Designing for Self-Reflection on Values for Improved Life Decision

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Abstract

Taking important life decision is a complex task leading to long-lasting consequences. It requires balancing one’s own needs and those of other stakeholders. Current digital decision support focuses little on the human decision making capabilities. Systems are designed as analytic tools to find optimal outcomes assuming stable and known preferences. However, insights from psychology and behavioral decision research show that people construct preferences during an adaptive decision making process and are less rational than assumed by current tools. It has been suggested that a stronger focus on personal values could lead to improved decision making, but reflection on values is difficult for people. This paper presents a first exploration of how to aid people in reflecting on their values. It serves as a starting point to develop digital value-focused decision support tools. We describe the design of a probe for value-reflection and several studies with experts and end-users that led to a first set of considerations for such tools.

Keywords: Values, Decision making, Self-reflection, Probe, Design, User Studies

1. Introduction

Taking major life decisions in today’s globalized society is a complex task. People cannot simply consider their local environment when deciding where to live, and occupational choices are vast (unlike for earlier generations who often followed into the steps of their parents). Take, e.g., a young family in which both mother and father have a job and take care of their children. The decision of one parent to apply for a new job depends, among other things, on the number of alternatives in the current job market, the person’s needs and wishes in terms of career opportunities, tasks, involvement with other people, salary etc. In addition, the decision requires consideration of the family, e.g. the time left for taking care of the children; whether the family needs to move, which will in turn affect the spouse’s work and life situation; and maybe the distance to other relatives. This type of
life-decision making requires balancing one’s own needs and those of the other stakeholders, i.e. family members, and dealing with long-term consequences.

As a process, decision making requires assessing an often vast set of alternatives according to one’s preferences in order to find a suited outcome. Economic theories, e.g. [5], 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 (i.e. people who are not familiar with decision-theories, the domain or decision making as a major part in their daily work) often follow an adaptive model [18].

According to this adaptive model individuals simplify decision making through applying choice heuristics as a response to their own limited cognitive processing abilities in complex decision tasks [18, p. 2]. As partially reflected in the example above, three major types of factors influence the choice of a decision strategy or heuristic, the problem characteristics (e.g. the task variables), the decision maker’s characteristics (cognitive ability and prior knowledge) and the social context (e.g. accountability). This behavior can lead to bad choices, because people ‘zoom in’ quickly on a small set of alternatives, find the best among these and then try to justify their choice to others, e.g. by adapting their original preferences. Keeney [10] has entitled this behavior alternative-focused thinking. He argued that a value-focused thinking approach which first identifies and analyzes one’s values and then creates or regards alternatives that would fit them would improve decision outcomes. Research has shown that people using this approach were more comfortable with their decisions, more knowledgeable about relevant issues to make an informed decision and considered a wider array of decision-relevant issues [1].

Value-focused thinking seems promising, but requires time and effort to assess one’s values, which are often hard for people to understand and articulate [14] [10]. We believe, technology can be designed to support people in self-reflection on personal values. A mobile tool, e.g. in form of a website or mobile application, would provide a resource for people to reflect whenever they feel like it, not just in dialog with a coach (as suggested by Keeney). Further, reflection on values could be captured within the relevant decision-context, e.g. thinking about work values at work.

As part of a large research project on digital decision and negotiation support, we are designing tools to improve decision making. As opposed to current technology-focused decision support system (DSS) [3], we propose a human-centered approach taking into account the cognitive and emotional characteristics of human-decision making in the design process.

The work presented in this paper is a first step towards value-focused decision making.
support systems. We report several studies comprising an exploration of how people reflect on their values and how digital tools can support this reflection. Based on this first exploration we conclude with a list of design considerations for value-reflection and propose directions for future work.

2. Background

2.1. Decision making

Research on decision making is vast and done in several disciplines, e.g. economics, psychology and organizational science. We will concentrate in the following on theories that have been most prominent in DSS research and relevant to our focus on values.

One prevailing decision making theory in economics is rational choice theory [5]. This theory describes rationality as an act to maximize personal benefits while minimizing costs. All models belonging to this theory assume people’s choice of the best action according to consistent and stable preferences which reside in the decision maker’s head. Other preference assumptions are completeness (alternatives can be ranked in order of preference) and transitivity (whenever A is preferred over B and B is preferred over C, then also A is preferred over C). Such assumption make it possible to express preferences in utility functions.

Rational choice theory has been subject to criticism from behavioral decision making researchers as it neglects psychological aspects. In reality decision problems are often ill-defined meaning the desired goal state is only clarified throughout the decision process and people are often not rational. According to Payne, Bettman and Johnson’s [18] adaptive decision making model, people adopt strategies or heuristics to simplify the decision making process in complex situations with many alternatives. Such heuristics are often much more selective in the use of information from the decision context than economic models suggest. Based on cognitive ability and prior knowledge decision makers have several decision strategies at their disposal that they use in an adaptive manner to solve a decision problem with reduced cognitive effort. While choosing a strategy a decision maker tries to maximize decision accuracy, reduce cognitive effort, minimize negative and maximize positive emotions and maximize the ease of justifying their decisions.

Which strategy is used depends on the characteristics of the person, 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.
While this adaptive behavior can be seen as an intelligent way to deal with decision complexity, it often leads to an elimination of a potentially good alternative early in the decision process. Furthermore, it has been shown that adaptive behavior can lead to preference reversals or changes depending on how a task is stated, e.g. either as a choice or a matching response [31], or in which order elements of a choice set are considered [30].

2.2. Preferences

Preferences are statements about a desired condition on an attribute. Preferences are crucial to DSS to assess options. However, current systems using rational choice theory create preference models based assumptions of stable and known preferences, which do not reflect the users’ psychological processes. Behavioral research has shown that preferences are constructive instead, i.e. attention to information and methods used to combine the information vary with different tasks. Therefore, they are hard to capture and may change [18]. With respect to designing digital decision support, it is important to take into consideration that preferences may change and be subject to effects related to information display. Values are stable over long periods of time and therefore, provide a good basis for preference elicitation for a given decision context.

2.3. Values

“The term ‘values’ has been used variously to refer to interests, pleasures, likes, preferences, duties, moral obligations, desires, wants, goals, needs, aversions and attractions, and many other kinds of selective orientations” [33, p. 16]. This variety of terminology led to confusions about the nature of values, but at least “the view that values motivate and explain individual decision-making has [now] been widely accepted.” [4] According to Keeney [11] “values are fundamental to all we do; and thus, values should be the driving force for our decision-making.”

