Aware but not in Control

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A Qualitative Value Analysis of the Effects of New Technologies

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Abstract. The wide distribution of information and communication technologies (ICTs) has affected our lives in the working environment as well as in private and social contexts and has done so not only in a positive, but also threatening way. Researchers and scholars have therefore called for a sustainable and value-based design of technologies. However, in order to propose better designs, we first need to understand how ICTs affect users. While many studies have focused on the effects of the internet, smartphones, and social media, reported results suggest that the influences of these technologies are complex and often depend on contextual factors. This study aims to provide a starting point for future value-based designs of ICTs by offering insights on how students, as representatives for regular users of new technologies, experience the changes ICTs have brought to their lives. A qualitative content analysis of twelve in-depth, semi-structured interviews identifies values that flourish with ICTs but also discovers paradoxical effects: ICTs affect many of these values also in a negative way. Results indicate that users of ICTs are aware of negative effects, but lack the control to change their own behavior. Our findings point out that users need better protection and motivate the adoption of ethical design frameworks for ICTs.

Keywords: ICTs, value-based design, interview study, awareness, control

1 Introduction

The advent of the internet and the widespread dissemination of new information and communication technologies (ICTs) have changed our lives in the working environment as well as in private and social contexts. As ICTs are widely distributed and used, they affect not only individuals but society as a whole. Salehan and Negahban [1] discuss how excessive use of mobile applications can be harmful for society. They conclude that mobile application designers should think about features that prevent users from becoming addicted and point to the responsibility of governments and non-profit organizations. In recent years, researchers, scholars, designers, and human rights activists have called for a more sustainable and ethical design of ICTs [2–4], for example, by putting human values into the center of technological designs. But in order to design and produce sustainable technologies that protect human values and resources, we first have to understand what harms ICTs can cause. Only then can we

consider “nonfunctional system requirements” such as the protection of values on top of functional requirements [4].

Existing research focuses on the negative effects of the internet [5–8], social media [1, 9–11] and cell phones [1, 12–14]. However, literature reviews have pointed out that reported results are contradictory as studies suggest harmful but also beneficial effects [15] and raise more questions than they can answer [16] because of methodological and theoretical shortcomings. Authors of review papers point to the “wealth of contradictory evidence suggesting both harmful and beneficial aspects of SMTs [social media technologies]” [15] and the need for further research to clear up these contradictions [17]. For example, contradictory results have been presented regarding the question whether internet access and use makes us happy [18] or decreases our level of happiness [9] and have also been discussed in the context of email and stress [19]. Often, results are difficult to compare and a holistic consistent insight into the true effects are missing. A recent literature review [17] summarizes the plethora of theoretical and conceptual frameworks that have been suggested for the adoption and use of social media. It discovered that previous studies used different constructs as antecedents, mediators, moderators, or outcomes of user behavior and its effects. The authors of the review article conclude that future research should address both positive and negative effects of ICTs. Others [20] stress that more research is needed that looks into users’ motivations and their real life contexts. This is consistent with conclusions regarding prior research, namely that it “does not examine the drivers and outcomes of social-media use” [16]. Therefore, to better understand when internet use becomes pathological and what causes maladaptive internet use, we need to understand both the motivations for using ICTs [20] as well as the effects of ICTs.

Studies that have focused on the effects of ICTs rarely used values as their theoretical framework. However, if we want value sensitive [21] or value-based design [4] of ICTs, we have to identify the values that are fostered by ICTs as well as values that are harmed and could be protected by better designed technologies. In the empirical study we are presenting below, our goal was to better understand which values are fostered and undermined by ICTs used by students on a regular basis. More precisely, we interviewed 12 students on their use of smartphones and social media technologies and tried to elicit the value space that unfolds based on this use.

1.1 Effects of ICTs

A review of existing literature shows that the use of ICTs affects many value dimensions, including individuals’ psychological and physiological wellbeing, the efficiency in their professional life as well as their freedom, which is reduced through online addiction. Furthermore, it presents factors that determine the effects of ICTs, such as the motivations of the users and the purpose and context of their use of ICTs.

