

# Bridging the gender and generation gap by ICT applying a participatory design process

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**Abstract** In this article, we present an interdisciplinary research and design project on gender and diversity aspects in the development of information and communication technology (ICT). We take this project as a case study in order to show how we dealt with the digital divide. The digital divide denotes a knowledge and communication gap that finally leads to social disintegration caused by unequal ownership of information and communication technology (ICT) and unequally distributed access to the online world. It separates the society into so-called onliners and “non-liners”. The digital divide is caused by social factors like age, gender, education, and local infrastructure (Arnhold in *Digital Divide. Zugangs-oder Wissenskluff?* Verlag Reinhard Fischer, München, 2003; Gehrke in *Digitale Teilung—Digitale Integration. Perspektiven der Internetnutzung.* ecmc Working Paper, München, 2004; Initiative D21, TNS Infratest (ed) in *(N)Onliner Atlas 2010. Eine Topografie des digitalen Grabens durch Deutschland. Nutzung und Nichtnutzung des Internets, Strukturen und regionale Verteilung,*

2010; Initiative D21, TNS Infratest (ed) in *Die digitale Gesellschaft in Deutschland—Sechs Nutzertypen im Vergleich. Eine Sonderstudie im Rahmen des (No)Onliner Atlas 2010,* 2010; Statistisches Bundesamt (ed) in *Wirtschaftsrechnungen. Private Haushalte in der Informationsgesellschaft Nutzung von Informations und Kommunikationstechnologien,* Wiesbaden, 2010; Statistisches Bundesamt (ed) in *Informationsgesellschaft in Deutschland,* Wiesbaden, 2009). In our case study, we particularly show how we dealt with the aspects of age and gender on a methodological and practical level. Finally, we present a design concept based on research results explicitly considering age- or female-induced ICT demands and preferences. With this concept, we show how we attempt to enhance social equality and inclusion based on distributed responsibilities within local social networks.

**Keywords** Gender · Generation · Participatory design research · Co-creation

## 1 Introduction

In this article, we present an interdisciplinary research and design project that aims at developing ICT services and products considering the aspect of age and gender. We take it as a case study in order to show how we contribute to reduce the digital divide on a methodological and practical level.

The digital divide denotes a phenomenon of social disintegration that derives from the unequal ownership and distribution of information and communication technology and the unequal access to information and communication sources in the Internet [1–6]. This gap is essentially influenced by the social factors of age, gender, education, and

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regional infrastructure. It still exists in Germany<sup>1</sup> despite of its high level of economical and technological development [3–6].

In our project, we approached the problem of the digital divide from three perspectives: gender, age, and education. We draw attention to a still marginalized group referring to technological research and development: women. We aimed at the development of ICT services and applications that explicitly consider female perspectives. For this reason, we established a user-centered design process [7–12] instead of a technically driven one and put women of different age, educational and cultural backgrounds in the center of attention. Our hypotheses were:

- Women are very heterogeneous and demanding users who are able to introduce multifaceted perspectives on ICT applications
- Corresponding to certain life phases and their circumstances, age also matters significantly when examining the usage of ICT—in some cases even more than the aspect of gender itself

In our project, we tried to bridge three different gaps: the gender gap, the generation gap, and the gap between experts and laymen within the development process. In the following, we give a brief overview of the research and design process, the applied methods and tools in order to show how we dealt with the digital divide on a methodological level. We structure the research results according to the focus on gender and age in order to answer the questions:

- How do age (according to certain life phases and circumstances) and gender influence the usage of ICT?
- How can ICT overcome the digital divide caused by these aspects?

Finally, we present one of our design concepts. It illustrates exemplarily how ICT can mediate aspects of age and gender to strengthen the reliability and relatedness of local communities aiming at social equality, participation, and inclusion.

## 2 Problem and knowledge gap

Successful research and innovation processes largely depend on the capture and adequate implementation, maybe even prediction, of individual needs. Thus, it is

<sup>1</sup> Results from representative surveys about the information society 2010 in Germany [3–5] prove that the digital divide expands with the increase of age, the decrement of the level of education in combination with being female: The ‘digital outsiders’ are averagely 64.9 years old, have a low level of education and are to 65% female [4, p. 12].

especially important to consider the preferences of diverse user groups at an early stage of an innovation process when developing new information and communication technologies (ICT).

Thereby one problem is often neglected: How does societal change affect individual needs related to ICT? In particular, the change in gender roles, the increasing market power of female consumers, the demographical change toward an “aging society”, as well as the market potential of elderly users<sup>2</sup> are rarely taken into account as reference point for technological development. Although there are some prior studies reflecting ICT design from a feminist point of view [13–17] and senior users are already discovered as a technically interested, quality-conscious [18] customer group with considerable purchasing power [19–21], the aspects of gender and age are still not enough considered within the field of HCI and design. The ignorance of cultural and demographical changes may result from the fact that technological research and development in Europe is conducted by very homogeneous research teams that are dominated by middle-aged male engineers and software developers [22]. In 2005, only 26% of the staff in the research and development sector was women. The percentage of female researches in the business sector was 11% [23].

This homogeneity often has serious consequences for the technological progress and innovation:

- It decreases the innovative power and inventiveness because of missing opponent, ambiguous or even conflicting viewpoints [24, 25].
- It increases the pitfalls of “I-Methodologies” [26] which means that the producers’ assumptions become more or less consciously the leading benchmarks for technological developments instead of real users’ needs and demands.

For this reason, it is very probable that including diverse female and generational experiences might enhance the quality of ICT developments in terms of user acceptance and new customer groups.

For these reasons, we searched for a way to reflect our assumptions and to pluralize the basis for ICT applications avoiding bias in research tools [27] as well as in designed artifacts [28–36].

<sup>2</sup> In Germany, the elderly internet users are a very heterogeneous group: 71.8% of them aged between 50–59 years are internet users, which corresponds to the Germany-wide internet usage rate of 72%. In contrast to that, just 54% of people between 60 and 69 years and only 23.3% of people older than 70 years use the internet, although there are growth rates of 5.5% in the age segment between 60 and 69 years and of 4.4% for the segment older than 70 years in comparison to 2009 [3].

### 3 Participatory design research considering gender and age

In the research project, we composed an interdisciplinary team consisting of design, diversity and innovation researchers, product developers, and interaction designers and combined a gender and diversity perspective with a participatory design research approach (Fig. 1).

The figure above (Fig. 1) gives an overview of the whole process: the research topics in focus; the structure of the sample; the different research and design phases; the applied methods, and the results. The research topics were identified within a pre-study in 2008. They guided our participants’ focus and enforced a critical debate about ICT with regard to its positive and negative effects like communication and information overload, the dissolution of boundaries between private, public, and professional spheres as well as the ambivalence of permanent availability.

Each group ran through the same research and design process. It started with an introduction where we presented our research intention. Then, a self-observation phase followed where the participants investigated the impact of

ICT on their daily life and environment during 2 weeks with the aid of Cultural Probes (Fig. 2). In contrast to standardized research techniques, Cultural Probes [37–41] establish an uncommon view on daily routines by posing provocative or playful questions and by offering verbal, visual, and material options for expressions and documentation. Our toolkit included, e.g., the task of a communication diet where all communication devices had to be switched off for 1 day, a disposable camera to record intimate locations or situations where women felt themselves disturbed by ICT, a map to sketch one’s social network, and a diary to document the impact of ICT during an ordinary day of the week.

Afterward we organized ideation workshops and provided different materials (Fig. 3) to make the participants create their vision of future communication in the form of prototypes and concept descriptions. During this co-design phase, we also used focus group discussions, role play games to explore daily communication problems and solutions supported by ICT, questionnaires to ask about their usage behavior of ICT as well as methods from team coaching in order to make everyone in the group feel comfortable.

