The Value of Answers without Question[s]: A Qualitative Approach to User Experience and Aging

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Abstract. This project investigates reasons for use and non-use of interactive products by two age groups. It was motivated by the assumption that older adults, when given the chance, report more than just usability-related aspects of interactive products. In laboratory settings, older adults are oftentimes confronted with unfamiliar technology. In this case, instrumental qualities are of primary concern. However, the picture might be different, when it is up to the participant to choose the device. Twenty younger (20-33 years) and 20 older (65-80 years) adults were provided with a disposable camera and a documentation-booklet for one week in order to photograph and describe positive as well as negative examples of interactive products in their surrounding. After this week of intensive sensitization, participants named five reasons that motivated them to use technology, and five that led to avoidant behaviour. A qualitative content analysis with an inductive development of categories was conducted.

Keywords: User Experience, Aging, Motivation, Methods, Content Analysis.

1 Introduction

In line with the current demographic shift, more and more older adults will be facing the use of technology in the upcoming years. Older adults are a target group that can clearly benefit from technology (e.g. compensating physical impairments as well as sensory and cognitive losses; facilitating communication).

However, in order to take advantage of this trend and to gain reinforcing experiences, one has to interact with the device in the first place. Many older adults underestimate their actual computer knowledge [1] and show low self-efficacy beliefs in this domain [2], which leads to a rather hesitant behaviour concerning the use of technology with increasing age. Much work has been done to address the concerns and challenges of cognitive and sensorimotor decline as people age [3].

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However, hardly any efforts have been undertaken to investigate cross-generational differences concerning the appreciation and relevance of emotions in the experience of interactive products. It seems short-sighted to assume that older adults do not care about non-instrumental qualities of interactive systems such as aesthetic, symbolic, and motivational qualities, which are closely linked to emotional processing [4]. Many products designed for older users lack respectful consideration of their tastes and personal surrounding. An interactive product, even if it is of high assistive value, might be rejected if it does not fit into the person's environment or communicates "disability" to others. A design tailored to older adults' preferences could be a promising path to facilitate initial interaction with technology and therefore increase the likelihood of usage.

2 User Experience: A Paradigm Shift from Usability

According to the ISO 9241 part 11 [5], usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." This is in line with a user-centred design approach, but, in practice, heavily focused on task fulfilment and objective performance data such as time of task completion and error rates. For decades the field of ergonomics and human factors contributed with fundamental as well as applied insights to an optimization of user interface design. But granted that user' safety and functionality needs are met, the emotional involvement of the user should to be taken into account in addition. Logan [6] coined the term *emotional usability*. With an even more pronounced focus on pleasure, Hancock et al. call for a shift from *ergonomics* to *hedonomics* [7].

As noted above, user needs go beyond the efficient achievement of tasks. The wave of the information age where usability/ease of use was considered to be the differentiator is coming to an end. Nowadays, it is expected that a given device will provide the intended utility and its means to meet these goals. The still rather young, but widely accepted and evolving field of *user experience* has widened the scope of usability and its strong task-dependency in the past decade by including non-instrumental qualities of a system and its emotional responses by the user.

"Usability factors determine whether a device *can* be used, aesthetic factors determine whether a device *will* be used" [8]. This distinction is most likely an oversimplification. However, the inclusion of non-instrumental qualities of an interactive device should be acknowledged. Petersen and colleagues take a more integrative approach: the pragmatist's [9]. Accordingly, *interaction aesthetics* has an instrumental value as well by promoting the user's drive for exploration. Most likely, it is the interplay of usability and aesthetics that is of importance [10].

3 Age Differences or Age Similarities?

Usually, within the literature of human-technology interaction, the section on *aging* highlights cognitive and sensory decline in the elderly. This negative emphasis on aging is a limited view. Designing for older adults should not be restricted to sensori-motor and cognitive issues in order to complete a task. Here, a more positive focus on maintained skills (e.g. emotion-regulation) and desires has been taken. Older adults should not be underestimated in their capabilities and desires. With the increasing importance of emotion-regulation and the resulting interplay of emotion-motivation-cognition in older adults [11] the field of user experience with its emphasis on emotional involvement seems a promising path for appropriate user interface design.

