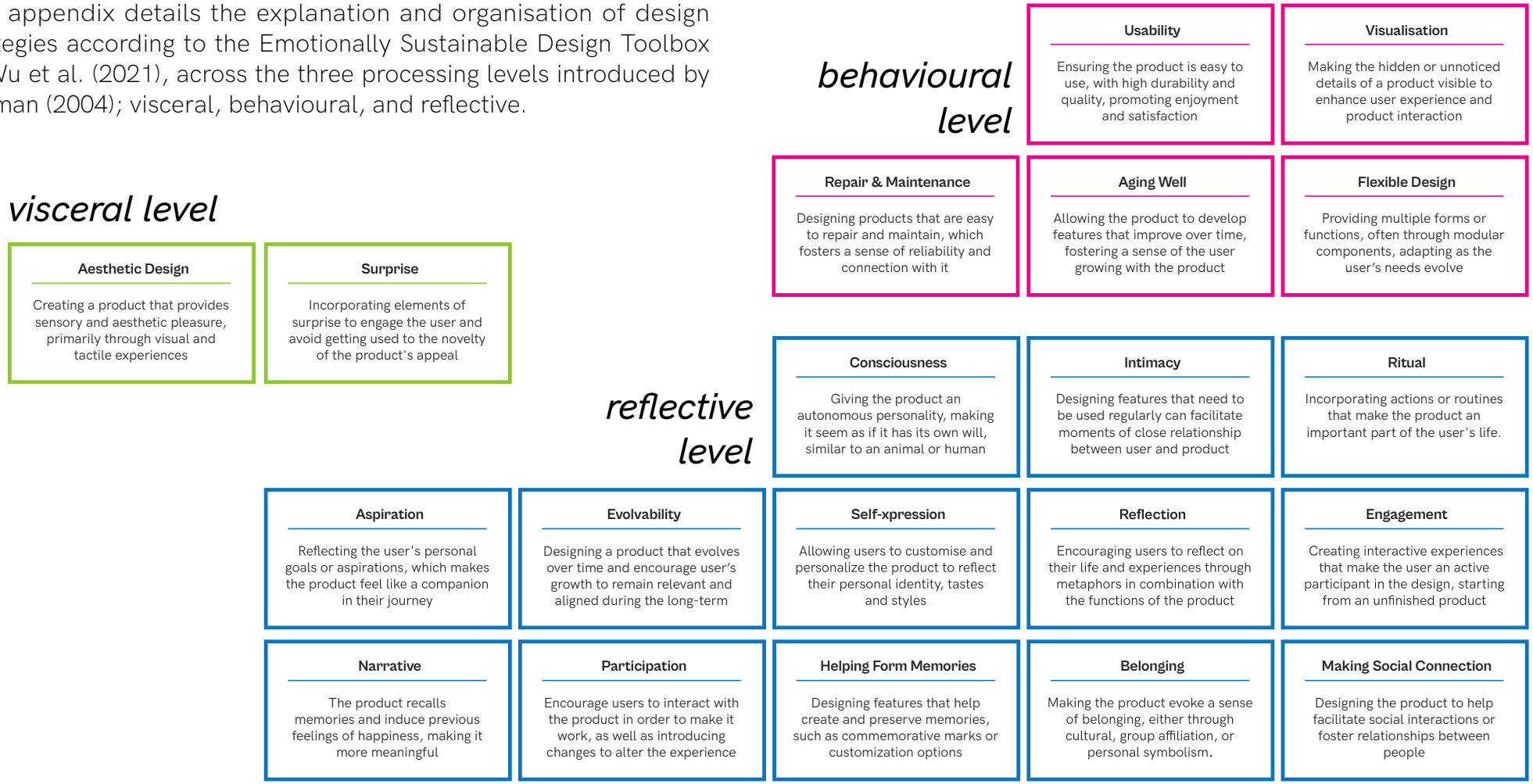
TU Delft 2024/25
Design for Interaction

				SEP				SEP-OCT	OCT			OCT-NOV	NOV				DEC				DEC-JAN	JAN		
				29-06	09-13	16-20	23-27	30-04	07-11	14-18	21-25	28-01	04-08	11-15	18-22	25-29	02-06	09-13	16-20	23-27	30-03	06-10	13-17	20-25
				Kick-off Thursday 29/08/24							Mid-term Friday 25/10/24							Upload G-I Friday 13/12/24	Green-light Friday 20/12/24				Upload docs next Monday 20/01/25	Graduation next Monday 27/01/25
	TASK	START	DURATION	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21
DISCOVER	Desk research	1	3																					
	Organize content	2	2																					
	User research - preparation	4	2																					
	User research - execution	5	2																					
DEFINE	Analyze & Synthesise outcomes	6	2																					
	Design brief	7	1																					
	Check & Update thesis	7	2																					
DEVELOP	Design exploration	9	2																					
	User intervention - preparation	10	2																					
	User intervention - execution	11	2																					
	Analyze & Synthesise outcomes	12	2																					
	Concept(s) development	13	2																					
	Check & Update thesis	14	2																					
	Validation & Conclusions	16	2																					
DELIVER	Final concept(s)	17	2																					
	Evaluation & Conclusions	18	2																					
	Check & Update thesis	18	3																					
	Writing thesis	1	20																					
	Presentation	20	2																					
	no working days											Friday 01/11/24								24/12/24, 25/12/24, 26/12/24, 27/12/24	31/12/24, 01/01/25			
	working days counter			7/100	12/100	17/100	22/100	27/100	32/100	37/100	42/100	46/100	51/100	56/100	61/100	66/100	71/100	76/100	81/100	82/100	85/100	90/100	95/100	100/100

Appendix II

Design strategies across the processing levels