**Fig. 1** From research to results

RESEARCH ISSUES				
<ul style="list-style-type: none"> <li>• Communication with one’s Social Network</li> <li>• Privacy &amp; Data Control</li> <li>• Non-Communication and Time-Out</li> </ul>				
SAMPLE				
<b>Group 1</b> Females 14 – 18 years 13 participants	<b>Group 2</b> Females 19 – 28 years 13 participants	<b>Group 3</b> Females 29 – 45 years 15 participants	<b>Group 4</b> Females 50 – 65 years 14 participants	<b>Comparison Group:</b> Males 14 – 65 years 18 participants
RESEARCH & DESIGN PHASES/ DURATION/ METHODS				
[1] <b>Introduction</b> / 2 Hours / Presentation of Research Project, Aim and Methods				
[2] <b>Self-Observation</b> / Two Weeks / Cultural Probes				
[3] <b>Ideation Workshop</b> / 1.5 Days / Prototyping, Prototype Descriptions & Presentation, Role Playing Games, Focus Group Discussions, Questionnaires				
[4] <b>Analysis, Evaluation and User Tests</b> / after each Ideation and Concept Development Phase / Focus Group Discussion, Paper Prototyping				
RESULTS				
Social Scientific Analysis	Design Research Analysis	Design Practice/ Ideation		
<ul style="list-style-type: none"> <li>• Research Reports about the Impact of ICT according to research issues, age groups, in comparison to male participants</li> <li>• Typology of 7 female user profiles</li> </ul>	<ul style="list-style-type: none"> <li>• 13 Personas</li> <li>• Analytical Visualizations</li> </ul>	<ul style="list-style-type: none"> <li>• 60 Design ideas</li> <li>• 10 evaluated Design Concepts</li> </ul>		



**Fig. 2** Cultural Probe toolkit

We analyzed and evaluated the huge amount of qualitative insights from different perspectives that led to a range of results that also mirrored the different disciplinary viewpoints of our team: We received

- detailed research reports about the role of ICT according to our research issues, in dependency of age/life phases as well as in comparison with the male participants
- analytical visualizations that could be defined as a design-specific way of analysis trying to preserve the visual quality of the research insights
- a typology of seven female ICT user profiles
- 13 personas
- 60 conceptual ideas
- 10 design concepts and video prototypes based on 60 use cases.

All design ideas and concepts referred to female insights: Nevertheless, they were discussed and tested by female as well as male users. Part of them were participated in the project, and part of them were freshmen.

### 3.1 Closing the gender gap by focusing on women

From a methodological perspective, we regarded the gender gap as a matter of the sample. We expected not only differences between women and men but also similarities,



**Fig. 3** Ideation workshop

but with regard to the increasing demands of reconciling private, public, and professional life, we expected women to be more experienced.

Consequently, we claimed that ICT design based on diverse female experiences did not only result in “female only products” but also addressed men. These assumptions were verified by our research results and by the user tests of the design concepts (look at chapter 4.3 and chapter 5).

### 3.2 Closing the generation gap by focusing on different life phases

Our understanding of the generation gap was influenced by the age range and structure of our sample, ranging between 14 and 65 years. While the female participants were clustered into age groups according to certain life phases, the male participants were a cross-generational group from 14 to 65 years (Fig. 1). The structure of our sample was based on the following assumption: We claimed that the facet of age—correlating with a certain phase of life—had a fundamental impact on the usage of ICT. This assumption was verified by our results (look at chapter 4.1) and also by quantitative data from representative surveys [3–5, 49, 50].<sup>3</sup>

In order to avoid gender or generational stereotypes, we additionally mixed the participants of each age group according to their education/profession, cultural background, and life style: Some of them lived in a family, as a single, in a relationship, a shared flat with or without children. The diverse personal insights indeed reduced a stereotypical view in favor for individual, sometimes ambiguous and contradictory findings.

### 3.3 Closing the gap between expert and layman

We regarded the distance between experts—in our case the researchers, product developers and designers—and amateurs—in our case the invited participants—to some extent as a matter of approach and methods. For this reason, we decided for a participatory design research approach [42–45]. It is based on a close and emancipated collaboration between experts and potential users at all stages of the research and design process. Here, we followed the trend within the field of HCI and design research which can be described as a shift from user-centered to participatory design research and co-creation [44–48]. This shift has also

<sup>3</sup> Referring to the results of representative studies about the information society 2010 in Germany [3, 5], age indeed matters a lot in terms of the usage of ICT and the internet. 97.5% of the pupils are online, independent from their gender and level or status of education. 95.8% of the people between 14 to 29 years, 87.1% people between 30 to 49 years and 49.6% people aged 50 years and older were online in Germany in [3].

consequences on the methods: The researchers and designers have to provide means to reveal peoples demands and desires on different levels of consciousness including tacit desires and visions [46]. Moreover, these methods have to provide prospective and inspirational insights that enable designers to envision future communication scenarios.

In our case, we used a mixture of methods (Fig. 1) that offered options for verbal, visual, behavioral, haptical as well as metaphorical expressions that addressed different depths of consciousness and provided descriptive as well as prospective insights. Moreover, our participants acted as co-researchers, co-creators; they discussed design ideas and concepts with us and sometimes even participated in the production of video prototypes.

#### 4 Research results according to aspects of age and gender

In the following, we present the results showing the impact of age and gender on the daily usage of ICT and on desires for future communication expressed by our participants. Generally, our qualitative research is not representative because of the small sample of 73 participants. Nevertheless, it provided necessary inspirational insights for the process of ideation, showed some interesting tendencies that certainly give impulses for further research and even correspond to results from representative studies in some points.

##### 4.1 Generational aspects of the female usage of ICT

The following insights into generational aspects of ICT usage and visions result from the comparison of the female-only age groups.

There are noticeable differences in the use of ICT according to age, respectively, life phase with regard to communication purposes, preferences and habits, and the level of dependency and stress caused by ICT.

##### 4.1.1 Female communication preferences and habits in dependence of age

The diagrams (Figs. 4, 5) clearly mirror the generation gap. The Internet and the mobile phone were generally less popular for the fourth group of women. Their preferred communication feature was voice telephony (Fig. 5). Nevertheless, they also corresponded via e-mail, surfed the Internet. However, they only used a few Internet services, and the management of the technical details was incumbent on their husbands, partners, or children. Discussion forums, blogs, games, or Internet pages for the exchange of

photographs and videos as well as social communities on the Internet were hardly ever used (Fig. 4). What could be interpreted as technical disinterest and disintegration of the elderly generation turned out to be a quality considering their autonomous relations to ICT: Their behavior made them much more independent and relaxed in comparison with the younger generations (Fig. 6; look at chapter 4.1.2).

Voice telephony was also popular for the other age groups but noticeably overran by e-mail as the most popular Internet feature for the first three groups as well as SMS as the most popular mobile feature for the first and second age group.<sup>4</sup> The female teenagers also used ICT for entertainment purposes like gaming<sup>5</sup> as well as to visit photograph and video sites. The second group used digital organizers and instant messaging, while the third group had particular interest in social network sites.<sup>6</sup>

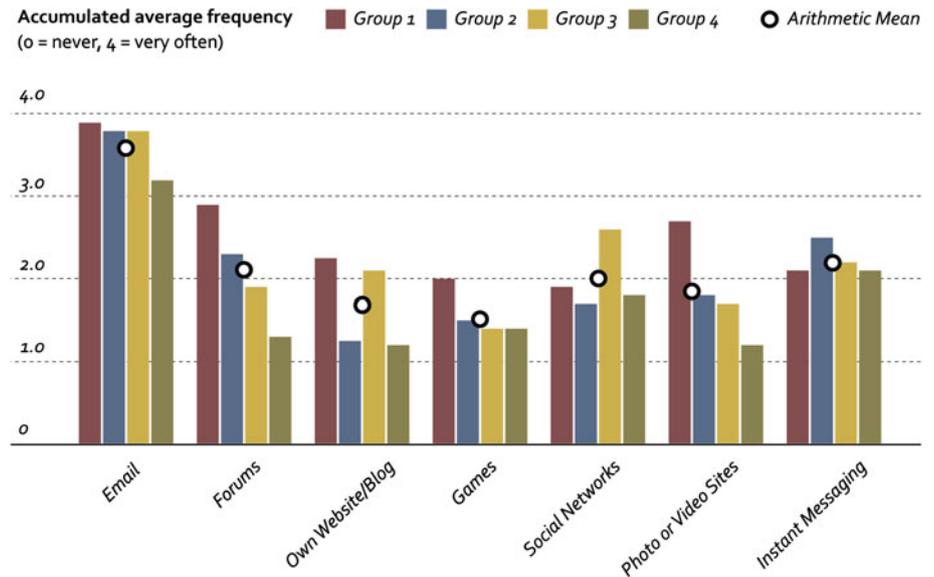
These results correspond to findings we derived from the other parts of our research like the self-observations and the ideation workshops that provided more insights into the

