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Design for Attachment: an explorative search for product qualities that enhance our emotional bond with digital products

Abstract

This paper describes an explorative search for elements of attachment: qualities that support a stronger emotional bond between user and digital product. Based on a reflection of attachment literature we conclude that digital products require a different approach towards attachment, namely one that focuses on both the physical artifact and the digital content. We hypothesize that the digital products should continuously adapt to the user affecting all product aspects: appearance, interaction, functionality and content.

In order to reach these goals, our research takes an explorative research-through-design approach with a focus on analysis through making. We start with an exploration phase, where we perform a series of case studies: small design iterations on different types of digital products (mp3 players, cameras and e-readers). The concepts from the case studies are coded and clustered into a first set of elements of attachment. In the implementation phase, these elements are used in the design of a new mobile phone concept: FLEX. In the evaluation phase, we evaluate FLEX on its translation of the elements and its ability to support attachment through expert review sessions. From evaluation we define a refined set of elements of attachment.

The elements that we present are *'Knowing each other'*, *'Creating focus'*, *'Sharing memories'* and *'Reflecting identity'*.

They can be used as inspiration and guidance in different phases of the design process.

Keywords

Design for Attachment; product attachment; concept phone; FLEX; elements of attachment; research-through-design.

1 Introduction

"We need things consumed, burned up, worn out, replaced and discarded at an ever-increasing rate." [1] This famous critique from retail analyst Victor Lebow about the American consumption society dates from 1955, but it still seems relevant. Think about the average life of your mobile phone, mp3 player or digital camera, for example. Quick replacement rates result in short product lifespans that have major consequences for the waste problem, especially with digital products [2]. A possible solution could be to design for attachment: by making people care for their (digital) products, we hopefully can increase product lifespan while enhancing user experience.

In digital products product attachment seems to be of a different nature than it was in earlier products. We believe that this is caused by in the increasing divide between interactive artifact and digital content. The relation between the artifact and its content used to be tied to the same rules: if the product got damaged or

lost, the information would be lost (think for example of text messages in early mobile phones). This is no longer the case as digital information can be freely transferred. Digital content has become an entity of value in and of itself, which has become subject to research [e.g. 3]. However, in this paper, we wish to re-focus on attachment to the digital products themselves, in order to increase product lifespans.

In what follows we first dive into product attachment literature to seek guidance for product design. As we find that attachment with digital products might be best supported through adaptation over time to the individual user, we set out to define a new set of elements to enhance attachment with *adaptive* digital products. The aim of these elements is to support the designers of such products in the future. In our journey, we take an explorative research-through-design approach [19]. We split the process into three main phases: *exploration*, *implementation*, and *evaluation*. In the *exploration* phase, three explorative design cases on different types of digital products (camera's, e-readers, and mp3 players) form the basis for a first set of elements. In the *implementation* phase, we use this first set of elements in the design of a new mobile phone concept. In *evaluation*, we evaluate the phone concept on its translation of the elements and we evaluate the elements on their use in the design process. We conclude this paper with a discussion of this new direction in design for attachment.

1.1 Product attachment

Product attachment has been researched throughout different disciplines. It concerns the relationship a consumer experiences with a specific product [4, 5, 6, 7], and is related to irreplaceability [8]. "Attachment tends to develop over time as a result of recurring interactions between an individual and the product" [5, p. 641]. These recurring interactions result in profound and sustained experience of meaning [6], which define the relationship between user and product. The experience of meaning include, e.g., feelings of confidence, independence, achievement, security, friendship, or control [6]. Following this course, we see attachment as a relationship between user and digital product that is defined by recurring interactions creating personal experience of meaning, which results in irreplaceability of that product.

This experience of meaning resulting from recurring interaction is explained through a process of *self-extension* [6, 9, 10]: our possessions contribute to our identity and reflect that identity back to us. Zimmerman [10] presents seven framing constructs for self-extension, which are *role engagement*, *control*, *affiliation*, *providing ability*, *longterm goals* and *rituals*. All these constructs have a clear overlap with factors that are known to influence product attachment. *Self-expression* for example (similar to Zimmerman's [10] affiliation and role engagement) is known to have an effect on product attachment: "Products with personality associations similar to the personality of the owner allow him/her to show the world who he/she is. Consequently, the product gains symbolic meaning to the owner, due to which the owner becomes more attached to the products." [11, p.10]. The influence of *memories* (similar to rituals) has also been researched intensively [e.g., 5, 8, 9]. Schifferstein and Zwartkruis-Pelgrim even call "a strategy based on the accumulation of memories" the most promising direction for designers to stimulate increasing attachment on the long term [8, p. 8]. Lastly the stimulation of forming *future goals* influences people's connection to possessions [4]. Apart from the self-extension constructs, there are other aspects that influence attachment. Perceived pleasure [5] or *enjoyability* [5, 12, 13] has a positive influence and *surprise* is again known to increase enjoyability [14]. Also the degree of *mental effort* that people invest to gain control and a feeling of ability in a product is positively related to the experienced emotional bond with a product [4].