This appendix details the explanation and organisation of design strategies according to the Emotionally Sustainable Design Toolbox by Wu et al. (2021), across the three processing levels introduced by Norman (2004); visceral, behavioural, and reflective.



Appendix III

Material for RA1

On the right is the template that record player owners filled after the initial conversation about their experience with the product. It includes the design strategies introduced in Appendix II and their division according to the processing levels.

3 levels	7 themes	20 strategies
visceral	pleasure	aesthetic design
		surprise
behavioural	integrity	usability
		visualization
	adaptability	repair and maintenance
		aging well
		flexible design
reflective	develop attachment	consciousness
		intimacy
		ritual
		aspiration
	individual's value	evolvability
		reflection
		self-expression
		engagement
	memory	narrative
		participation
		helping form memories
	positive relations	belonging
		making social connections

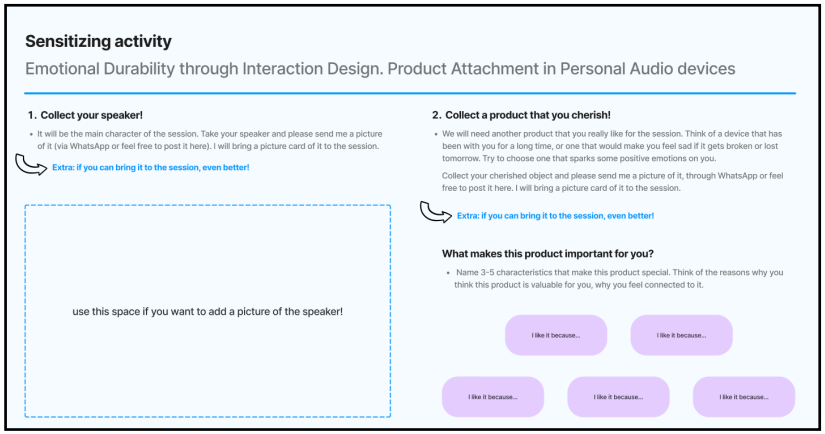
Appendix IV

Material for RA2

This appendix contains the templates used during the contextmapping sessions with speaker users. The purpose of each resource is detailed alongside it.

sensitising material

before the research activity, participants were asked to bring their speakers and undertake a brief reflective exercise on their perception of another product with which they have a positive connection.



Sensitizing activity

Emotional Durability through Interaction Design. Product Attachment in Personal Audio devices

1. Collect your speaker!

- It will be the main character of the session. Take your speaker and please send me a picture of it (via WhatsApp or feel free to post it here). I will bring a picture card of it to the session.

Extra: if you can bring it to the session, even better!

use this space if you want to add a picture of the speaker!