<sup>4</sup> Results from representative surveys indeed show that the communication preferences differ with age: E-mail can be regarded as the most popular online communication channel which overarches generations: 73% of people aged 10–15 years old; 95% of people aged 16–24 years old, 93% of people aged 25–44 years old, 87% of people aged 45–64 years old, 87% of the people aged older than 65 years old use e-mail for private communication [5, p. 28]. Other online communication channels like social network sites, chats and instant messengers become more and more popular for young users: 68% of people aged between 10 to 15 years old, 89% of people aged between 16 to 24 years use these channels in comparison to 46% of people aged between 24 to 44 years, 20% of them between 25 to 44 years old and just 10% of them older than 65 years old [5, p. 28].

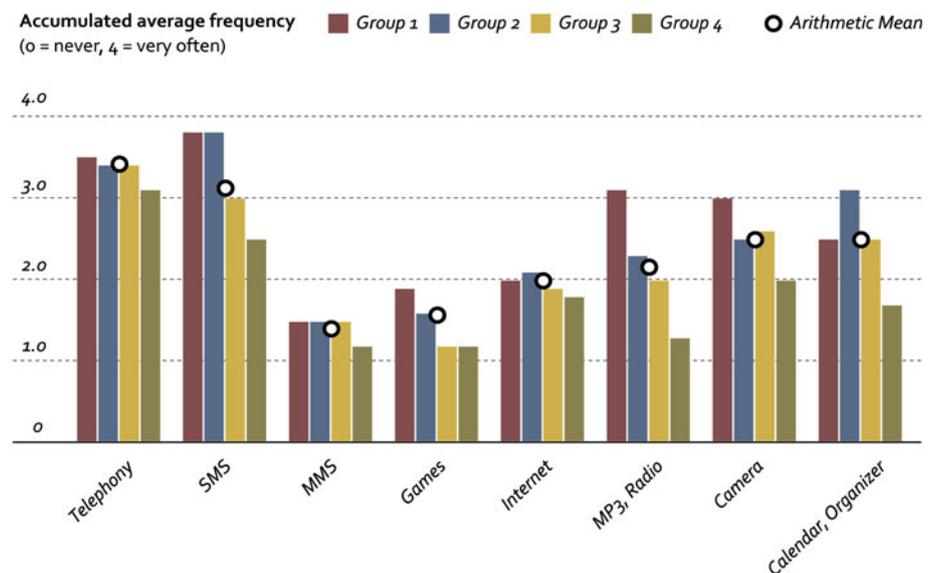
<sup>5</sup> The JIM study [49] differentiates between the frequency and the importance of teenage ICT and media use: While the mobile phone, internet and TV are most frequently used [49, p. 12], the teenagers evaluate listening to music as the most important media activity for them [49, p. 13]. Female teenagers possess more digital cameras than male teenagers (61% female owners vs. 41% male owners) which may be an indicator for their general interest in photography [49, p. 8]. Generally, e-entertainment decreases with the age of 25 years [5, p. 29].

<sup>6</sup> Referring to the JIM study the use of ICT and internet of teenagers between 12 and 19 years look like this in [49]: The mobile phone is definitely the core device for male as well as female teenagers, but also the internet is mainly used for communication: 46% of the teenagers communicate via social network sites, chats, e-mail or instant messengers, 25% use the internet for entertainment and 17% for online games. 75% of the girls and 66% of the boys use online communities daily or several times a week. [49, p. 41]. The most popular internet services for girls are online communities like “SchülerVZ”, “StudiVZ” and “facebook”, followed by instant messengers (ICQ, MSN) and e-mail [49, p. 32]. There is an interesting finding of another survey [5] in terms of online participation and contribution: Especially girls are active content providers: 36% of them between 10 to 15 years and 47% of young women between 16 to 24 years post and upload own texts, photos and videos in contrast to 26% of the boys and 43% of young men [5, p. 30].

**Fig. 4** Internet usage: How often do you use the following functions and services on the Internet?



**Fig. 5** Mobile phone usage: How often do you use the following functions and services on your mobile phones?



respective environments and everyday lives of our female participants.

The young women (14–28 years), especially the teenagers (14–18 years), used ICT not for exchanging information, but for staying in touch with their peer group.<sup>7</sup> Constant availability was important for young women's personal self-esteem. "I love when I got online and find someone has written to me, commented a photo or made an offer for friendship. It is a courtesy and feels good to know someone is thinking of me." (Female, 16 years). Being

<sup>7</sup> The mobile phone is more important for female (86%) than for male teenagers (75%) [49, p. 13]. Girls spend 54% of their online time for communication in online communities, chats or with e-mails, boys just spend 38% for similar activities [49, p. 29].

always available was mutually expected among friends. It became apparent that ICT altered conventions of appointments. We found out that the first and second group often arranged lax appointments, while concrete places and time were finally fixed via text messages or e-mail shortly before a meeting took place. Consequently the permanent availability of teenage and young women was necessary in order to stay in connection to their social networks and not to miss short-term rearrangements. In particular, ICT amplified "the window to world" for the teenagers as they enjoyed the higher flexibility based on ICT. In contrast to them, young women (19–28 years) started to communicate more and more self-determined and purpose-led, particularly if ICT-mediated communication started to become part of their professional lives. "I want to know what the

call is about before I take it” (Female, 23 years). “There are such days when the phone rings all the time and people just call for no good reason.” (Female, 26 years).

The communication habits of teenagers were obviously influenced by their social living environment: All of our teenage participants (14 to 18 years old) still lived at home. We assumed that ICT played a central role to establish their own intimate space with their friends besides parental control and to explore one’s identity and different social roles, which is much more important in this phase of life than in later ones. Because of the decreasing integration into local groups like sports or youth clubs, ICT-mediated communication seemed to be fundamentally important to become self-aware of being part of a social network. Moreover, we had to consider that teenagers and young women (14–28 years old) already grew up in a technical environment—they were so-called digital natives—hence ICT was fundamentally integrated within their lives, which was also confirmed by the representative survey JIM 2010 that explored the ICT and media usage of teenagers between 12 and 19 years old in Germany [49, 50]. “My daily routine is strongly influenced by electronic communication.” (Female, 21 years). “I own four mobile phones; I carry two in my pocket; the other two are in my handbag.” (Female, 26 years).

Women in the so called “rush-hour of life” (30–45 years) used ICT more and more for private and professional organization. It became extremely important if they had underage children or other family members to care for. Parents told us that they and their children often exchanged short, frequent, and informal information: The mothers reported parental controlling calls or instructions (e.g., shopping lists). Our research provided an indication that especially parents tried to enhance their control through ICT (e.g., controlling calls).

The fourth group of women (50–65 years) was split: Most of them were still working, while one-third of the group was already retired which had a significant influence on their affinity to ICT. For those who were still working, time pressure and organizational duties even increased because of higher occupational positions, children who still lived at home and/or further family members in need for care. Consequently the generation gap became obvious by elderly women (60–65 years) who were retired and rarely got in contact with ICT, except for the landline phone.<sup>8</sup> These women were still healthy and active.<sup>9</sup> They enjoyed

<sup>8</sup> This phenomenon is also confirmed by representative studies about the information society in Germany 2010 [3, 5, 6]. The gap between male and female online users as well as within one gender category increases seriously at the age of 50 years: Within the age range of 50 to 59 years, there are 64.6% women and 79.1% men online. Between 60 and 69 years, there are just 43.1% female online users in comparison to 65.8% male online users. At the age of 70 years and

their spare time where they met other women, traveled or looked after grandchildren. They appreciated ICT to support safety, for emergency situations concerning themselves, other family members, or friends.

