Towards value-focused decision support systems

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ABSTRACT

Motivation – To support people in taking life-decisions in an informed way by reflecting on their values.

Research approach – A user-centred mixed methods approach. (1) a prototype was built based on expert advice; (2) the prototype was used in participatory user studies to elicit design considerations; (3) sketches based on the considerations were tested in a user survey.

Findings/Design – We present five design guidelines that were derived from the participatory design study and the online survey.

Research limitations/Implications – Only four participants took part in the participatory study, which may have led to a limited set of design considerations.

Originality/Value – Designing value-focused decision support systems and, in specific, tools for value-reflection is under-explored in HCI. Our guidelines raise awareness of this important area of research. Our results are also relevant for value sensitive design.

Take away message – When designing digital support for value-reflection, it is crucial to consider (1) uniqueness of each user, (2) trust in the system, (3) adjustable levels of guidance, (4) emotional triggers and (5) integration with social networks.

Keywords

Self-reflection, value-focused thinking, decision support

1 INTRODUCTION

Taking major life decisions is a complex task. Take, e.g., two parents with children, both employed; the decision of one parent to apply for a new job depends on the number of alternatives in the job market, his or her needs and wishes in terms of career opportunities, tasks, involvement with other people, salary etc. The decision also requires consideration of the family, e.g. time left for taking care of the children or whether they have to move, which will affect the spouse's work and life situation.

This type of life-decision making requires balancing one's needs and those of other stakeholders, such as family members or negotiation partners.

Decision making requires assessing an often vast set of alternatives according to one's preferences in order to find an outcome. Economic theories, e.g. (Coleman & Fararo, 1992), assume this to be a matter of rationally calculating each option's utility based on given, stable preferences. However, this view does not represent real-life decision making. Especially, untrained decision makers often follow an adaptive model (Payne et al., 1993). Individuals simplify decision making through applying choice heuristics as a response to their own limited cognitive processing abilities in complex decision tasks. This behavior can lead to less optimal choices. People 'zoom in' quickly on a small set of alternatives, find the best among these and try to justify their choice to others.

Keeney (1992) entitled this behavior alternative-focused thinking and argued that a value-focused approach would improve people's decision making. He sees decision making as a creation of decision opportunities rather than decision problems. This is possible by, first, identifying and analyzing one's values and then creating or choosing alternatives that fit these. While value-focused thinking seems promising, it requires time and effort to gain experience and understanding of one's values. We believe technology can be designed to support people in self-reflection on their personal values. A mobile tool could provide a resource for decision makers to reflect whenever desired.

In this paper we present our work on designing a digital tool to support people in reflecting on and assessing their values. This work is part of a research agenda aiming at designing new technologies for improved decision making for non-expert decision makers. As opposed to current decision support system (DSS) design which focuses on technical solutions implementing economic theories (Carenini and Poole, 2002), we propose a human-centered approach taking into account the cognitive characteristics of human-decision making in the design process.

Besides our design of a value-reflection tool prototype we present several user studies, and a resulting set of design guidelines for value-reflection tools.

2 BACKGROUND

2.1 Decision making, preferences and values

While rational theories of decision making assume that people always act to maximize benefits given a stable set of preferences, Payne and colleagues (1993) argue that people adopt strategies or heuristics to simplify complex decision making processes. Such heuristics are more selective in the use of information from the decision context than economic models suggest and, thus, less rational. Based on cognitive ability and prior knowledge decision makers have several strategies, which they select based on the decision problem

(e.g. task variables, such as the number of alternatives or time pressure) and the social context (e.g. accountability to family members). Even small changes in the task environment may lead people to adapt their strategy. Overall a decision maker follows four meta-goals: maximizing accuracy, reducing cognitive effort, minimize negative and maximize positive emotions and maximizing the ease of justifying a decision. While this adaptive behavior can be seen as an intelligent way to deal with decision complexity, it also leads to problems. Some strategies can eliminate a potentially good alternative early in the process. Furthermore, it has been shown that adaptive behavior can lead to preference changes depending on how a task is stated (Payne et al., 1993).

