Stories of Technology

Thesis
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Bachelor of Science
Psychology

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Abstract

Stories of Technology analyzes the themes and meanings underlying adoption of communication technology in older adults of at least 65 years of age in relation to their conceptions about their own and younger technology generations. Furthermore, the continuity of technology adoption profiles was assessed. A qualitative, semi-structured and technology-oriented life story interview was developed and applied to a sample of 6 older adults. Idiosyncratic meanings were extracted from the narratives by means of holistic content analysis and inductive coding. Second, deductive codes from theoretical concepts of both the Technology Acceptance Model (TAM) and the Diffusion of Innovations (DOI) theory were applied to the data. The results demonstrate that current adoption models fail to recognize technology adoption in older adults as an inherently social process that is informed by the evaluation of generational preferences, technology-inherent learning processes and age-related adoption hurdles. All theoretical concepts from TAM, DOI and technology generations were confirmed in the data and adoption profiles were equally divided between early and late adopters, exhibiting high continuity throughout life. The narrative approach enriched these conceptions by highlighting that the availability of learning opportunities in old age determines both generative identity and technology socialization. The study emphasizes the need for narrative guided theory making as a strategy to overcome the gap in current technology acceptance models that largely exclude individual socio-cultural processes.

Key words: technology acceptance, technology adoption, life story interviews, older adults

Introduction

Changing technologies, changing communication

People engage in storytelling to form a coherent and internalized narrative of their lives in an attempt to provide meaning and purpose (McAdams, 2001, p. 110). Throughout the last decades, rapid innovations in technological development have inevitably become interwoven with the lives of the masses. Especially the issue of how older people, who, throughout the course of their life, have witnessed a large variety of technological

developments, assign meaning to technological change in relation to their personal life story and generation, has remained largely uninvestigated. Successive changes in basic communication technology are what McQuail (1987, p. 19) has described with the term '*communication revolution*', thereby relating to continuous and incremental developments in communication technology starting from the invention of early printing techniques towards modern computer technology. All these innovations mediated the way people thought about transmitting information in a social system, and it was not until the invention of the first e-mail in 1971 that communication patterns underwent a pronounced change driven by novel technologies.

According to Sackmann and Winkler (2013, p. 494), the term *technology generation* was coined in sociology in the 1990s. Technology generations were defined as "birth cohorts whose conjunctive experience with technology is differentiated by social change", stating that differences between age cohorts are likely to perceived as a *generational difference* when fast *changes of basic technology occur*. The authors trace generational differences back to a *socialization in a technology style* dissimilar from that of subsequent generations shaped through engagement in public discourse. As older-aged technology generations show slower adaption speed to technological innovation, generational differences were thought to accumulate over time. Recent approaches to technology generations have characterized inter-generational differences by means of changes in basic technologies. Johnson and Finn (2017) have provided clear age-cohorts for the different technology generations in relation to the dominant basic technology:

Table 1

Birth cohorts of technology generations

Technology generation	Date of birth
Mechanical generation	before 1939
Electromechanical generation	1939 - 1948
Analog electronical generation	1949 - 1963
Digital computer generation	1964 – 1978
Internet generation	1979 - 1989
Internet, social networking and smartphone generation	after 1989

Note. From Johnson and Finn (2017), p. 125

It is especially striking that older adults, who have personally experienced various technological innovations throughout their life, are both experts for their experienced changes while at the same time being separated from current generations by the impacts of generational difference. In that sense, Docampo-Rama, de Ridder and Bouma (2001, p. 28) have described inter-generational differences as a consequence of *technological availability during the formative period* (between 10 and 25 years) of the individual. After this period, attitudes and norms towards technology are thought to be fairly stable, resulting in the fact that older individuals exhibit differences in technology usage simply because they could not acquire the necessary technological skills during their formative years.

Technology acceptance and adoption as a product of life experience

When we consider technology generations as being differentiated by their conjunctive experience with technology, a sound understanding about which factors drive technological acceptance and adoption to enable such experience in the first place. Different models have identified factors that affect user acceptance and adoption of technology (Taherdoost, 2018). Understanding the driving factors factors of technology adoption and acceptance as well as how past experiences have contributed to the understanding and uptake of technology throughout life may assist to find "better methods for designing, evaluating and predicting the response of users to the new technologies" (p. 961). For the present case, first, the Technology Acceptance Model (TAM) and, second, the Diffusion of Innovations Theory (DOI) were examined in order to explain technology adoption both from an individual-psychological and societal point of view.

The Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989; Tahderdoost, 2018, p. 962) is a psychological model that seeks to explain "peoples computer acceptance from a measure of their intentions, and the ability to explain their intentions in terms of their attitudes, subjective norms, perceived usefulness, perceived ease of use" (Davis, Bagozzi and Warshaw, 1989, p. 982) on an individual level. The model shows how personal beliefs on usefulness and ease of use (evaluated in their degree of favorableness to the system) impact the attitude towards the use of a given technology that is expressed in a behavioral intention to use and ultimately in the actual use of the technology itself. Especially noteworthy is that perceived usefulness had a strong impact on intention to use, accounting

for more than half of the variance for intentions while for subjective norms, no effect was found. (Davis, Bagozzi and Warshaw, 1989, p. 982).

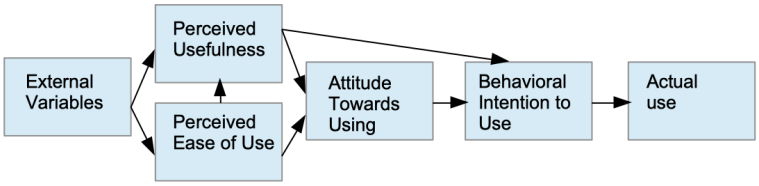

Figure 1. Technology Acceptance Model (TAM)

Previous TAM research by Maier, Laumer and Eckhardt (2011, p. 104) has identified that older technology adopters are, when it comes to the uptake of social networking sites, motivated by utilitarian results, normative beliefs, perceived ease of use and fear of technology, especially privacy concerns. Non-adopters were mostly influenced by utilitarian outcomes and fear of technology; older non-adopters would perceive usefulness of social networking technology as less important than older adopters, and the perceived pressure to adopt social networking sites was deemed less than that exhibited in the network of the older adopters. However, while TAM focuses on the individual, other theories have adopted a wider scope targeting social systems at large.

The Diffusion of Innovations Theory (Rogers, 1983) as a sociological theory places a stronger emphasis on the societal characteristics of socio-technological systems, their organizational attributes and continuity aspects (Tahderdoost, 2018, p. 963). For Rogers, diffusion of technology is a gradual, non-linear, *process* that occurs through communication amongst adopters acting in a social system faced with an innovation (Rogers, 1983). The innovation-decision process occurs in five phases (Rogers, 1983, p. 163), starting with individuals gaining *knowledge* about the innovation without having yet taken the decision to adopt it. In the subsequent *persuasion* stage, individuals engage in attitude formation that brings about either a favorable or unfavorable attitude towards the innovation. During *decision phase*, individuals either take the decision to adopt or reject the innovation. When the person actively engages to use the innovation, the *implementation stage* has occurred, that ultimately brings *confirmation*, that is the decision to engage in ongoing use of the technology by means of social confirmation. Rogers (1983, p. 244) stipulates that adopter distributions follow a normal distribution as a result of the diffusion effect and "the cumulatively increasing degree of influence upon an individual to adopt or reject an innovation, resulting from the activation of peer networks about the innovation in the social system". In this normal

distributed curve, innovativeness is measured in relation to the point in time at which individuals engage to adoption the technology. From this, different categorizations of adopters were determined (Rogers, 1983, p. 248): *innovators*, often possessing substantial financial resources and faced with danger of losses, possess the knowledge to apply technological knowledge in a mindset of venturesomeness including the predisposition to risk-taking. The innovator introduces the technological innovation into the social system from outside the system boundaries. *Early adopters* have the task of reducing uncertainty about an innovation by providing subjective evaluations to their peer circle following adoption. The early adopter acts as a pioneer for the diffusion process and acts as a role model for other individuals inside the system. Influenced by the early adopters, the *early majority* markedly adopts innovations prior to the average member in society, thereby constituting a link between early- and late-adopting individuals. The *late majority*, however, takes a more skeptical stance and is thought to adopt the innovation after the early majority has done so, often as a result of social network pressure or economic reasons. Rogers (1983, p. 250) sees this network pressure as the focal motivating factor in the adoption process and states that, for the late majority, uncertainty towards the innovation has to be reduced before the late majority would be willing to adopt. Lastly, the *laggards* adopt an innovation as the last group in a system. Without possessing leader-functions, those often-isolated individuals tend to reference their reasoning in the past and base their decision towards adoption on cognitions about "what has been done in previous generations", thereby exhibiting suspicion, traditional orientation and resistance (Ibid) to the innovation.

Narrative approaches and the technological life story interview

Current technology acceptance theories have largely taken a deductive top down approach in describing the uptake of technology. The concepts of such models leave little possibility to perceive actors as individuals with their respective and unique strategies for meaning making, causing the individual voice to be largely lost. Furthermore, since such theories were not specifically designed to capture adoption processes in older adults, validity concerns arise when they are applied to subgroups of exclusively older adults.

