Exploring Intended and Unintended Uses of (e)Books as Design Inspiration for Ambient Displays in the Home

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Abstract. Books at home are used for more than reading, such as collecting them, using them as decoration, or expressing personality. In order to get a better understanding of intended and unintended uses of printed books, we conducted seven book tours in different homes followed by semi-structured interviews. This data was complemented with a large-scale online survey with 300 respondents. We describe our findings focusing on *storage*, *sorting*, *decoration*, and *self-expression* and how they inspired us to develop a digital bookshelf (ambient display) as a technology probe to explore decoration with eBooks in the home. We argue for a transition from decoration with printed books to eBooks as design inspiration that does not simply replicate a bookshelf as ambient display, but makes eBooks tangible by combining users' habits with qualities of digital material.

Keywords: Printed books; eBooks; home; storage; sorting; decoration; self-expression; ambient display;

1 Introduction

The reading of printed books as their primary purpose has been widely studied (e.g., [19]). Within the past 15 years studies on eBooks gained increased interest [1, 10, 12, 20, 21] and also focused on digital libraries [6, 25, 26]. However, little attention has been given to the other intended or unintended uses of printed books, such as decoration or self-expression as design inspiration.

Items in the home and how they are arranged, stored, and displayed are important clues about the people living there [23]. Decoration within the home makes us feel comfortable or can provide guests with a "wow-experience", in terms of "I've never seen something like that before". It aims to enhance the beauty of our home and

enable us to intentionally and unintentionally express our personalities and tastes by mixing and matching objects, materials, etc.

Our aim was to investigate intended and unintended uses of printed books (other than reading) to identify the value of eBooks as design inspiration for ambient displays in the (digital) home used for decoration from a user-centered perspective. The lack of physicality of digital objects (in this case eBooks) means that they are often hidden and, therefore, have no real presence in the home (i.e., they are intangible) [11, 22]. We were specifically interested in stories and details that would help us to better understand how people are using printed books to create a feeling of hominess or why they let them lie around. We wanted to understand how and why people decorate their homes with printed books or use them for self-expression, next to where they are stored and how they are sorted.

In response, we selected seven university graduates and academics from our social network, as we assumed they were used to working with and interested in printed books and eBooks. We asked them to take us on a book tour through their homes (which is an adapted form of the technology tours [5]) followed by semi-structured interviews. On the tours, we explored the intended and unintended uses of printed books. Afterwards, we created an online survey in order to gain broader insights from a wider range of people. With the survey, we collected within a month feedback from 300 people being interested in printed books and eBooks. We describe the most interesting insights regarding storage, sorting, decoration, and self-expression to facilitate a better understanding about additional uses of printed books as design inspiration for ambient displays, providing eBooks a visual and decorative representation in the home. We found out that future designs need to go beyond one-to-one mapping between what users do with printed books and what they potentially could do with eBooks by exploring how users' habits can be combined with affordances of digital material.

In order to explore such future designs of ambient displays for eBooks, we designed a digital bookshelf as a technology probe [13]. By applying research through design we further investigated decoration and self-expression with eBooks in a field study with three households over three weeks. Based on our different user studies, we conclude our paper with four key lessons around the intended or unintended uses of printed books and eBooks in the home regarding (1) atmosphere, (2) self-expression and wow-experience, (3) hiding, and (4) interacting with the invisible. For reading purposes, the term (e)Books is referring in the following to both printed books and eBooks. Otherwise we will use the terms separately to make an explicit distinction.

2 Related Work

Mass printing in the 15th century established what we know as the printed book, with its different covers and paper pages. Reading as a complex human activity has evolved and co-evolved with technology over thousands of years (see [19] for a summary of reading goals). The effects of judging printed books by its covers have also been described, for example, by Yampbell [27]. However, when eBooks first appeared in the 1990s, many information technology experts predicted that printed books would become obsolete [9], which is not yet the case. Several studies have investigated the change in reading habits between printed books and eBooks (e.g., reading hours) [12, 20, 25]. Other studies have looked at the challenges and opportunities that arise with eBooks [1, 10, 12, 21, 25]. Regarding future developments for eBooks, Grasset et al. [10] introduced a design space for mixed reality and visually augmented books and Pearson et al. [21] developed HCI design principles for eReaders.

Blandford and Buchanan [6] found out that digital libraries are powerful tools, but their potential will only be realized, if people are able to use them in an efficient and effective way. They concluded that people need to be able to promptly become familiar with the structure, the type of contents, and the search mechanisms. These issues were also addressed by Witten et al. [26], describing how to build a digital library, or by Thudt et al. [25] presenting the Bohemian Bookshelf, which supports serendipitous discoveries in the context of eBook collections by offering a unique overview with multiple visual access points (i.e., a timeline, an author spiral, keyword chains, cover color circles or book piles).

Terrenghi et al. [24] state that integrating some of the aspects of physical interaction in the design of digital media has been taken for granted and not systematically discussed from a user-centered perspective. They argue for a better understanding of people's expectations and mental models about digital and physical media, as well as understanding the affordances when interacting with them. They conclude that it is necessary to think more deeply about how designers and developers can be inspired by the physical affordances, while exploiting new and exciting possibilities of digital media at the same time. Chen et al. [7], for example, explored the differences between online and physical bookstores in terms of visual exploration, in order to design a digital bookwall. Whereas Meese et al. [16] investigated how codes can be used as patterns for designing interactive decoration for tableware by first learning various rules and constraints of the technology and then creatively exploiting them to extend patterns in order to hide them within backgrounds.

The study of the "meaning of things" by Csikszentmihalyi and Rochberg-Halton's [8] revealed that the home as a domestic space accommodates objects with a range of values, amongst which utilitarian values were considered less important than other types of meanings, such as memories, style, and experiences. Odom et al. [17] additionally provide a framework for understanding why people preserve and discard things in the home (based on function, symbolism, material qualities and relationship properties like engagement, histories, augmentation, and perceived durability). Recent studies have focused on understanding the values and new practices with digital material. Examples are how digital picture frames give digital data a presence in the home [4], whether as family archiving as digital footprints [23], or the importance of serendipity while interacting with digital photos [14].

Encouraged by the different related work we wanted to investigate intended and unintended uses of printed books and eBooks than reading (in phase 1 - analyses), design a digital bookshelf as a technology probe (in phase 2 - design), and investigate its usage in the home to deepen our understanding (in phase 3 - exploration). Therefore, we combine user-centered design with research through design.

3 Phase 1: Analyses – Gaining Insights

In order to understand intended and unintended uses of printed books and potential uses of eBooks, we present insights from our qualitative and quantitative user research. In the following, the two approaches are described separately, but for better understanding the findings and insights of both approaches they are described together.

3.1 Approach

We started our analysis with a qualitative approach by asking people from our social network to take us on a tour through their homes to explore (1) how and where they

keep their printed books, and (2) the additional intended and unintended uses of them. As these initial qualitative insights were biased by the selection of people to participate, we conducted an online survey with people interested in (e)Books to strengthen the qualitative insights and prove their relevance.