Preferences are statements about a desired condition on an attribute. As an implication of the use of heuristics in the decision process, preferences are constructive, i.e. attention to information and methods to combine the information vary with tasks. While constructive preferences are hard to elicit due to their adaptive and changing nature, values are seen as more stable in a given decision situation. Values are defined over fundamental aspects of life. Importantly, "the view that values motivate and explain individual decision-making has [now] been widely accepted." (Cheng & Fleischmann, 2010) and, still, values are not yet considered in the majority of DSS.

In our work, we borrow Cheng and Fleischmann's value definition. Accordingly, we conceptualize values "as guiding principles of what people consider important in life." Examples are happiness, independence, social recognition or ambition.

2.2 Value-focused thinking

As a basis for our work we take Keeney's (1992) proposed framework of value-focused thinking. A main aspect of the framework is its proactive stance, which puts the decision maker in control over the situation. In specific, Keeney posits that typical approaches to decision making, i.e. first concentrating on a given set of alternatives and then evaluating them according to one's values, leave the decision maker in a reactive position. However, by actively approaching decisions through focusing on one's values and then choosing or creating alternatives that suit these values, the decision maker can channel efforts to achieve better decisions.

The process is structured into the following steps: (1) identifying values through hard thinking and creativity, (2) structuring values (3) creating alternatives beyond obvious ones and (4) evaluating in how far alternatives promote or trade-off values.

Improvements in decision making through value-focused thinking have also been found by Arvai and colleagues (2001), who compared it to alternative-focused thinking in dealing with management of risk in environmental decisions. The outcomes showed that people in the value-focused condition felt more comfortable with the decisions and more satisfied that choices reflected their values. They considered a wider array of decision-relevant issues and felt more knowledgeable in order to make an informed decision.

Despite its benefits, value-focused thinking requires substantial mental effort from decision makers. As Keeney acknowledges, articulating and revising values is difficult. People may feel that they are merely reflecting on their values as a philosophical exercise and may not see the immediate advantage with respect to decision making. However, over time they will gain experience and coherent value patterns will emerge to be instantiated to decisions. Value-focused thinking suggests a dialog-based approach assessing one's values. In the job domain, e.g., this would be comparable to a career coach asking many open questions to probe a client's values and support the client to understand his/her values. We believe, a digital tool can provide additional support in value-reflection.

3 OUR APPROACH

Given the benefits of value-focused thinking and its applicability to complex life decisions, we aim at creating value-focused decision support. First, we focus on supporting people in value-reflection as this is the most difficult and effortful step in the process. Given that values are not naturally in the focus of people's thoughts and conversations, we believe that a digital tool should aim at reaching a state of awareness in the user. Awareness is defined as "having or showing realization, perception or knowledge" (Merriam-Webster). This can be achieved through self-reflection, i.e. "examination of one's own thoughts and feelings" (Merriam-Webster). According to Sas and Dix (2009) "reflection on experience has the potential to improve learning and practice, through enabling understandings gained from one's experience and consequently better future choices. Reflective skills … can help people notice … underlying values and believes".

According to our user-centered design stance, we put the user in focus of the design work. While we generally favor participatory design, asking users early in the design process about value-reflection did not seem to be appropriate given that values are abstract concepts difficult for people to express. Therefore, our current work is rather design-led, meaning that the focus of our efforts lay on designing prototypes to convey ideas about how value-reflection can be supported and to trigger user feedback. We would like to emphasize that the prototype is to be seen as a means to trigger users' critical deliberation and engagement with the designers/ researchers, which was fostered through the set-up of our user studies.

4 PROTOTYPE DESIGN

This section describes the design of the so-called *Reflections* website which was used in three studies to engage in dialog with users about value-reflection support. Three counsellors were involved, most prominently in the early phase to provide insights into their practice supporting people in value-reflection.

4.1 Expert sessions

We conducted two semi-structured interview sessions, one with a job coach and one with two life counsellors, as supporting people in reflection on their lives is a major aspect of their work. They were briefed with the overall aim of the project (decision support) and our current work (support for value-reflection). The sessions were structured into 3 parts, (1) typical work practice, (2) methods for reflection and (3) ideas for digital tools.

The interviews were audio-recorded and transcribed. Two researchers annotated the data separately using the following predefined codes: cases (work examples), question (used in coaching), method (methods and tools the experts use), aim (purpose of the experts' work), assumption (underlying the experts' work), application (anything related to what a digital tool should be like). After separate coding the researchers discussed the data, in specific the few conflicts in the annotations, to reach an understanding of the emerging themes. Summaries of findings were sent back to the experts for validation.