2. Collect a product that you cherish!

- We will need another product that you really like for the session. Think of a device that has been with you for a long time, or one that would make you feel sad if it gets broken or lost tomorrow. Try to choose one that sparks some positive emotions on you.

Collect your cherished object and please send me a picture of it, through WhatsApp or feel free to post it here. I will bring a picture card of it to the session.

Extra: if you can bring it to the session, even better!

What makes this product important for you?

- Name 3-5 characteristics that make this product special. Think of the reasons why you think this product is valuable for you, why you feel connected to it.

I like it because...

I like it because...

I like it because...

I like it because...

I like it because...

context labels

for defining how their current interaction with the speaker is through 3 categories: frequency of use, parties involved, and type of activity it is used for.

focus activity	studying/working, excercising, etc.
relaxing activity	gatherings, reading, painting, sleeping, etc.
outdoor activities	picnic, traveling, etc.
active listening	just focused on listening, no other tasks in between.
daily routine	**alone**
2-4 times weekly	**friends**
occasionally	**family**

ESD Toolbox cards

for defining how participants perceive the user experience with the speaker, and how they want to envision it.

Aesthetic Design Creating a product that provides sensory and aesthetic pleasure, primarily through visual and tactile experiences	**Surprise** Incorporating elements of surprise to engage the user and avoid getting used to the novelty of the product's appeal	**Usability** Ensuring the product is easy to use, with high durability and quality, promoting enjoyment and satisfaction	**Visualisation** Making the hidden or unnoticed details of a product visible to enhance user experience and product interaction	**Repair & Maintenance** Designing products that are easy to repair and maintain, which fosters a sense of reliability and connection with it
Aging Well Allowing the product to develop features that improve over time, fostering a sense of the user growing with the product	**Flexible Design** Providing multiple forms or functions, often through modular components, adapting as the user's needs evolve	**Consciousness** Giving the product an autonomous personality, making it seem as if it has its own will, similar to an animal or human	**Intimacy** Designing features that need to be used regularly can facilitate moments of close relationship between user and product	**Ritual** Incorporating actions or routines that make the product an important part of the user's life.
Aspiration Reflecting the user's personal goals or aspirations, which makes the product feel like a companion in their journey	**Evolvability** Designing a product that evolves over time and encourage user's growth to remain relevant and aligned during the long-term	**Self-xpression** Allowing users to customise and personalize the product to reflect their personal identity, tastes and styles	**Reflection** Encouraging users to reflect on their life and experiences through metaphors in combination with the functions of the product	**Engagement** Creating interactive experiences that make the user an active participant in the design, starting from an unfinished product
Narrative The product recalls memories and induce previous feelings of happiness, making it more meaningful	**Participation** Encourage users to interact with the product in order to make it work, as well as introducing changes to alter the experience	**Helping Form Memories** Designing features that help create and preserve memories, such as commemorative marks or customization options	**Belonging** Making the product evoke a sense of belonging, either through cultural, group affiliation, or personal symbolism.	**Making Social Connection** Designing the product to help facilitate social interactions or foster relationships between people

Appendix V

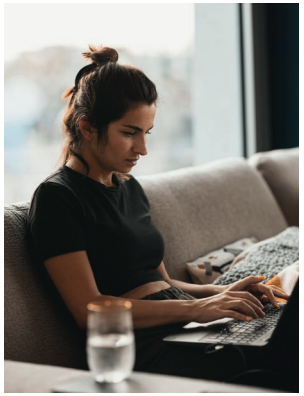
Material for co-creation workshops

This appendix contains the templates used during the co-creation workshops with designers. The purpose of each resource is detailed alongside it.

user persona

profile of the type of user that participants designed for during the session. On the right, the template for Workshop 1 can be found, and below it, the variation of the same for Workshop 2.

Ella, 29-year-old architect



Background
Ella is a 29-year-old architect who has been living in Rotterdam for the past 3 years, where she works remotely part of the week. She is **very active on social media, where she draws inspiration** on how to upgrade her place with products that enhance her daily life, reflecting it in her home decor. In addition, growing up in a modern generation aware of environmental issues, **Ella and her friends strive to reduce their consumption by acquiring pieces that are both durable and technically appealing**, proudly discussing their possessions whenever they get the chance.