Social media use has been associated with higher technostress, lower happiness, and worse performance [9]. Similar results have been observed for high cell phone use, which has been associated with worse academic performance as well as with higher anxiety and lower life satisfaction in college students [22]. These results were supported in subsequent studies of the same research group, which additionally found

an association with poor sleep quality [23] and higher distress during leisure [12]. Stress has also been associated with email [19]. However, the association between stress and email cannot be explained by considering solely "material factors", e.g., the number of received emails and the workload they create. Rather, social norms that pressure individuals into keeping up with their e-mail load and being informed about new messages cause the perception of email as a symbol of stress [19].

Social factors play a role in the use of the internet and social media, too. For example, there seems to be a vicious cycle between internet addiction and loneliness [7]: excessive and unhealthy use of the internet increases feelings of loneliness over time, and loneliness then decreases offline social contacts – as people retreat. Therefore, the positive counter-effects of strong offline social contacts cannot unfold, and internet addiction continues to increase loneliness. The authors conclude that online contacts cannot replace offline contacts [7]. This claim is supported by other research [24], which discovered that the negative impact of online interactions on subjective wellbeing is greater than the positive impact of offline social networks. Correspondingly, it was found that smartphone use reduces the quality of face-to-face interactions and thus their positive impact on wellbeing [25].

It is not surprising then that social media use has been associated with decreased subjective wellbeing in a longitudinal study [24] and with depression in different age groups [5, 26]. In a study with young adults [27], those participants who used multiple social media platforms had substantially higher odds to experience symptoms of depression and anxiety. Thus, it is presumably the *number* of used social media platforms rather than the *time spent* on individual platforms that causes the association with these psychological symptoms.

There is growing research interest in framing excessive use of ICTs as a form of addiction in order to capture better its effects on the individual. However, theories propose different objects, causes, and consequences of addiction and set the level of pathology at different levels [8, 20, 28–33]. No general theory has been agreed on yet and it is not clear why people keep using the internet despite its negative effects [20]. This unclear theoretical grounding of empirical research makes it difficult to produce consistent findings. Therefore, researchers work on redefining the concept of addiction with regard to digital services and devices and reconsider the evaluation of the effects that using ICTs has on us.

In this context, arguments against the dismissal of excessive internet use as pathological are especially noteworthy. Researchers emphasize that the use of ICTs should not be considered in isolation. Rather, one needs to take into account several additional factors. For example, the outcomes of ICTs depend on the individual characteristics of users, such as "who they are, with whom they use the media, and for what purposes" [33]. Furthermore, it is important to look into users' motivations and the potential of online activities to compensate for psychosocial problems *before* framing user behavior as pathological [20]. Arguments in this direction stress that it is difficult to define objective criteria, as it is the individual user's subjective experiences, resources, and environments that determine whether internet use is healthy or unhealthy [32].

To summarize, whether ICTs exert positive or negative effects is often rather subjective than objective. It seems that in the end, it is the individual who determines whether he or she is using the internet in a healthy or pathological way [32]. We conclude that any research or design goals that considers effects on the users should take into account this subjective dimension, e.g., by including individual users in qualitative research and design studies.

1.2 Value-based approaches to a sustainable and ethical design of technologies

Values reflect "what a person or group of people consider important in life" [21]. They are "desirable transsituational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity" [34]. Maslow [35] proposed physiological needs, safety needs, love needs, esteem needs, and the need for self-actualization in his theory of motivation. Spiekermann [4] aligns values identified in psychology and philosophy [36, 37] with Maslow's hierarchy of needs. The result is a structured arrangement of select values, which she then conceptually investigates for value sensitive design purposes (see figure 1).

Besides this work, many alternative lists of values relevant for ICTs have been proposed, e.g., by Friedman, Kahn, and Borning [21]. Yet, value lists can be misleading as values are contextually bound. The digital devices and services used by people in different situations bear the values that unfold [38]. And it is because of these individual predispositions that some values unfold more than others for a respective person, even if he or she uses the same technology as someone else [38]. This is what the research discussed above shows very well.