The Qualitative Approach. Inspired by the *technology tours* of Baillie et al. [5] and *personal inventories* of Odom et al. [17], we were seeking for a heterogeneous sample of seven people that would take us (as researchers) on a book tour through their home. We aimed for provocative, diverse, and inspiring stories about their printed for a better understanding of intended and unintended uses of them in the home. We recruited university graduates and academics from our social network, as we assumed they were used to working with and have an interest in (e)Books. Therefore, we prepared a shortlist of possible participants based on their reading habits, attitudes, size of collection, etc. The most distinct participants were selected, who were not closely related to us, but distant acquaintances.

The participants were free to choose which rooms to show us on the book tour throughout their home. Although they were free to choose, they willingly showed us their printed books in every room. Some participants asked us not to take pictures while being guided on these tours but offered to take some themselves (after the tour) and send them to us. The book tours were combined with semi-structured interviews to allow for both prepared and ad-hoc questions. An example of a prepared question was "What kind of printed books do you own?"; an example ad-hoc question within the book tour was "Why do you keep professional literature hidden in the cupboard, while you display others openly in the same room?". In total, we conducted seven book tours and semi-structured interviews that were audio recorded for analyses purposes.

Participants of the Book Tours. The seven participants (3 male and 4 female) are described in the following to provide a better impression of them. In order to reference them later on in the findings section, we gave them fictional names.

Prof. Analog is a retired literature professor. We picked him under the assumption that printed books play a very important role in his life. We also knew that he has no prejudices towards digital media. We were interested to find out more about intended and unintended uses, as he owns a very large collection of printed books.

Dr. Style is the head of a department at a university of applied sciences. We knew him as being very well-read and owning many printed books. We wanted to see, if and how he includes his printed books as decoration of his newly built house.

Mr. Gadget is a computer scientist. He has a strong affinity for all kinds of digital devices and regards himself a collector of digital media. He was selected for his large digital library. As he describes himself as a "child of the digital age", we were wondering if, where, and why he keeps printed books in his home.

Mrs. Cooper is also a head of a department at a university of applied sciences and a self-proclaimed "nerd". We decided to include her into our study, as she is a very direct person that admits judging other people by their printed book collections when visiting them. When we asked her to participate in the book tours, she immediately told us about her "representable" literature, which she keeps visible for visitors and about her old sci-fi book series she is a bit ashamed of and hides in the second row of the bookshelf.

Mrs. Poppins is a retired elementary teacher. She was selected for her great interest in books and particular taste regarding the type of literature she has at home. We were interested in finding out, where she stores the books and how she presents them.

Mrs. Green works at the Ministry of Environment. She cares greatly about her house and how it is decorated. We picked her as she reads a lot, but printed books are not prominently present in her home. This made us curious to find out more.

Mrs. Holiday heard about our book tours and approached us on her own. She claimed that printed books play such a significant role in her life and she wanted to tell us all about it. She told us immediately that she enjoys reading (e)Books and often goes on so-called "books-holidays" each year (she leaves her family alone at home for one week, travels abroad with a suitcase full of printed books, and spends the entire trip reading them).

The Quantitative Approach. In order to strengthen our qualitative insights in terms of user habits, we sought for additional insights from a broader range of people interested in (e)Books. We set up an online survey (using the lime survey tool www.limesurvey.com) to complement the qualitative data, aiming also for a better understanding of intended and unintended uses of eBooks. The survey was spread over different mailing-lists, Facebook, and LinkedIn in order to reach a wide audience of people (with varying backgrounds). In the invitation for the survey, we asked people who are interested in (e)Books to participate.

Terrenghi et al. [24] argue for a better understanding of people's expectations about digital and physical media. Therefore, we decided to extend our findings by collecting comparable and not biased data for (e)Books. In the survey, we investigated 1) how many (e)Books people have, 2) how often they read them, 3) where they are stored, 4) how they are sorted, 5) if they are used for decoration and/or 6) to express oneself. The survey consisted of 34 questions, whereof 8 questions were open and not mandatory to fill in. The open questions enabled us to collect further qualitative data, for example, why participants use printed books for decoration. Within one month, we collected 300 responses for further analysis.

Participants of the Online Survey. The participants (n = 300) from our online survey were between 13 and 72 years old (avg. = 31.43 years, SD = 11.26). Nearly half of them indicated to have more than 150 printed books (49.40 %); about one third have between 50 and 150 printed books (38.60 %) and the rest have less than 50 (12.00 %). Only one third of all participants have eBooks (31.30 %) and, of these, two third indicated to own less than 50 eBooks (66.00 %); 14.90 % own between 51 and 100 eBooks and the rest owns more than 100 eBooks (19,10 %). Printed books are read on a daily base by 46.30 %, but only 7.50 % read eBooks daily.

3.2 Findings

We used open coding to analyze the transcripts of the book tours, which resulted in the four topics storage and sorting (referring to organizational issues), as well as decoration and self-expression (helping to understand the personal preferences behind organizational issues). The clustered qualitative findings were used as a reference point to determine their relation with the quantitative findings, in order to describe the most important insights.

Storage. The book tours revealed that the participants store printed books all over the home, but the preferred places differed among the participants. Prof. Analog highlighted the distributed storage in his home, where most of them are stored in the staircase and corridors (see Fig. 1): "*… we own approximately 3000 books at home but there might be more … most of them are stored in the staircase or the corridor …*

but I have books in all of the rooms at home … the books I need daily are stored in the immediate surroundings. For example, I stack books for a long time in my bedroom next to my bed, but once there are more than one hundred, I put them back …"

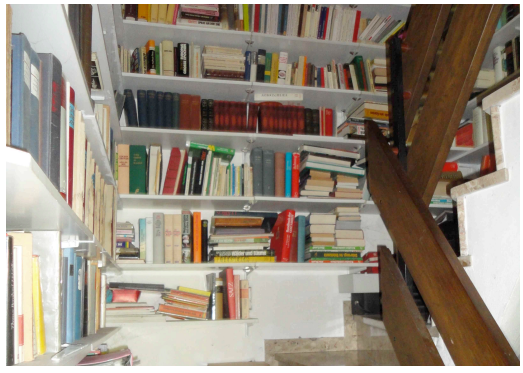

Fig. 1. Picture sent from Prof. Analog, showing that he stores lots of books in the staircase.

Additionally, Dr. Style stated to display different kinds of printed books in different rooms: "*… beautiful books I have in my living room, but novels and other stuff I have in the room upstairs where it does not matter so much … travel books I have in one place, and books about the town I live in I have in one place, and books about India in one place, and novels I have in another place …*"

The qualitative data revealed that different printed books are stored in different rooms (possibility of multiple responses). This made us curious to find out, which rooms are used most to store printed books. This showed that most of the participants indicated to store printed books in the living room (71.60 %), in the bedroom (63.90 %) or in the home office (51.20 %). Some participants also stated that they store them in the attic, basement, or elsewhere (see Fig. 2).