1.2 Focus on adaptive digital products

The role of the different constructs that influences attachment changes over time. Mugge et al. [5] found an inverse U-shape relation between duration of ownership and attachment: after a stable first year attachment decreases but after twenty years it is highest. According to this research, attachment is first most associated with enjoyability but after time the qualities pertaining to memories become key. We see possibilities in extending the positive factors from the beginning of the relationship as well as bringing the long-term triggers forward through adaptive digital products. Moreover, adaptive digital products can change along with users changing facets of the self and can adapt their way of supporting identity, which could increase

the opportunities for self-extension. Therefore, in this study, we focus on adaptive digital products.

Related adaptive design directions. We are not the first one to focus designing on adaptive products to support the relationship between user and product. We discuss the three most well known directions and in order to specify our focus further.

Customization. In customization, patterns of customer needs lead to a set of personal choices within product families [15]. Think for example of NIKEid [16], where sneakers can be customized based on predefined choices. Customization makes products more personal, which certainly has an effect on their enjoyability, but there is no transformation of the product over time and use. The adaptation happens only at purchase, which means that there is no elongation of surprise and enjoyment. Moreover, the adaptation is based on target groups instead of individual users, which diminishes the connection to the facets of users individual identities.

Personalization. Personalization does have a continuous adaptation based on the individual user [17]. For example, Google's search engine [18] learns from previous search actions and continuously adjusts result accordingly. So as for its adaptation, personalization seems very suitable for attachment. However, personalization is mostly software-based, which makes the adaptation transferrable and not product specific.

Graceful aging. The adaptation of graceful or dignified aging products [13] is, in contrast to personalization, product specific. It focuses on aesthetically pleasing wear and tear of materials that make products look unique. This effect is often named when people mention their favorite products (think for example of a leather bag that becomes more beautiful with every scratch). The adaptation in these products is continuous and based on the individual user but only focused on appearance. Especially in digital products we need a broader effect on multiple product aspects, including at least the interaction and digital content.

Direction & contributions. Concluding from this review, we propose a new direction in design for attachment with digital products. We aim at digital products that adapt continuously to the individual user, affecting all product aspects: appearance, interaction, functionality and digital content. In general, this paper has two main contributions: we define elements that

can support designers of adaptive digital products and we present a mobile phone concept to illustrate and evaluate our direction.

2 Exploration

We started this project with a designerly exploration of product elements that could enhance the bond between user and adaptive digital product. We performed three case studies three different digital product groups: cameras, MP3 players and e-readers. We chose these products because they are prime examples of products that we trade in easily for a new version. Moreover, they are also all products that function as a shell for external, interchangeable data. Lastly, all of these examples have analogue predecessors (analogue cameras, books and music carriers like vinyl or cd's) that have the potential to form an emotional bond with their owners.

To gain inspiration for the design case studies, we held a focus group where we asked five people to bring a product they would never throw away and to explain the reasons for this irreplaceability. We also performed a social media enquiry on the meaning of different relationships, i.e. the difference between acquaintances and friends. The resulting anecdotes and examples formed the input for the case studies on cameras, MP3 players and e-readers. Each case study took two weeks and followed a similar process. We started with one or two group brainstorms involving three to five master students with a background in Design. The goal of each brainstorm was to come up with more personal and more 'attachable' versions of the digital product we were designing for (MP3 players, cameras, or e-readers). The brainstorm was followed by a weeklong individual ideation session. We captured the most promising ideas into low fidelity prototypes made of paper, cardboard, and scrap materials. An example of results from the case study on cameras can be seen in figure 1.

Analysis. The resulting camera, mp3 and e-reader concepts were used in an inductive thematic analysis [20]. Each concept was evaluated and compared to constructs deriving from attachment research [e.g. 4, 5, 8, 9, 10, 11, 14] through extensive discussions between the two authors of this paper.