That said, there are certainly dispositions in the mentioned technologies that incentivize typical reactions on the side of the users. For instance, it has been suggested that today's digital technologies, such as smartphones and social media, are explicitly designed to foster addiction and hence undermine mental freedom [39, 40]. In the study presented below we identify and discuss a number of values that seem to be recurring among various users and hence may be triggered by the technological designs chosen.

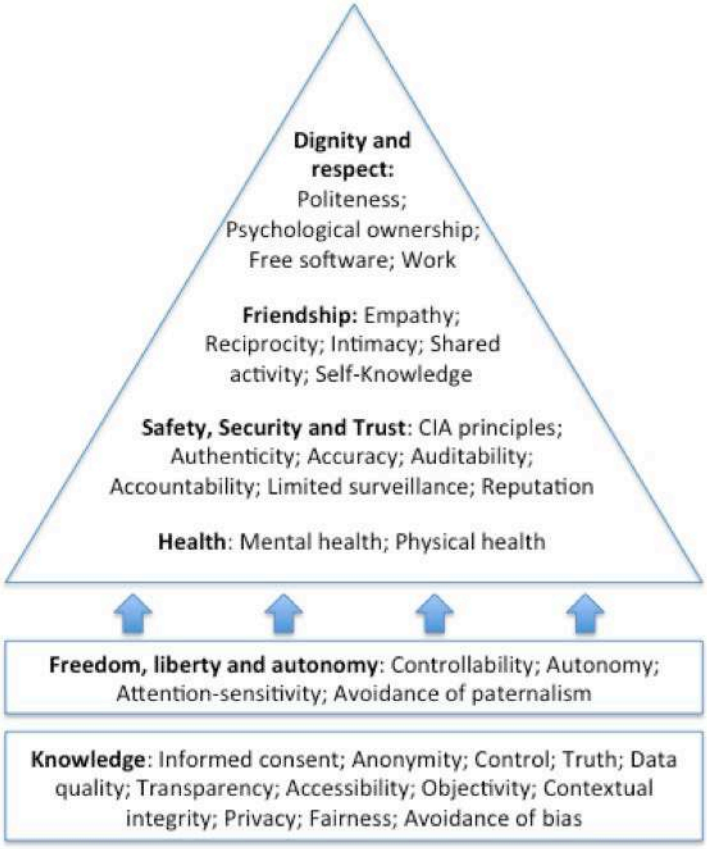

Fig. 1. A hierarchy of values relevant for ICTs (Source: Spiekermann [4], page 150)

ICTs do not only have an impact on values. There are certain preconditions that have to be met in order to allow for values to unfold. Maslow named freedom and cognitive capacities as preconditions for the satisfaction of basic needs [41]. We want to take up this differentiation and include preconditions here as "resources". In Davis' definition of healthy internet use[1] [32], time, cognitive wellbeing, behavioral wellbeing, and identity appear as individual psychological resources that can be affected by the use of ICTs. Psychological resources are linked to values, as without these resources, values cannot unfold. For instance, if someone is tired, the resources that are necessary to build friendship are missing. If someone is constantly distracted, it is

[1] "Healthy Internet refers to using the Internet for an expressed purpose in a reasonable amount of time without cognitive or behavioral discomfort. Healthy Internet users can separate Internet communication with real life communication. They employ the Internet as a helpful tool rather than a source of identity. There is no specific time limit, nor is there any behavioral benchmark."

hard to build knowledge, etc. Therefore, we look into how ICTs affect not only human values that matter to users, but also their psychological resources.

1.3 Aim of this study

This study takes a qualitative approach to explore the value space impacted by ICTs. Looking at prior research in the literature, we made two observations. On the one hand, high use of ICTs is often associated with addictive behavior, which explains observed negative effects with a lack of control. On the other hand, researchers neither agree on the specific effects of ICTs and their direction (positive or negative), nor the constructs of addiction and problematic use of ICTs.