4.1.1 Themes

One of the main themes from the interviews was *uniqueness*. The experts described in depth how different every client is. Counsellors have to adapt by using different methods to help the client reflect. The job coach pointed out, that the exact methods to be employed may be less important, but the fact

that they enter the reflection on an emotional level is crucial. *Emotional triggers*, (e.g. art, poetry) are used for this.

Overall, the experts agreed that despite their uniqueness, people need *guidance* to get from concrete reflection on experiences to abstract values. According to the experts it is hard for many people to think of abstract values. Thus, the reflection process needs to be divided into several small steps. Questions, e.g. "why is this important to you?" are useful to trigger reflection.

Another theme was the role of *trust* between the counsellor and the client. It is often difficult for people to open up and discuss intimate experiences. This difficulty can be reduced through a trusting relationship and a comfortable setting. In addition, the life counsellors emphasized that one should not judge the expressions of clients and their interpretations, e.g. by pointing out that what a client says contradicts to what he mentioned previously. The experts labeled this aspect a person's 'individual truth'.

Another theme was the role of *group* therapy. In the counsellors' experience group sessions in which people can share thoughts and reflections are preferred to individual coaching by some clients.
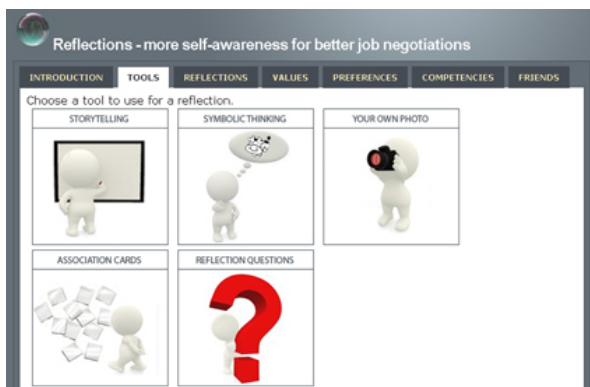

Figure 1: available tools for reflection

4.1.2   Methods

Experts' methods for reflection included metaphorical, visual, or storytelling ones. Visual methods include stimuli like pictures or paintings. The association card method is one example, in which the counsellor lets the client choose a card (e.g. from card sets used in psychological therapies) that appeals to him/her. The card is then used for reflection, starting with the concrete content, i.e. what is shown on the card, to reasons for picking the card, experiences that the card triggers and their importance leading to more abstract values. The same reflection process can be used with other triggers. Metaphors are often used due to their figural nature. Clients can pick figures that represent personal aspects without directly mentioning them (e.g.: "If you had to describe yourself as an animal, which animal would you pick?") Storytelling can also be used as a starting point by asking clients to tell a story of a previous experience. Concrete questions from the counsellor, e.g. "what does friendship mean to you?" can also be used. These questions should be formulated as starting with 'why' or 'what' to trigger reflection. For concrete links between reflection and values, one expert explained the use of lists of values for the client to pick relevant ones to the reflection discussed.

4.2   Design of the *Reflections* website

The website was developed for the career domain. The website includes seven tabs: introduction, tools, reflections, values, preferences, competencies and friends. This layout provides guidance to the user (navigation from left to right tab) without being strict as users can go forth and back as desired. The

introduction tab explains the importance of value-reflection for decision-making. The tools tab (Fig. 1) offers several ways to reflect based on the expert sessions: association cards, storytelling, reflection questions, symbolic thinking and uploading personal pictures. For each tool the user clicks on its icon and a pop-up (Fig. 2) opens allowing the user to fill in a so-called *reflection* (in italics whenever we refer to the prototype). Once the means to reflect has been chosen (e.g. a photo) or entered (e.g. a story), the user is asked to describe the content, what important things it does remind him/her of, an emotion, and a value that is related to the *reflection*.

Figure 2: pop-up form to enter reflection

This strict design has been chosen (1) due to the experts' advice on supporting users to get from the concrete experience to the abstract reflection on values and (2) as it simplifies processing the data in a later stage. We defined a list of work-related values (e.g. functional competence, security, independence and lifestyle) that was shown to the user in the last step of a *reflection*. While using predefined values may limit a user's uniqueness, we took this choice consciously to probe user reaction to such a preset of values.