Each concept was labeled with codes (see figure 1), which were clustered again, resulting in nine themes (*shared experiences, memory recollection, showing content, physical digital content, personal interaction,*



Fig. 1. The prototypes resulting from the camera case study and the coding of these prototypes.

layered functionality, effort, patterns and intimacy). To condense our themes in a more workable set, we mapped the nine themes on one of the four aspects of digital products that they influence most: interaction, functionality, appearance, or history. The four resulting clusters were given names and descriptions, of which this set of four elements of attachment is the result:

- *Knowing each other*. This element (resulting from the theme *personal interaction*) is based on the idea of growing familiarization of interaction. In time mutual adjustments between user and product make the interaction personalized.

- *Creating expertise*. Through this element (resulting from the cluster *layered functionality & effort*), the product supports more specific and goal oriented functionality over time, by enhancing often-used features and forgetting about lesser-used functionality.
- *Expressing identity*. This element (resulting from *showing content & physical digital content*) changes appearance of the product to express the connection between user and product towards others.
- *Sharing memories*. This element (from *shared experiences & memory recollection*) triggers recollection of shared experiences between user and product, which leave their mark on the product.

Fig. 2. A selection of explorations in the development of the phone concept.





Fig. 3. FLEX with (A) a flexible rim and (B) hardware components around (C) the screen.

3 Implementation

In this phase, we used the set of elements in the design process in order to design an adaptive digital product that matches our direction. We decided to take smart phones as the product group for this implementation. Phones form a clear example of digital products that are indispensable but that are rarely irreplaceable [21]. The most important reason for replacement has very little to do with the functional life of the phone, but mainly depends on the contract length with a service provider [22]. These characteristics make the phone an interesting case for design for attachment.

We took again an explorative approach with a focus on making, and the aim to start with a broad range of concepts (see figure 2). The set of elements was used in different parts of this process. In idea generation, we used the elements to structure a group brainstorm session with five design students. The three-hour brainstorm was split up into four phases, and in each phase one specific element was introduced and used to redesign the mobile phone. During the selection of a final concept, we used the elements as requirements, and we compared each concept on the opportunities they offered on each requirement. During concept development, the elements were used as guidelines and for regular check-ups to see if development went in the right direction.

3.1 FLEX: The mobile phone concept

The result of the design process is the mobile phone concept FLEX (figure 3). In FLEX, specific in- and output components (camera, LED, speaker, microphone, GPS, and keyboard; figure 3B) are located at the border of the screen (figure 3C). A flexible rim is placed around the components (figure 3A). By pushing the rim surrounding the components in or out, one can explore the functionality related to that component.

By gently flexing the rim of the phone around one of the components, the applications that are relevant for that component appear. So by flexing the speaker for example, applications like *Spotify*, *Soundcloud*, and *myRadio*, are presented. The applications appear in order of relevance: the more they are used, the sooner they appear and the larger the icons. If quick access is required, the rim can be pushed in one resolute movement, which will directly open the most-used application for that component. Different in and output components can be combined. For example, by pushing the speaker and microphone simultaneously, the phone application will show (see figure 3). This rim behavior is expected to result in short cuts and personalized interaction, and forms an example of how the element *'Knowing each other'* can be translated.

In FLEX, applications are not actively stored on the phone. Instead, the phone gives seamless access to the 'App Store' within the user interface. This means that there is a continuous invitation to explore new types of applications and new types of functionality based on the current state of the hardware, your preferences and community recommendations. This offers the flexibility and ability to specialize in functionality, and forms a translation of the element *'Creating Expertise'*.

The flexible rim is made of a silicone outside with a highly viscous liquid core. The core slowly moves to the sides in the places that are used a great many times, which deforms the rim in those areas. The deformed locations in the rim are thinner, so rim becomes more flexible around the often-used components, leading to more comfortable usage (this represents the element *'Knowing each other'* again). With time, through the deformations in the rim the phone will show use patterns to the user and to others, which links to *'Expressing identity'* and *'Sharing memories'*.

Aside from the translation of the elements, FLEX represents our direction towards designing for attachment (see section 1.2). It is adaptive to the individual user's actions and usage. The adaptation is open-ended and continuous and affects the phone in appearance (in the rim), in interaction (through the rim's flexibility and ordering), and in functionality and digital content (in the available applications and new recommendations).

4 Evaluation

The evaluation phase has three main aims: (1) to see whether FLEX could trigger attachment, (2) to evaluate the translation of the elements in FLEX, and (3) to refine the four elements of attachment.