Acknowledging the contextual sensitivity of values, Friedman et al. [21] suggest semi-structured interviews for the empirical investigation of values relevant for stakeholders. Specifically, they suggest probing the interview partners' reasoning and asking about values not only directly, but also indirectly – for example, by addressing a hypothetical situation or common events in the interview partners' everyday lives. In order to account for these considerations, the present study takes a qualitative approach to explore values in the context of ICTs. In the European Union, almost all (96%) young people and individuals with a higher level of education use the internet regularly [42]. Therefore, this study looks into how students, as representative users of new technologies, experience their use of ICTs. In doing so, this paper wants to add to existing literature by offering further insights on the users' subjective experience and perception of values.

The aim of this study is twofold. First, it aims to identify values that are currently fostered by ICTs as well as values that need to be better protected in future designs. Second, it takes into account that there is not yet a generally accepted theoretical framework that allows to differentiate pathological from non-pathological use of ICTs. Therefore, this study looks into two core factors that can help to better understand the current use of ICTs. On the one hand, it tries to find out to what extent users of ICTs are aware of their own usage and whether they are able to detect changes that have occurred because of it. On the other hand, it explores how psychological resources are affected by the use of ICTs. Finally, we want to understand to what extent students are still in control over their own resources and hence the value space that is accessible to them. To operationalize perceived control over ICTs, we explore which measures are proposed by students to meet negative influences of ICTs.

To summarize, this study tries to answer the following research questions:

- Which values are fostered by ICTs?
- Which values are undermined by ICTs?
- To what extent does use of ICTs affect psychological resources?
- Are users of ICTs aware of the effects of their usage behavior?
- Are users of ICTs in control of their usage behavior?

2 Method

Procedure. In-depth interviews were conducted at the Vienna University of Economics and Business in 2017. The sample was composed of five German native speakers and seven participants with a different native language. Therefore, the interviews were conducted in German or English, according to the personal preference of each participant. Interviews were audio-recorded and transcribed. Participants gave informed consent to their participation in the study, the recording of the interviews and the subsequent anonymized data analysis.

Sample. Participants (N = 12) were between 20 and 28 years old (M = 23.9, SD = 2.5). All of them were undergraduate students at the Vienna University of Economics and Business. The sample showed an equal distribution of gender, with six female and six male participants.

Interview Guide. We conducted semi-structured interviews, that is, interviews roughly followed prepared questions. At the beginning, we briefly introduced the participants to the topic and specific terms. They were instructed to think about ICTs as referring to new technologies and (social) media and we suggested the smartphone as a symbolic representation for these technologies. The first questions targeted costs and benefits or advantages and disadvantages of everyday use of ICTs. In case our interview partners found it difficult to come up with ideas, we suggested thinking of their daily routines and behaviors in different contexts. Subsequently we asked if they could think of anything that they would like to change about their own or other people's use of ICTs. Two scenarios were offered. We asked them what they would change if they were God, that is, an almighty power with the ability to change anything with immediate effect. In an alternative phrasing, we asked about the changes or measures they would suggest if they had to come up with a guideline for the following year as "Minister of Technology". We concluded by asking if they had any comments or wanted to share anything else.

Analyses. After the recorded interviews had been transcribed, we conducted a summarizing content analysis [43]. In this process, the qualitative data is subjected to several stages of analysis, which are described in the following section. The goal is to "reduce a large volume of material to a manageable level, but in so doing retaining the essential content" [43].

First, relevant units of analysis were identified. A text passage or expression was considered relevant if it hinted at a value or psychological resource that was fostered or harmed by ICTs. Measures and changes that were proposed or desired were also coded as relevant units. In a second step, all identified units were paraphrased, focusing only on relevant content within the unit ("Paraphrasing"). Text passages from German interviews were paraphrased in English. In a third step, a higher level of abstraction was obtained by summarizing the most important points expressed in the paraphrased text passages ("Generalization"). These generalized statements were then selected and the level of abstraction was further increased ("First reduction"). Through binding, integration and construction, general statements and expressions were formulated and finally arranged within a system of categories ("Second reduction").