A general distinction made in ethics literature, is between intrinsic and instrumental value. While an intrinsic value is the value an object carries in itself and is an end in itself, an instrumental value is a means to an end. For example, consider someone valuing happiness (intrinsic value), for whom the love (instrumental value) to his wife is a path to happiness. Another term used for intrinsic is *terminal* coined by social psychologist Rokeach [21]. He classified 18 terminal values (e.g. happiness, equality, freedom, social recognition) and 18 instrumental...
values (e.g., ambition, love, courage, honesty, independence). Schwartz [25] specified 56 basic human values grouped into 10 value types (achievement, benevolence, conformity, hedonism, power, security, self-direction, stimulation, tradition, universalism). Others have classified values differently, e.g., the type of benefits at issue, according to which values can be classified into material and physical, economic, moral, social, political, aesthetic, religious (spiritual), intellectual, professional, and sentimental [20]. For an in-depth discussion of value definitions, classifications and inventories, please see [4].

In the following we borrow Cheng and Fleischmann’s [4] definition, which conceptualizes values “as guiding principles of what people consider important in life.” It is important to point out that values should not be seen in isolation. People have value systems consisting of a complicated web of values and as Schwartz [24] pointed out, “attitudes and behavior are guided not by the priority given to a single value but by trade-offs among competing values that are implicated simultaneously.” In particular, complex decisions may promote some values while violating others cherished by the decision maker. This leads to conflicts, which are often avoided by people.

2.4. Value-focused thinking

As a basis for our focus on explicating values relevant to a decision making context, we take Keeney’s proposed framework of value-focused thinking [12]. A major aspect of this framework is its proactive stance. By suggesting to consider decision making as a creation of new opportunities rather than problem solving it puts the decision maker in control over the situation she has to face. To be more specific, Keeney posits that the typical approach 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 position which is merely reactive to a given situation. By actively approaching decision situations through (1) focusing on one’s values and (2) choosing or creating alternatives that suit these values, the decision maker can channel thinking efforts to achieve better decisions.

Value-focused thinking proposes to make values explicit in the first stage of decision making. Simply listing values or objectives – statements of what one wants to achieve in a decision context – however, is not sufficient. Often people confuse ends with means. It is, therefore, important to identify which are the mean objectives that ultimately lead to fundamental objectives, i.e., the ends one wants to achieve in a decision context. Means and ends are context dependent. If your decision context, e.g., concerns investing your available funds for retirement, the amount of money you receive at the start of your pension may be a
fundamental objective. If you are, however, deciding how to achieve a good life during retirement, the amount of money may serve as a means objective. Overall, value-focused thinking is structured into the following steps: (1) identifying objectives through hard thinking and creativity, (2) structuring objectives into mean and fundamental ones (3) creating alternatives beyond merely obvious ones by e.g. thinking about how to better achieve one’s objectives and (4) evaluating in how far alternatives promote or trade-off fundamental objectives. When applying these steps to decisions over time people will gain experience and coherent value patterns will emerge that can be instantiated to many decision situations.

Other research has shown that people using value-focused thinking felt more comfortable with their decisions and more satisfied that choices reflected their values than people using traditional approaches. Furthermore, they considered a wider array of decision-relevant issues and felt more knowledgeable with regard to being able to make an informed decision [1]. In line with Keeney’s observation that articulating and revising values is difficult and needs hard thinking, this research reported that participants using value-focused thinking considered the decision task more mentally difficult than participants using alternative-focused thinking.

To reduce this mental effort people should be supported in the process of assessing their values as well as articulating them and relating them to a given decision context. Value-focused thinking suggests a dialog-based approach assessing one’s (fundamental and means) objectives, i.e. one’s values in a given context. In a career choice context this could be compared to a career coach who asks many open questions to probe a client’s values and support the client to understand her values. While we are not planning to make such coaches obsolete by introducing a tool that can take over these tasks, we believe that a digital tool can provide additional help in people’s self-reflection on values.

2.5. HCI research on self-reflection

Assessment of one’s values can be achieved through self-reflection, which is the “examination of one’s own thoughts and feelings” (Merriam-Webster). As stated by [26], reflection is “bringing unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice”. According to Sas and Dix [22] “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, when properly applied can help people notice patterns of behavior (more or less effective), together with the underlying values and believes”.

http://mc.manuscriptcentral.com/iwc
Most prominent research within HCI on self-reflection has been done in the area of affective systems building on Boehner and colleagues’ [2] interactional model of emotion. An example in this area is the Affective Diary [16], which augments traditional diary keeping with sensor technologies. While such systems lead the user to gain emotional awareness, “self-reflection can [also] be focused on thoughts and behaviors, and in particular on the identification of values, beliefs and assumptions that motivate such behaviors.” [22]

Recent trends in HCI on monitoring and improving people’s behavior, which are related to decision making in life, are going towards persuasive systems [28] and personal informatics [15]. The latter has a strong focus on supporting self-knowledge through collecting personal data and analyzing it, which is similar to our goal. However, they do rely heavily on quantitative data collected automatically from sensors and they have no specific link to decision making. Take e.g. the quantified self movement (http://quantifiedself.com/) with many participants who are simply curious about their own data but do not use it explicitly for given decision situations.

The focus of persuasive systems lies less on self-knowledge, but on motivating people to change their behavior. Many of these systems focus on health or environmental choices. While the focus on (behavioral) choices relates to our work, we do not agree with the approach taken in persuasive systems. It seems that these systems mainly embed the designer’s values and notions of what good and bad behavior is. Often it is even unclear whether these values are made explicit to the users and whether the user can critique or adapt them. In our view, this approach does not lead to knowledge about how decisions may affect the user’s values and what consequences the decisions have. Little emphasis is placed on self-reflection of one’s own values. Similar critique has come from Purpura and colleagues [19], who question these system’s ethical limits. “When designers make decisions about the ‘one right way’ that should drive suggestions to influence the ‘flawed’ user, it removes agency from the individual.” They pose the question whether such an approach to technology design is respectful of the user.

Another related HCI research agenda is that of Slow Technology, coined by Hallnäs and Redstrom [8]. This area has recently gained more attention ¹ as an opposition to our fast-past way of living augmented through ubiquitous computing leaving people with an omnipresent need to be constantly efficient and connected to others through technology. Slow technology aims to balance these aspects of

¹(http://www.willodom.com/slowtechnology/)
people’s lives with moments for reflection, mental rest and solitude. One could view our efforts as part of this agenda in respect to slowing down the decision making process, taking time to reflect on one’s values and considering alternatives in depth.