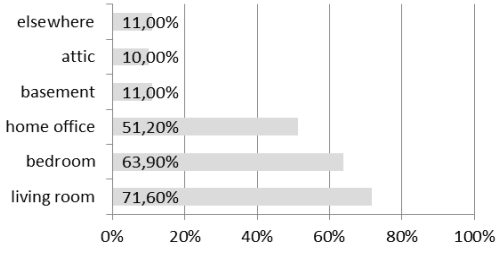

Fig. 2. Storage of Printed Books (Multiple Responses)

Literature tells us that digital media is typically distributed on different devices and intangible [11]. Regarding digital books, we found out that their preferred storage is on mobile devices, like the laptop (66.70 %) or an eBook reader (58.10 %). Others store them also on a desktop computer (32.20 %) and only few in the cloud, on a media center, on a web platform, or elsewhere (see Fig. 3).

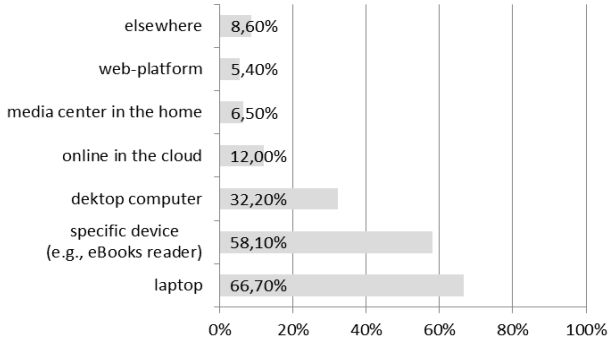

Fig. 3. Storage of digital Books (Multiple Responses)

The findings for books illustrate a distributed storage, which was previously across places for printed books and is now across devices for digital books. Petrelli and Whittaker [22] address an important aspect regarding the storage of digital media in their paper. They mention that it seems to be locked in the device and is mainly available on an individual basis. This was also addressed by Prof. Analog in his interview: "*… when I see a book at home, it attracts me taking it out of the shelf and reading it. This is missing for digital books …*"

From the survey we knew that digital books are mainly stored on laptops or other mobile devices. They are kept more private and cannot be easily seen by other persons (if not being directly shown by the owner of the digital device), whereas, many printed books are visibly placed in rooms (e.g., the living room). They attract attention and often serve as inspiration for discussions and conversations. So, while a visitor can look at printed books inside a bookshelf rather casually, this is not possible without digging for digital content on a device. This seems to be one of the biggest changes from printed to digital that might affect our relationship with digital books. Some participants in the interviews additionally indicated that the storage of printed books has also to do with the sorting. As we believe the sorting strategies hold additional potential for design inspiration, we investigated this topic separately.

Sorting. Although books are stored all over the home, the book tours and interviews highlighted certain sorting and structuring of printed books. The picture of Dr. Style (see Fig. 4) illustrates that he hides his professional literature. Other examples of sorting strategies were provided by Prof. Analog and Mrs. Holiday, who referred to a topic (genre) related sorting: "*… of course, there is a topic related sorting in my shelves … in certain rooms or places there are mainly books from authors of great literature, whereas in other places, there is mainly professional literature … initially, when installing the shelves, I had a rough alphabetical sorting for the different walls with different topics, but now we have too many books …*" or "*… trashy literature or novels are always stored in my bedroom. Illustrated books, cookbooks, or standard work is stored in the living room. …*"

Fig. 4. Professional literature hidden in a shelf by Dr. Style

Mrs. Cooper claimed to have the same sorting for different kinds of printed and digital media: "… *my sorting structure for books is the same as for my music albums, interpreter or author and then the book name or series … the same I use for my digital books …*" Additionally, the interview of Mrs. Green revealed an interesting kind of sorting, which inspired us to ask participants in the survey also for other styles of sorting. "*… I keep nice books in bookshelves as decoration and literature connected to work or hobbies in other places … right now I sort them roughly by color. I keep blue green and orange books in one room where they match with other things and red books in another room etc. …*"

In the online survey, participants could select multiple responses for the used sorting strategies. The results show that preferably printed books are sorted by author/ interpreter/producer (23 %), by genre (18.30 %), or most surprisingly not at all (41.30 %). Only some sort their books by title and few by date (see Fig. 5). In the survey several participants additionally stated that they sort their printed books by size, topic, color, volume, language, or where they fit (best) on the shelf.

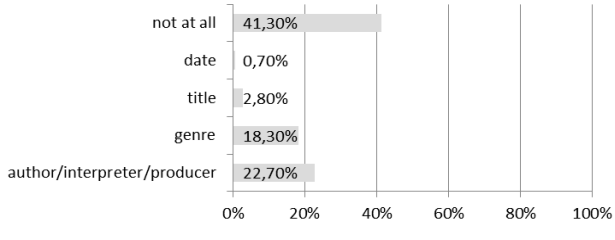

Fig. 5. Sorting of Printed Books (Multiple Responses)

Regarding digital books, we found a small difference in the sorting strategy, as more sorting strategies were selected by the participants. Sorting by title is most popular (24.70 %), which might be due to the fact that sorting of digital books is easier. However, sorting digital books by author/interpreter/producer (24.70 %), by genre (18.30 %) or not sorting them at all (44.10 %) is nearly as popular as for printed books, although sorting of digital content is easier due to sorting functionalities. Additionally, some participants stated in the open question to sort their digital books by topic, language, producer, color, or tags.

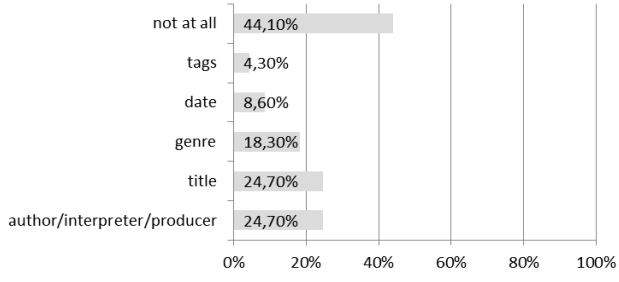

Fig. 6. Sorting of digital Books (Multiple Responses)

Further analysis revealed a weak, positive, and significant relationship between the number of books and sorting by author, interpreter or producer ($r_s = .24$, $p < .001$) as well as between the number of books and sorting by genre ($r_s = .25$, $p < .001$). Due to missing normal distributions of the answers that were given on a five-point Likert scale (ranging from 1 - strongly agree to 5 - strongly disagree), we used non-parametric correlations (Spearmans Rho). A similar relationship was also found between the number of digital books and sorting by author, interpreter or producer ($r_s = .33$, $p < .001$), between the number of digital books and sorting by title ($r_s = .23$, $p < .05$) as well as between the number of digital books and sorting by genre ($r_s = .21$, $p < .05$). Corresponding to this, we found negative relationships between the number and sorting printed books ($r_s = .29$, $p < .001$) or digital books not at all ($r_s = .47$, $p < .001$). Meaning the more books people have, the more they want to sort them (preferably by author, interpreter or producer, genre or title).

In this context, we also asked the participants about the importance of having an overview about their books. More than half of the participants indicated that it is (rather) important for them to have a good overview on their books. Here, we also found a weak positive and significant relationship ($r_s = .36$, $p < .001$) between number of printed books and the importance of overview. There was also a similar relationship ($r_s = .39$, $p < .001$) between the number of digital books and the importance of overview. In general, we found out that the more the participants are satisfied with their sorting of printed media, the more they are satisfied with their overview ($r_s = .58$, $p < .001$) and an even stronger relationship was found for digital media in general ($r_s = .78$, $p < .001$). This highlights the aim of people to sort and structure their books the more they have. This is far more difficult for a large number of printed books than for digital books due to provided sorting functions.