Personality
Ella prefers quality over quantity, carefully researching each purchase. Since she spends much of the week at home, she values **items that seamlessly integrate into her daily life**, looking for products that align with her identity and her space. However, if they **fall short of her expectations, she eventually replaces them.** This behaviour challenges her commitment to sustainability, creating an **internal conflict between her desire for novelty and her eco-conscious values.**

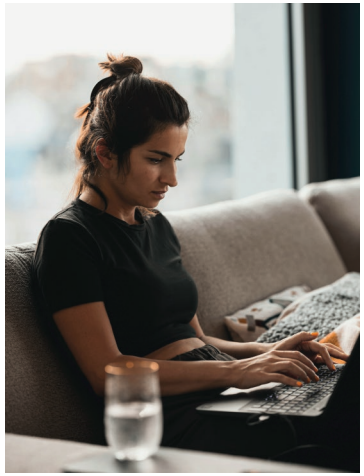
> *Ella's love for music infuses her daily life, serving as a backdrop for her routine. She is now looking for a speaker that elevates those moments, one that can enjoy both alone and when friends come over her place.*

---

participation to elevate the ritual

how can Ella enhance the frequent interactions with the speaker, making her daily routine a meaningful process?

Ella, 29-year-old architect



Background
Ella is a 29-year-old architect who has been living in Rotterdam for the past 3 years, where she works remotely part of the week. She is **very active on social media, where she draws inspiration** on how to upgrade her place with products that enhance her daily life, reflecting it in her home decor. In addition, growing up in a modern generation aware of environmental issues, **Ella and her friends strive to reduce their consumption by acquiring pieces that are both durable and technically appealing**, proudly discussing their possessions whenever they get the chance.

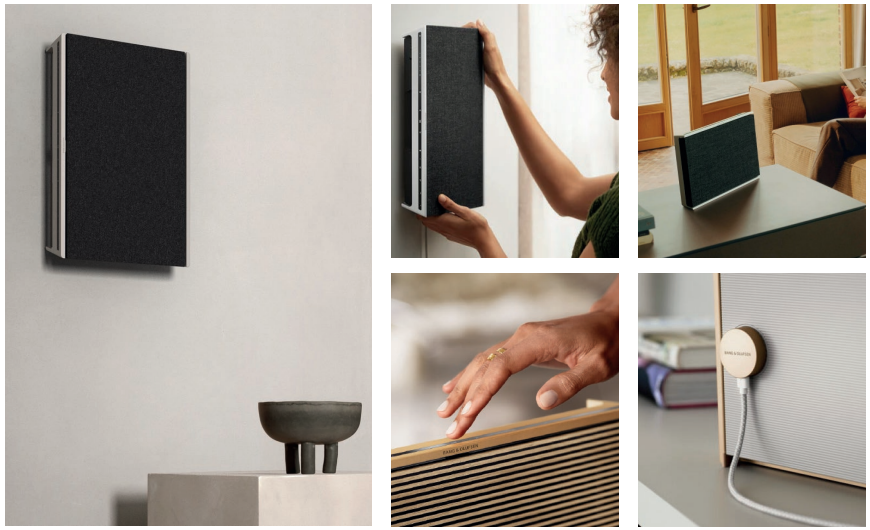
Personality
Ella prefers quality over quantity, carefully researching each purchase. Since she spends much of the week at home, she values **items that seamlessly integrate into her daily life**, looking for products that align with her identity and her space. However, if they **fall short of her expectations, she eventually replaces them.** This behaviour challenges her commitment to sustainability, creating an **internal conflict between her desire for novelty and her eco-conscious values.**

> *Ella's love for music infuses her daily life, serving as a backdrop for her routine and social gatherings. She is now looking for a speaker that resonates with her identity, one that feels personal and connected to her.*

---

self-expression through visualisation

how can Ella physically adapt the speaker to her preferences, making it a statement piece that feels unique to her?



self-expression through visualisation
idea dumping

idea dumping

after introducing the original model to the participants, they could start generating the first ideas that came to mind. For the second workshop, the title *"self-expression through visualisation"* is changed to *"participation to elevate the ritual."*

design template

this template was used by the different teams to present their speaker proposal, after having conducted the workshop activities. For the second workshop, the title*"self-expression through visualisation"* is changed to *"participation to elevate the ritual."*

self-expression through visualisation

CONCEPT DESCRIPTION

team:

intervention 1

what?

how?

intervention 2

what?

how?