Reflections can be reviewed on the reflections tab. Users can still add values to their *reflections* or share them with others. This functionality is also available on the values tab (Fig. 3), but with focus on analysis of the value frequencies and reflecting on situations sharing a value. This is conveyed through a system-generated tag cloud of all values based on their frequencies. If a user adds e.g. lifestyle to the majority of *reflections* this will be the most prominent word in the tag cloud. The user can click on a value to filter reflections according to it.

The website also offers functionality to create a preference profile and reflect on core qualities. The preference construction interface (adapted from Pommeranz et al. (2012)) offers a holistic view on preferences, job offers, and a suggestion by the system based on the user's most prominent value. The competencies tab offers a simple way to reflect on one's core qualities. The friends tab allows connecting to others using the system. Once befriended, users can exchange direct messages and share *reflections*.

5   USER STUDIES

The prototype described in the previous section was used as trigger for communication and deliberation between users and the authors of this article of how value-reflection can be supported by technology. We conducted three sequential user studies described next.

5.1 Study 1: Interactive user study

The first study aimed at getting direct feedback on the prototype as a way to engage in discussions of how the design could be improved. To support engagement between the designer of the prototype (first author) and the users, the study was set-up interactively allowing the users to give direct feedback through the message function in the prototype or by sending an email.

Eleven participants (3 female, 8 male) aged between 21 and 50 (M=30.4, SD=8.9) from six different countries were recruited through the university group's network to take part. Each person used the prototype for minimal one week and maximal four weeks. Participants were instructed to use the website and its mobile version as often as they want, but if possible at least once per day. They were instructed to try all functions at least once. We asked for any kind of feedback and specifically to name positive and negative aspects after the use time.

During the study we received feedback from seven users: four messages through the system, six emails and one chat conversation reporting between one and five problems each. The majority of responses considered bugs (9), three comments regarded aesthetic representation and three were on a conceptual level about the understanding of values and attaching values to a *reflection*. The latter led to discussions between users and designer, but no changes were administered to avoid influencing the experience of other users. Participants liked that there were several ways to reflect. Furthermore, they said that the website was easy to use and learn. Major problems that were identified were the abstract nature of some tools,

which leads to a lack of clear links between the (rather personal) *reflections* and work-values. Several participants mentioned that it was difficult to link a value to a *reflection*. One participant suggested having a layer using more personal values that are related to work values later. A related aspect was that participants had trouble finding values that they hold and to understand predefined ones. This was elaborated by P1: "... maybe I want to add my own values and not the predetermined ones. When an interface prescribes certain steps (tell a story, tell what's important about it, select some values) in some ways I feel that I'm not able to express myself as I see fit." A comment about guidance was made by P2: "At present, the system more or less prompts you to make up your values, preferences and competencies by yourself and then input them. I believe the system needs to become one that actually helps you discover them." and P5: "the tools are a good start, but need better guidance." P8 suggested "when you chose a photo or a story the platform should tell you which value or competencies are you talking about."

In conclusion, while many ways to reflect are appreciated, more guidance could be provided by the system to link *reflections* to personal values.