These HCI trends support the importance of investigating the design of tools for reflection. In summary, our work takes inspiration from Personal Informatics and Slow Technology, using the capture of data for in-situ reflection and the notion of slowing down respectively. It contrasts Persuasive Technology approaches as we aim for informed decision making instead of using smart algorithms that “push” people towards a certain choice that is considered right by the designer of the system. That said, we do not deny that future systems can provide intelligent support in form of analyses of user input, but the analysis should be transparent and not be used to force choices but to offer insights that users can scrutinize and use to form a decision.

3. Methodology

Given the presented background we aim at designing support tools that help people to assess their values and take informed decisions. Due to the abstract nature of values and the “inherent difficulty in talking about values” [14] we decided that a first exploration of value-reflection is needed before we can develop concrete value-focused DSS. This exploration aims to give insights into how people reflect on values and can be triggered to do so and how a digital tool can support the process.

In this exploration described in the remainder of the paper we engaged experts and end-users in order to get a deep understanding of self-reflection and support thereof. We used a methodology that combines qualitative and quantitative research drawing on User-centered Design and participatory methods to create design considerations collaboratively. Close contact between the researchers and participants was important in the first stages. To elicit deliberate and critical feedback from end-users we used a probe designed based on expert knowledge. Ideas coming from the first stages were transformed into design sketches and used in a large scale online survey to gain more insights. The different activities within our study build closely on each other and are outlined in the following.

3.1. Participants

Three counselors (one career coach and two life counselors) were involved as experts throughout the study, most prominently in the early phase to provide
insights into their practice to support people in value-reflection.

We also worked closely with eleven end-users (3 female, 8 male) aged between 21 and 50 (M=30.4, SD=8.9) from six different countries, who participated in the first study using a technology probe [9]. These were recruited through the universities network, but except for one participant they were not familiar with the research. Three participants dropped out due to a self-stated lack of time, eight people remained to finish the study. We invited the users and experts to participate in the follow-up workshop, however, only four users (all male) had time to participate.

When we created the final large scale survey we pre-checked that the design sketches used in the survey would be easily understood by users with 10 people, five who were engaged in our earlier studies (2 experts, 3 users), and five who did not know the research with different backgrounds (in terms of education level and expertise). For the survey itself we recruited participants through our personal networks and further snowball sampling. From 119 people who approached the study, 82 completed it, 35 female, 45 male and two with unknown gender. We targeted young people that are about to or have recently finished their education, as this reflects our target group of untrained decision makers for career choices. Respondents were aged between 22 and 64 (M=31.71, STD = 7.095), which shows the majority to be what we call young professionals (ca. 25-35 years old). The majority of respondents, ca.75%, held a university degree. Participants came from 13 different countries, the majority from the Netherlands (30), the United States of America (15), Germany (11), China (7) and Sweden (6). All 82 participants were included in the analysis.

3.2. Materials

3.2.1. Probe: Reflections Website

As our work constitutes a first exploration into digital value-reflection support we considered a technology probe to be a good way of triggering user feedback and entering a creative dialog with the users. “A probe is an instrument that is deployed to find out about the unknown. [...] Technology probes are a particular type of probe that combine the social science goal of collecting information about the use and the users of the technology in a realworld setting, the engineering goal of field-testing the technology, and the design goal of inspiring users and designers to think of new kinds of technology to support their needs and desires.” [9] We developed a website including a mobile version to be used as such a probe.

The website was developed for the career domain, in particular to prepare for a job negotiation. The website’s structure is based on a tab layout. Users can go
forth and back between tabs as they wish. An introduction tab contains explanations and outlines the basic interaction with the probe. The tools tab (Figure 1a) offers several tools for reflection (based on the expert sessions described below: association cards, storytelling, reflection questions, symbolic thinking and uploading personal pictures).

The interaction steps for each tool are the same: When a user clicks on a tool icon, a pop-up (Figure 1b) opens allowing the user to fill in a form describing his reflection. Once the means to reflect has been chosen (e.g. a photograph) or entered (e.g. a story), the user is asked to describe its content, what important things it does remind the user of, an emotion, and a value that is related to the reflection. This strict design has been chosen for two reasons, (1) due to practicality, as it simplifies saving to the database and processing the data in a later stage and (2) due to the experts’ advice on supporting users to get from the concrete experience, e.g. what happened in a story or what do you see in a picture, to the abstract reflection on values related to the experience. Similar to value tables that the experts use to label written reflections of their clients with concrete values, we defined and offered the users a list of work-related values (functional competence, managerial competence, service, security/stability, entrepreneurial creativity, challenge, autonomy/independence and lifestyle as introduced by Schein [23]).

Once a user saves his entry, it is entered into a database. All entries can be reviewed on the reflections tab. Here, the user can share any entry with other users connected to him via a friends function (to be found on a friends tab). On a values tab (Figure 2) the frequency of occurring values is captured and displayed as a tag.
cloud, in which a bigger font strength and size indicates a higher frequency. The user can also get a quick overview over all entries belonging to a certain value by clicking this value in the tag cloud.

### 3.2.2. Design Sketches

In the online survey we used hand-drawn design sketches that were based on expert and user feedback from the first stages of the work. For each idea that we wanted to probe with the larger set of users we created two extreme versions of how the interface could look like, e.g. a free-form entry of reflections versus a very structured form-like interface (see Figure 3). This way people were asked to make a clear choice of what they preferred. In total, we created 10 sketch pairs presented in Table 1 (ideas are explained in sections 4.1 and 4.2).

### 3.3. Set-up

In the following we will discuss our activities in chronological order.
Table 1: Overview of design sketches

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

3.3.1. Expert Sessions

We conducted two sessions, one with the career counselor and one with the two life counselors. The experts were, first, briefed with the overall aim of our project (decision support) and the details of our current work (support for value-reflection). The remainder of the sessions were structured into three parts, (1) focusing on typical work practice and sharing of experiences of the experts, (2) focusing on methods used to support people’s value-reflection and (3) brainstorming ideas for computer-supported value-reflection. Both interviews were audio-recorded and transcribed.

3.3.2. User Study

Based on the expert sessions we created Reflections - the technology probe described above. This was used in a two-phase study with end-users. In the first phase we gave the probe to 11 participants to use it between one and four weeks in their daily lives. We asked people to try both the website and the mobile version and enter data with the different tools provided every day. This first phase was aimed at giving the participants time to explore the probe and deliberate on value-reflection, a new activity for most people. In order to create a relationship between the researcher and the users we asked people to stay in contact with us either through the system’s built in message function or via email. This allowed users to give in-situ feedback. To facilitate an easy start for a dialog we did not limit the type of feedback to value-reflection alone, but asked for other types of
feedback, e.g. on bugs or aesthetic issues, which are easier to express. After using the prototype over the given time period participants were asked to answer the questions shown in Table 2.