3.1 Aim of the Study

The motivation for this work was the concern that in lab settings elderly people may focus on the challenges of using unfamiliar technology, but that if allowed to reflect on more familiar devices less functionally-oriented themes may arise.

In other words, the goal was to define relevant dimensions that are crucial with respect to motivational aspects of human-technology interaction. What constitutes a good interactive product, what a bad one? Davis' technology acceptance model [12,13] highlights the role of intentions, which are based on the perceived ease of use and usefulness of the product. Here, we wanted to investigate whether there were more criteria that needed to be taken into account when designing interactive products that should not only be useful and usable but actually used [14]. By this nature, we chose an open question format, not restricting the participants, in order to see what is of relevance in real-life scenarios. Instead of providing a list of questions that just needed to be checked off, we only asked two questions: (1) do you like this interactive product or not and (2) why? The answers given by the users were not pre-determined by the experimenter who might be only interested in quantitative differences. Instead, the answers revealed valuable information about qualitative differences. These answers should be the questions in studies to come.

This approach called for a qualitative content analysis. Given that inferences from a content analysis heavily depend on the participants, the task (instructions) and the chosen procedure of the analysis, these shall be outlined in the following.

4 Method

4.1 Participants

The study involved 40 participants, recruited from two age groups in order to draw cross-sectional comparisons: 20 older adults (M = 70,8, SD = 5.094), ranging from 65 to 80 years and 20 younger adults (M = 25,2, SD = 4.171), ranging from 20 to 33 years; each group consisting of ten males and ten females from all over Hamburg, Germany.

The participants were recruited from a wide range of family friends and their coworkers. However, most of the participants were unknown to the experimenters. A connection to the experimenters, despite the anonymous treatment of the collected data, encouraged to participate and helped considering the study trustworthy. Potential participants were contacted via telephone or approached personally.

One older woman and two younger men were not willing to participate after the instructional session, because the study was too time-consuming and one older woman changed her mind after the instructional session because of privacy issues (feeling uncomfortable taking pictures of personal possessions).

Participants signed an informed consent prior to the introduction session and after re-collecting the provided tools they received a voucher as a reward: Older adults received a book-voucher (10€), younger adults received a voucher for one cinema visit (~ 10€).

4.2 Apparatus and Material

Control Measures. We used a questionnaire on technology affinity [15] with the four subscales (1) enthusiasm towards electronic devices (Cronbach's $\alpha = .842$), (2) subjective competence in using electronic devices ($\alpha = .789$), and (3) perceived positive ($\alpha = .722$) and (4) negative consequences ($\alpha = .747$) connected to the use of electronic devices. This questionnaire is a 19-item self-report measurement, using 5-point Likert rating scales ranging from 1 (does not apply at all) to 5 (applies exactly) in order to express the agreement or disagreement with a given statement. Apart from the means with respect to the subscales, the authors also computed a composite score which was the sum of means, thus limited to a maximum of 20 (4 subscales * 5 maximum score each). Items with a negative connotation were reversed. As a result, the higher the score the more people feel affinity towards technology. Additionally, demographic data (family status, years of education, current occupation, health status, self-rated well-being) was collected.

Task equipment. We handed each participants a zipper-bag that included a snapshot-camera (Agfa Photo, Le Box Camera Flash single use, for in- and outdoor use, with an Agfa Vista film ISO 400 for 27 colour prints), a documentation-booklet, an instruction letter and a pen.

The documentation-booklet was designed for this purpose. It included (1) a brief description of the task demand, (2) an overview table for the number of "positive" and "negative" examples the participants photographed and the corresponding picture-number, (3) a double-page for each picture, including space for the name of the object photographed, space for marking whether it is judged to be a "positive" or "negative" example, and several lines for listing relevant reasons for this decision. An open question format was chosen to ensure that participants would not be misled by the experimenter's expectations. Apart from the name of the device and a mark indicating the judgement's valence, the list of reasons was the only question per device. This was done to avoid missing data on this crucial question. (4) At the end, two pages offered space to list five reasons that motivate the participant to use an interactive product and five reasons that keep him/her from using interactive products. (5) The last spread was meant for comments, critique, or suggestions for improvement.