Narrative approaches contribute to existing theories by providing meaningful understandings about the subjective world of the individual and its meaning making as a result of their reconstructed experience (Pinnegar and Daynes, 2007, p. 3). One form of

narrative inquiry is the life story interview. Atkinson (1998, p.8) defines life story interviews as *"the story a person chooses to tell about the life he or she has lived, … what is remembered of it and what the teller wants others to know of it, usually as a result of a guided interview by another"*. Drawing on the methodological techniques of ethnography and field-research, the collection of idiographic first-person narratives situates subjective meaning in a holistic view on life as whole (Atkinson, 2012, p. 26). Life stories include the different roles individuals have taken in society during their life, their experienced conflicts and successes (Atkinson, 1995, p.4) as well as their acquisition and maintenance of values and beliefs. By providing insight into how a given individual comes to find meaning in his or her narrative and by how stories act as connecting agents between different stages in life (Atkinson, 2012, p. 26), life story interviews can help to enrich technology acceptance models with individual perspectives underlying theoretical conceptualizations.

Life story interviews are analyzed on four functional dimensions of analysis (Atkinson, 2012, p. 6.): first, *psychologically*, how we relate to our self; second, *sociologically*, how we relate to others; third, how we *spiritually* relate to life; fourth, *philosophically*, how we relate to the surrounding world. These dimensions allow to gain rich insights into how the individual experiences its past and present and frames how struggles in life are epistemologically approached by "the self as a meaning-maker" within a broader socio-cultural context (Freeman, 1992, as cited in Atkinson, 2006). In line with this notion, Bruner (1991, p. 4) has earlier argued that human experience and memory is organized by narratives which he perceives to be product of cultural transmission. For him, narratives are thought as "a version of reality whose acceptability is governed by convention ... rather than by empirical verification". Narratives of actors in their idiosyncratic world were thought be rooted in a specific setting whose experience is coherent with their internal state. Narratives contributing to the individual's autobiography thus "depend on being placed within a continuity by a constructed and shared social history in which we locate ourselves and individual continuities" (p. 20). Atchley (1989, as cited in Bohlmeijer and Westerhof, 2011, p. 277) confirms this notion in arguing that continuity helps to preserve an individual's sense of identity and ownership. Individuals would engage in strategies to achieve continuity by relating to and recollecting their lifetime narrative, a strategy that Butler (1974, p. 531) perceived as a "major developmental task" especially during the last phases of life. Life story reminiscence in the elderly so function to pass on personal life experience to others and to identify the essence of what was obtained throughout a life-long process of learning. This process of clarification about oneself is what McAdams (2015, p. 1) has described with the

term *narrative identity*: live stories determine the present and future identity of the person both to the person itself and in relation to others. For him, narrative identity is determined by key scenes, themes and episodes in the life of the individual that are reshaped throughout the developmental process and ultimately serve the psychological function of achieving temporal coherence. Narrative identity is thus the approach to internalize and integrate the personal story involving the "reconstructed past, experienced present, and imagined future" (p. 2) of the individual. McAdams (2008) finally developed the life-story interview to capture how such narratives become organized around a person's key episodes, ideological settings, central characters and themes as well as the anticipated narrative for the future self.

Research questions

In this paper, first, it is investigated which themes and meanings underlying the adoption of communication technology are reflected in the life narratives of older individuals. Second, it is discussed how perceived differences between older and younger technology generations influence attitudes towards the use of communication technology. Third, the continuity of adoption profiles throughout the life of older individuals is assessed. The following research questions are proposed to guide the qualitative analysis:

- Which meanings and themes underlying the adoption of communication technology are reflected in the life narratives of older individuals?

- Which perceived differences between older and younger technology generations relate to attitudes about using communication technologies?

- How continuous were the profiles of technology adoption throughout the lives of older individuals?

Target group

A target group of older adults of 65 years and older, who have engaged with different forms of communication technology in their life, is investigated. Czaja et al. (2006) have demonstrated that for this target group, general use of technology and internet use have

increased during the last years while at the same time, major difficulties in operating the technology as compared to younger generations were prevalent, likely to cause "disadvantages in terms of their ability to live and function independently" (p. 333). Given these pretenses, we deem a target group of older adults of 65+ years of age as suitable.

Methods

Participants

The study was conducted in 2019 and focused on older individuals of at least 65 years of age, who were willing to share their life-time experiences about communication technology. A total of six participants, that were not previously known to the researcher, were interviewed consisting of four women and two men. The age of the participants ranged from 66 to 85 years with a mean of 76.3 years (SD = 8.5). Geographically, all interviews were conducted in various districts of western North Rhine-Westphalia, Germany: Coesfeld district (N = 4), Borken district (N = 1) and the city of Hamm (N = 1). Inclusion criteria were an age of at least 65 years or more. Exclusion criteria were insufficient cognitive or verbal ability as a result of aging and/or disease and insufficient memory recall. However, no participants had to be excluded on the grounds of these criteria.