In the second phase of the user study we invited the same participants to a workshop based on the Future Workshops [13] method. Four of the users participated. The aim of the workshop was to invent new design ideas. The workshop lasted 1.5 hours and had three main parts (1) a critique phase, (2) a fantasy phase and (3) an implementation phase. We structured the phases so that the largest time portion was reserved for the generation of ideas. In a short briefing, the method’s steps and rules were introduced and written down to be visible during the session.

**Critique phase (25 minutes):** This phase was meant to offer the participants an easy entry to becoming engaged in discussions without having to be creative from the start. Participants were instructed to critique the Reflections website, which they had all used in the previous phase. Each participant was restricted to 30 seconds talking time per critique statement to allow every participant to voice himself and not be interrupted by a dominant person. The statements were written on post-its and put up on a wall labeled ‘problems’ to be grouped into categories by the participants afterwards.

**Fantasy phase (40 minutes):** To further overcome difficulties of non-designers to be creative we started with the generation of metaphors, inspired by Kensing and Madsen [13]. Metaphors help people think outside the box and see artifacts from new perspectives. For instance, besides being a website, the prototype could also be seen as a diary. Next, participants were given time to create new ideas. We provided materials, such as colored pens, post-its and paper, for noting critiques and ideas as well as sketching new design proposals. To open up for creativity participants were instructed to come up with utopian ideas and did not have to think about technical constraints. 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 labeled ‘ideas’. Three out of four participants created sketches of designs, while one participant wrote down
his ideas in words. After collecting ideas each participant had three votes (green stickers) for their three most preferred ideas.

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

### 3.3.3. Online Survey

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement/Question</th>
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</table>
| item3.0 | My Facebook (or similar network) account should ...  
  a. be used to create a profile of me on the Reflections website.  
  b. be used to create reflections based on status updates in Facebook.  
  c. be used to connect me to my Facebook friends on the Reflections website.  
  d. never be used on the Reflections website.  
  e. The above does not apply, as I don’t have a Facebook (or similar network) account.                                      |
| item3.1 | I expect the system to help me create links between personal reflections and values.                                                                                                                             |
| item3.2 | I know better than the system how my personal experiences relate to abstract values.                                                                                                                              |
| item3.3 | I want the system to teach me something I did not know about myself.                                                                                                                                              |
| item3.4 | Looking at (old) photographs often makes me reflect on my past experiences.                                                                                                                                         |
| item3.5 | I often play songs that remind me of a certain situation or experience.                                                                                                                                            |
| item3.6 | Artworks inspire me to think beyond what I see.                                                                                                                                                                    |
| item3.7 | My old diary entries make me think of who I was or who I am.                                                                                                                                                      |
| item3.8 | I only share reflections on myself with people I trust. The same is true for a digital system.                                                                                                                      |
| item3.9 | I need to know that my data will be held private; otherwise I would not enter reflections on myself.                                                                                            |
| item3.10 | A breech of privacy would make me stop using the system immediately.                                                                                                                                             |
| item4.1 | I know exactly what a value is.                                                                                                                                                                                    |
| item4.2 | The concept of values is still hard to grasp.                                                                                                                                                                    |
| item4.3 | I know what my values are.                                                                                                                                                                                         |
| item4.4 | I know how my values relate to my decision making.                                                                                                                                                               |
| item4.5 | I have a clear idea of my life goals.                                                                                                                                                                               |
| item4.6 | I know exactly how my life goals relate to my values.                                                                                                                                                              |
| item4.7 | More awareness about my values will be beneficial to choose a job/career.                                                                                                                                           |
| item4.8 | More awareness about my values will be beneficial in a job negotiation.                                                                                                                                             |
| item4.9 | I would use a digital tool (designed similar to the interfaces presented before) to self-reflect.                                                                                                                      |
| item4.10 | I think, using a digital tool to self-reflect would help many people in making better decisions.                                                                                                                     |
| item4.11 | Imagine an upcoming job negotiation. After using a digital tool for self-reflection I would probably feel ...self-confident; ...well-prepared; ...know exactly what I want; ...know what I already know; ...nothing of the above |

Goal of the online survey was to test the expert themes and design ideas from the end-user sessions with a large sample and relate the respondents’ preferences to personal characteristics of self-reflection as well as their attitudes towards awareness of values and value-reflection tools. For this survey we used the sketched design pairs as presented in the Materials section. To ensure that each pair represented the theme we wanted to test, we asked 10 people (see Participants) to rate the extent to which this was the case (on a 7-point Likert scale).
Based on the feedback we adjusted some sketches until everyone agreed that they match the theme/idea we want to express. We ran a pilot test of the final survey with six participants to ensure everything was working and comprehensible.

The survey was divided into four parts: (1) demographic information including age, gender, level of education, occupation and frequency of writing a diary, (2) reflection-rumination questionnaire (RRQ) [29], (3) design ideas for value-reflection (separated into binary choice of sketches (3a) and a set of questions probing links to social networks, emotional triggers and trust (3b)), and (4) a set of statements probing respondent’s attitudes towards self-reflection, awareness and decision making.

We hypothesized that there maybe differences in what type of interfaces people prefer depending on their current level of self-reflection, e.g. that more reflective people may want less guidance. Therefore, we used the RRQ in part 2 to retrieve a score for people’s level of reflection and rumination (a less healthy and often insecure way to think about oneself over and over.).

In the third part, we presented the sketch pairs together with their titles (see Table 1). We explained to the participants that the sketches were a means to elicit information on different themes and ideas, not to choose an interface that would be implemented in a final version. The sketches were shown from first to last in the same order for all participants, however, 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 they proceeded to the following sketch by clicking a next button. For each sketch pair respondents had the possibility to enter a comment. Based on the expert sessions we added extra questions (see Table 3) regarding the integration with Facebook (item 3.0), individual truth (item 3.1-item 3.3), emotional triggers (item 3.4-item 3.7) and the role of trust (item 3.8-item 3.10).

Part four consisted of items (see Table 3) aimed at measuring the understanding of the value concept (item 4.1 and item 4.2), self-knowledge of values and their relation to decision making (item 4.3-item 4.6), perception of benefits of value awareness (item 4.7 and item 4.8), attitude towards a digital value-reflection tool (item 4.9 and item 4.10) and perceived effect of a tool (item 4.11).