4.3 Procedure of Data Collection

Data collection was divided into two phases: the instructional session with the experimenter present lasted approximately 1 to 2 hours for the young and older adults, respectively. The second phase lasted one week during which participants independently completed the task of photographing and documenting verbally good and bad examples of interactive products. The introduction sessions were executed individually at the private homes of the participants.

In the beginning of the instructional session, information on the participants' technology affinity was gathered and the demographic data obtained. We handed over the Zipper-bags containing the camera, documentation-booklet, and the instructional letter. Actively involving the participants, we thoroughly went through the instructional letter to provide a precise understanding of the task demands and to motivate the participants. Examples from a list of interactive products (from the letter) and randomly picked examples from the current environment (usually, their living room) were pointed out.

The general introduction was followed by a phase of familiarization. First, the handling of the camera was explained, including the operation of the flash and the viewfinder and information on the appropriate distance to the object when taking a picture. The participants followed the instructions while testing the provided cameras on their own: five interactive products, an Apple iPod (20 GB, 2004), a digital camera (Lumix, Panasonic, DMX-LX1, 2006), a calculator (Casio SL 300, 1995), a Nintendo Gamboy Advance (2004), and a mobile phone (Nokia 2652, 2005), were laid out in front of the participants to demonstrate the task they would later have to perform on their own. The devices differed in the status of being worn out, the designs, the brand and technical complexity. Participants were confronted with the task to evaluate the examples, selecting one device they liked and one they disliked, to take a picture of the chosen devices and to list the reasons relevant for their decisions in the documentation-booklet. This short demonstration not only exemplified a realistic training of the task and its procedure that participants would have to engage in on their own in the course of the week, but it also served as a 'framing' with respect to what we considered and outlined to them as being *interactive products.* Interactive products were described to be technical devices that had some kind of higher order structure of interactive elements. In other words, it was not sufficient to just plug the device in with no further means of interaction or selection. Although not explicitly instructed, a "product" here had the connotation of some hardware components to it (in theory, a website is a product as well). However both, analogue and digital, menu structures were considered to be valid modes.

It was stressed that the subjective opinion and experience of the participant was of interest and that there was no "right" or "wrong" answer.

4.4 Data Analysis

Subsequently, the pictures were developed as print-outs and scanned to make them digitally available. All data, including the digitalized images, were first entered and coded in Excel 2003. Final statistical procedures were conducted with SPSS 17.

The data discussed here reflect the overall reasons for use and non-use that participants named after one week of intensive sensitization to the topic by photographing and describing 24 interactive products. They were asked to name five reasons that motivate them to use an interactive product as well as five reasons that lead to avoidant behaviour regarding technology use.

Five participants (two older and three younger men) who were engaged in the entire task over the course of the week did not fill out the overall reasons. Consequently, the following analysis is based on a subsample. Since an inductive development of categories was conducted, it is especially important to know who provided the data: 18 older adults between 65-80 years (M = 70.7, SD = 4.897; 10 women) and 17 younger adults between 20-33 years (M = 25.7, SD = 4.120; 10 women). Older and younger adults did not differ with respect to years of education (M_{old} = 16.81, SE_{old} =.789, M_{young} = 16.9, SE_{young} = .666, $t(31)$ = -.089, p > .05). However, older adults showed a less pronounced technology affinity than their younger counterparts (M_{old} = 11.71, SE_{old} =.450, M_{young} = 15.16, SE_{young} = .310, $t(31)$ = -6.381, p < .001). This difference is based on less enthusiasm, less subjective competence, and more perceived negative consequences (values have been reversed) of technology in older adults. There was no age difference regarding the perception of positive consequences (see Table 1).