5.2 Study 2: User workshop

To gather qualitative feedback and creative ideas we held a 1.5 hour user workshop. Four previous users (no experts, all male) participated and the same prototype was used to trigger feedback. We used craft material for noting critiques and ideas and sketching designs. Based on Future Workshops (Kensing & Madsen, 1991), our session had the following parts.
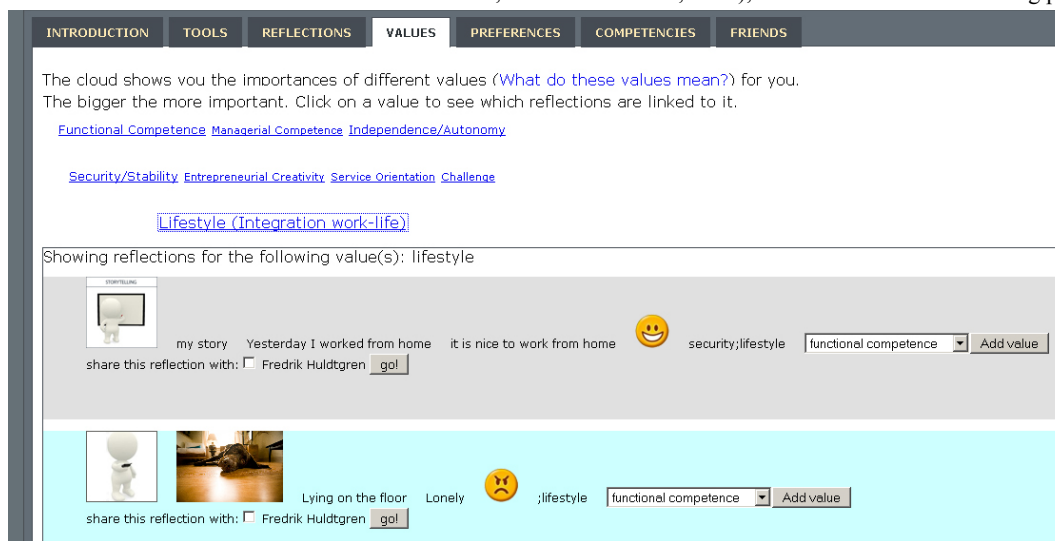

Figure 3: overview of values and reflections

Critique phase (25 minutes): Participants were instructed to critique the prototype within 30 seconds talking time per critique statement. The short speaking time allowed every participant to voice himself and not be interrupted by dominant people. The statements were written on post-its, put up on a wall labelled 'problems' and later grouped into categories by the participants.

Fantasy phase (40 minutes): To overcome difficulties of non-designers to be creative we started with generating metaphors, inspired by Kensing and Madsen (1991). Metaphors can help people see artefacts from new perspectives. Next, participants were given time to sketch ideas on paper. After about 15 minutes of sketching, we started an open brainstorm similar to the first phase. People stated ideas in 30 seconds and noted them on post-its that were stuck on the wall labelled 'ideas'. Three out of four participants created sketches of designs and one participant wrote down his ideas.

Implementation phase (15 minutes): We ended the session with a discussion of practicability and implementation of different ideas.

5.2.1 Results

Problems identified in the first phase were categorized by the participants into technical, graphical, user experience and concept of reflection. The latter two categories often overlapped and contained most problems. Examples are lack of motivation to use the tool, too much time needed, unclear preference input, gap between work and life values, little guidance, lack of private feel, and no option to add values.

The metaphor generation in the second phase resulted in: therapy, meditation, consultant, career advisor, diary, stress relief, dream, conflict resolver and dating site, highlighting the different functions the tool could fulfil. Participants used the metaphors as inspiration for the sketches without being

instructed to do so. Ideas ranged from concrete design suggestions (diary for personal feel) to utopian ideas (a pill dispenser for therapy) and abstract thoughts (adding life goals and links to values). In the last phase it was agreed upon that development should focus on simple, but highly usable functionality.

Besides the concrete ideas several other design considerations were in the focus of discussion. These included the user's motivation, personality, privacy, guidance and advice. Participants discussed how crucial it is that the tool provides a personal and secure feeling similar to a diary that you use to write intimate notes. A participant suggested a diary-like interface. Participants liked that the website provided several ways to reflect which allowed picking one suiting them best.

In a discussion of guidance and free-form style participants mentioned that guidance is needed to get from the concrete (images, stories) to the abstract (values). One participant thought it would be a motivational factor, as less guidance could leave the benefits of a reflection tool unclear. However, other participants thought that too much guidance can also impede the use as reflecting is an activity that is more free and personal. All participants agreed that *reflections* should first be tagged with personal values added by the user to the system, but these then had to be matched to the work-values predefined in the system. The latter were, however, hard for participants to grasp and definitions would be needed. One participant suggested a system-led dialog with the user to give him/her a deeper understanding about a certain value and find out whether a work-value relates to him/her. Guidance is also related to considerations of individual truth and in how far the system should judge its users. Participants discussed in how far the system should provide new insights to the user, to surprise the user to make him/her learn something new about him/herself.

In any case participants preferred the system to have a certain level of transparency, which could be achieved through explanations, e.g. for the benefits of each reflection tool (e.g. why should I write a story?). They also suggested more personal and context-sensitive questions. In addition, one participant suggested giving immediate feedback from the system on the importance of the different values while entering a *reflection*.