Interview and materials

A qualitative, semi-structured life story interview design was chosen to obtain first-person insights into subjective life time narratives about communication technology and their underlying meanings. Therefore, a nineteen-question technology-specific adaptation of McAdams (2008) life story interview was developed for use in German language (cf. appendix A).

First, the interview obtains a *general structure of the participants life narrative* covering communication technology; this was achieved by asking the participants to chronologically provide distinct chapters of communication technology use throughout their lifetime. Communication technology was described to the participants as “every means of technology used for interpersonal communication used during life” including both digital and analogous technologies (e.g. letters). For each of the provided technological chapters, the participant was then asked to provide a concise and well-remembered *key scene* about the used technology.

Second, after having obtained a chronological and scenic overview of the participants technological life narrative, ten questions (including four sub-questions) were asked about the provided key scene to assess the *underlying meanings of technology* use. Questions

thematically assessed the associated emotional events in regard to the specific use technology (high points, low points), the impact and effects of the technology adoption on life and an assessment of subjective factors that enable or inhibit technology adoption (subjective norms, perceived usefulness, perceived ease of use).

Third, the participants were invited to think about *inter-generational differences* between their own technology generation and that of all following younger technology generations. This concluding part of the interview consisted of five questions, assessing the participants continuity of adoption profile throughout their lifespan, the thought-of specifics of their own technology generation, their perceptions about the differences between their own generation and subsequent generations in regard to technology use and the comparison of differences in technology adoption styles between the own and following technology generations.

Probing was used when individuals departed from the chronological structure of the interview or when participants mixed narratives about other technologies into the current chapter. Participants were reassured that there would be sufficient opportunity to talk about the mixed-in technologies later, accompanied by asking to return to the initial key technology of the chapter order ("We will talk about this technology later in its designated chapter, for now, could we come back to technology A?"). Additional probing was used when participants exhibited difficulties remembering things in the course of events; in these cases, mirror probes reflecting on the previously stated content were used to foster the flow of narrative remembrance ("You found it easy to use. What happened then?"). In some cases, probing occurred in the form of nodding to acknowledge the presented contents without interrupting the thought process of the participant.

Procedure

Ethical approval of the interview study was obtained by the Ethics Committee of the Faculty of Behavioral, Management and Social sciences (BMS) under registration nr. 190466. Previous to participation, all participants were informed about the aims and nature of the study without use of deception, its data collection and data processing methods and had the opportunity to ask all relevant questions. Informed consent was obtained in writing, including the permission to record, store and quote audio material (cf. appendix B).

All participants were obtained by means of snowball sampling. This was done to gain access to a group of older adults unknown to the researcher, regardless of their presumed technological attitude, that would otherwise have remained hidden. The first participant was obtained by a public announcement in a hospice organization. From there, each participant was asked to identify further potential participants fitting the inclusion criteria, which were subsequently contacted by the researcher and asked to participate. One person refused to participate in the interview.

All interviews were conducted by the author in the participants home for reasons of convenience and/or decreased mobility within the sample. Mean length was 61.8 minutes within a range of 53 to 74 minutes. All participants were cooperative, talkative and interested in the topic. However, two participants expressed problems to recall specific key scenes. The structure of the interview was generally well understood but occasionally, participants had problems to focus on a single technology when answering the questions on meaning within a specific technological life chapter. In these situations, probing was used to remind the participants of the chronological order, which worked in all instances.

Analysis

Interviews were manually transcribed using F5 audio-transcription software. Personal identifiable information, including names and locations were omitted and replaced with neutral wild-cards to ensure data protection. Analysis was conducted on the original German transcript data and quotes used in this thesis were translated into English by the author. All transcript data was coded using atlas.ti 8.4.0.

The interview transcriptions were analyzed by means of *holistic content analysis* (Lieblich, 2011; Iyengar, 2014) in addition to a deductive coding round based on theoretical models. First, the interviews were read and subsequently summarized to a persona in order to capture a condensed overview on the idiosyncratic narrative structure of the interview. All personas depict an interpretation of the case. However, supplementary quotes in the personas were selected on their degree of variability and representability for the person.

Second, a case-wise *inductive coding round* was applied to the data at the level of individual sentences until saturation (Saunders, Sim, Kingstone et al., 2018) was reached. All codes were generated from the transcript data without any reference to pre-existing theoretical conceptions by means of color-coding. In the next step, inductive color codes relating to the

same dimension were clustered to form *labels* that characterized each participant. All labels and their constitutive color-codes were listed in section 4 (Interview transcriptions and labels). By means of axial coding, the generated labels relating to the same concept were clustered across cases to form overarching and more abstract themes (see table 3) describing the underlying factors of (non-)adoption.