#### 4.1.2 Impact of and dependency from ICT according to age

ICT serving for daily organization, communication, social connection as well as information was important for all women of our study. ICT reassured every generation of their social network. All women appreciated that ICT offered more mobility, flexibility, and individualization, although they were also aware of the negative effects of ICT like informational overstrain, communication stress, and the distraction of concentration (Fig. 6). Especially the young women (14–28 years) of our study complained about communication stress caused by ICT.

We found a strong correlation between age and the impact on and dependency from ICT on everyday life (Fig. 6). Generally, we can say the older the female participants were, the less they were dependent from or stressed by ICT.

Our female teenagers (14–18 years old) were the most addicted,<sup>10</sup> but also most stressed group toward ICT in comparison with other age groups. On the one hand, they reported feelings of obligatory availability, decreasing concentration, and an overwhelming amount of communication.

On the other hand, the young women were threatened by the absence of ICT. It made them often feel lonely or not enough socially involved. This became extremely evident in one of our task during the self-observation phase: One half to one-third of the young women could not stand the “communication diet.” This task prohibited the use of any electronic communication devices for 1 day. It was very successful with regard to its psychological effect. The participants, in particular the younger test persons, became aware of the impact of and dependency from ICT in managing their everyday life and social relations that they did not realize before.

In comparison with the first group, the young women (19–28 years old) used ICT in a more self-determined and

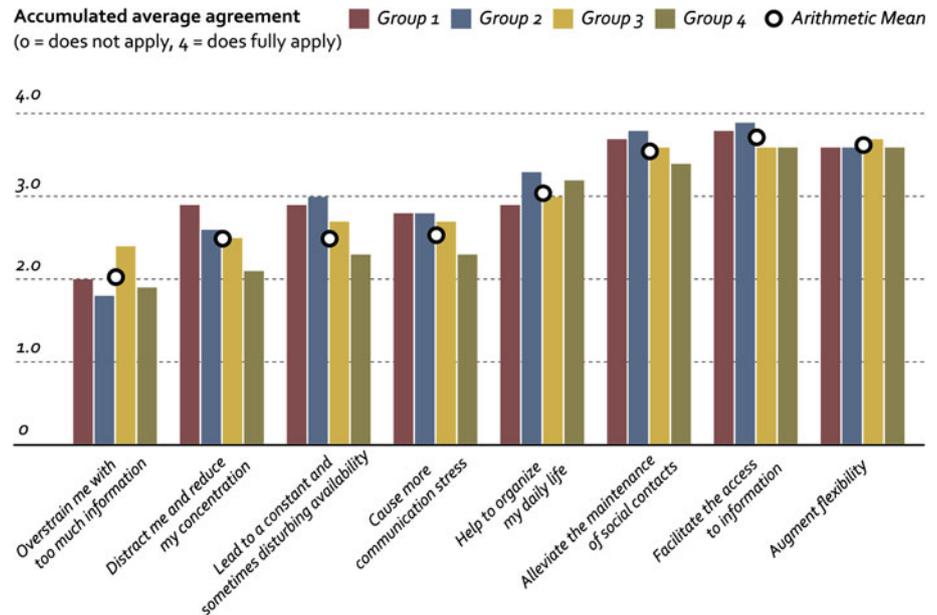
Footnote 8 continued

older, just 14.4% women in comparison to 36.6% men use the internet [3, p. 44].

<sup>9</sup> Although women over 70 years are very active and socially involved, they manage their lives without internet. According to our findings, the (N)Onliner study [3] also finds out that these women participate in internet services and use online offers indirectly via the support of relatives or friends.

<sup>10</sup> This is also confirmed by the representative studies [3, 5, 49] which show that nearly every pupil or teenager in Germany has a mobile phone, a computer and nearly daily access to the internet.

**Fig. 6** Everyday-life usefulness of ICT information and communication technologies



purpose-oriented way, e.g., to organize their leisure dates and activities. They were much more able to separate themselves from ICT and were less disturbed and stressed by electronic communication. “Sometimes I just don’t know at all what’s going on.” (Female, 26 years).

Most of the women aged between 29–45 years old made their career or started a family. For this group, it was remarkable that each day was meticulously scheduled. Consequently ICT became more and more important for organizational duties bridging private and professional life. Most of the women reported that they had to fulfill an abundance of duties and responsibilities during the day. In this regard, their stress tolerance was very notable and also their self-conception about child care and housekeeping; they often were solely responsible for. They appreciated ICT very much when they had underage children for whom they cared about being available all the time. “I’m always somewhat nervous when I’m not reachable on my phone, that I might get an important call from my children, needing my help.” (Female, 33 years) “Typical situation: The phone is ringing; I see it’s my son. Maybe something bad happened! But then everything’s fine. Whew.” (Female, 39 years). They reported about unforeseen events and spontaneous rearrangements that caused a lot of stress: “Typical stressful situation: School is calling: kid is sick. I’ll have to organize to pick her up.” (Female, 42 years). Moreover, the women coordinated the appointments of their partners and children in addition to their own duties and responsibilities.

Hence, it was not surprising that especially these women wished that ICT provided more support and enable time efficiency. It should incorporate family duties like child education and housekeeping as well as leisure time and

make life easier all in all. Although we did not ask the women explicitly whether they minded being overall responsible, we wondered that they did not complain or questioned it with regard to emancipation and gender equality.

The fourth group with women between 50 and 65 years was the most independent and relaxed group toward ICT, even if time pressure and organizational duties increased if they were not retired due to higher occupational positions that required more presence and time, children who still lived in the household and/or additional family members in need for care. The “communication diet” had rarely been interrupted within the older groups. These women even occasionally practiced communication diets on their own: They rejected being constantly available and created personal relaxing spaces/times that were defended confidently against any disturbances. “Relaxing means to me spending time with familiar people at familiar places.” (Female, 44 years). This independence might result from the fact that they did not grow up with communication technologies.

Only mothers with underage children and women who tended to relatives voluntarily ensured constant availability, due to the lack of differentiated services as some of them stated explicitly.

#### 4.2 Desires and demands of female users 4 toward ICT

The different communication preferences, habits, dependencies, and stress tolerances of each female generation led to different ICT demands that are listed below. They address a lot of aspects that result from gender-specific socialization and life circumstances.

#### 4.2.1 ICT for leisure time organization and contact management

Especially the teenagers and the younger women asked for services that enlarged flexible, frequent, and mobile communication via new channels.

They wished ICT to better manage communication, contacts, their leisure time activities (e.g., shopping or their hobbies), and desired personal advice for health, fitness, and beauty. They mentioned ideas like integrated mirrors, virtual style check, mutual fashion advice among friends, shared calendars, shared moods, or status indications, more options to precisely manage one's availability within certain times for certain people or groups. Organizational efficiency, controlled availability as well as privacy were already issues of the young generation which became more and more relevant for elder women.

#### 4.2.2 ICT for overall life management

Women—especially the ones who were heavily involved in their professional career and/or family—desired for an overall life support by ICT. This was, e.g., expressed in names and concept descriptions of prototypes from group 2 to group 4. The prototypes, e.g., called: “Life Manager” (Fig. 15), “Julyversal,” “All in one,” “The invisible Allrounder,” “Multi-Ball,” “Work-Life-Leisure-Time-Automat,” “Buddy,” “Dandy,” “Multitalent,” “Fully,” “One-in-all—El Mundo,” “Multimaxima,” “Flexi-Maxi,” “IAT—I’m always there” (Fig. 17).

They desired organizational relief for themselves and for other members of their social network as well as psychological advice, health, and fitness suggestions. As researchers we wondered whether these needs might give a hint that these women do not have enough support within their social networks nor do they have enough time to care for themselves. This would not be surprising because most of the middle-aged female participants managed professional, family and housekeeping duties, leisure time activities, and appointments for their partners and children in addition to their own duties and responsibilities.