Last, participants discussed an integration of the website with social networks like Facebook. One participant suggested that besides inviting Facebook friends, profile information and even status updates could be used to create a value-reflection profile automatically. Other participants preferred to keep *Reflections* a private tool. The more private and secure the tool feels the more a user can trust it. While these discussions were insightful and provided interesting design ideas, they had to be tested with a larger audience.

5.3 Study 3: Online Survey
Based on the results above we created design sketches representing different ideas and tested them in an online survey. We recruited participants through personal networks and snowball sampling. 82 participants from 13 different countries completed the survey (35 female, 45 male, two unknown). We tried recruiting young people that have recently finished or are going to finish their education. Respondents were aged 32 on average (STD=7.1) and 75% held a university degree.

5.3.1 Design sketches
We created two opposing versions for 10 different design ideas to ask people to make a clear choice. Table 1 gives an overview of the design pairs, including the theme each represents. While people have more nuanced preferences (e.g.,

prefer a little bit of guidance over no guidance), "overemphasizing distinguishing features makes the point more easily understandable for participants" (Bødker et al., 2000). We ensured in the survey that participant understood that the options were extreme and implementations could be more nuanced.

To ensure that each pair represented its theme well enough, we asked 10 people to rate (on a 7-point Likert scale) the extent to which this was the case and made small adaptations to the designs before the real study.

Considerations that could not easily be represented in sketches (social networks, individual truth, emotional triggers and trust) were added as additional items.

My Facebook (or similar network) account should ...
(1) be used to create a profile of me on the Reflections website. (2) be used to create reflections based on status updates in Facebook. (3) be used to connect me to my Facebook friends on the Reflections website. (4) never be used on the Reflections website. (5) The above does not apply, as I don't have a Facebook (or similar network) account.

[to be rated on a 5-point Likert scale:]
Item1: I expect the system to help me create links between personal reflections and values.

Item2: I want the system to teach me something I did not know about myself.

Item3: Looking at (old) photographs often makes me reflect on my past experiences.

Item4: I often play songs that remind me of a certain situation or experience.

Item5: Artworks inspire me to think beyond what I see.

Item6: My old diary entries make me think of who I was or who I am.

Item7: I only share reflections on myself with people I trust. The same is true for a digital system.

After asking for demographic data and the frequency of writing a diary, we presented the sketch pairs.

Table 1: design pairs

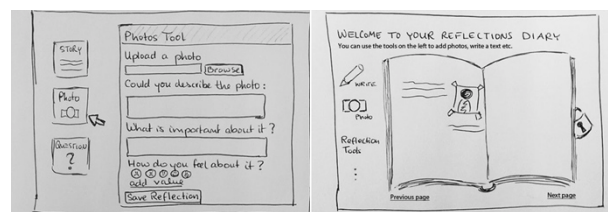| Design pair (theme)	Design A	Design B
1 uniqueness	same look & feel for all users	personal look & feel (customizable)
2 uniqueness	only given values	possibility to add new values
3 guidance, uniqueness	structured form-style	free-form (scrapbook/ diary-style)
4 guidance	no explanation for tool	explanation for each tool
5 uniqueness	general reflection questions	personal reflection questions
6 guidance	system shows inputs (user can adjust them if (s)he thinks it is inconsistent)	system points out possible inconsistencies of inputs
7 transparency	value chart on separate tab after entering reflections	value chart adjusts while entering reflections
8 guidance	definitions for values given in the system	find out the meaning of a given value and whether it fits you through questions
9 guidance	link a reflection directly to pre-defined workvalues (for job choices)	link a reflection first to personal values & then to predefined work-values
10 guidance	overview of reflections without explanation	overview of reflections with explanation

Figure 4: example of design pair 1

The sketches were shown in the same order for all participants, while the position of sketch A and B was randomized between left and right.

Respondents could select the preferred sketch by clicking on it. They could change their selection until proceeding to the next sketch by clicking a button. For each sketch pair respondents

had the possibility to enter a comment. Next, we asked the additional items listed above. The survey was checked by two experts (one on value-reflection and one researcher) to ensure face validity. We then ran a pilot test with six participants to ensure everything was working and comprehensible.