Third, the interviews were re-coded in a separate *deductive coding round* independent of the conducted holistic content analysis. Therefore, a coding scheme (Mayring, 2000, pp. 4-6; cf. appendix B) with theoretical concepts from both TAM, technology generations and DOI models was developed and applied to the data in order to first, investigate underlying factors of technological adoption, second, to identify how perceived differences between technology generations relate to the adoption process and third, assess the continuity of technology adoption profiles (DOI) of the participants during their lives.

To account for issues of inter-subjectivity, the coding scheme was discussed with a non-involved researcher until consensus was reached concerning the coding rules.

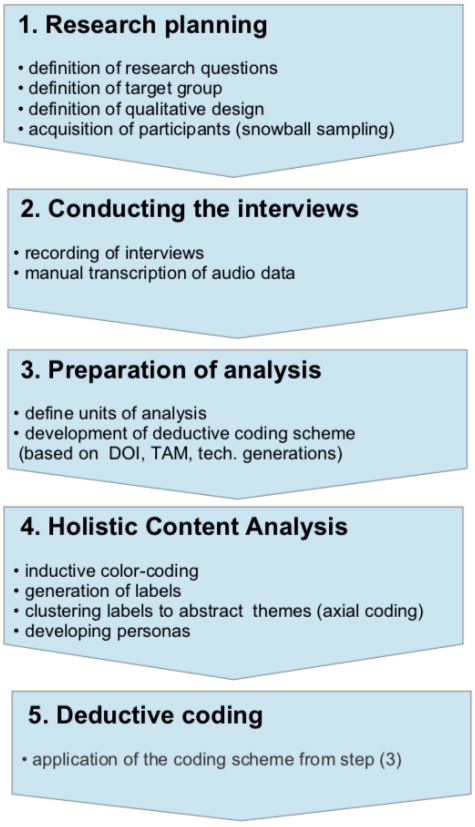

Figure 2. Research process.

Results

Without exemption, all participants were using current day communication technology. Most often mentioned was the telephone (N = 5), the smartphone (N = 4) and the computer (N = 4). Analogous technologies such as the typewriter (N = 2) and letters (N = 2) were less prevalent. It seems that tablet PCs, such as the iPad, were only seldomly (N = 1) used.

Table 2.

Used technologies in the sample

Technology	Frequency (percentage)
language	1 (16.6%)
letters	2 (33.3%)
typewriter	2 (33.3%)
telegraph	1 (16.6%)
telephone	5 (83.3%)
fax	1 (16.6%)
mobile phone	3 (50.0%)
smartphone	4 (66.6%)
computer	4 (66.6%)
internet	1 (16.6%)
iPad	1 (16.6%)

I. Themes and meanings underlying technology acceptance and adoption in the elderly

The first research question sought to investigate which meanings and themes underlie the adoption of communication technologies in elderly individuals. Eight overarching themes were synthesized from the labels obtained by holistic content analysis of the interview data. Table 3 provides an overview about the themes and their constitutive labels.

Table 3.

Abstract themes and their constitutive labels

Themes	Constituting labels
T1: Generational preferences influence usefulness-assessments	3.5: preference of analogous behavior as a generative characteristic (Mrs. G.) 4.3: evaluations of usefulness determine technology adoption (Mr. F.) 6.3: technological non-adoption as a result of needs assessment (Mrs. U.)
T2: Age-related decline as an adoption hurdle	1.2: age related decline of ability and interest (Ms. W.) 3.1: bodily function as barriers to technology adoption ‘ (Mrs. G.) 1.4: complexity of technology as a hurdle and needs for simplistic designs (Ms. W.)
T3: Technology adoption as a social process	2.2: peer pressure and peer comparison drive technology adoption (Mr. K.) 3.4: gender perspectives influence the assessment of technology (Mrs. G.) 3.6: availability of technology as a normality of zeitgeist (Mrs. G.) 4.2: technology introduction as a social process (Mr. F.) 5.5: technology adoption as a result social referencing and social reinforcement (Mrs. J.)

T4: Technology inherent learning processes and aging	1.1: learning new technologies fosters independence and self-efficacy (Ms. W.) 5.6: fast technological development requires specialized learning interventions for older people (Mrs. J.)
T5: Technology requires increased information-processing efforts	1.5: increased flow of information as a result of technology use (Ms. W.) 5.2: smart technologies allow selective consumption of information (Mrs. J.) 5.3: increased consumption of information and its role as a time killer (Mrs. G.) 6.1: communication technology requires proactive interaction-management (Mrs. U.)
T6: Dependence on others and external help	1.6: accepting help from others (Ms. W.) 3.2: adaptive technological design decreases dependence from others (Mrs. G.) 5.4: technology supports personal mobility (Mrs. J.)
T7: risk sensitivity	1.3: privacy concerns while interacting with technology (Ms. W.) 4.1: technology acceptance is governed by contextual use (Mr. F.) 6.2: technology improves work-related processes (Mrs. U.)
T8: Technology enables self-expression and participation	2.1: technological innovations allow for immediate expression (Mr. K.) 2.3: developing own ideas through technology (Mr. K.)