The findings show that participants were satisfied with their overview, if they were satisfied with their sorting. The primary sorting strategies for books proved to be similar (mainly sorting by author/interpreter/producer, genre or title is used). A bit more diverse sorting strategies were used for digital books due to the fact that sorting is easier with sorting functions. Most of the time not one sorting strategy is used for printed books, but rather a combination that varies for the different rooms in the home. However, an indicated visual sorting for printed books, like using color, size or form, is yet very limited possible for digital books. This type of sorting might also be related to decoration, which will be discussed separately in the following.

Decoration. The interviews revealed different attitudes and habits regarding the usage of printed books for decoration, such as displaying selected printed books in certain rooms, creating atmosphere in the home or hiding them (see Fig. 4). Decoration is a very individual topic, as pointed out, for example, by Prof. Analog: "*… books are for sure not decoration, as they are unnecessarily taking up space …*

there is a topic related sorting in my shelves … in certain rooms or places there are mainly books from authors of great literature, whereas in other places, there is mainly professional literature …" or Dr. Style: "… there is hardly any decoration at home, this I really like. The less things that are on the wall or standing in the room, the more I like the room … beautiful books I have in my living room, but novels and other stuff I have in the room upstairs where it does not matter that much …"

Whereas Mrs. Green, for example, provided the opposite statement about decoration with printed books: "*… I keep beautiful books in bookshelves as decoration and literature connected to work or hobbies in other places … right now I sort them roughly by color. I keep blue, green, and orange books in one room, where they match with other things and red books in another room … I think, books might be less used for information in the future and more as memories and decoration …*"

Moreover, two other book tour participants stated that printed books are exhibits, pretty to look at, and create atmosphere (see also Fig. 7 and Fig. 8 as examples). Mr. Gadget: "*… books are exhibits … this shelf only contains pretty looking books, with nice, appealing covers. But I don't decide which ones, that's the job of my girlfriend. For example, I had this huge collection of fantasy books, but she didn't like the covers, so she banned them from our shelf …*" and Mrs. Holiday: "*… trashy literature or novels are always stored in my bedroom. Illustrated books, cookbooks, or standard work is stored in the living room, where the large bookshelf is placed across the dining table … I have the need to sort the books in an aesthetic way … the back of the books should look nice together*"

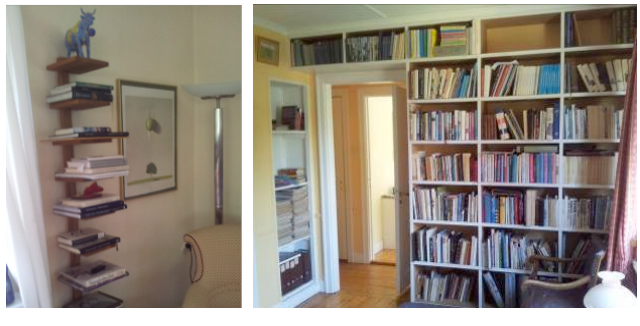

Fig. 7. Printed books used to create atmosphere and express oneself by Mrs. Poppins

Fig. 8. Decoration of Mrs. Poppins (left side) and Mrs. Green (right side)

The qualitative data revealed diverse attitudes regarding decoration. However, the descriptive results of the survey indicated that nearly half of the participants use

printed books for decoration in their home (47.90 %), more than one third indicated not to use them for decoration (39.40 %), and the rest are unsure (12.70 %). Proving that for half of the people surveyed decoration with printed books in homes is of relevance. Additionally, further insights were gained from the open questions in the survey, as the participants were asked to explain why they use printed books for decoration. Printed books, for example, are pretty to look at, create an atmosphere of knowledge and learning, or would be bought for decoration. Here are two exemplary explanations of those from the survey: "*… books have a pleasant charisma … create an atmosphere of knowledge and learning, which is desirable for me …*" or "*…certain books I would buy and use them for decoration (and of course for reading) …*"

Another relevant aspect pointed out by Dr. Style was that "*decorating with digital media is not possible in the home*". We could not further investigate this aspect with eBooks, as digital media currently seems to be locked within the device, intangible, and is mainly available on an individual basis [22, 11]. Prof. Analog in the interviews also addressed this with "*… when I see a book at home, it attracts me taking it out of the shelf and reading it. This is currently missing for eBooks …*"

eBooks are mainly kept private and cannot be easily seen by other persons (if not being directly shown by the owner of the digital device), whereas, many printed books are visibly placed in rooms (e.g., the living room), where they attract attention and often serve as inspiration for discussions and conversations. While a visitor can look at printed books inside a bookshelf rather casually, this is not possible with digital materials without digging for content on a device. The findings show future design potentials, as decoration with eBooks is currently not possible. For half of the survey participants (using printed books as decoration) the creation of atmosphere with eBooks seems to be promising for decoration. For example, by providing various visual sorting strategies for eBooks (e.g., color or size as material qualities of printed books), they might also become attractive for decoration.

Self-Expression. As we were interested in various forms of self-expression, we asked the participants in the interview whether they use printed books for this purpose. We learned that they want to visually present themselves or a certain aspect of their personality to others, who might visit their homes. The following example statements of Mrs. Poppins illustrate this: "*… they give a certain atmosphere, not to show off, but perhaps to demonstrate deeper interests … Helena, my daughter, borrows books from me even though she does not have a bookshelf, as she wants to keep a stylish home, but she wants to have books lying around because that says something about being educated …*"

During the book tours, we also asked why certain printed books are placed in certain rooms. Dr. Style pointed out that they are placed in social spaces especially for visitors (see Fig. 9): "*… in this shelf are the books, I like to show others. The books are illustrated books, visitors can take a look at on the side … I own most of my illustrated books for the sake of sharing ... I would definitely love coming to someone's place, waiting for something, or talking and then there's such a cool book, where I just think 'Wow, I've never seen something like that!' ... I'd like to offer my guests such an experience …*"

Fig. 9. Dr. Style has this shelf with printed books in his living room to show others

Mrs. Cooper stated that she likes to present/express herself and when other people show their printed books. However, she hides some printed books (which was already addressed by Mr. Gadget on page 4). Mrs. Cooper: "*… regarding image and self-expression, I put away whole series, like Star Trek or Dr. Who. I also hide lots of books behind others … I make a statement with my books about me. When I show my science fiction series, then they say something else about me, than if I hide them … certain books of a certain author reflect a good professional knowledge. Just recently I visited a professor for programming and when looking at his books, I immediately thought … mhm, yes this fits - good authors and good publishers …*"

Another person on the book tours gave a similar statement, illustrating that it is important to hide certain printed books. Unsurprisingly, the participants did not send pictures of printed books they would not show to other visitors (like the ones stored in the bedroom). Mrs. Holiday: "*… sometimes I feel ashamed about my books in the bedroom … if I have guests staying longer, then I hide certain books behind others, so that they are not visible …*"