4. Data Analysis and Results

4.1. Expert Interviews

To analyze the expert interview data two researchers annotated the data separately using the following predefined codes: cases (work example), question (ex-
pert questions used in coaching), method (specific methods and tools the experts use), aim (purpose of various aspects of the experts’ work), assumption (underlying the experts’ work), application (anything related to what a digital tool could or should do or be like). After separate coding the researchers discussed the data, in particular any conflicts in the annotations, to reach a shared understanding of the themes discussed during the sessions. We sent summaries of our findings back to the experts to validate that we understood them correctly and the experts agreed. In the following we present the data relevant to the design of digital tools to support value-reflection including the dominant themes that arose from the discussions and an inventory of reflection methods used in practice.

4.1.1. Themes

The main theme that arose from the discussions was the uniqueness of the client. The experts described in depth how different every client and, thus, every session is. Therefore, the counselor has to adapt to each client by trying and using different methods to help the client reflect on his (work-)life. This aspect of uniqueness was also the result of our previous work on methods for value elicitation [blinded].

The job coach pointed out, that the exact methods to be employed with the clients may be less important, but the fact that they enter the reflection process on an emotional level is important. Thus, emotional triggers, such as art or poetry, are useful in making people reflect. Overall, however, the experts agreed that despite their uniqueness, most people need guidance to get from concrete reflection on experiences to more abstract values. According to the experts it is hard for many people to think of abstract values. Therefore, the reflection process needs to be divided into several small steps. Specific questions of the form “Why is this important to you or what does this mean to you?” can be used to support reflection.

Another overarching theme that was brought up in both sessions was the role of trust between the counselor and the client. It is often difficult for people to open up and discuss their intimate experiences. This difficulty can be reduced through the built-up of a trusting relationship between the counselor and client and a setting producing comfort for the client. Part of this is the adaptation to the unique features of the client. In addition, the experts in the first session emphasized that one should not judge the expressions of the clients and their interpretations. Thus, one should not point out that what a client says now contradicts something mentioned by the client previously. The experts labeled this aspect as individual truth held by each person. While something may seem contradictory to us, it may make
sense for the client.

Another less prominent theme, but still discussed, was the role of group therapy. In the counselors’ experience group sessions where people can share their thoughts with others and make sense out of different situations and reflections together work better for some people than individual conversations.

4.1.2. Reflection Methods

Experts use several methods to support people to reflect including visual, metaphorical or storytelling ones. Visual methods provide the clients with visual stimuli, e.g. pictures or paintings. The association card method is an example of this type. The counselor lets the client choose a card with an image from a set of so-called association cards (e.g. card sets used in psychological therapies or a set of images preselected by the counselor) that appeals to her. This 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, e.g. paintings (e.g. in a museum) or photographs. Metaphors are often used due to their figural nature, i.e. a person does not need to talk about personal aspects directly, but can pick figures that represent these aspects. One method mentioned by the experts is asking people: “if you had to describe yourself as an animal, which animal would you pick?” Storytelling is an aspect of many methods, but can also be used as a starting point, asking clients to tell a story of a previous experience. Storytelling can also be triggered by the use of concrete questions from the counselor, e.g. “What does friendship mean to you?” According to the experts these questions should be formulated as starting with Why? or What? to trigger reflection instead of How-questions. For concrete links between reflection and values, one expert explained the use of value tables, i.e. lists of values given to the client to pick the ones relevant to the reflection discussed with the counselor.

4.2. User Study

4.2.1. User feedback during and after probe use

During the first phase, when participants used the probes in their daily life, we collected feedback from seven participants: four messages through the system, six emails and one chat conversation reporting between one and five problems each. In total we collected 47 data entries (one to seven per participant). A major aspect that was discussed between users and the researcher was the choice of work related values that were difficult to attach to their input, which often focused
Table 4: Positive and negative aspects of Reflections

<table>
<thead>
<tr>
<th>Participant</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>a way to capture daily reflections, which feels good - like you telling someone your deep thoughts and feelings which you might rarely do with actual human beings; multiple ways to capture reflections</td>
<td>List of values feels forced and limited and doesn’t always seem to match [the reflection] i choose; I’m missing a more free form tool, where i just collect some thoughts</td>
</tr>
<tr>
<td>P2</td>
<td>tools are nice; nice application for people without self-knowledge or self-reflection.</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>the idea of making a link between your lifestyle and your work-style is a very good goal.</td>
<td>it needs to fill the gap between the tools (like a photo of my life) and the conclusions about your way of working; questions asked in the tools could be sharpened; system could introduce me more to the different kinds of values.</td>
</tr>
<tr>
<td>P4</td>
<td>it kept giving me consistent important values; unique experience, I never used anything like this before that showed me what i care about most</td>
<td>values it listed did not include all the values i cared about.</td>
</tr>
<tr>
<td>P5</td>
<td>association cards: helpful, but still too abstract; good idea to make values and competences explicit.</td>
<td>[some tools] are too abstract; not all values i am seeking there; once i add a value i cannot remove it.</td>
</tr>
<tr>
<td>P6</td>
<td>many options</td>
<td>definitions of some values not clear; difficult to attach a value to certain activities (everything seems to be lifestyle).</td>
</tr>
<tr>
<td>P7</td>
<td>more than one way to know yourself</td>
<td></td>
</tr>
<tr>
<td>P8</td>
<td>it helps to you to think about things that you aren’t used to; you can see your hard points easily; you can see all your reflections together.</td>
<td>you don’t obtain any feedback of your own reflexions; difficult to see the relation between the work and your reflections; I don’t think that a photo or an story can help you.</td>
</tr>
</tbody>
</table>

on private aspects of life. One participant suggested having a layer using more personal values that are only later related to work values. Eight participants (2 female, 6 male) answered our questions (Table 2) after they used the website. Table 3 highlights the positive and negative aspects relevant to value-reflection (other aspects not shown here related to usability issues).

Overall, from the positive comments we can see that participants liked the diversity of the reflection tools. 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) input and work-values. Several participants mentioned that it was difficult to link a value to their input or that they did not understand or like the predefined ones. This was further elaborated by P1 in a general comment: “... 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 - it feels like I’m behaving how someone else wants me to behave.” Other general comments with regard to the guidance of the system were made by P2: “At present, the system more or less prompts you to make up your values, ... 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 takes it even a step further by saying “when you chose a photo or a story the platform should tell you which value ... are you talking about.”

Additional job-related values mentioned by the participants were: cooperation, participation, contribution, empathy, motivation, innovation, change, flexibility, independence, respect, appreciation, money, pleasure, teamwork, being around other people, friendliness and, generally, social aspects of work. This shows the large number of values relevant to the career context which were not represented in the preselected values.