Table 1. Age Group Statistics of Technology Affinity (independent *t*-test). Item examples have been translated by the authors; participants received the scales in German.

subscale	example item	group	*mean*	*SE*	*df*	*t*	*p*
enthusiasm max 5	"I love to own new electronic devices”	old	2,12	,193	33	-4.784	**< .001**
		Young	3,32	,156			
competence max 5	“I easily learn the use of a new electronic device”	old	2,44	,196	32	-4.960	**< .001**
		Young	3,75	,177			
posConseq. max 5	“Electronic devices enable independence”	old	3,76	,114	32	-.875	**> .05**
		Young	3,89	,094			
negConseq. max 5	“Electronic devices cause stress”	old	3,15	,154	32	-5.114	**< .001**
		Young	4,20	,135			

In total, 375 reasons were given, of which 188 in the category of positive aspects and 187 in the category of negative characteristics. This classification was already done by the participants themselves. Due to the explorative nature of this study, an inductive development of the categories differentiating the stated reasons (e.g. ease of use vs. quality of outcome) was undertaken. The authors primarily followed the systematic, rule-guided suggestions of Mayring’s content analysis [16]. The process of inductive development of the classification scheme included several iterations of

(1) Initial formulation and structuring of the reasons into distinct categories that were characterized by unique characteristics not found in other categories.
(2) This classification was revisited and modified after 20, 40, 60, 80 and 100 % of the data set. If an item could not be classified into an existing category, a new one was generated.
(3) Coding instructions were formulated, including definitions, anchor examples of positive as well as negative examples that fall into the according category, and, if appropriate specific coding rules or exceptions were pointed out. Each statement was only allowed to be assigned to one category. Thus, the coding scheme needed to be straightforward and categories easily distinguishable.

(4) A subsample of 20% (75 items, including difficult items that were challenging to classify) was presented to two colleagues, both usability professionals, together with the coding instructions. After a short introduction to the coding instructions they classified the 75 statements to the defined categories. Despite an agreement of over 90%, they were asked to critically comment their coding experience. Specifically, cases of disagreement were discussed and consensually classified. The coding scheme was refined and instructions reformulated.
(5) All 375 statements were classified accordingly.
(6) A random sample (generated by SPSS 17) of 20% (75 items) was drawn. A colleague who was 'naïve' to this study and with a background in computer science was provided with the coding instructions and a short introduction to the study. In the following step, she coded the 75 items on her own to the provided 33 categories (see Results). This classification served to determine the inter-coder reliability using Krippendorff's α statistic [17]. The agreement among coders (inter-coder reliability) is one of the most important quality indicators with respect to nominal scale data developed from qualitative judgments [18].

Frequency statistics are reported in percent due to different cell sizes (there is more data available from older adults and less for motivating reasons). Consequently, relative values (percent) within groups of interest (valence x age group) are more appropriate and less misleading for the reader.

5 Results

Both, motivating and hindering, reasons were given the same chance of inclusion to a category. Put in other words, there were no categories developed that would not allow the consideration of a statement due to its valence. This decision was made to see whether reasons for use and non-use are the same, only on different ends of a scale, or whether separate dimensions are relevant.

We tried to find a justifiable balance of clustering related reasons on one hand and permitting a wider diversity of reasons than usually found in the literature on the other hand. Even in the case of small units, we decided to keep them as separate categories if they were distinguishable from the others, keeping in mind that the aimed classification scheme should serve later on as a deductive application on the reasons associated with the individual devices. As a result, we are happy to have an almost empty 'rest' category (only one item "engineers were not thinking"), but we are aware that this is partly due to the fact, that categories with small sample sizes were allowed too.

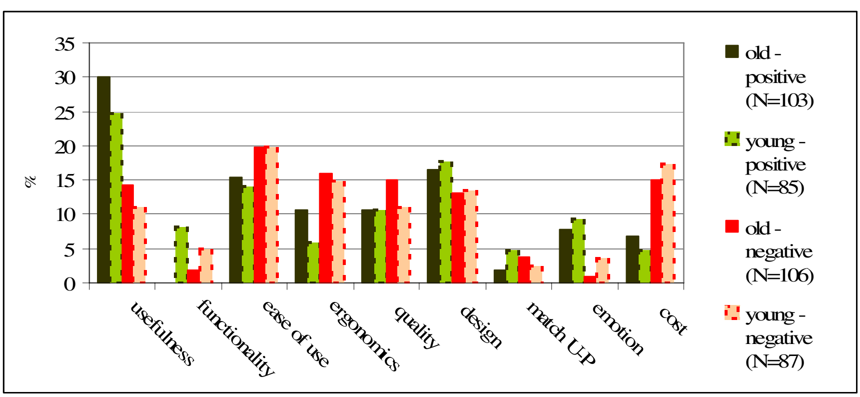
Altogether, 33 categories could be found. For the sake of simplicity, they were further allocated to 10 main categories as Table 2 illustrates.