Once the system of categories depicting the effects of ICTs had been established, each set of categories was associated with a value or psychological resource. Proposed measures and changes were considered separately.

3 Results

The following sections present a summary of the values and resources impacted by ICTs. The last section displays the measures and changes that were proposed or desired by our interview partners. Wherever a quote from the interviews is presented, an ID is given in squared brackets that identifies every interview partner with a character ("A" to "L"), followed by the number of the interviewee's statement in the interview analysis database.

3.1 Values fostered by ICTs

When talking about positive effects of ICTs, study participants directly referred to smartphones, laptops, computers, internet, and mobile internet as specific technologies and devices in their examples. Next to general applications like a browser and email, they also mentioned the following applications in their interviews: Facebook, Facebook Messenger, Google Drive, Google Maps, Instagram, Apple's navigation app Maps, Microsoft Word, Nike sports app, Playtube, Qando (an Austrian public transportation app), Snapchat, Skype, Tinder, WhatsApp, and Youtube.

The following sections present and describe values fostered by ICTs in more detail, based on summaries of the expressions as well as exemplary statements from our interview partners. The core values fostered by ICTs go beyond convenience, efficiency, and information accessibility as they also include the unleashing of belongingness and joy.

Information accessibility. ICTs are a source of information. Being equipped with a smartphone or laptop that has internet connection, students feel that they have easier, faster, and better access to information than it was ever possible before. Thinking especially about (social) media, students feel that they get information about everything in the world, all of the time. They also appreciate that they encounter new opportunities by chance as news or job possibilities pop up while browsing social media.

- [L #1] "Well, information is more available. We can find out whatever we want sooner than we were able to, I don't know, ten or fifteen years ago. So that would be the greatest advantage."

Belongingness. ICTs facilitate communication and connection to people. Many of the students' comments focused on how their smartphones, instant messaging, and social media applications allow them to feel constantly connected to their family, friends and colleagues. They like that they can share their experiences instantaneously, always reach people, and keep in touch with relatives or friends who live far away. They feel as if they can be everywhere, informed about everything, and therefore do not feel left out.

- [I #6] "….even if you're not there, you know everything, you feel like you're there, because, you know, you're kind of like - everywhere, you can be – everywhere"

Convenience and efficiency. Perceived convenience comes from the perception that ICTs increase efficiency, help to structure everyday-life, and make everything easier. For example, ICTs allow organizing things last-minute, like buying concert tickets, and buying or booking stuff online. ICTs help to better structure and organize work and everyday-life. They save time as communication is faster, getting from one place to another can be organized easily and more efficiently, and information is better available. Apps that provide a timetable for public transport and offer navigation are especially appreciated in this context.

- [G #1] "I have to say I get lost incredibly easily, and I see with the mobile phone, it navigates me somewhere, where I don't know the place at all. So for me the navigation system on the mobile phone is one of the two things that I find fantastic."

Joy. ICTs are a source of entertainment and increase the joy when doing sports. They enable better access to music, movies, TV series and news. Several students especially appreciate that they can listen to music with their phones.

- [A #9] "One of the most important things regarding my phone. . . is music, I listen to a lot of music, also on the go"

One study participant was particularly fascinated by the advantages of smartphone apps for doing sports. He referred to an application that plays music and tracks you while running. It offers music with different paces that adapts to your personal speed and motivates you with cheers when you reach a specific milestone. GPS connection allows comparing personal results, which can then also be shared on social media and platforms.

3.2 Values undermined by ICTs

Study participants named negative influences of ICTs on friendships and social relations as well as on knowledge and specific competences.

Friendship. ICTs digitalize friendships and reduce personal contact. Our interview partners feel that the role that ICTs play in their social lives noticeably impacts their personal relationships. They see the personal aspect reduced and communication altered through social networks and instant messages. First, students are bored by the many postings they see from their friends online. Second, when they meet with their friends in person – which they notice to happen less often as most of the interactions take place in the digital world – they often do not know what to talk about, as what they have experienced in the past days had already been discussed online. Third, they criticize that they cannot have normal conversations anymore as their conversation partners are distracted by their phones and do not listen.