4.2.2. User feedback from the workshop

In the critique phase participants discussed barriers for using the website such as a lack of motivation to use the tool, too much time needed to use the tool, the gap between work and life values, lack of guidance, lack of private feel, and no option to add own values.

The metaphor generation in the second phase resulted in: therapy, meditation, consultant, career advisor, diary, stress relief, dream, conflict resolver and dating site. These metaphors highlight the different functions a value-reflection tool could fulfill. Participants used the metaphors as inspiration for the sketches (without such an instruction). Ideas ranged from concrete design suggestions (mind-mapping as a reflection tool, scrapbook or diary with handwriting for personal feel) created during the sketching to utopian ideas, e.g. a pill dispenser (for therapy) and abstract thoughts, e.g. on adding life goals and links to values.

Besides the concrete ideas other discussed topics included the user’s motivation, personality, privacy, guidance and advice. Personality was mentioned as an important aspect of a value-reflection tool. The participants discussed how important it is that the tool provides a personal and secure feeling. Similar to a diary that you use to note intimate feelings or experiences. One participant suggested a diary-like interface. Further, participants liked that the website provided several ways to reflect allowing to pick the one that suits the user’s personality best.

A discussion arose regarding the free-form diary style and guidance that should be provided by the system. 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 with less guidance it can be unclear for people what the benefit is of using such a website. However, other participants thought that too much of it can also impede the use as reflecting is an activity that is more free and personal. Too much structure would feel like the system’s values would be imposed on the user. Overall, all participants agreed that reflections should first be tagged with personal values, that a user could add 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 the user a deeper understanding about a certain value and find out whether this work-value relates to the user.

Participants also discussed in how far the system should provide new insights to the user, to surprise the user and make her learn something new about herself. A designer needs to consider to what extent the system would make assumptions about a user’s input. In any case participants preferred the system to have a certain level of transparency, i.e. that they would easily understand how the reflection tools work and how the system analyses the data. This could be done e.g. through explanations of the benefits of each reflection tool (e.g. why should I write a story?). Especially for the rather general reflection questions participants were unsure how reflecting on those would give them insights to work-related values. Thus, one suggestion was to have more personal and context-sensitive questions. In addition, one participant suggested to give immediate feedback from the system on the importance of the different values while entering data. This idea was sketched by a participant as a pie chart in which each piece represents a value which grows as soon as the value is added to a data entry. This sketch was voted as one of the best ideas in the workshop.

Last, participants discussed an integration of the website with social networks like Facebook. Such group functionality is interesting considering that the experts suggested that group discussions can support the reflection of an individual. 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 it a private tool. This was also seen as a matter of trust. The more private and secure the tool feels the more a user can trust it, a prerequisite to enter intimate data.
4.3. Online Survey

4.3.1. User characteristics and attitudes

From an analysis of correlations (using Pearson’s coefficient) between the different user characteristics measured, we found a weak significant correlation, \( r(80) = .272, p < .05 \), between the frequency of writing a diary and the level of self-reflection (obtained from the RRQ). Other emotional triggers play a big role in people’s reflection. As shown in Figure 4 all mean values are clearly above the neutral point of the scale (3). Especially photographs, songs, and artworks can inspire reflection. The lower value on diary entries may be related to the fact that not every participant writes diaries on a regular basis.

Furthermore, we found a weak significant negative correlation, \( r(80) = .223, p < .01 \), between the age of the participants and their level of rumination, which suggests that young people ruminate more than older people. This could also explain the moderate significant positive correlation, \( r(80) = .315, p < .01 \), we found between age and the construct of individual truth. Whereas older people prefer the promotion of their individual truth, younger people prefer that the system teaches them something new about their values.

To measure the reliability of the multi-item constructs in part 4 of the survey (understanding of value concept, self-knowledge values-decisions, benefits of value awareness, attitude towards value-reflection tool) we used Cronbach’s alpha. Acceptable alpha values were obtained for understanding of value concept (.636), self-knowledge values-decisions (.837), benefits of value awareness (.672) and attitude towards value-reflection tool (.790). We found a moderate significant correlation, \( r(80) = .322, p < .01 \), between the level of understanding of the value concept and people’s understanding of the relation of values to decision making. In addition, we found a strong significant correlation, \( r(80) = .442, p < .01 \), between the perceived benefits of value awareness for career choices and a positive
attitude towards using a value-reflection tool.

As shown in figure 5, more than 50% of the respondents would feel well-prepared for an upcoming job negotiation after using a value-reflection tool. Almost a third of the respondents would (also) be more self-confident and know exactly what they want. However, at the same time about a third of the participants think they would know what they already know. In addition, an analysis of responses to items 4.9 and 4.10 showed that about 40% would use a digital tool (with similar interfaces as the ones presented) to self-reflect and about 56% believe it would help many people make better decisions. The data also showed that for both questions about a third of the respondents picked the neutral point on the scale. This shows that many people are indecisive or do not see the benefits of such tools. Using an actual tool could help people form a directed opinion about the benefits.

4.3.2. User reactions to design ideas

As shown in figure 6, clear preferences were found for design idea 2 (given values vs. adding own values), 5 (general vs. personal reflection questions), 7 (separate or combined visualization of reflection input and value importance) and 8 (given value definition vs. dialog with system to see if value fits). In particular, almost 80% of the respondents prefer to be able to add their own values to the system and about 80% prefer personal questions for reflection to more general ones. Over 70% of the respondents would like to receive immediate, visible feedback about their value frequencies (i.e. how often they reflect on each value) while using a reflection tool. About 66% of the respondents prefer a dialog with the system (or a coach in the system) to understand the definitions of predefined values and whether they fit to them.
For each design idea (1-10, see table above) the percentages of people who chose design A (left column) or design B (right column) is shown.

We calculated (Pearson) correlations between the level of self-reflection and the different design options. A moderate significant negative correlation, $r(80) = -0.329$, $p < .01$, was found between self-reflection and design 7, meaning that less self-reflective people prefer immediate feedback, while for highly self-reflective people the information could be shown in separate screens. Assuming that users would become more reflective while using the tool over longer time, this preference should be considered in the design of the tool.

To investigate if we can predict any of the design choices based on personal traits we used a binary logistic regression (forward stepwise) analysis to predict each design pair with age, gender, reflection, rumination, perceived self-knowledge of values, understanding of the value concept and relation between values and decision making as covariates. For design pair 5 gender and people’s understanding of the relation of values to decision making were significant ($p < .05$) variables predicting design choice. About 95% of all females chose design B (personal reflection questions), whereas only 70% of the males chose this design. In addition, the more people understand how their values relate to decision making, the more they prefer general questions. For design pair 7 level of reflection (as explained above) and people’s understanding of the relation of values to decision making were significant ($p < .05$) variables predicting design choice. In a separate correlation analysis of the latter construct and design 7 only a very weak correlation was found. Thus, this factor can be neglected. For design pair 8 the frequency of diary writing was significant ($p < .05$) in the prediction model. A positive correlation, $r(80) = 0.251$, $p < .05$, was found, meaning that people who
write their diary more frequently prefer a dialog approach to finding out the meaning of a value and whether the value fits them. However, since the correlation was only a weak one this aspect needs to be retested.