4.1 Setup

Since the FLEX prototype is not fully functional we made use of an expert panel for the evaluation. Experts can understand the underlying ideas and potential despite of prototype limitations, foresee problems, and elaborate on opportunities [24].

The expert panel consisted of eight senior design researchers with different expertise, including system design, business design, and user-centered design. The differences in expertise highlight different implications of the design of FLEX, of the elements, and of design for attachment, such as usability, user experience, business cases, and technical implications.

Each review session lasted for 30 minutes, and existed of two parts. In the first part, we introduced the phone concept without mentioning our aim to design for attachment, in order to get unbiased opinions on the value of FLEX. FLEX was presented by means of an animated movie and a prototype, existing of a 3D printed model equipped with flex sensors, connected to a Flash [24] interface on a laptop to function as the phone's screen. Material samples were available to show the deformation of the rim from use patterns. In a semi-structured interview we asked the experts about the value of the concept, its usability, the interaction, and the overall experience.

In the second part of the session, we explained our aim to design for attachment with adaptive digital products through an animated movie. We introduced the four elements of attachment through cards, and we briefly explained what we meant with them. We did

not explain the translation of the elements in FLEX, or their translation in product aspects in general. In a semi-structured interview we asked the experts about their opinion on whether they thought the elements would support attachment, on the completeness of the elements, on whether they recognized the elements in the phone and if so, in what way, and about the value of the elements for designers.

The setup was tested in a pilot with a master student. All sessions were filmed and transcribed.

We performed a thematic analysis [20] on selected quotes from the transcriptions. We categorized quotes on subjects related to the different parts of the evaluation: the phone concept and the interaction, the four elements, their translation into the phone, and the value of the elements for designers.

4.2 Findings

In the following section, we discuss the main results by using quotes of the experts. We briefly discuss the evaluation of FLEX as a mobile phone concept, after which we elaborate on the elements and their translation into FLEX.

The mobile phone concept. Overall, the experts appreciated the new way of interacting with the phone. The value of FLEX is especially seen in navigation, since it helps to avoid hierarchal and confusing menu-structures: *"It [the rim] becomes a sort of tangible frequently-used app selection that I can access fast and easy."* The central placement of the hardware components is seen as an interesting way to create understanding of the phone's functionality and abilities that should invite the user to explore new functionalities. Similarly, the recommendation of relevant applications was cheered upon, as long as reliability of the recommendation system is secured. The physical interaction with the flexible rim was evaluated positive, as well as the aging qualities: *"I love the traces of use"*. So, apart from some implications that need to be resolved in further development, FLEX was seen as an interesting phone concept.

The elements. The background of the project, and the reasons to focus on a new direction in design for attachment with a large focus on adaptive systems, was understood and met with enthusiasm by all experts. The

elements were generally appreciated but were received with some insecurity about their completeness. Because of the complexity of the matter, there was hesitation to accept a list of only four elements to describe the effect. However, no missing elements could be named.

Knowing each other. The feeling of attachment through familiarization, as seen in 'Knowing each other' was easy to relate to. Most experts could easily find an example from their own cherished products: "I feel in the way of playing [my contrabass], how we make each other sound better. I feel a steering from it that makes me intone with the instrument." In FLEX, this element was also recognized and appreciated: the ordering of the applications in the interface and the changing flexibility of the rim were seen as good examples.

Sharing memories. All experts recognized 'Sharing memories' as part of attachment. "My running shoes from the first marathon, souvenirs from the first holiday with my wife... You cherish the products that are connected to the peak moments in your life." It was recognized by 6 out of 8 experts in FLEX: "This is one of the few devices I know that tries to hold on to moments physically through the rim, which I really like", even though it was mentioned that the implementation could be stronger.

Expressing identity. This element is meant to contribute mostly to self-extension, where our possessions contribute to our identity and reflect that identity back to us. However, by some of the experts, the identity-expression was perceived as 'pretending to be someone you are not': "Identity... maybe that is a generation thing. I mean, I am who I am." People want to distance themselves from this interpretation, which led to a negative assessment. The people that recognized the more reflective qualities did underwrite it as a possible element of attachment and also saw this element reflected in the phone, especially in the use patterns that show in the material as a result of recurring interactions. However, questions were raised on what is actually being expressed: "with [FLEX] I cannot really see what kind of applications you use. Say that you use your camera intensively. That might mean that you are a photographer, or a moviemaker, or a Skyper. [...] In current phones [...] I can see how you handle your phone; whether you are careful with it or not. That might be even nicer". So it might be that the style interacting (how you bend the rim, where you store your phone) is more interesting to

show than the subject of interaction. It is expected that the phone has this type of expressivity in the material already (strong, direct movements give different deformations than exploratory, soft bending), but this quality could be enhanced more. Overall, strong clues point towards the value of 'Expressing identity', but we decided to rephrase it to move away from 'pretending', and to highlight the reflective qualities. The new name for this element is 'Reflecting identity'.