The reflections on our book tours illustrated that most participants tended to display different books in different rooms, partially also for self-expression. We identified a certain need to display representative printed books others should see visibly in the living room, which is a place for socializing and most common storage location. Other printed books of personal interest, such as novels, are preferably placed in the background or hidden in more private rooms (e.g., the bedroom as it is rarely shown to visitors and also a common storage location). Another important aspect that was mentioned, was buying printed books for the library although they might never be read. Dr. Style: "*…Sometimes, I do buy books I do not read immediately, or even do not know, when I will get to read them at all … Like I once discovered a book somewhere and I thought, this is a book that one should own. …*"

All these diverse findings were transferred to the survey to get a better understanding in terms of relevance of physical media in general for self-expression. Therefore, the participants in the survey were asked to read through three statements of the book tours, for example, the statement of Mr. Gadget on page 4, the statements of Dr. Style on page 5 and the one above. After having read the statements, the following items regarding self-expression (derived from the book tours) were rated by the participants on a 5-point Likert scale (ranging from 1 - strongly agree to 5 - strongly disagree):

- I buy physical media (e.g., books, CDs, DVDs or photos) although I know I will never use them.
- I want my guests to have a "wow experience", when seeing my physical media (e.g., books, CDs, DVDs or photos).
- I use my physical media (e.g., books, CDs, DVDs or photos) to show-off.

- I use physical media (e.g., books, CDs, DVDs or photos) to present myself at home.

The analysis of the results revealed that physical media is rather not used for self-expression (only 17 % agreed to express themselves with physical media or 14.30 % wanted guests to have a "wow-experience"). However, a weak positive and significant relationship was found between those agreeing to use physical media for decoration and showing-off ($r_s = .38$, $p < .001$), i.e., the more they indicated to use them for decoration, the more they also indicated to use them for showing-off. Due to missing normal distributions of the answers that were given on a 5-point Likert scale, we used non-parametric correlations (Spearmans Rho).

Even stronger (middle) positive and significant relationships were found between decoration and wanting the guests to have a "wow experience", when seeing physical media ($r_s = .48$, $p < .01$) or decoration and using physical media to present oneself at home ($r_s = .51$, $p < .001$). We also found a rather weak, positive, and significant relationship between decoration and the willingness to buy physical media although it will never be used for reading ($r_s = .22$, $p < .001$). All these relationships illustrate that the more people agree to decorate with physical media, the more they also agree to express themselves with it. These findings show that decoration and self-expression are related to each other, but decoration appears to be relevant for a larger amount of people.

In summary, the gained insights indicate that ways to display eBooks as part of the decoration in the home, or to present oneself may be worth considering in design. The survey, for example, revealed that half of the people decorate with printed books and that most books are stored in the living room or bedroom. From the book tours we additionally know that people want to display selected books (present themselves) or hide others in certain rooms. Additionally, the survey revealed relationships between decoration and different aspects of self-expression. We want to close the findings section with another statement, which already highlights one potential design idea. Dr. Style: "*… in the future there will be no such media diversity, like TV, radio and so on, but there will be screens with all the media available on it … showing eBooks would then be interesting … for example, the black glass wall in the kitchen could be a touch screen to present data. I would not install separate displays for showing digital media, as the presentation surface needs to seamlessly migrate with the rest of the home …*"

4 Phase 2: Design – Prototyping a Bookshelf

The book tours and the survey revealed various insights on intended and unintended uses of printed books, but still less is known about eBooks. Therefore, we aimed at developing a technology probe [13] for collecting additional insights on the use of ambient displays as digital bookshelves for decoration in a real-world setting. Inspired by our insights, the digital bookshelf enables people to display a selection of eBooks in a visually appealing way (i.e., as part of the decoration or for self-expression) in the living room. Therefore, we intentionally kept the features of the digital bookshelf limited and did not, for example, provide the possibility of reading the displayed eBooks.

4.1 Design Ideas

Both the survey and the book tours with interviews revealed that printed books are stored at different places in the home for different purposes (e.g., representative books in the living room, where nearly three quarter of the survey participants store printed books). The findings illustrated that people hide certain books guest should not see and also how they do it. Therefore, we had the idea for a digital bookshelf that enables people to display a selection of digital books to guests, for example, cookbooks could be displayed in the kitchen (see Fig. 10).

Fig. 10. Example of a digital bookshelf for the kitchen displaying selected cookbooks.

It is also important for people to structure books in an individual way that can be visually presented to others in an appealing way (i.e., not just a list of digital books). It is something very personal to figure out one's sorting habits (such as name, author, genre, topic, year, size, color, beautiful books to look at, etc.), as each person has a slightly different approach. In terms of design, this is a very interesting aspect, as the structure of printed books in a bookshelf can affect the atmosphere of a room. The results of the survey illustrated that the more books people have, the more they want to sort and structure them (e.g., favorably by author, interpreter or producer, genre or title). In the book tours with interviews as well as in the open question data of the survey we found additional interesting visual sorting strategies, such as color, size and format. These sorting strategies can offer new access points to a selection of digital books in terms of visual aesthetics. For example, different genres in a bookshelf can be displayed in different colors that also fit with the decoration in the room. This example is inspired by physical sorting strategies and exploits additionally the possibilities of digital books.

Additionally, a relationship between decoration and wanting guests to have a "wow-experience" was found in the survey data. This could mean that guest should not only have a great experience when looking at the bookshelf, but also have a great experience when taking a book out. Bookshelves placed in rooms with lots of social interactions (like the living room) can also serve to express oneself. In the studies, we found out that people carefully decide, which printed books they want to show and put into a bookshelf, but also that they want to display the books in a visually appealing way. This offers new possibilities for a digital medium selection and various sorting strategies with different visualizations that can easily be changed for certain guests or occasions.

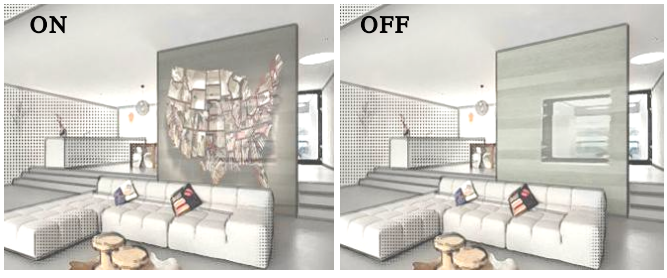

Fig. 11. Example of a digital bookshelf for the living room that can be turned on and off.

Another design example would be the digital bookshelf for the living room (as a social space), where a unique overview of selected digital books can be showed to guests. People should be given the possibility to hide certain digital books, like physical books are hidden in the second row of the bookshelf or in a separate room. The digital bookshelf should also provide various creative visualizations as shown in Fig. 11 to support a "wow-experience", like selecting different displays and "bookshelf-types" for various categories (e.g. in Fig.11, the digital books are stored in a visual representation of a map-shaped shelf that might already indicate the relevant category of the included ebooks). The selected ambient display of the bookshelf can be turned off (as shown in Fig. 11), if no digital books should be displayed as part of the decoration. These are new possibilities given by the digital medium.