User preferences for different levels of integration with Facebook are shown in figure 7. More than half the users would not want to integrate the tool with Facebook (or other social network) data. One fourth of the respondents would use it for importing their Facebook profile to Reflections and about a fifth would use it to create automatic reflections based on their status updates or to connect to their friends. From the participant’s comments it becomes clear that integration possibilities should be provided, but users want to be able to opt out. One participant stated “linking to Facebook should be optional, with multiple privacy options (settings to share your activity with others, or ability to only share with certain people, or linked but kept completely private-only accessing your status etc. for your personal insight...)” Another said, “I’d note that Facebook integration is probably important for some of the intended users. That said, I would not want to use it. I should be able to opt out.”

4.3.3. User comments

Participants were able to enter comments for each design sketch and after part 3. Two participants commented on the usefulness of customizing the tool to a personal look & feel (sketch pair 1). P48 said, “The question is - is this a tool solely for accomplishing its goal: reflect and learn about yourself, or is it a place for one to sit down, reflect but also enjoy the process of reflection? In the latter case customization would be more 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 to the importance of the content. “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.” Several participants commented on design choice 3 that they would like to be able to get explanations when they ask for it, but pop-ups or other forced types of explanations should be avoided. E.g. “Explanation is good, but only if I ask for it please.” (P10) Similar comments were made on the explanation offered for the overview (design choice 10), e.g. “I might want to see it the first time but have the option to dismiss and/or never show again.” (P47) Another related aspect was the way the system judges the input of a user (design choice 6). Similarly to the idea of individual truth mentioned by the experts, 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)

Although we agree with this view, over 40 % of the respondents liked that the system pointed out inconsistencies in the values linked to a reflection.

With regard to the level of personality of the questions, four participants reported that they would prefer a mix of general and personal questions, e.g. P47: “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.”

Overall comments from the users referred to the importance of trust, e.g. as P1 stated, “it has to feel intimate and trustworthy”. Another respondent commented 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. Some systems use a humanoid avatar designed as a person the target user can relate to.” (P17) The importance of trust to users is also reflected in the answers to item3.8. (“I only share reflections on myself with people I trust. The same is true for a digital system.”), which was agreed to by 79.3% of the participants (54.9% strongly agree).

Two additional ideas for functionality mentioned in the overall comments were the “evaluation of my past critical decisions” (P14) and allowing “others who can access my page to rate my values from their perspectives. (What they think my values are).” (P23) One participant raised the concern of a possible lack of continuous motivation to use the tool and mentioned several interesting questions for further research: “What would promote continued use of such a system? Beyond distinguishing what values a person currently holds important, why would such a
system help a person develop more positive values, or values that help the person grow or adapt? Is that an objective, or would the social pressure of wanting to evolve past one’s current state be of value to a system such as this?” (P34) While our focus is more on identifying existing values to make better decisions, these questions are relevant for the general design of value-reflection tools.

5. Discussion

5.1. Design Considerations

Based on the work presented in this paper we present the following five design considerations for value-reflection tools to improve decision making.

Uniqueness and Personalization The theme of uniqueness was first brought up by the experts during the interviews. One important aspect of value-reflection tools is to offer many different ways to reflect and leave it to the user to choose the way that suits her best. The first user study confirmed that users liked this. Further, it was found that users consider a personal feel important. Ideas that were brought up were being able to customize the tool, adding one’s own values and having a more diary or scrapbook style approach where users can create a personal (art-)piece of reflection. The survey confirmed that there is a strong preference to be able to add own values. One participant explained that “trying to fit very personal values in predefined boxes seems very forceful, and even condescending, dismissive of the values that might be very important, but are not on the list.” (P48) Preferences for the other two design ideas were distributed among the two design options. Thus, we can conclude that customization and diary style is based on a user’s personal preferences. They could be used as additional functionality in a value-reflection tool. In addition, regarding reflection questions, a mix of personal and general questions could be offered for males, while females could be provided mainly with personal questions, as more than 90% preferred this type of questions.

Trustworthiness, privacy, and transparency Reflecting on personal experiences and values is an intimate action, and thus when shared with others a level of trust needs to be established first. The counselors emphasized the importance of trust between counselor and client and a comfortable atmosphere that is necessary for the creation of trust. That this aspect can be transferred also to computerized systems was confirmed by the participants of the survey (ca. 80% agreed on the importance of trust to a value-reflection tool). From the participants’ comments (in the first study and also the survey) we learned that the establishment of trust is based on the feeling the user has when using the tool as well as the privacy...
and the type of interaction a tool provides. Especially when implementing group functionality, it is important to ensure that the user can set who is allowed to see what. Increasing a trustworthy feel could be achieved through transparency and user-system dialog. An example of transparency would be immediate feedback from the system when entering reflection data, as this visualizes to the user how the system’s value profile is adapted in real-time. In the survey more than 70% of the respondents were in favor of this option. In addition, many respondents favored a dialog with the system to clarify a value and see whether the value suits them.

Guidance from concrete to abstract The level of guidance that the system offers to the user was a theme mentioned first in the expert interviews and discussed in the user workshop. While the experts deem it an important aspect of helping people to get from concrete experiences to abstract value concepts, similarly, the users emphasized that it is important to understand how to get from personal reflections to related work values. One user suggestion was to have a layered approach in which first personal values (e.g. added by the user) would be identified in a reflection and then linked to work values with the help of the system. This is closely in line with value-focused thinking which suggests a differentiation of intrinsic (in this case the personal values) and instrumental values (in this case the work-values that would lead to personal values).

While we hypothesized that the level of preferred guidance could be dependent on a user’s level of reflection or rumination this could not be confirmed through the survey. However, we found that younger respondents tended to prefer that the system teaches them something new about their values, thus, guides them in their exploration of values. Furthermore a substantial amount of respondents liked the system to point out inconsistencies (>40%) and a structured approach to entering reflections (>45%). This diversity shows that balancing guidance with the open nature of reflection is difficult and needs to be considered carefully in the design of the tool.