Creating expertise. With this element, worries were expressed about the implementation: "In a design this element needs to be implemented very subtly in order to make it feel as a natural guidance." Experts also foresee an issue with the static nature of hardware: in order to reach expertise a product needs to have features that offer enough room for growth.

Otherwise the user's skills might outgrow the system's ability to adapt too soon. These are valid and valuable remarks. However, we feel that they have to do with the naming of the element: the word expertise is very strong. We are aiming at more subtle development of functionality that is often used. In FLEX this element is represented by the recommendations for certain applications, which become more detailed for the components that are used often and more general for the ones that are hardly used. Since this aspect of the phone was received with great enthusiasm and since it is underwritten in literature (in, e.g., providing ability [10] and self empowerment [21]) we decided to hold on to the element but renamed it to the more subtle 'Creating focus'.

5 Discussion

The elements of attachment. Our final set of elements of attachment exists of 'Knowing each other', 'Creating focus', 'Sharing memories', and 'Reflecting identity'. Through their connection to the various constructs of attachment theory we have indicators that the elements support attachment between user and digital product. We do expect that individual users might value some elements higher than others. This shows in the variation in answers in the review sessions, and is also found in literature [21, 25].

FLEX as an example. Whether FLEX supports attachment is difficult to conclude as longitudinal evaluations in use were not possible in the current state of development. However, the translation of the

elements in the phone was overall recognized well and the resulting product features were appreciated. Therefore, we suspect that FLEX does have the potential to support attachment. The concept can serve as an inspiring example of how the elements can be translated into digital product aspects.

The need for a multi-facet adaptation. Our direction for increased attachment with digital products involved a continuous adaptation of the product to the individual user. We envisioned multi-faceted adaptation on physical object, interaction and digital content. In FLEX, the digital content is mainly represented by the functionality (the applications of the phone). As a result of the multi-facet aspect, the adaptation applies to both emotional and utilitarian properties like interaction and functionality. In attachment research, product utility is often not perceived as a precondition for product attachment [e.g., 8]. However, we believe, in line with Meschtscherjakov et al. [21], that it is necessary to also focus on the functional aspects for attachment in the type of digital products we researched. Even though we can think of scenarios where people have strong attachment to non-functional mobile phones (the authors also save their old phones as a memory cue), it will still get replaced for a new one that fulfills our utilitarian needs. Therefore, in digital products indispensability (relating to utilitarian needs) and irreplaceability (relating to emotional needs) should go hand in hand. Therefore, we believe that attachment requires multi-facet adaptation, taking next to the emotional, also the utilitarian properties of the phone into account.

Approach & Limitations. In this project we took a research-through-design approach with a large focus on analysis through making, in order to (1) create elements to support attachment with adaptive digital products and (2) ground the elements in an example. The explorative approach allowed us to investigate different implementations and translations of the elements through the case studies before making decisions for FLEX. However, the elements themselves and the implementation of the elements in FLEX are not yet validated. In order to do so we advice further development of FLEX, to evaluate longitudinally whether FLEX actually supports attachment and if the elements hold up.

Throughout our process, we involved users, design students, and senior design experts in, e.g., focus groups, creative sessions, and the discussed review sessions. However, FLEX is currently our only design. Even though the elements of attachment are based on explorations of different types of digital products, we currently only have one implementation. Therefore, we must be cautious when generalizing our findings. We would like to invite other designers to use the elements and to build up a larger variety of examples of adaptive digital products that can support attachment.

6 Conclusions

Even though the set of elements of attachment are not yet validated longitudinally, they build upon constructs and models that are known from literature [e.g., 4, 5, 8, 9, 10, 11, 14]. The elements are linked to aspects of digital products (interaction, functionality, appearance, and history) and focus on the adaptation. The elements are suitable as inspiration in various phases of the design process. We especially experienced their value in the idea generation, concept development, and for reflection. In these activities the elements can be used more loosely: as inspiration, reflection tools, and as a way to set challenges; rather than as hard requirements. The mobile phone concept that we presented, FLEX, forms an example of how the elements can be translated into aspects of digital products and of how elements can be combined.

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