	2.4: technology to participate in family and society (Mr. K.)
	3.3: using technology for the management of emotions (Mrs. G.)
	5.1: innovative and custom design choices make technology desirable (Mrs. J.)

Note. Themes were sorted according to their position in the process from pre-adoption to active technological participation. Numbers provide interview number and theme number.

Theme 1: Generational preferences influence usefulness-assessments

Throughout three interviews, it was found that membership in a given technology generation provided the criteria for the assessment of personal needs and usefulness in which the individuals engaged when confronted with a novel communication technology. Prior to any adoption decision about a given technology, individuals engage in assessment to provide themselves with judgments about the perceived usefulness and expected ease of use of the innovation.

One participant explicitly stated, that this usefulness assessment influenced his adoption decision: *"when it was a relief and I realized that, then I transferred (the technology) it. And when it was a burden, which eventually occurred, then I rejected it"* (4:76). It is illustrative to notice that characteristics of a given technology generation, such as the preference for buying things offline, seem to be incorporated into the assessment of expected ease of use: *"I prefer to go to the store … and then it has to be mailed back and forth … this is not comfortable to me"* (3:87). If technology adoption is connected to behavior contradicting such personal preferences, it might be the case that such generative characteristics form barriers to technology adoption in a very early stage of the decision process.

Further examples indicated that such need-assessment is not limited to the perception of expected usefulness, but also connected with the assessment of whether the technologies, which are already used by that individual, are sufficiently useful: *"now I know that it is useful, but I also could serve my needs with the other devices. I would not need to have it"*

(6:94). Whether an innovation is adopted seemed to be both a result of perceived usefulness and backward comparison to already owned technologies.

Theme 2: Age-related decline as an adoption hurdle

The effects of aging, including decline of bodily function and cognitive abilities seem to be a hurdle towards the successful adoption of communication technology; as one participant concretely put it, *"the bodily barriers are really big"* (3:86).

Most prevalent bodily barriers in this study included decreases of eye vision and tactile ability. It seems that older individuals face difficulties to operate communication technology as a result of small printed elements on screens and buttons or due to smaller sizes of the operational controls. As a consequence of such inaccessible product design, the ability of elderly individuals to independently operate the technology has been reduced: *"I only have 50% of eye-vision. Therefore, my daughters have to write the bank-transfer forms for me, otherwise I could not do it"* (3:97).

Specifically designed devices intended for use by senior citizens were a strategy highlighted by various participants: in one example, after having bought a mobile phone for senior citizens, the participant was now able to read her messages on her own again: "*and because this one has such big letters on it, it is wonderful! Now I can at least read it"* (3:61). Design choices that are sensible to the bodily abilities of older must be perceived as a precondition for technological inclusion.

Besides bodily decline, the increasing complexity of technological innovations is perceived as a hurdle if it is co-occurring with cognitive decline during aging. Increasingly complex technological devices were reported to introduce fears of not being able to independently operate the device anymore: *"No, it is not only getting easier. That is why I think that one has a bit of fear about doing some things wrong"* (1:44). Therefore, some participants highlighted a preference for simplistic design choices, as these support their perceived certainty of being able to operate the device on their own: *"I wanted the simplest I could use"* (1:13).

Theme 3: Technology adoption as a social process

All participants described technology adoption as a social process but provided highly varying interpretations as to which specific social processes were the driving force fostering acceptance and adoption.

First, participants often cited peer pressure as a motivating factor for technology adoption. In all interviews, adoption of the mobile (smart) phone was described as a result of peer pressure: "*It was so that buying it came out of peer pressure, because everyone got one and if you did not have one, you were outside."* (2:71).

Second, social referencing and social reinforcement were described as the driving processes in technology adoption: individuals would engage in technology adoption only after evaluating the ability to interact with a given technology of similarly aged role models: *"a friend of mine has always waited until I bought something. And then she looked at it and noticed: Oi, Mrs. J. is able to operate it, then I am able to do it as well"* (5:46).

Third, one participant shared her experiences of technology acceptance being shaped by her role as a woman. Influenced by the outdated, stereotypical social norm of woman being reduced to "house wives", she describes that acceptance of the telephone has helped her escape this cage for some moments through exchanging cooking recipes with other woman impacted by the same deprivating situation: *"As a woman, one is always at home and is unable to talk to someone external … we shared cooking recipes on the telephone. …"* (3:49).

Fourth, technology adoption was described as an evaluative process in the work-environment. Here, the decision to adopt a technology was not taken by the affected individuals themselves, but socially mediated by their manager: "*I have equipped them with computers and most of them were very positive about it"* (4:48).

All of these examples demonstrated that technology acceptance must be perceived as an inherently social process that cannot be examined separately from the subjective norms of their socio-cultural context.