#### 4.2.3 ICT for availability management

Many women between 30 and 65 years would like to have communication devices that are able to separate different parts of life like professional and private times by using different interfaces, phone numbers, etc. This would substitute the necessity of having one private and one professional mobile. “I wished my phone could indicate that I’m in office and switch to a kind of offline mode without switching off completely.” (Female, 32 years). “Work-related communication stresses more than when it comes to personal issues.”

(Female, 44 years). As we know from the gender comparison (look at chapter 4.3), availability is an ambivalent issue especially for women. Their feeling of overall responsibility often got in conflict with their need for time-out. Women with care taking responsibility wished to be available only for the respective group of people. Women who used ICT mainly for professional purposes tended to avoid it privately and resorted consciously to alternative communication forms. “I associate e-mails and phone calls with stress, as I get a lot of them at work. Unexpected phone calls are stressful.” (Female, 42 years). Older women appreciated their relaxation time without disturbances. Therefore, they wished that ICT could support different levels of availability, offer possibilities for non-communication, and time-out or provide easily manageable filter functions.

#### 4.2.4 ICT for emotional connectedness

A lot of women desired for transmitting or sharing fast, flexible and above all authentic emotions via ICT within the family or circle of friends. In this context, the women named a real hug or a protection shield against bad moods or stress. “Hugging my friends at school is my morning ritual.” (Female, 17 years). They thought about alternative communication channels besides language embracing the whole spectrum of different senses. They mentioned ideas like mobiles that were able to change colors or their temperature. “I like it when products not only communicate on a functional



**Fig. 7** Pillow phone, Group 1



**Fig. 8** The sandman, Group 2

level, but also on a symbolic one.” (Female, 24 years). Similar desires were expressed in prototypes like, e.g., the “Pillow Phone” (Fig. 7) that can alternatively be used as a pillow to be close to the loved ones or the “Sandman” device (Fig. 8) that has a soft corpus to be pressed for stress reduction, spends warmth, has a shining heart that can be calm someone, an emergency button as well as alerts which smell like coffee for relaxation or like flowers if the family calls.

#### 4.3 Gender aspects of the usage of ICT

At the end of this chapter, we present gender similarities and differences of the use and demands toward ICT which resulted from the comparison of the female results with findings from the cross-generational group consisting of 18 male participants.

In general, the basic needs of the participating women and men were considerable akin. But some differences could be observed; some of them were caused by different age, and others could derive from gender-specific socialization.

Communication with the peer group is as important for young women as for young men. This finding corresponds to the representative JIM Study 2010 [49] that investigated the ICT and media usage of German teenagers between 12 and 19 years.<sup>11</sup> In contrast to young women, the boys were also very much focused on ICT entertainment (gaming, soccer, and sports news, etc.) that can be regarded as gender-specific interest which was also quantitatively verified by the mentioned study [49].<sup>12</sup> Elder women and men then set priority on daily life support by ICT.<sup>13</sup> Both genders at the age of 30–50 years old would like to have ICT tools that offered daily information, consultation, and organization and that were intelligent and adjustable to their individual profile.

We noticed that the female participants generally communicated less online than the male participants. Moreover, the male participants considered ICT as a mean for entertainment through all generations.<sup>14</sup> In contrast to our female

participants, the male counterparts did not experience (non-) availability as a problem. It was judged as a conscious decision to be available or not; since one could always go offline or switch off the mobile phone. While women often emphasized their want to support others by ICT use, for example by sending emotions or hugs, men generally wished ICT tools to support or amuse themselves. The male participants generally related ICT use less to the care for others or emotional connection to family and friends. The facilitation of family work and household chore by ICT was mentioned by the male group only with regard to the daily shopping and the control of housing technique. Moreover, children as ICT users have been taken into account exclusively by the female participants. Complementarily, the women participating were often in charge of the family and household by their own, sometimes additionally to their jobs. They were rarely supported by their husbands or partners, but this was not critically reflected. On the contrary, it was accepted as a matter of course.

But women and men had a lot of similar approaches concerning their concrete ideas for prototypes. They mentioned more use of solar energy, ICT-supported telepathy, voice-controlled ICT, ICT assistance for various circumstances (health, sports, daily shopping, administration of contacts, etc.), separation of private from professional life by ICT, indestructible surfaces, biometric protection of personal data, and better security mechanisms against thievery.

We noticed already during the investigation process that the female groups—particularly in the ideation workshops—anticipated less than the male group given technical limits. They dared to create visions and to realize them in prototypes and role play games. Women’s experiences from very different areas of life (children, family, housekeeping, care, traveling, health, wellness, fitness, emotions, privacy, beauty, style, etc.) were incorporated whereas men mainly referred to their professional life, entertainment, and health.

All female groups stressed environmental subjects much more often than the male one did. On the other hand, men’s proposals were qualified by more technical details and a higher degree of technical differentiation.<sup>15</sup> Prototypes also differed regarding their product design. Women tended to design fancy, colorful artifacts of various materials and

<sup>11</sup> Referring to the data of the “Statistisches Bundesamt” [5], there is no significant difference of the online communication frequency between female and male internet users [5, p. 26]. Moreover, the mobile phone is the core device for male as well as female teenage users. The internet is mainly used for communication: 46% of the teenagers used it for communication via social network sites, chats, e-mail or instant messengers, 25% for entertainment and 17% for online games. 75% of the girls and 66% of the boys use online communities daily or several times a week. [49, p. 41].

<sup>12</sup> There is a gender difference with regard to online activities of teenagers: While girls spend 54% of their online time for communication, boys just spend 38% for it. Boys spend four times more than girls for online games (28% vs. 6%).

<sup>13</sup> E-entertainment (download of games, photos, movies or music) is averagely more important for young men, but it decreases with the age of 25 years independent from gender [5, pp. 29–30].

<sup>14</sup> There is a general male preference for downloading software which 47% of male online users do, versus 23% of female online users [5, p. 26] and playing or downloading games, photos, movies or music which 43% of males do in comparison to 32% of female online users [5, p. 26].

<sup>15</sup> This corresponds to the technical and online activities of male users: They are indeed much more practiced in the installation of devices and software, programming or compressing of files [5, 6], they download and purchase more computers, respectively video games and software (37% male vs. 16% female customers), electronic devices (41% male vs. 21% female customers) and computer equipment (33% male vs. 14% female customers) [5, p. 33].

**Figs. 9–14** **9** No title, Group 1, **10** Phototype, Group 2, **11** Green, Group 3, **12** Universal tool 5000, Group 5, **13** Buggi, Group 5, **14** Rudi, Group 5



Fig. 9

**Female Prototypes**



Fig. 10



Fig. 11

**Male Prototypes**



Fig. 12



Fig. 13



Fig. 14

**Figs. 15–20** **15** Life manager, Group 2, **16** Fully, Group 4, **17** IAT (I'm always there), Group 4, **18** Magic Glasses, Group 5, **19** Ahora (“Now”), Group 5, **20** Solo 14, Group 5



Fig. 15

**Female Prototypes**



Fig. 16



Fig. 17

**Male Prototypes**

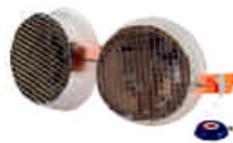


Fig. 18



Fig. 19



Fig. 20

forms (Figs. 9, 10, 11). Men used reduced colors, sometimes metallic and rather square-shaped tools which reminded of laptops, touch pads, or technical instruments (Figs. 12, 13, 14). They indeed confirmed cultural stereotypes of femininity and masculinity that should not be regarded as biological preferences rather than a “successful” internalization of cultural gender images.

Nevertheless, there have been some (however few) exceptional cases in each group where women and men acted not accordingly to the gender stereotypes: A couple of men experimented with colors and forms (Figs. 18, 19, 20) and some women set a high value on reduced colors (metallic, black, white) and square shapes (Figs. 15, 16, 17).