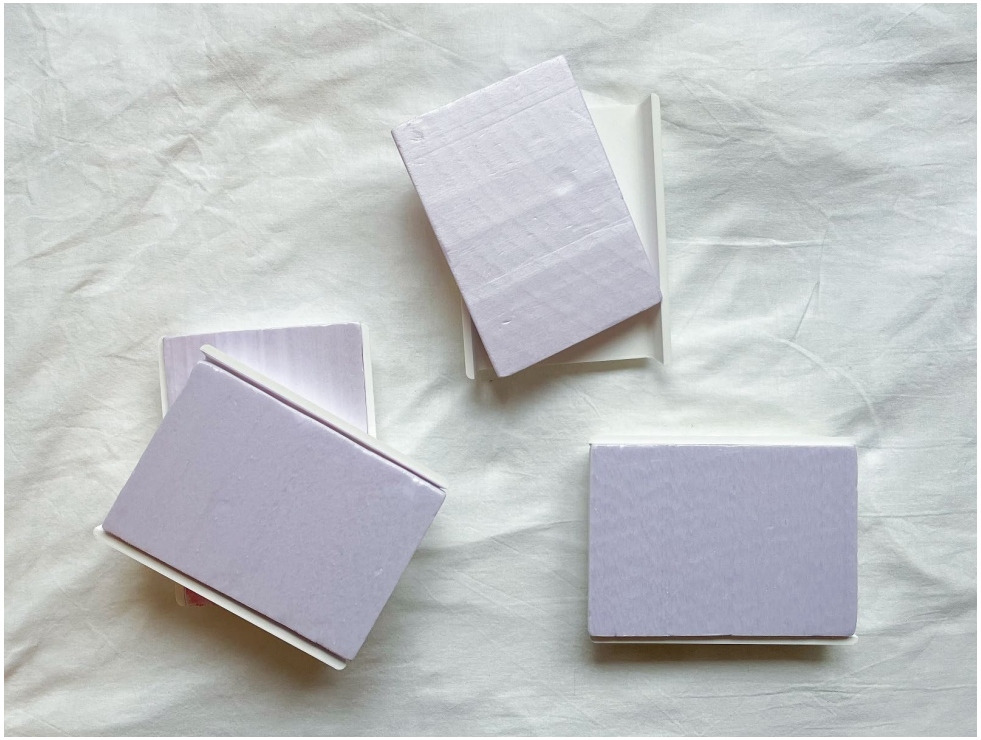
intervention 3

what?

how?

base prototype

unit that each team used to introduce their redesigned version of the speaker that would pursue the chosen interventions from the ideation analysis part.



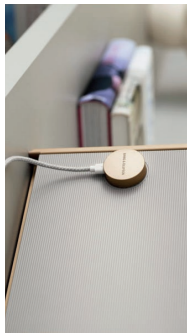
Appendix VI

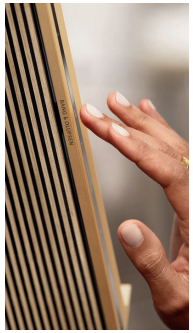
Material for user validation

This appendix contains the templates used during the validation test of the final concept. The purpose of each resource is detailed alongside it.

original concept

material used for introducing participants to the original speaker, the BEOSOUND LEVEL. Later would be compared with the final concept.