5.3.2 Results

Figure 5 shows clear preferences for option B of ideas 2, 5, 7 and 8. In particular, almost 80% of the users prefer to be able to add their own values to the system and about 80% prefer personal questions for reflection. Over 70% of the respondents would like to receive immediate, visible feedback about value importance while filling in new a *reflection*. About 66% of the respondents prefer a dialog with the system to understand predefined values and their fit to the user.

To investigate if we can predict any design choices based on personal characteristics we used a binary logistic regression (forward stepwise) analysis to predict each design pair with age, gender and frequency of diary writing as covariates. For design pair 5 gender was a significant (p <.05) variable. About 95% of all females chose design B (personal questions), whereas only 70% of the males did. Four participants reported that they would prefer a mix of questions, e.g. "I chose personal because I think it will elicit more concrete writing, but I think overall I'd prefer a mix of both types of questions." For design pair 8 frequency of diary writing was significant (p <.05). A positive correlation, r(80) = .251, p < .05, indicates people who write their diary more frequently prefer a dialog approach to finding out the meaning of a value.

Considering Facebook integration more than half the users would not want to integrate *Reflections* with Facebook data (Fig. 6). One fourth would use it for importing their Facebook profile and about a fifth would use it to create automatic input based on status updates or to connect to friends. One participant stated "linking to Facebook should be optional, with multiple privacy options."

For individual truth we aggregated item1 and item2 (Cronbach's α= .68). We found a significant positive correlation, r(80) = .315, p < .01, between age and individual truth, i.e. older people prefer the promotion of individual truth, while younger people prefer that the system teaches them something new about their values.

Emotional triggers play a big role in people's reflection, indicated by ratings above the neutral point (3 on a scale from strongly disagree (1) to strongly agree (5)) (Fig.7). Especially photos, songs, and art inspire reflection. The lower value on diary entries may be related to few participants writing diaries on a regular basis. Two participants commented on the usefulness of customizing the tool to a personal look&feel. P48 said, "Customization would be […] useful, as it is also an indirect way to reflect yourself. However, as reflection is something not really tied to a tool, and can be done without it, I see little incentive to spend time customizing the look and feel in cases when you would use the tool only occasionally." P77 pointed out "though customizable sounds good, I guess what's important is the content (the pictures/notes you uploaded). I'd think a fancy look and feel would distract me from the content."

Some participants said that they prefer explanations when asked for, but forced explanations should be avoided. "Explanation is good, but only if I ask for it please."(P10) or "I might want to see it the first time but have the option to dismiss and/or never show again." (P47) A related aspect was the system judging a user's input. Similarly to individual truth, one participant pointed out, that "part of reflection includes also conflicting thoughts and emotions that can be perfectly valid - but it is up to user to decide what does and what does not make

sense, not for the tool to divide reports into premade boxes of possible and impossible value combinations." (P48) Still, over 40% of the users liked the system to point out inconsistencies in the values linked to a *reflection*.

Other users referred to the importance of trust, e.g. P1: "it has to feel intimate and trustworthy". P17 said that, "Trust is a big issue, not just about privacy but also in the guidance the system provides. It also changes what people enter in the system." The importance of trust is also reflected in the answers to item7 (see above) which was agreed to by 79.3% of the users (54.9% strongly).
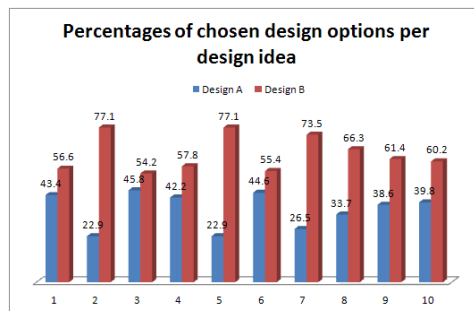

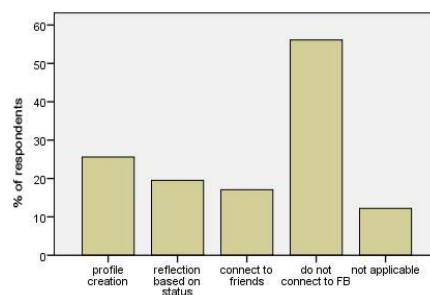**Figure 5: percentages of chosen options per design pair**
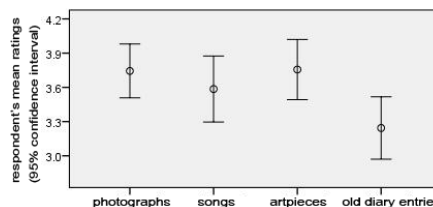

Figure 6: Facebook integration

Figure 7: emotional triggers as means for reflection

6   DESIGN GUIDELINES

We compiled a list of the following five design guidelines suggesting concrete designs where possible.