Referring to the names and concept descriptions of the prototypes, women as well as men desired for an overall life support by ICT. The male participants' prototypes call, e.g., "PeLiMan—Personal life Manager," "Universal Tool 5000" (Fig. 12), "Ultracom 600 SE," "James—my personal butler." They are very similar to similar to the names selected by some female participants for their prototypes (look at chapter 4.2.2). But referring to the preliminary findings, we assume that the male participant indeed thought of a butler for their own needs and demands instead of an overall life manager, which also considers other persons of one's social network.

## 5 Family Wheel: a gender and generational informed ICT concept

The Family Wheel concept is one out of 60 design ideas we generated based on our insights. Next, to ten other design concepts, we worked it out in detail based on evaluations and user tests we conducted with female and male users who partly participated in our project and were partly freshmen. Within this article, we used this concept as an example to show how female issues can be articulated in ICT. In this context, the concept is important in two respects:

- It completes the illustration of the whole process from research to design we ran through.
- It is very important due to its socio-political implications we necessarily deal addressing issues like gender and age.

The Family Wheel can be described as a tool for organizing everyday tasks. It covers some of the identified ICT demands: It offers control over one's availability, considers different communication preferences, clusters people of one's social network together, enforces to distribute responsibility, and therefore may strengthen local communities. In the latter respect, it may even provide emotional closeness as a side effect of local collaboration and mutual help. It is particularly relevant for organizing everyday chores, unforeseen events, or small tasks and helps distribute them among a group of people. It can be applied for private as well as professional purposes. In the following, we describe typical use cases as an example of its ordinary application and then describe how it works and which features it embraces.

### 5.1 Family Wheel scenarios

#### 5.1.1 Scenario 1: spontaneous organization

Little Bob gets sick and his mom Rebecca has to take him quickly to the doctor, but she needs a baby sitter for

Charlie! She opens the Family Wheel on her smart phone, where she can already see that her boyfriend is currently busy and therefore deactivated. So the Wheel skips this contact, and first calls Grandma Elma. But Grandma Elma is out on the sea and cannot take care of Charlie right now. So the Wheel calls further. Mr. Hulbert, the neighbor, turns out to have some spare time, and he comes running over.

#### 5.1.2 Scenario 2: leaving a text or a voice message

Grandma Elma forgot to pick up her meds at the pharmacy. She leaves a voice message asking whether anyone could pick it up for her and sets a timer on it. So the message gets automatically deleted at 7 pm, since that is when the pharmacy closes. Elma's grandson Luis is out when he hears her message. He replies that he will pick it up later.

#### 5.1.3 Scenario 3: adding a family Wheel member

Aunt Jane has just arrived in town and would like to help this week whenever she can. So Rebecca places her on position 1 of the Family Wheel.

### 5.2 Family Wheel functions and features

The Family Wheel is a service that basically works like a calling chain that connects different people. When a member starts a call, the other members of the wheel are called one after another until someone picks up. The service concept embraces the following features:

- *Status indication:* Every member of a wheel can indicate his/her current status that has an impact on his/her availability: When someone's status is set to, e.g., "busy" then the calling chain leaves him/her out and skips to the member on the next position. This feature satisfies the need for distributed availability and allows temporary non-availability, reducing the risk that no one is in reach within a social network.
- *Editing groups and memberships:* One can have several wheels consisting of different contacts for different purposes which can be named individually. The members of a wheel can be added and deleted, and their position can be changed at any time. This feature also supports selective availability and covers the desire for a differentiated management of social relations.
- *Leaving text or voice messages:* Besides, calling one can also leave text or voice messages in order to inform the others about events, to ask for help or distribute tasks which one of the members may carry out alongside. For this purpose, the respective communicant can indicate the urgency of a task and add a time to it when it has to be finished. This feature considers

individual preferences for different communication channels which can also differ according to the urgency of a task or a question.

### 5.3 Target groups and concept evaluations

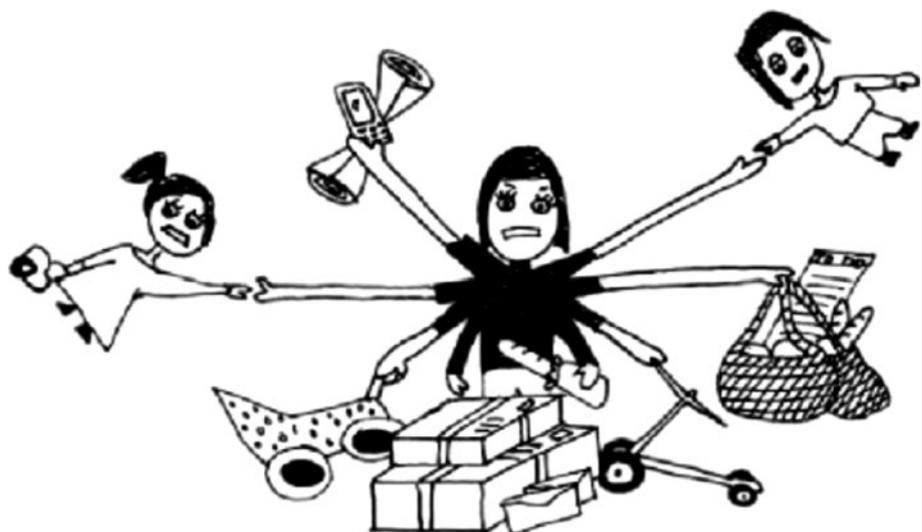
Referring to our research results and observations, the Family Wheel especially benefits women and men in the “rush-hour-of-life.” As we know from them, mostly the mothers organized the family and household duties, even if today husbands were more involved in household chores than before and if there were supportive grandparents, neighbors, and babysitters. On the one hand, these women appreciated ICT, especially mobile communication, because for being permanent available for their children and family, the possibility to rearrange unforeseen events or to distribute small tasks. On the other hand, they reported that people of their social network were sometimes cumbersome to reach and that it was hard to coordinate all the activities. Consequently, the current ICT possibilities of communication were not enough to provide organizational efficiency and relief. Having to call everyone to just ask a small favor became more tedious than actually doing the task by oneself, as well as just informing the others that a special task had been settled. As a consequence, the women tended to take care of everything by themselves (Fig. 21). Within the session for concept evaluation, we got additional insights: The female test users reported to feel embarrassed when they had to ask for help and therefore appreciated such service. “I often find that I don’t want to bother others with tasks. So having some indication whether others would be available would be great. Adding the level of urgency would be helpful.” (Female, 32 years). “Often I find that people are too shy to ask my help because they think they would

disturb me. Through such a Wheel it would be clearly defined whether one’s available or not.” (Female, 27 years).

In contrast to that, our male participants did not feel the need to be always available and less mentioned the need to care about others (look at chapter 4.3). Therefore, it was very surprising that especially the male test users noticed the benefit of the Family Wheel in strengthening social responsibility in local communities and regarded this as a major benefit. “This is a great concept—it’s fantastic as it strengthens connections between people. Distributing work would be so helpful. I just might forget to re-activate myself again in the Wheel.” (Male, 27 years) “It’s an active way and much more honest than saying ‘oh, if you need me, I’ll be there for you’—that’s often just a phrase.” (Male, 30 years). According to our research results, the male test users made suggestions for professional purposes of the Wheel, even considering the aspect of elderly care: “Could be also interesting for logistics companies.” (Male, 40 years). “As a musician you’re always on call, so a “musician-wheel” could make sense there.” (Male, 25 years). “It could be interesting as well for medical contexts or elderly care.” (Male, 40 years).