Theme 4: Technology inherent learning processes and aging

Multiple narratives have centered around the theme of learning. It became clear that novel communication technologies often require learning processes in older individuals to bridge the gap between their previously existent technological knowledge and the new skills that are required to successfully interact with the innovation.

Participants have exhibited multiple strategies for skill acieration: while some preferred autodidactic methods, others participated in goal-directed technology-courses for the elderly population. These attempts, however, were not always met with success: *"the teacher of the course was unknowledgeable … he didn't teach us anything! I instantly thought that this is the biggest nonsense ever! Everyone wanted to write SMS, but nobody has learned something!"* (3:82). It seems that older individuals question their ability to acquire new skills as a condition of their age by assessing whether one still *"would come to terms"* (5:52) with an innovation given their age.

However, various examples also highlight successful outcomes of technology related learning processes that, as a consequence, resulted in feelings of self-efficacy and gained independence: *"What kind of feeling did I have? You've made it! In your age!"* (1:5). Experiencing the capacity of the self to successfully engage in goal-directed learning despite any awareness of aging was often associated with feelings of agency and ownership.

While some individuals focused on their individual learning experience, others perceived technology learning as a collective responsibility of society: *"there ought to be done more politically for people from 60 upwards, to offer them … help"* (5:99), a task that for some participants was likely *"societally neglected, especially with this generation"* (5:102).

All these examples suggest a division between internally motivated loci of control (autodidactic learning, attending courses) and rather external motivated loci of control (perceiving learning as a responsibility of society).

Theme 5: Technology requires increased information-processing efforts

Throughout the interviews, various participants described that, as a consequence of adopting innovative communication technologies, increased information became available to them. As a consequence of that, most participants reported the need increased information-processing efforts that successively took away free time of their day. In many cases, this was perceived to be as negative or outright *"annoying"*. One participant provided that she gets *"a lot of WhatsApp messages from my relatives. Every morning I have a new picture on it, which sometimes annoys me, as it is too much"* (1:76). Descriptions like this highlight that both changes of the communication style (towards non-traditional means such as us using picture messages) as well as the frequency of incoming information is perceived as a burden. One participant went so far as to convey *that "all these*

systems are time-killers" (5:81).

However, the fact that technology adoption increases access to information does not necessarily have to be experienced negatively. While some individuals feel overwhelmed by the amount of information, others have reported to use smart technologies in order to select information that is relevant to their personal interests: *"which for me makes it highly important as I am very politically interested, …, and the first thing I do in the morning in my bed is to look what new has occurred"* (5:43). How elderly individuals experience the increased flow of information seems to be dependent on their behavioral disposition towards the technical system: passivity seemed to be associated with perceptions of being overwhelmed, while goal- and interest-specific motivations to use the technology allowed individuals to perceive the technical system as a useful tool for information selection.

Theme 6: Dependence on others and external help

Multiple participants highlighted their need for help from other individuals. Most often, help was sought from other members of their family, and especially so from the younger ones. It seems that help-seeking behavior is connected the required learning processes that come with the adoption of new technologies (cf. Theme 4). One participant described her uncertainty as a barrier to use: *"I would have never used it if it wasn't explained to me how to use it"* (1:63). It is likely the case that help-seeking behavior is associated with feelings of shame or the belief that asking for help is perceived as burdensome to younger people: *"I have often experienced that when their grandparents want to adopt something, they often have to look and help so that they can come to terms with it! Alas, this is why I would not want to adopt such a thing"* (3:81). In that sense, being afraid of asking for help depicts a major hurdle towards technological adoption.

Theme 7: Risk sensitivity

Lastly, the interviews revealed that technology adoption in the elderly seems to be differentiated by the context in which the innovation is to be used. Many individuals were aware of privacy risks associated with the contexts of use in which novel communication technologies are operated. One person stated that *"I have fear that my whole data runs*

around the world. Maybe it is a bit stupid ... maybe I am a bit fearful." (1:61). Another individual made an even more strict distinction between private and work-related context, again in an attempt to avoid perceived risks of data abuse: *"private things could be passed on, work-related things not. ... This is why I had to make the distinction between private and work related"* (4:78). It appears to be the case that older individuals possess a higher risk sensitivity to privacy and data protection and incorporate judgments about the likelihood of data breaches into their decision to use novel technologies.

Theme 8: Technology enables self-expression and participation

For various participants, using communication technology served purposes of self-expression and participation in social systems.

Concerning participation in social systems, various participants reported that communication technology has helped them to participate in their family life by being able to quickly obtain knowledge about ongoing social developments: "*that you know what occurs in your clique, on the one hand ... and what happens at home with my parents, sisters, children, the clique, friends"* (2:20). Usage of communication technologies fostered feelings of participative connectedness to their group of reference and helped to further strengthen these connections by providing the ability to plan ahead future interactions. In other instances, communication technology served the purpose of affective participation in the life of others: by writing and receiving letters to her kids, one participant was able to participate in the experiences of their kids from far away, thereby providing emotional reassurance to both parties: *"when we got a response, it was calming, so that you knew all were well"* (3:24).