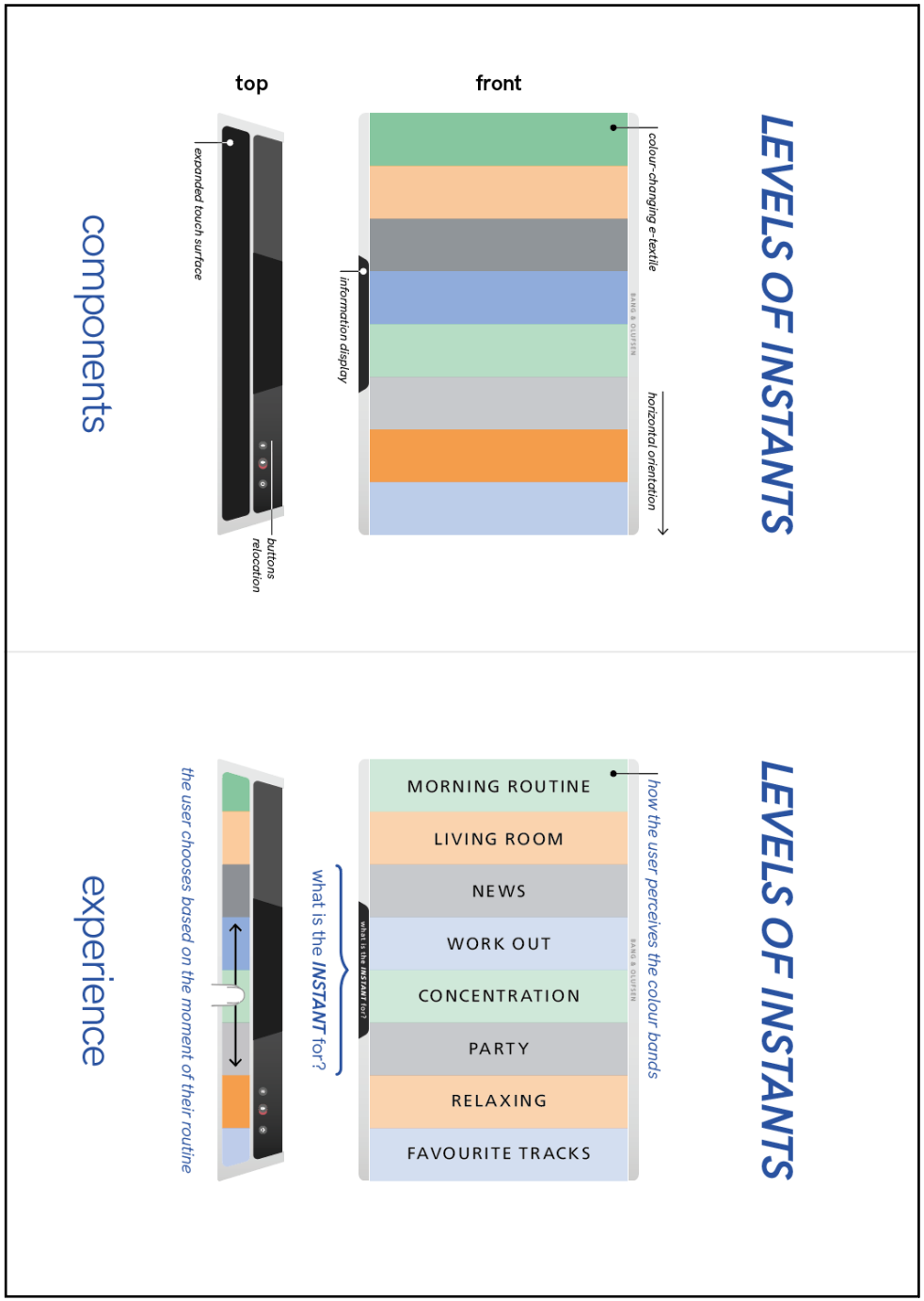




BEOSOUND LEVEL

final concept

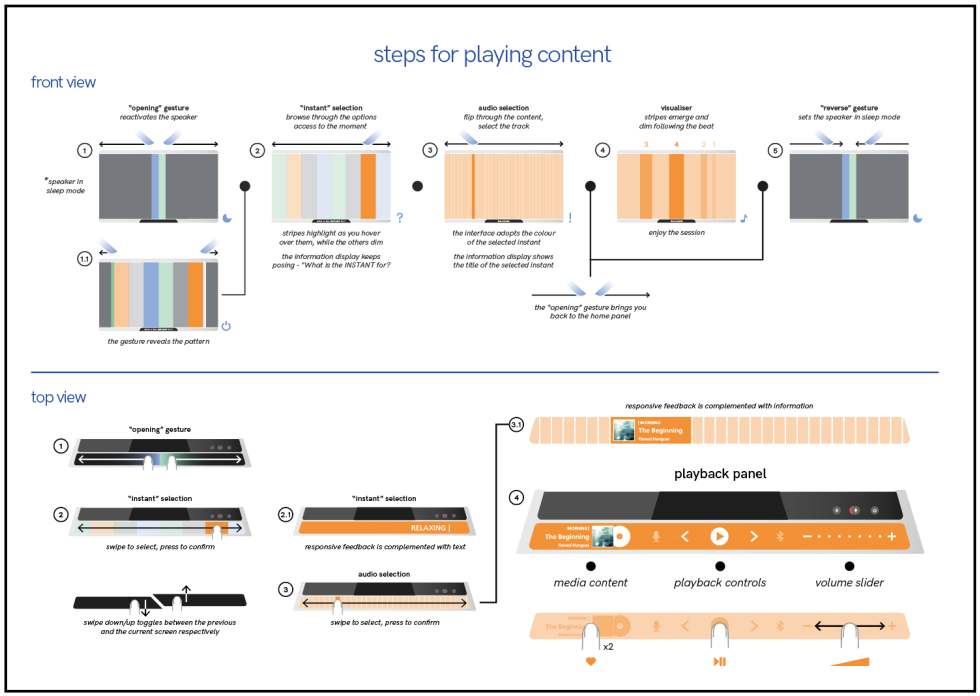
material used for introducing participants to the final concept, LEVELS OF INSTANTS. The 3D model was used during the features walk-through.

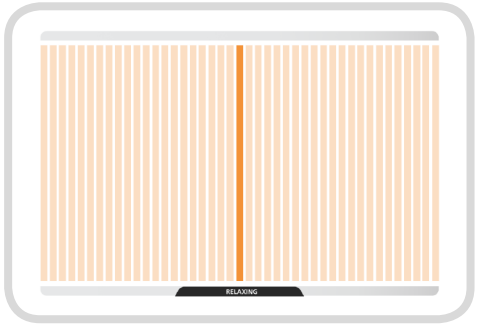


content selection