The female test users were also immediately convinced of the usefulness of the Family Wheel service, because it made it easier for them to offer as well as to deny help in an easy way. “I’m rather a part of other mothers’ wheels. I often get called to take care of their children, which I don’t mind doing. However, sometimes would be nice to “deactivate” myself from their reach.” (Female, 36 years). “Such a service would be so helpful for exactly the typical Kindergarten pick up situation—just posting a message instead of calling everyone. Many women I know are both mothers and freelancers, they would surely find this very useful. Since it is a pure organizational tool without any personal or emotional element, it is ok to just leave a simple

**Fig. 21** Multitasking days require multitasking ICT applications for spontaneous organization and involvement of one’s social network



“yes” or “no” or activating icons to indicate availability.” (Female, 38 years). “A friend of mine’s always been the social centre, organizing everything, even before she became a mother. I’m not a “centre” myself but I’m part of her planning, so I often get calls if I can babysit or act as key service. Therefore I’d find it practical to log in or out of her Family Wheel when I’m available.” (Female, 29 years.)

But in accordance to our preliminary research results, the women did not reflect it as a way to increase the involvement of, e.g., their partners into daily organization with regard to a gender equal division of work.

## 6 Summary and conclusion

In the following, we summarize our research results according to the aspects of age and gender and the political implications of ICT.

The main generational differences we discovered within the female sample were:

- Teenagers and young women were much more dependent and stressed by ICT than older women who used ICT more often and were challenged by a higher degree of organizational complexity within their lives.
- The older the women, the more independent they were from ICT.
- Women in “the rush hour of life” generally had a very high potential of stress tolerance in comparison with teenage or young women.
- Young women used ICT essentially for being connected with and aware of their social network, while older women used it for organizational duties.

Intergenerational issues were:

- the ambivalence of availability, the need for selective or partial availability, and time-out
- the desire for new channels of social connectedness and emotional communication

Referring to gender, we found out that that the young female and male participants used ICT essentially for communication with their peers and for entertainment purposes. In later phases of life, ICT was more and more used for organizational duties by men as well as women, whereas women’s lives seemed to possess more (organizational) complexity than men’s lives.

The main gender differences we discovered were:

- Women used ICT more for emotional or organizational connectedness.
- Women were more concerned about interpersonal communication or care for others, while men used ICT in a more self-referential way.

- Men used ICT more for entertainment purposes throughout all generations.
- “Availability” and “asking for help” were critical and ambivalent issues for women, while men stated not having any problems being unavailable or out of reach for others.
- Women were generally concerned with more and diverse topics (e.g., privacy, friendship, partnership, children, family, housekeeping, care, traveling, health, wellness, fitness, emotions, beauty, and style) than men (professional life, entertainment, and health).
- Women’s lives posed more challenges in coordinating different life spaces as well as mediating between their own and other people’s needs.
- Women often regarded ICT from a perspective of daily purposefulness and anticipated less technical limits than men, while men were more qualified in more technical details and showed a higher degree of technical differentiation.

The Family Wheel covers some of the needs and demands that partly result from gender- or age-induced life circumstances. First and foremost, it is an organizational tool that provides a practical solution for everyone to better deal with one’s organizational complexity and to better control one’s availability. In this respect, it provides organizational flexibility, efficiency, and relief by distributing tasks within a group. It also considers different preferences for communication channels that vary with age. But besides these obvious practical purposes, this example also shows the political dimensions of ICT; we as feminist researchers and developers are very much concerned about. From this point of view, we have certain demands toward ICT that has a direct impact on the way we design applications and services: ICT shall provide empowerment, social equality, and integration. How do we address these demands? Does our service provide a satisfying solution? We do not regard the presented service as a best practice example for gender- and age- sensitive ICT development, but it shows how we tried to deal with feminist demands in the development and design of ICT. We would like to speculate about desirable effects that the Family Wheel may have on social integration and participation and on a gender equal division of work. We suppose that it strengthen local boundaries and provide emotional closeness, or the other way around: It even requires a locally functioning infrastructure. The female participants throughout all age groups mentioned the importance of their family, friends and desired more technical possibilities for emotional communication for different reasons: Teenagers became aware of belonging to a social network and adult women strived for organizational flexibility and relief, while elderly women wanted to be in reach for family and friends, also in case they needed help.

Moreover, the Family Wheel supports social or intergenerational integration by exploiting complementary ways of using ICT: Teenagers were mostly available via ICT that made them very reliable contacts that could be used by other members of the wheel.

Although none of the adult or elderly women who participated in our study explicitly complained about her situation in terms of a lack of gender equality or social integration we think, the service might provide a kind of social control among the group members. It can make transparent who is engaged in the group, offers his/her availability for help and who does not. This may increase mutual engagement and responsibility even if a bad consciousness is the motivating factor. It can even make gender gaps in daily organization visible, which may introduce changes in behavior and responsibilities.

Finally, we think that a gender- and age-sensitive ICT development has to explore heterogeneous experiences, perspectives, and issues of real men and women in different life phases. It should reinforce social participation, distributed responsibility, and social integration within real social communities instead of substitute these aspects.

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## References

1. Arnhold K (2003) Digital divide. Zugangs- oder Wissenskluff? Verlag Reinhard Fischer, München
2. Gehrke G (2004) Digitale teilung—digitale integration. Perspektiven der Internetnutzung. ecmc Working Paper, vol. 5. München
3. Initiative D21, TNS Infratest (ed) (2010) (N)Onliner Atlas 2010. Eine Topografie des digitalen Grabens durch Deutschland. Nutzung und Nichtnutzung des Internets, Strukturen und regionale Verteilung, Juli 2010. Download: <http://www.initiatived21.de/wp-content/uploads/2010/06/NONLINER2010.pdf>
4. Initiative D21, TNS Infratest (ed) (2010) Die digitale Gesellschaft in Deutschland—Sechs Nutzertypen im Vergleich. Eine Sonderstudie im Rahmen des (No)Onliner Atlas 2010. Download: [http://www.initiatived21.de/wp-content/uploads/2010/12/Digitale\\_Gesellschaft\\_2010.pdf](http://www.initiatived21.de/wp-content/uploads/2010/12/Digitale_Gesellschaft_2010.pdf)
5. Statistisches Bundesamt (ed) (2010) Wirtschaftsrechnungen. Private Haushalte in der Informationsgesellschaft Nutzung von Informations- und Kommunikationstechnologien, (IKT)—Fachserie 15 Reihe 4—2010 Wiesbaden. Download: <http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Publikationen/Fachveroeffentlichungen/Informationsgesellschaft/PrivateHaushalte/PrivateHaushalteIKT2150400107004.property=file.pdf>
6. Statistisches Bundesamt (ed) Informationsgesellschaft in Deutschland. Ausgabe 2009. Wiesbaden, November 2009. Download: [http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Publikationen/Fachveroeffentlichungen/Informationsgesellschaft/Querschnitt/Informationsgesellschaft103070109004\\_9.property=file.pdf](http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Publikationen/Fachveroeffentlichungen/Informationsgesellschaft/Querschnitt/Informationsgesellschaft103070109004_9.property=file.pdf)
7. Buxton B (2007) Sketching user experience. Getting the design right and the right design. San Francisco
8. Raskin J (2001) Das intelligente Interface. Neue Ansätze für die Entwicklung interaktiver Benutzerschnittstellen. Addison-Wesley, München
9. Cooper A, Reimann R (2003) About face 2.0: the essentials of interaction design. Wiley, Indianapolis
10. Moggridge B (2006) Designing interactions. MIT Press, Massachusetts
11. Nielsen J (1993) Usability engineering. Academic Press, Chestnut Hill
12. Norman DA (2002) Design for everyday things. New edition, USA
13. Bratteteig T (2002) Bridging gender issues to technology design. In: Floyd C et al (Hg.) Feminist challenges in the information age. Leske + Budrich, Opladen, pp 91–106
14. Clegg S, Mayfield W (1999) Gendered by design in: design issues 15(3):3–16
15. Oudshoorn N, Rommes E, Stienstra M (2004) Configuring the user a s everybody: gender and design cultures in information and communication technologies. In: Science, technology and human values 29(1):30–63
16. Rommes E (2000) Gendered user representations. In: Balka E, Smith R (Hg.) Women, work and computerization. Charting a course to the future. Kluwer Academic Pub, Dordrecht, pp 137–145
17. Traut EM (2006) Encyclopedia of gender and information technology. Hershey, London
18. Buchmüller S, Joost G (2009) Design for elderly people—a methodological case study about the development of a dect phone. In: Sapio B, Haddon L, Mante-Meijer E, Fortunati L, Turk T, Loos E (eds) The good, the bad and the challenging: the user and the future of information and communication technologies, conference proceedings of the cost conference 298, 13th–15th May, Vol II, ABS-Center, d.o.o. Koper, Slovenia 2009, pp 710–719
19. Herbert L (2007) GfK-Forscher zum Konsumverhalten von Senioren (Researcher from the German Organisation for Consumer Research writing on the Behaviour of Senior Consumers)—WDR.de—Wirtschaft, 30.03.2007, p 1 (in German)
20. Robert S (2006) Zielgruppenanalyse und Produktadaption im Wachstumsmark “Alter” (“Target Group and Product Analysis of the ‘Older’ Growth Market”), FH München, Fachbereich Wirtschaftsingenieurswesen, July 2006, p 36 (in German)
21. “Generation 55+, Chancen für Handel und Konsumgüterindustrie” (Generation 55+, Chances for Trade and the Consumer Industry), PricewaterhouseCoopers and University of St. Gallen Switzerland, January 2006, p 21 (original in German)
22. European Commission (2006) (ed) Women in science and technology—the business perspective. Download: [http://ec.europa.eu/research/science-society/pdf/wist\\_report\\_final\\_en.pdf](http://ec.europa.eu/research/science-society/pdf/wist_report_final_en.pdf) (retrieved March 10, 2010)
23. BMBF (Bundesministerium für Bildung und Forschung) (2008) (ed) Bildungsbericht Forschung und Innovation 2008. Berlin. Download unter: [http://www.bmbf.de/pub/bufi\\_2008.pdf](http://www.bmbf.de/pub/bufi_2008.pdf) (retrieved March 10, 2010)
24. Cox TH, Blake S (1991) Managing cultural diversity. Implications for organizational competitiveness. In: Academy of management executive, 5(3):45–56
25. Rastetter D (2006) Managing diversity in teams. Erkenntnisse aus der Gruppenforschung. In: Krell G, Wächter H (eds) Diversity management. Impulse aus der Personalforschung. München, Mehring, pp 81–108
26. Akrich M (1995) User representations: practices, methods and sociology. In: Rip A, Misa TJET, Schot J (eds) Managing technology in society. The approach of constructive technology assessment, pp 167–184