4.1 Probe Development

The software part of the system consists of three main modules and runs on a standard personal computer. How the three modules communicate via TCP/IP with each other technical details of each module (e.g., how the statistics module applies a principal components analysis) is described in depth in our previous work [3]. In the following, we will briefly describe each module highlighting their purpose.

Module one is the *statistics module*, which is implemented in R (http://www.rforge.net/) a programming language for statistical computing and graphics. It provides dynamic calculations based on the books which are presented on the screen and the books in the library. Each book has Meta data (e.g., HSB values of the mean cover color, price, user rating, and number of pages). Statistics are computed to calculate similarities between books in the library and books, which the user is showing interest in (e.g., pointing at) on the screen.

Module two is the *visualization module*. It is implemented in Processing (http://processing.org/), which is a programming language for visual design and media art. The visualization module is used to process images of book covers and animations, depending on results provided by the statistics module (i.e., set of book ids and how they should be sorted on the 2D screen based on a principal component analysis over all dimensions, including price or number of pages). Since the statistics module provides adjacencies it is possible to create visually aesthetic expressions when variables are used that explain visual aspects of the book covers (e.g., HSB values of the mean book color). Fig. 12 presents as an example three different visual expressions. When we implemented the digital bookshelf, we used book covers as main representations of eBooks; however, we also explored changing the original cover visualization in order to highlight characteristics of books that are not represented by the cover (e.g., price and user rating). Fig. 13 presents on the left hand

side a screenshot of the original covers and on the right hand side abstract representations of the same books, visualizing price (i.e., degree of gloss) and rating (i.e., size of star) of books in the bookshelf.

Fig. 12. Depending on which books the user is focusing on the bookshelf transitions over time into visual expressions where the focused books move to the center and get surrounded by books with similar characteristics.

Fig. 13. On the left side the digital bookshelf with original covers. On the right side a visualization of non-visual characteristics of books (i.e., price and user rating based on the level of gloss and size of the star).

Module three is the *Kinect module*, which recognizes user interaction (e.g., full body gestures). It is implemented in Visual C++ and makes use of the native Microsoft Kinect SDK. The sensor data of the Kinect device is interpreted by this module. Fig. 14 presents the kind of data that we captured using the Kinect module. The data we received from the Kinect module was the foundation for our further exploration of whole-body movement as input for the system.

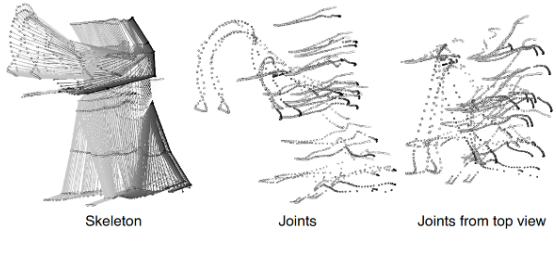

Fig. 14. Exemplary plots of a person moving forward and backward while moving the right hand. The first plot on the left hand side shows the skeleton data and the rest of the plots show only the joints

Since we were motivated to allow users to interact with the bookshelf from a distance using gestures the first mode of interaction that we implemented was a simple hand-based pointing gesture (see image at the right hand side of Fig. 15). In this mode the user can point to some area in the bookshelf to interact with the digital bookshelf. The pointing gesture was easy to use and the performance was good, however, it was not physically and bodily as engaging, as we envisioned the interaction to be. In order to identify an alternative way of full-body interaction, we extensively explored movement data. This exploration is described in detail in our previous work [2]. Consequently, we implemented an alternative mode, which allows a user to perform dynamic gestures (e.g., pretending to fly, see image at the left hand side of Fig. 15) to interact with the bookshelf.

Fig. 15. Screenshots from exploring the interactions with the digital bookshelf setup. Screenshots were captured from a video recording of users interacting with an earlier version of the digital bookshelf.

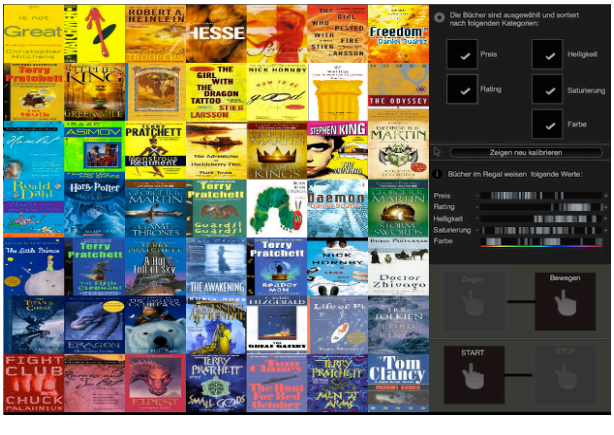

Fig. 16. Showing the final design of the digital bookshelf

In summary, the probe provides users a way to create and explore different visual and meaningful views of eBooks. Furthermore, the probe highlights similarities between eBooks based on qualities such as price, rating or cover color by using proximity (i.e., by placing eBooks that are similar to each other, next to each other in the bookshelf). While similarities of qualities, such as color, can be easily observed, there are "invisible" qualities such as price or rating that are rather hidden. Having explored different ways to visualize these hidden qualities, we decided to add a sidebar (see Fig. 16), providing the user feedback about the qualities of eBooks that are presented in the bookshelf without manipulating the original cover visualizations. The user can physically engage with the bookshelf through standing in front of it and

using gestures to make modifications (e.g., add new eBooks to the bookshelf or change the qualities of the sorting). Hence, it allows the user to rapidly experience different views and foster unexpected but valuable discoveries (see also Fig. 19).

A projector was used in combination with the Microsoft's Kinect device to display eBook covers on an empty wall in the home (see Fig. 16). We did not use the TV for the bookshelf, as it should also be visible while watching TV. Since the Kinect device is already associated with physically engaging (group) interactions in the home, we decided to implement two ways of interaction. The user can either interact with the bookshelf via a pointing gesture or s/he can utilize the movement of her/his whole body (i.e., all joints recognized by the Kinect device). With both modalities, the user is capable to point to a specific eBook, which results in filling the bookshelf with similar eBooks (i.e., eBooks having similar qualities) and allows exploration of different visualizations. Through the sidebar, it was also possible for the users to change the modalities, qualities that should be used to sort the bookshelf and to "freeze" a visualization by stopping the interaction with eBooks or starting it again.

The probe visualizes 49 eBooks at a time from a personal digital library (e.g., a set of eBooks that the user would want to put on the digital bookshelf). For each eBook in the digital library, qualities (e.g., price, number of pages, when it was first published, or rating) have been collected and information related to the appearance of the cover (i.e., mean color, saturation and brightness) was computed. The algorithms that are used to sort the digital bookshelf are based on multivariate statistics. These algorithms transform data about the eBooks (e.g., qualities of eBooks) on a 2D view of the bookshelf.

5 Phase 3: Exploration – Placing the Bookshelf in the Home

We aimed to explore the interaction with the digital bookshelf as a technology probe in the context of the home. We were interested in how the members of a household as well as their visitors behave, interact and perceive it over time in terms of decoration and self-expression.