GL1: Consider the uniqueness of the user by offering means for personalization. People's unique ways to reflect was emphasized by the experts. Thus, one important aspect of value-reflection tools is offering different ways to reflect and leave it open to the user to choose one suiting him/her best. The user studies confirmed that people like this. Further, it was found that users consider a personal feel important. Being able to customize the tool, adding one's own values and having a diary style approach were ideas mentioned. The survey confirmed a strong preference to add own values. Preferences for the other two ideas were distributed. They could be provided as additional functionality in a tool. Regarding reflection questions, a mix of personal and general questions could be offered for males, while females could be provided mainly with personal questions.

GL2: Aim for a trustworthy design through careful implementation of privacy, user-system dialog and transparency. Reflecting on values is intimate. The counsellors emphasized the importance of trust between them and the client and a comfortable atmosphere. It was confirmed in the survey that this aspect can be transferred also to computer systems. From the users' comments we learned that the establishment of trust is based on the experience of using the tool including transparency, the privacy and the type of interaction a tool provides. An example of transparency is the immediate system feedback when a user enters a *reflection*, visualizing how the system's value profile was adapted in real time (liked by more than 70% of the respondents). When implementing group functionality, it is important to ensure that users can set privacy options for each *reflection*. Last, the majority of users favoured a dialog with the system to clarify values.

GL3: Consider adjustable levels of guidance to get from concrete reflections to abstract values. The level of guidance by the system was a prominent consideration emerging from the discussions with experts and users. While experts deem it an important aspect of helping people to get from concrete experiences to abstract values, similarly, the users emphasized that it is important for them to understand how to get from a *reflection* to the related work value. We found in the survey that younger respondents tended to prefer the system to teach them something new about their values. Furthermore, a substantial amount of respondents liked the system to point out inconsistencies (>40%) and a structured approach to entering *reflections* (>45%). While our data did not provide clear preferences, the diversity shows that balancing guidance with the open nature of reflection is difficult and needs careful consideration. Furthermore, several people stated that explanations should be available on demand. Based on the findings we propose different guidance levels to be set by users at runtime.

GL4: Use emotional triggers to enter the reflection process. Mentioned by the experts and confirmed by the survey, people use emotional triggers to begin a reflective process. Concrete examples are visual stimuli such as preselected images, paintings or personal photographs, audio stimuli such as music, written pieces, e.g. old diary entries or poems, or other art pieces. In line with GL1 it is important to provide several triggers to be selected by the user.

GL5: Integrating a value-reflection tool with social network functionality should be optional and nuanced to allow for privacy. The survey revealed a clear division of opinion towards the integration of social networks. More than half of the respondents were against it and about 10% of the respondents do not use social networks. The remaining people preferred different levels of integration from just importing friend connections to using status updates as *reflections*. Based on this data we propose that designers provide functionality for integration with social networks, but leave it completely up to the user whether to use it or on what level. In addition, a social function could also be implemented in the value-tool itself (as in our prototype), and provide functionality for assessment and

discussion of other users' values. Again, users should be able to set the privacy level of such functionality.

7   CONCLUSION

Based on value-focused thinking supporting people in value-reflections, in particular with mobile tools, is an important way to enhance people's decision making. We presented our ongoing design work including the development of a value-reflection tool prototype and several design sketches based on expert and user input. Designs have been tested in an online survey. Based on our results we have compiled a set of five design guidelines (and designs) for value-reflection tools. We believe, such tools are also useful in professional decision making that has to deal with ethical dimensions. Especially the web-based style allows for several people (even when remote) to share value-reflections that are relevant to a decision. Similarly, the work presented is also valuable for value considerations in value sensitive design (Friedman et al., 1996).

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