steps to follow in order to play content. On the right, footage of the digital ptrototype, and the following link leads to it (Figma account is required):

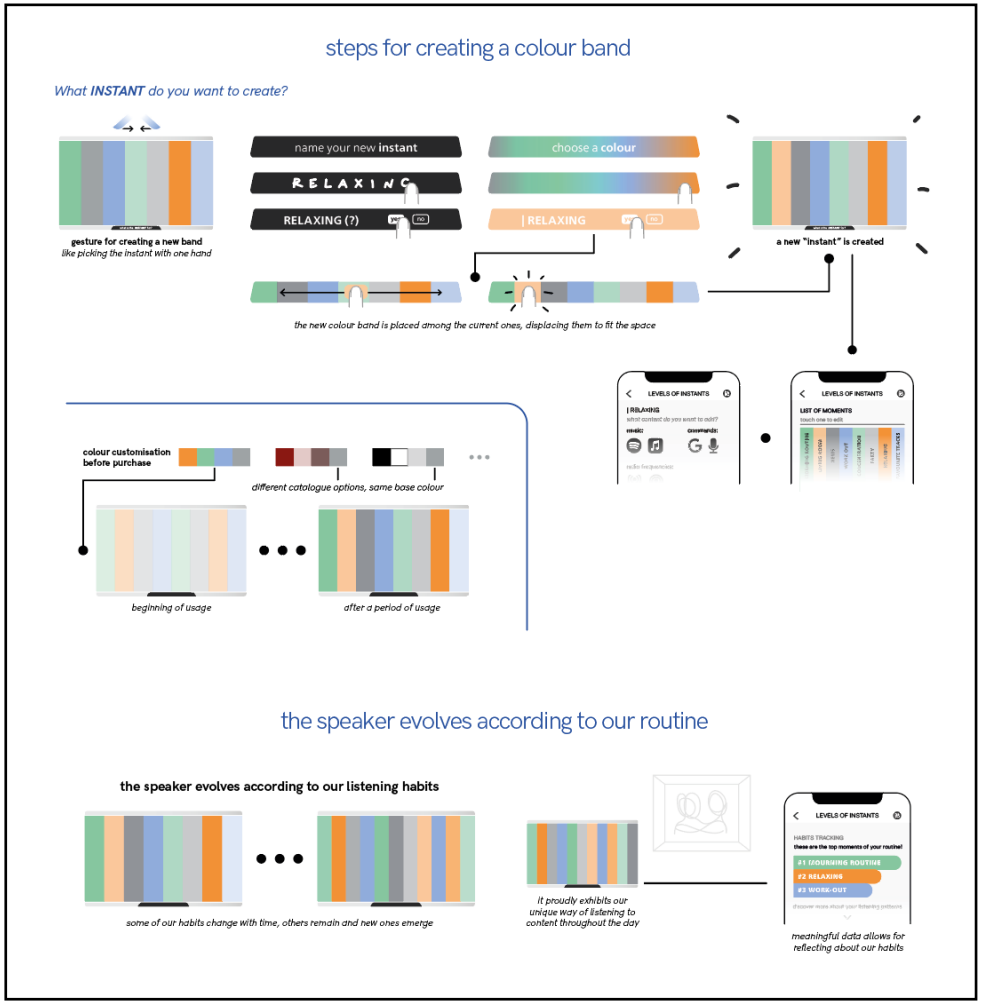
https://www.figma.com/proto/21U2WlMz4LYZll9CW93iMC/User-validation?page-id=0%3A1&node-id=6-1004&viewport=282%2C355%2C0.2&t=riDYytYfksNXf7jf-1&scaling=contain&content-scaling=fixed