27. Bredies K, Buchmüller S, Joost G (2008) The gender perspective in cultural probes, participatory design conference, 1.10–4.10.08, Indiana University, Bloomington
28. Brandes U (2001) Designing gender: das drama der Geschlechter in Logo-Gestaltungen. In: Zurstiege, Guido, Schmidt, Siegfried J (Hrsg.) Werbung, Mode, Design, Wiesbaden, pp 197–212
29. Brandes U, Stich S (2004) Objektkörper—Körperobjekt. Mobiltelefone im interkulturellen Vergleich. In: Fachhochschule Köln (Hrsg.) Insider—Hauszeitschrift der FH Köln, Titelthema: Interkulturelle Kompetenz, Köln, S. 24–25 unter: [http://www.verwaltung.fh-koeln.de/imperia/md/content/verwaltung/dezernat5/insider/insider1\\_2004.pdf](http://www.verwaltung.fh-koeln.de/imperia/md/content/verwaltung/dezernat5/insider/insider1_2004.pdf)
30. Buchmüller S, Joost G, Chow R (2009) The role of interface in virtual gender presentations. In: Online proceedings of the 5th European symposium on gender & ICT, digital cultures: participation, empowerment, diversity, Bremen, Germany, 5th to 7th March 2009, [http://www.informatik.uni-bremen.de/soteg/gict2009/proceedings/GICT2009\\_Buchmueller.pdf](http://www.informatik.uni-bremen.de/soteg/gict2009/proceedings/GICT2009_Buchmueller.pdf)
31. Buchmüller S (2008) Gendered by design. Zur kulturellen Konstruktion von Geschlecht durch Design in: Hochschule für angewandte Wissenschaft und Kunst (HAWK) and Joost G (Hrsg.): Gender and Design, Maria-Goeppert-Mayer Programm, Hildesheim, pp 10–19
32. Buchmüller S, Joost G (2009) Der Schein bestimmt das Sein. Zum Verschleierungsmechanismus der kulturellen Gestaltung von Geschlecht. In: Stein EK, Walzel F (Hrsg.) Oberflächen/Untersichten, Neuwerk, Zeitschrift für Designwissenschaft, eine Publikation der Schriftenreihe der Burg Giebichenstein, Hochschule für Kunst und Design Halle, pp 73–84
33. Kirkham P (Hrsg.) (1996) The gendered object. Manchester University Press
34. Ehrnberger K (2007) Materializing gender, design inquiries 2007. Interactive Institute Stockholm, Schweden
35. Zentrum Frau in Beruf und Technik (Hrsg.) (2006) Gender and design, castrop-rauxel unter: [http://www.zfbt.de/veroeffentlichungen/dokumente/gender\\_design\\_2.81%20Leitfragen%20final.pdf](http://www.zfbt.de/veroeffentlichungen/dokumente/gender_design_2.81%20Leitfragen%20final.pdf)
36. Stein S, Bessing N (2009) Gender and diversity in innovation processes. In: VDI (ed) Gender and diversity in engineering and science. 1st European conference. Report 39. Düsseldorf, pp 95–110
37. Gaver W, Boucher A, Pennington S, Walker B (2004) Cultural probes and the value of uncertainty. Interactions, Sep–Oct 04, pp 53–56
38. Gaver W, Dunne T, Pacenti T (1999) Cultural probes. ACM, pp 21–29
39. Graham C, Rouncefield C, Gibbs M, Vetere F, Cheverst K (2007) How probes work, OzCHI 07, pp 29–34
40. Boehner K, Vertesi J, Sengers P, Dourish P (2007) How HCI interprets the probes. In: CHI proceedings 07, pp 1077–1086
41. Lucero A, Lashina T, Diederiks E, Mattelmäki T (2007) How probes inform and influence the design process. ACM, pp 377–391
42. Sanders E, Stappers PJ (2008) Co-creation and the new landscapes of design. In: CoDesign, Taylor & Francis [http://www.maketools.com/pdfs/CoCreation\\_Sanders\\_Stappers\\_08\\_preprint.pdf](http://www.maketools.com/pdfs/CoCreation_Sanders_Stappers_08_preprint.pdf)
43. Sanders E, William CT (2001) Harnessing people's creativity: ideation and expression through visual communication. In: McDonagh P (ed) Focus groups: supporting effective product development, Taylor and Francis
44. Sanders E (2002) From user-centered to participatory design approaches. In: Frascara J (ed) Design and the social sciences. Taylor and Francis
45. Sanders E (1999) Postdesign and participatory culture. In: Useful and critical: the position of research in design. University of Art and Design Helsinki (UIAH), Tuusula
46. Stappers PJ (2009) Meta-levels in design research: clarifying the roles we play in design, research, and elsewhere. In: Conference proceedings IASDR 09
47. Redström J (2008) RE: Definitions of use. Design Stud 29(4):410–423
48. Redström J (2006) Towards user design? On the shift from object to user as the subject of design. Design Stud 27(2):123–139
49. Medienpädagogischer Forschungsverbund Südwest (ed) JIM-Studie 2010. Jugend, Information, (Multi-)Media. Basisuntersuchung zum Medienumgang 12 bis 19-Jähriger. Download: <http://www.mpfs.de/fileadmin/JIM-pdf10/JIM2010.pdf>
50. Medienpädagogischer Forschungsverbund Südwest (ed) JIM-plus—Nahaufnahmen 2009. Einstellungen und Hintergründe zum Medienumgang der 12-bis 19-Jährigen. Qualitative Zusatzbefragung zur JIM-Studie 2009, August 2010. Download: <http://www.mpfs.de/fileadmin/JIMplus/Nahaufnahmen/JIMplusNahaufnahmen2009Print.pdf>