- [D #6] "Real friendships suffer"
- [E #15] "The fun of just being with your friends is not enough anymore"

Knowledge. Dependence on ICTs causes loss of competences. Relating to the aforementioned benefits of efficient organization of everyday-life as well as navigation and public transport, students become aware of their dependence on technology. They realize that they lose the competence of getting along on their own by relying on having their smartphone and constant internet connection always. Without their smartphone, they feel as if a part of their body is missing. They feel incompetent, lonely, and are afraid of getting lost.

- [L #10] “When you lose your phone you feel useless and disconnected”

Also, they feel that we are all becoming “more stupid”. In their opinion, we rely on technology too much, which is why our concentration and creativity decrease and our abilities, such as doing mental calculations or reading long texts, are lost. Moreover, we do not solve problems or find answers on our own anymore.

3.3 Psychological resources depleted by ICTs

Several psychological resources are negatively affected by ICTs. ICTs seem to impede control and autonomy by creating addiction, they cause stress and social pressure, are distracting, and waste time.

Loss of control and autonomy. Negative effects on individuals that came up repeatedly were symptoms of addiction combined with perceived loss of control. Participants felt that they spent too much time on their phones, watching TV series, engaging in online shopping or browsing social media platforms. Once they start, they find it very hard or even impossible to stop, which creates the feeling that they are not in control of their own behavior. They also spoke of habits that they cannot change, such as taking their laptop to bed with them or falling asleep and waking up with their smartphones.

- [E #13] “What I'm noticing with myself and with my friends is that.... we cannot control it - that is the problem”

Reachability and social pressure. Students feel that they have to be reachable all of the time on a number of different channels and reply to messages within a short time. They fear that other people will worry or feel neglected if they are not reachable or do not reply, which gives them a bad feeling. But the vicious circle continues: they themselves do not want to miss out on anything that their friends post and start to worry or feel offended if their friends do not reply. These mutual expectations produce a social norm of reachability.

- [C #31] “People expect from you all of the time that you reply immediately, this is really, I find this very annoying”

Distraction. Students feel distracted by their smartphones and other devices with internet connection. At work, incoming emails disrupt their concentration. When their phone or somebody else’s phone lights up or makes a noise when receiving a message or call, their attention is drawn towards it. Whatever allows them to connect with

other people or to get to information easily and quickly also presents a source of distraction. Even the mere possibility of somebody trying to reach them makes them nervous. They want to check what messages they have received, sometimes because they do not want to miss out on anything, sometimes because they look for an excuse to stop working.

- [H #11] “For example, I'm writing my homework, I'm submitting my assignments and it's, yeah, then it's like I need to check my phone”

ICTs waste time. While ICTs are convenient to use and allow an efficient organization of everyday life, they can waste one’s time, especially with social media and playing games.

- [C #27] “In the evening we don't work, we watch movies, videos, listen to music, we write for nothing, we chat”

3.4 Societal resources depleted by ICTs

Our resources cannot only be depleted at the individual level; some issues with ICTs directly play out at the societal level. The issues that came up in the interviews focus on the power imbalance between users and companies that produce, offer, and sell ICTs.

ICTs create issues concerning information privacy. Students fear a lack of data protection and intrusion of digital privacy because big corporations gather a lot of information about their users. One issue they discussed is big data and how a whole profile can be built based on digital information about a person. Another issue are social platforms that share the data of the users and “spy” on them in instant messaging services.

- [F #5] “Facebook, for example, is a real data-collection and also data-selling machine, and this is something that I keep in mind”

ICTs affect users’ perception of reality. Some students worry about the information distribution through ICTs. Social networks and media often create a restricted representation of the real world, leading to an ignorance of real world problems such as global warming and world hunger. As users become distributors of information, the reliability of information sources is often not easy to verify. Students criticize especially that social network platforms do not take the effects of the distribution of false information seriously enough.