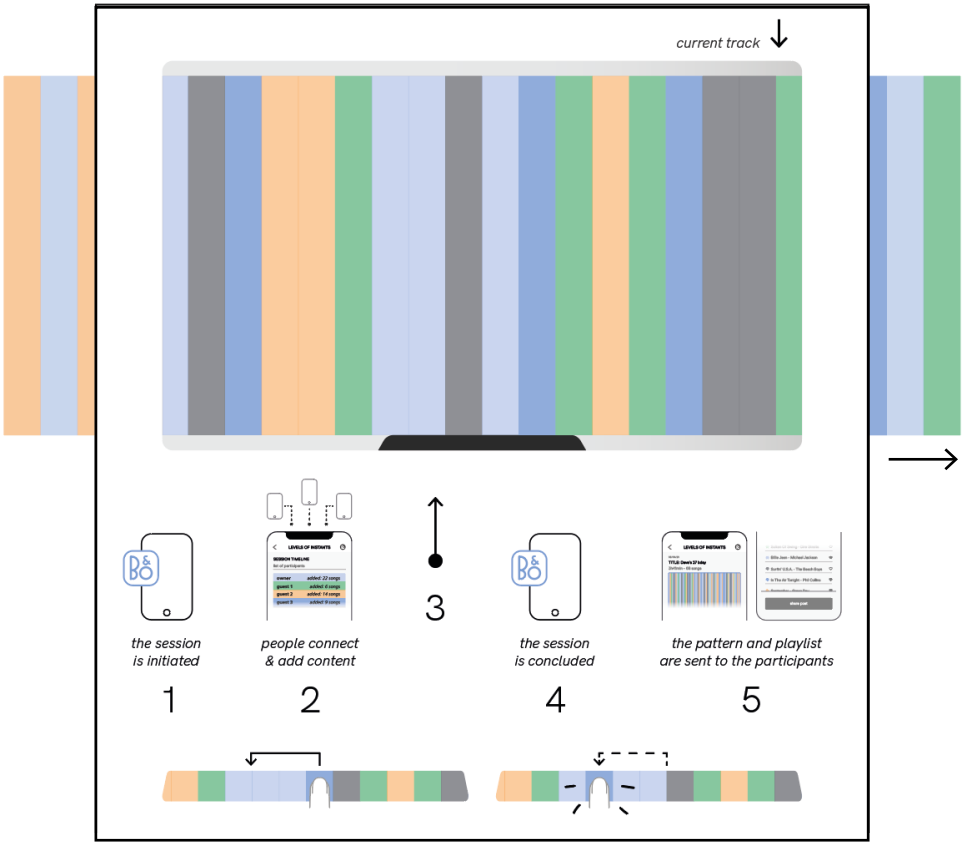
band creation & evolvability

flash card including the steps to follow in order to create a new colour band. below, a visual explanation of how the concept evolves through usage.



collaborative session

interactive paper prototype for explaining how the collaborative session unfolds.



Emotional Durability through Interaction Design

Product Attachment in Personal Audio Devices

Alfonso Martín Mateo

TU Delft - MSc Design for Interaction