5.1 Approach

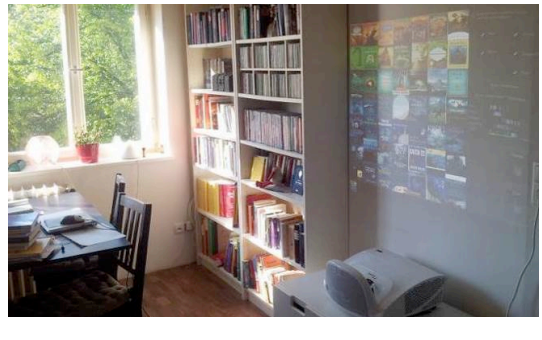

Fig. 17. Showing the digital bookshelf setup in HH1

Three households with as many members as possible were recruited via a mailing list, in order to gain additional insights with the probe over a period of three weeks. Each

participant was allowed to pre-select between 50 and 100 (e)Books of the 1000 best rated at Amazon via a web service or provide the ISBN of another one. These (e)Books were part of the digital library, whereof selected were displayed on the digital bookshelf (i.e., providing familiarity with the selected (e)Books). The participants also filled in the same survey as described in Phase 2; collecting basic demographic data and initial insights on intended and unintended uses of (e)Books.

At the beginning of the study the bookshelf was installed in the living room of the households (see Fig. 17) and its basic functionalities were explained. The household members themselves decided where it should be placed and would fit best in their living room. We visited them every week to conduct semi-structured interviews to explore their experiences with the digital bookshelf. Additionally, they also demonstrated how they had used it during the week.

5.2 Participants/Households (HHs)

Household 1 (HH1) is an apartment-sharing community with four people, whereof three were working and one was about to finish her studies. For them, it was very important to have a well-organized and nice-looking apartment, which consisted of five rooms and was located near the city center of Salzburg. Household 2 (HH2) is also an apartment-sharing community with five students. The apartment consisted of six rooms and was located outside the city of Salzburg in a rural area. In household 3 (HH3), a young couple had recently moved into the apartment. Therefore, they had lots of empty walls in the apartment consisting of two large rooms. The participants were between 21 and 30 years old (avg. = 25 years, SD = 3.34). More than one third of them indicated to have more than 100 printed books (37.50 %). Only half of the participants have eBooks and, of these, most of them indicated to own less than 50 eBooks. Printed books are read on a daily base by 62.50 %, but none read eBooks daily (most read several times a week or less). Half of the participants indicated to use printed books for decoration, but not for self-expression. This shows that the household members were representative for the survey participants.

5.3 Findings

The data from the interviews that were carried out through the course of the field trial was analyzed by means of a content analysis [15]. We aimed at investigating participants' experiences when interacting with the bookshelf (e.g., purpose of use in terms of self-expression or decoration) and identifying potentials for improvement.

Decoration. All HHs overall appreciated the visual representation of the digital bookshelf for its decorative value, although HH2 indicated not to decorate their home with printed books as they simply store them in bookshelves. The members of HH1 liked that digital media has a representation now in the home. A member of the HH3 mentioned that it was a visual highlight in the living room. Typically, the household members turned on the bookshelf when they came home. They appreciated the bookshelf as a kind of decorative item at home, which can be illustrated by the following quote: *"We hardly have any wall decoration, however I would appreciate the bookshelf as a decorative item." (HH3)* They briefly interacted with it until they were happy with the atmosphere created and then left it turned on for the rest of the evening (see Fig. 18).

Fig. 18. The digital bookshelf in HH3

Although participants appreciated the bookshelf as form of visual presentation, they also lack qualities they knew from "physical" books, i.e., size or thickness of books, which are considered important. *"If you hold a book in your hands … see the size and thickness …you already know that it might be a long and elaborated story … you know what you can expect … It would be cool if the digital books that are presented differ with regards to e.g., size or thickness."* (HH1)

Some participants claimed that the digital bookshelf provided a nice atmosphere through the warm colors and was used as light source. Thereby, they discovered the need to store favorite views in order to be able to reuse them for different occasions. HH3 claimed that they did not want to make a new sorting of eBooks every time they turn it on, as they also do not sort their physical bookshelves in the home that often. However, we intended for a reoccurring interaction with the bookshelf upon starting the device, as the participants should frequently interact with the eBooks over time to explore what is possible. At the end, the participants also started to understand the qualities of digital material and thought of different ways such a digital bookshelf would fit into their homes (e.g., one for cookbooks in the kitchen).

Self-Expression. The HHs also agreed to express themselves with the digital bookshelf by showing their interests in eBooks. However, as it contained eBooks from all household members, it was not so easy for a single member to express her/himself. HH3 wanted to show their games, as they would better express themselves and HH2 was thinking about the usage of music and videos. Additionally, HH1 reported that they turned the bookshelf, particularly, when they expected guests. *"We interacted with the bookshelf either to a greater or lesser extent. However, in particular when we had guests we played around … it serves the purpose, i.e., if you have guest …"* (HH3). This example illustrates that participants considered the bookshelf as a means of self-expression. In this context, they also pointed out that they wished for the possibility to hide certain eBooks guests should not see. They told us that presenting the bookshelf to the guests and letting them interact with it was fascinating and fun for them. *"It is actually an eye-catcher and motivated guest to play around."* (HH1) It was reported by several HH members, that some of the guests had a "wow-experience" when seeing it the first time and became intrigued by it. However, it was also reported that the digital bookshelf captured the attention of guests, which became annoying after some time and even disrupted conversational practices in the home.

Sustaining Memories. Placing the digital bookshelf in homes not only provided insights on how home owners and their visitors used the probe for decoration and self-expression, we also gained some insights based on the participants' and our own reflections about printed books and eBooks in general. We became aware of how deeply a single book can be integrated in human memories (and maybe even cognition). During the interviews many of the participants expressed some anxiety towards new digital modalities to represent their books in their homes and how these new modalities could not sustain and enable memories as printed books did. For example, one participant told us how he takes a single pocket book with him when he goes to bike tours, because he has time to read exactly one pocket book during a single journey, which he throws away at the end of the journey. He argued that while he might be able to do this with an ebook reader, but an ebook reader is more valuable than a single pocket book. Another participant from HH2 explained that she owns a book with lots of scratches that were made by her father and that this book filled her with memories and is precious because of all these scratches. She argued it would be difficult to establish and sustain these kinds of emotional attachments with eBooks. However, a participant from HH1 told us during one of the interviews, pointing to a children's book, how she had forgotten about this book, and now whenever she looked at the digital bookshelf she somehow would spot this book from her childhood.

Serendipity. Besides this we could also identify a positive effect of the digital bookshelf with regards to serendipity. Presenting the eBooks by using different visual views based on "hidden" qualities such as price or rating often revealed new books participants did not know so far and it motivated and stimulated some of the participants to read a new book. *"It is cool because there are books displayed we did not know so far … You do not have this in a "real" bookshelf, because you will not find books there you have never had before."*(HH1) *I discovered new books where I already knew the author, however not the title of the book. It inspired me to read the book … I don't even knew that there are so many books written by Terry Pratchett* (HH2). *"I have seen a lot o books I did not know so far."* (HH3)

While these and similar stories were not related to decoration or self-expression in the home with a set of books, having the probe in their homes triggered these concerns and reflections associated with practices and qualities of single books. People are aware of the value of the physical material books are made of and how a book can physically accumulate history/memories/emotions etc. through signs of use, through being ephemeral or because a physical book allows spatial interaction like any other physical object that human bodily engage with.