Emotional triggers Mentioned first by the experts and confirmed by the survey, people use emotional triggers to begin a reflective process. They are more useful than asking direct questions about people’s values, which are difficult to answer due to their abstract nature. Concrete examples of emotional triggers are visual stimuli such as (e.g. value-laden) images, paintings or personally owned photographs, audio stimuli such as music, written pieces, e.g. old diary entries or poems, or other art pieces. It is important to design a tool so that each user can select her personally preferred trigger. Whereas some people like writing or looking at art, others reflect through listening to a song or the lyrics of a song.
Social network functionality Benefits of social settings for reflection were mentioned by the experts. The survey revealed a clear division of opinion towards the use of social networks together with a value-reflection tool. A bit more than half of the respondents clearly stated that they would not want such an integration at all 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 reflection. 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, e.g., provide functionality for assessment and discussion of other user’s values. Users should be able to set the privacy level of such functionality by themselves.

5.2. Critical Reflection

The work presented constitutes an exploration of digital support for value-reflection and ultimately value-focused decision making. When entering a new design domain it is important to get in-depth insights into the domain, preferably from different perspectives and through collecting different types of data. This is why we chose for a methodology that combined qualitative investigations including experts and end-users and a larger quantitative end-user survey. As digital value-reflection tools do not exist we worked closely with end-users through participatory methods to allow us to envision such tools. We believe that overall this methodology was useful in providing detailed design considerations for value-reflection tools. However, as the methodological steps built upon the results of one another a critical reflection on the outcomes is needed.

For instance, the experts interviews delivered a set of themes relevant to value-reflection and support thereof, which we tried to account for in our probe. One could assume that especially with a functional probe it is hard to get participants to think outside of what they see in the probe. Indeed, in the discussions with end-users we saw that many themes were the same as the ones that the experts had brought up, e.g. differences in which means for reflection are preferred or having trouble to get from concrete reflections to abstract values.

We noticed, however, that the end-users’ accounts were more nuanced and while they partially confirmed the expert themes, some new controversial aspects surfaced, e.g. the tension between guidance of the system and the freedom in expressing reflections and values, which also may affect the motivation of users. Tensions like this, how they would play out in a concrete tool (e.g. problems in translating concepts like trust to the digital) and concrete design ideas were the
results of the user workshop. We believe that the group setting and steps of the workshop facilitated this.

Considering the participants of the workshop, a mix of males and females would have been better, as it can be assumed that gender would have an effect on reflection. This was indicated in the survey, where the majority of females preferred personal questions while 30% of the males preferred more abstract questions. In the survey we had more balanced group of participants well reflecting our target group of young professionals.

Generally, it would have been beneficial to conduct several user workshops and include more end-users from the first phase and the experts. (Limited time and scheduling problems made this impossible for us.) Currently the design ideas and themes tested in the survey were based on a small set of participants. While this small number of people allowed us to consider ideas in more depth, it may have limited us in finding all relevant factors. As a result we cannot claim the list considerations to be exhaustive. Several other workshops or in-depth user interviews could reveal more factors that may be of relevance.

Another limitation was that the design sketches presented in the survey were static and thus the exact interaction was up for the respondent to imagine. We do not believe, this led to any major problems as the focus lay more on testing ideas instead of concrete implementations. However, animated examples of ideas or even a new set of interactive prototypes could provide more nuanced user preferences. In addition, some of the data from part 4 of the survey was inconclusive and participants were not all convinced of the benefit of the envisioned tool. Testing several prototypes and using a final prototype over longer time could mitigate some of the users’ doubts and give more conclusive data with respect to people’s attitudes towards value-reflection and support tools.

Last, our work gave insights on our theoretical concepts. Especially with regard to the value concept we found that people considered it hard to understand given values and link them to experiences or thoughts. However, it seemed that it would be easier for them to add their own value expressions and then have the tool help mapping them to work-related values. This indicates that the difficulty may lay in articulating rather than reflecting. Furthermore, it seems that the tools supported reflection on fundamental values that need to be mapped to mean values for the given decision context (i.e. career values that can lead to personal values relevant for all aspects in life). In how far the decision making will be improved by assessing values cannot be concluded yet, based on our data. This will be part of the future work.
6. Conclusions and future research

According to the best of our knowledge there are currently no digital tools dedicated to value-reflection. Furthermore, decision support systems research has not yet focused on the integrating value-reflection in existing tools. However, we argue based on Keeney’s model of value-focused thinking that supporting people in value-reflection, in particular with mobile tools, is an important direction to enhance people’s decision making on major life choices.

We have presented a first exploration of this area using a probe based on expert knowledge and design sketches to trigger end-user feedback. Our methodology was focused on the one hand on idea creation through close collaboration with experts and end-users and on the other hand on reaching out to a large population through an online survey. Based on our results we have compiled a preliminary set of design considerations for value-reflection tools. We believe our work is a first contribution that other researchers in HCI and related fields can build upon.

We envision the following future work. First of all, more creative workshops similar to ours should be conducted in order to gather a larger range of issues and concrete ideas. It needs to be seen if the set of considerations is complete or needs to be expanded. Such workshops should be followed by the implementation of several design alternatives of a value-reflection tool to be tested by end-users. An advanced version of such a tool would also aid in structuring the identified values into fundamental and mean values and support deliberation on value trade-offs.

The final design should be tested in a longitudinal study because has to be seen over time in how far these tools can motivate users to achieve awareness, enhance decision making or lead to behavioral changes. Especially, motivational aspects should be investigated further, as a reflection tool can only be useful if the user uses it on a regular basis. Last, the integration into existing or new DSS needs to be accomplished.

References


Highlights

- Reflection on personal values is beneficial in life-decision making.
- We present user-centered exploration on creating tools for value-reflection.
- Several studies with experts and users were conducted to gain insights in value-reflection.
- We developed a probe of a value-reflection website for job choices.
- We present five design considerations for digital value-reflection tools.
Choose a tool to use for a reflection:

- Storytelling
- Symbolic Thinking
- Association Cards
- Reflection Questions

Thinking about these things makes me: 

-  

What are the important values that may play a role:

- Functional competence
- Managerial competence
- Independence
- Security
- Entrepreneurial creativity
- Service orientation
- Challenge
- Lifestyle

What important things does it remind you of?

- Art
- Nature
- Family
- Travel
- Health

What can I learn and do?
Describe this image:
A woman stretching her arms in the air. Looks like she is at the ocean.

What important things does it remind you of?
Being at the ocean, which usually makes me feel relaxed and free

Thinking about these things makes me:

What are the important values that may play a role?
- functional competence
- managerial competence
- independence
- security
- entrepreneurial creativity
- service orientation
- challenge
- lifestyle

Save my reflection