- [A #26] “You make up your own realities by simply blocking out those things in the world, that are heading into a bad direction”

ICTs’ powerful position within our society. Some students reflected on the impact of ICTs on society as a whole, which they see critically.

- [E #21] “I think, if we continue using it this way, it will seriously do us more harm than good”

Their reflections mostly focused on the consequences of increasing automation and progress in the development of intelligent systems. Cyber-unemployment and self-driving cars were some of the phenomena they named next to a growing belief in the infallibility of technological systems and the attribution of a human status to new technological devices in homes. They stress that societal measures have to be taken, such as an adaptation of our tax systems and careful design considerations.

3.5 Desired changes and missed activities

One aim of this paper was to identify whether users are aware of the effects of ICTs. The activities that our interview partners miss out on because of ICTs seem to hint at an unsuccessful anchoring of users in the real world that they are aware of and reflect upon when thinking about what they would like to change. Students express that through the widespread use of social media, the experience of a moment loses its value if it is not digitally shared. At the same time, they enlist a variety of activities that they could do if there was no internet connection or social media. These range from staying with their family to going outside to play, traveling, meeting friends in person, appreciating the moment, and resting and sleeping. Often, students nostalgically reported memories of their childhood or youth when they reflected on these missed activities.

- [D #6] "When I was kid we were going outside [sic] and we met outside without messaging ourselves or telling the time or date or day so basically we just went outside and we knew that some friends are waiting there and we could play or do whatever we wanted and because of the technology we are staying at home, playing PC games or internet and basically those bonds that people have had earlier are somehow losing themselves."

With these missed activities, we can identify rest and sleep, friendship, and being in nature as additional values that are harmed by ICTs.

3.6 Proposed measures

We asked students what they would like to change about other people's behavior and to come up with measures that they would put forward as minister of technology. Some of the measures that they proposed or wished for were quite drastic. Students wanted to completely abolish and "delete" social media, the idea of smartphones, and any technology that would not let people think on their own. One person was especially concerned about the distribution of information on Facebook and wished to close down Facebook to protect its users from getting stuck in a filter bubble or being spied on.

The measure that was most often mentioned was the introduction of an age limit for the use of smartphones, the internet, social networks, and computer games. Age limits were set differently, ranging from 10 to 16 years. While some students allowed

smartphones only after high school, they did not consider normal cell phones without internet connection as problematic.

Internet- or phone-free days or time periods were wished for by the students themselves as well as proposed from the imagined position of a minister of technology. These measures differed in their strictness, ranging from proposed guidelines for the population to restrictions of internet connection, e.g., in the evenings from 9 p.m. onwards. Often, students mentioned these measures in relation with the activities they feel to miss out on. For example, they hoped that internet-free periods of time would decrease the social pressure to reply immediately and increase the chances that they went outside to meet someone in person.

Some measures focused on better education and awareness in the population as part of school teaching, others specifically targeted adults who had not grown up with technologies and should be supported in their use of technologies. Next to specific IT trainings and awareness for the value of personal data, some students proposed that schoolchildren and adults should reflect about the role of technology within our society.

Especially those students who were concerned about the distribution of information and privacy wished for measures that specifically targeted social media platforms or networks. They wanted harder sanctions for data breaches by companies and better regulations for digital copyright violations. Companies offering messaging services should be closely examined to check for privacy violations and social networks should leave more control to the user, which also means less personalization.

4 Discussion

This study explored the motivations for using ICTs and identified values that are fostered by ICTs. Results of the summarizing content analysis present a paradoxical picture: ICTs also have a negative impact, not only by harming the same values they foster, but also by depleting psychological and societal resources that are necessary to perceive and appreciate values in the first place. Our findings indicate that the negative influences of ICTs on users have not yet been fully understood because of this complex interplay.

4.1 Paradoxical effects of ICTs

While it is valuable to users to have better digital interconnectedness, ICTs act as technological mediators, which change the nature of friendships and move interactions to the digital world. Personal reunions decrease and real interactions are perceived as unsatisfactory. Moreover, being connected and reachable all of the time has the negative effects of inducing a fear of missing out, evoking addictive behaviors as well as stress.