The inter-coder reliability was found to be Krippendorff's $\alpha = .93$ (95% CI (.859, .986)) and therefore a strong support for the coding scheme [18].

Table 2. Categories and main categories (black filling). The five most frequently named reasons by valence (+ / -) x age group (O / Y) are marked accordingly.

usefulness	**quality**
1. utility / need (**+O**/**+Y**/**-O**/**-Y**)	16. quality of product
2. facilitation of tasks (**+O**/**+Y**)	17. quality of outcome
3. time saving	18. reliability / prone to defects
4. access to information	19. wear
5. communication	20. up-to-dateness
functionality	21. ecologically friendly
6. functionality (**+Y**)	22. service
ease of use	**design**
7. usability (**+O**/**+Y**/**-O**/**-Y**)	23. design/ visual appearance (**+O**/**+Y**/**-O**/**-Y**)
8. manual	24. fit in appartment
9. installation	**match user-product**
10. accessibility	25. status
ergonomics	26. identification
11. handling	27. brand
12. maintenance (**+O**)	28. marketing
13. safety	**emotion**
14. size (**-Y**)	29. joy
15. noise level	30. entertainment
	cost
	31. expenses (money) (**-O**/**-Y**)
	32. power consumption (**-O**)
	rest
	33. rest

Table 3. Distribution of main reasons responsible for use (first two bars per category) and non-use of technology by older (continuous frame) and younger (dashed frame) adults in percent



6 Discussion

Notwithstanding, the importance of useful and usable products with respect to technology acceptance as pointed out by Davis [12,13] and confirmed in the present findings, it seems that people have a number of additional criteria when considering adopting an interactive product such as the outer appearance of the product, its related costs, or aspects of quality. The most prominent criterion was perceived usefulness of a device. However, "second runners-up" were ease of use as well as design. This observation holds true for older adults just like for their younger counterparts. Hence, elderly also pay attention to non-instrumental qualities which should be taken into account when designing for this age group: technology that goes beyond meeting users' cognitive and physical needs. Similarities across age groups are even amplified when considering that the two groups significantly differed in technology affinity. In other words, one does not necessarily have to be overly enthusiastic about technology in order to care about non-instrumental qualities. Less interest might even sometimes call for a shift in expectations to more hedonic qualities.

One limitation when trying to generalize the results should be mentioned: participants of both age groups were highly educated. Users with other social or academic backgrounds might have other preferences, interests, and concerns.

Interestingly, there seem to be differences between reasons that attract and reasons that discourage potential users. For example, the consequences of an ill designed product with respect to cognitive as well as to physical ergonomics might be worse than the earnings of a well designed version. This contrast is most apparent when it comes to financial costs. Such comparisons could be helpful indicators in product development processes.

"Feed-back" information on a pre-selected system with regard to its usefulness and usability does not necessarily imply corresponding real-life user/consumer behaviour. It is "feed-forward" information of users, thus, the communication of their needs, aspirations and preferences that can shed light onto the question of *why* certain products are *used* and others *not used*. The method presented here was intended to gather comprehensive information regarding real-life appliances in a standardized but unrestricted manner. Older and younger adults were given the opportunity to express their take on things via self-documentation. In this manner, answers were given that were not constrained by the experimenter's questions. For example, the experimenter's professional focus might lead to neglecting relevant issues that are not part of his/her discipline (e.g. psychology, engineering, marketing, design). When given the chance, the user is the true expert with an overarching perspective.

In conclusion, this work highlighted the appropriateness and necessity to integrate older users in considerations of user experience instead of leaving them with mere usability-related issues behind. The new ISO norm on user experience, ISO 9241-210 [19], is basically a summary of the picture we outlined with our study: "All aspects of the user's experience when interacting with the product, service, environment or facility. It is a consequence of the presentation, functionality, system performance, interactive behaviour, and assistive capabilities of the interactive system. It includes all aspects of usability and desirability of a product, system or service from the user's perspective".

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