Interaction Modalities. Besides decoration and self-expression, the participants of our field trial also discussed alternative ways to interact with the digital bookshelf. Voice or gaze control were considered as useful alternative ways to arrange the digital books. One participant in HH2, for example pointed out: *"… it would be great if one could just mention the name of an author and that the system would automatically display the appropriate books."* However, most of the participants in the three HHs considered motion control as most convenient and suggested to provide additionally the possibility to control the bookshelf via the tablet or mobile phone.

6 Discussion

Petrelli and Whittaker [22] pointed out that the various digital media people possess is most often locked in the device and mainly available on an individual basis. Dr. Style made a similar statement: "*… when I see a book at home, it attracts me taking it out of the shelf and reading it. This is missing for eBooks …*"

This is the starting point for our discussion on key lessons learned following on the user studies presented so far in this paper. The design space for interaction with eBooks is not just about efficient and effective use (as stated by [6]), but also about their other intended and unintended uses.

6.1 Atmosphere

We found out that it is relevant for people to structure (e)Books in an individual and appealing way (i.e., not just show a list of eBooks). It is something very personal to decide one's sorting habits (such as name, author, genre, topic, year, etc.). In terms of design inspiration, this is a very interesting aspect, as, for example, the sorting of printed books in a bookshelf can affect the atmosphere of a room. On the book tours, as well as in the open question data of the survey, we found additional visual sorting strategies, such as color, size, or format, as well as other more complex sorting strategies. These strategies can offer new access points to a selection of eBooks in terms of visual aesthetics and decoration, as they can easily be realized with computers. The developed digital bookshelf offered a sorting according to the color and saturation of eBook covers, which was experienced and used by the participants to create a nice, warm atmosphere, especially in the evening (see Fig. 19). Thereby, they integrated the bookshelf as new light source in the decoration of the living room.

Fig. 19. Example of a digital bookshelf for color sorting.

6.2 Self-Expression and Wow-Experience

We identified the habit to present selected printed books others should see. In the studies, we learned that people carefully decide (e.g., Mr. Gadget or Mrs. Green) which printed books they want to show and put into a bookshelf. It also became clear that some want to display them in a visually appealing way. We also found out that the more people agreed to decorate with physical media, the more they agreed to express themselves with it and wanted guests to have a "wow experience". The selection of eBooks displayed in the digital bookshelf was experienced to say

something about the household (like a digital footprint) and provided some guests a "wow-experience", while it also captured attention and, thereby, affected conversational practices. Another example mentioned was the use of a digital bookshelf in the kitchen to display cookbooks or the recipe currently prepared (see Fig. 10).

Ambient displays like bookshelves placed in rooms with lots of social interactions (such as in the living room) can serve to express oneself. Digital media offers new possibilities for selecting and sorting in the form of different visualizations that can easily be changed for certain guests or occasions with little effort. The visual sorting of covers can enhance curiosity in eBook collections, as we know from Yampbell [27] that the cover is often the reader's first interaction with a printed book in order to entice her/him. Additional inspiration can be taken from the work of Zimmerman [28] applying product attachment theory to design for the self.

6.3 Hiding

Both the survey and the book tours revealed that printed books are stored at different places in the home for different purposes (e.g., representative ones in the living room, where nearly three quarters of the survey participants store printed books). The findings also illustrated people's habit to hide certain printed books that guests should not see, for example, in the bedroom (where nearly two third of the survey participant store them), behind other printed books, or in closed shelves (see Fig. 4). This is contributing to aspects of self-expression. In a shared household, where the digital bookshelf was jointly used, members wanted to have the possibility to hide eBooks of other members and only display their eBooks. This addresses the management of presence and absence of objects for defining the self [23], i.e., ways to hide things we deem to be personal, painful or private, and display those things we want to share.

6.4 Interacting with the Invisible

In phase 3, the developed technology probe was intended to support a visual and meaningful representation of eBooks through highlighting similarities between them, i.e., visible and invisible material qualities such as price, rating, cover color, etc. Presenting the eBooks by using different visual views based on "hidden" qualities such as price or rating often revealed new books participants did not know so far and triggered serendipity.

However, the household members also complained about the missing visibility of qualities for each eBook, which made it fuzzy to control the bookshelf. The color sorting was perceived to be the dominant one, as this was visually observable. Future research needs to investigate how other qualities such as price, age, size, or genre could be better supported visually (e.g., 3D visualization for more image depth, glow for prize, or dust for age). Additionally, the appearance of eBooks needs to be improved, as it was perceived to look like tiles or CD covers and less like (e)Books.

7 Conclusion

Motivated for a design inspiration of ambient displays showing eBooks in the home, we wanted to better understand other intended and unintended uses of (e)Books. Hence, we applied a user-centered explorative approach and chose to start our

investigations with printed books, as eBooks and printed books are often considered to be the same. The combination of the qualitative book tours with semi-structured interviews and the quantitative online survey to complement the findings was very satisfactory to gather initial insights. These studies enhanced our understanding of intended and unintended uses of (e)Books, in particular for decoration and self-expression.

Through research through design, i.e., the development of a technology probe and the observations in real homes with the probe, we became aware of the differences and similarities between eBooks and printed books. We also realized the extent of the conceptual "gap" between printed books and eBooks. For the probe, we used on the one hand results from an exploration of existing culturally rich practices with printed books, and on the other hand, we used the "immature" representations of eBooks (i.e., cover images) as a basis for our design activities as well as an "immature" but promising technology (i.e., ambient display in combination with Kinect) as the basis for the interaction design. Very often we have old, rich, mature practices and valuable organic materials, which are being replaced by cheap, fast, bright technology and digital alternatives, which are ephemeral in their own way. The implemented technology probe and its placement in three different households was a means to an end and revealed the need for future research in the digital home investigating different ways to display (e)Books. This applies also for other media like pictures, as digital photo frames were not successfully adopted.

We would also like to mention that the analysis and design phase, were not conducted sequentially and overlapped slightly. The fact that phases overlap in a user centered design process in practice is not atypical [17] and resulted also from the combination with research through design. The developers and designers started with the prototyping and design activities before the end of the analysis phase, since they needed to explore eBooks separately as a screen-based material. We would argue that such a parallel exploration approach is appropriate whenever designers have to design with digital representations of physical artifacts and need to understand how these artifacts are embedded in social and cultural practices.

The home is a very sensitive place to design for, especially as the living room is seen as a social space with its diverse practices. This needs to be carefully addressed in future designs offering digital media a representation in the home, as they will affect social practices. Finally, the need for further interactions with the digital bookshelf, in terms of the primary purpose of eBooks, is essential for a permanent integration in the home. Out lessons learned described in the discussion section should inspire new design for eBooks and help to better define the design space.

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