A similar paradoxical effect can be observed for the values of information accessibility, efficiency and convenience. The beneficial functions of ICTs present a great potential to make users addicted [1]. It is this dependence on technology that is creat-

ed, which, in turn, results in a loss of competences. As all information can be found on the internet, there is no need to remember facts anymore. Instead of solving problems or finding answers to questions on our own, we go back to support online. Any cell phone has a calculator, therefore we don't need to do mental calculations. And the constant stream of short social media entries, postings and instant messages causes impatience when confronted with longer texts. It seems that with ICTs, users trade long-term knowledge, creativity, and cognitive abilities with short-time information.

Time seems to present a third paradox in the context of ICTs. Our interview partners expressed that while technologies save our time, they also waste our time. This is interesting to consider, as time also plays an important factor in the consideration of internet addiction or problematic internet use. Problematic internet use is predicted by a deep absorption and engagement with online activities that causes an individual to lose track of time [44] and is associated with wasting time online without a purpose [32]. Therefore, saving time with online communication and information appears to lie close to wasting time because of a too deep absorption in online activities.

A paradox on a higher level is the fear of missing out, which is experienced in two ways. One reason for the addictive power of smartphones is the desire to be informed about what your friends are doing and to not be left out in any activities. This has been termed the "Fear of Missing Out" [45]. Interestingly, students do not only report a fear of missing out on the digital world. It seems that through their engagement in the digital world, a fear of missing out on the real world is created. This becomes apparent in the changes they desire. They miss being outside in nature, experiencing the moment, real interactions with their friends, as well as sleep and rest. The increasing importance of the digital seems to cause a desire for experiencing the real world again.

4.2 Loss of resources and control

It is interesting to see that our study participants mention activities and values they fear to miss out on in the real world because of their engagement in the digital world, but do not react by decreasing their use of ICTs. Spending a lot of time online and less time on other pleasurable activities, isolation from friends in favor of online friendships as well as a sense of guilt [32] are typical symptoms of internet addiction and seem to describe the experience of our interview partners. Other symptoms of internet addiction such as the loss of control and ongoing use in spite of negative effects [20] fit equally well to their reported experiences. Insights gained from the interviews suggest that with digital experiences and interactions a bubble is created. This bubble restrains users in their freedom and autonomy by causing distractions, addictive behaviors, and stress.

Our interview partners are fully aware of this going on, but feel incapable of reacting. They expressed the wish to stop, reduce, or change their use, but they do not feel in control of their own behavior and bring up other responsible entities with the legal and societal measures they propose. Looking at these measures, it is easy to see that students struggle with the amount of time they spend with new technologies (which is probably why they proposed technology-free periods of time). As they themselves

find it very difficult to control their own behavior, they suggest other responsible entities, such as the government and schools. In some cases, the technologies themselves were held responsible, which is why students wanted to erase some of these technologies, such as social network platforms. They feel the need to regulate the use of ICTs at an early stage, targeting children and adolescents, and to raise awareness in the general population. As some students expressed in the interviews, early intervention and better awareness could prevent the development of addiction to ICTs.

Certain preconditions have to be met to enable human development: psychological as well as societal resources have to be protected by not allowing ICTs to put users into a situation in which they feel distracted, nervous, incompetent, and without control. These key human resources are indispensable for higher needs and values to flourish. However, findings of this study suggest that these resources are threatened.

4.3 Conclusion

We need to move towards a more critical and holistic view on technology and its role within our lives. We should be mindful of the trend that seems to become apparent with the ongoing widespread use of ICTs: human values that are dear to us are pushed into the background while at the same time important resources and preconditions for the perception of these values are depleted. New technologies do not only bring about beneficial changes. Therefore, we have to take into account potential negative effects on the individual, social, and societal level before products are launched. That is, we have to put more effort into the design phase. Design methods that focus on human values seem especially promising in that regard.

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