In other cases, technology provided the necessary safety and reassurance to participate independently in everyday life, which, for older persons, seemed often to be associated with perceived risks of emergency situations. This was especially prevalent with the mobile phone: many participants reported that the mobile phone brought them the needed reassurance to participate in daily life with less fear: *"If you are outside as a single woman and do not know where to go, do not come home anymore, you feel sick or so, then I can call my kids to pick me up."* (3:72) and *"I always feel secure when I have the mobile phone with me, that is important if I want to go out for a walk or to the graveyard"* (3:71).

For other participants, technology was a means to express themselves: one woman bought extraordinarily designed phones to express her personality and design choices. For others, technology was used to develop own ideas through coding own computer programs:

"*it is fun if everything works … that you can work on what you like"* (2:54). In both cases, individuals have adopted technology as a solution for expressing their personal dispositions.

II. Differences between older and younger technology generations

The second research question asked, which perceived differences between older and younger generations were thought to influence attitudes towards using communication technologies. Three deductive codes describing differentiating factors between technology generations were developed from literature review in addition of a fourth coding accounting for all descriptions of difference that did not fit theoretical deductive assumptions:

Table 4.

Frequencies of deductive codes for technology generations

Code	Frequency
G1: change of basic technology	9
G2: socialization in a different technology style	24
G3: availability during formative years	8
G4: miscellaneous	59

G1: change of basic technology

Change of basic technology ascribes generational differences as a result of different basic technologies that were experienced during life. Older individuals have usually witnessed fundamentally different basic technologies than the following, younger generations. One participant illustrated this by describing the increasing introduction of robots into the work process. While unusual for him, he beliefs that for younger generation, robots will constitute a basic technology: *"and when you grow older and there are some changes of technology, e.g. with robots which now appear, this is a change of technology that surely comes, also in everyday life, for them (younger gen.), it will be a process worth thinking about"* (2:95). He believed that younger generations, who were raised in this new technological era are likely to face similar generational differences when they eventually grow old themselves and experience drastic changes of basic technologies in later years: *"I also believe that they will have an equal problem with it, just as we did at that time …, because by then, they will be of*

equal age … and get confronted with an entirely new technology" (2:99). Other participants reported that the speed by which basic technologies have changed in recent years has caused generational differences: *"there are many among them, who do not properly come to terms with it anymore"* (5:98).

G2: socialization in a different technology style

Second, socialization in a different technology style was established as a factor informing generational difference. For Sackmann and Winkler (2013), discourse among the actors in a social system characterizes the style of technological socialization by which individuals are affected. One participant provided the example of her son, who, born in the digital computer generation, exhibited a highly different style of techno-socialization, which she strongly rejected for herself: *"and when I see what my son does, he monitors his entire home with the telephone or mobile phone, such things I do not want"* (1:21). Another participant reflected about how socialization shapes the perception of normality and how the lack of technological socialization in his youth has affected his current attitudes towards technology: *"Now it is normality, but back then it simply came on top of it throughout the course of life … all these technological things were not existent, but successively were introduced, and then when one is in the respective age when he gets to know the technology … then one is somewhat more biased or approaches it with more anxiety."* (2:94). Yet another participant described how her socialization in the mechanical generation has shaped her preference for analogous behaviors today: *"I prefer to go to the store to buy! Ordering things (online) has to be mailed back and forth … this is not comfortable to me"* (3:87). It is remarkable how one participant explicitly named the concept of socialization: *"I believe that first of all, the parental home plays a role. How they … practically get socialized, the younger people"* (5:110).

G3: availability during formative years

Availability during formative years (below 25 years of age) describes generational difference as a result of technological availability during the early years of the individual. Growing up with certain technologies is associated with learning the skills necessary to operate these technologies. When the dominant technologies change over time with individuals of the older generation not having had the opportunity to obtain necessary skills during their formative phase, generational differences occur. Participants provided ample

examples that support this theory. One participant drew an analogy towards learning to cycle: *"for the kids, or the younger generations, it is the normal life. They grow up with it, it is the same as learning to cycle like for us, when we were little"* (2:93). Another participant put forward a similar notion: *"the younger generation does directly grow up with it … for them, it is self-evident … they do not know a live without the TV or all these other things, there are worlds in between, also by means of understanding"* (5:105). In the last interview, curiosity for innovations in the younger generations was ascribed to growing up with technology: *"and I think for them it now is curiosity, because they have grown up and got accustomed with these things; they wait for more."* (6:107).

However, the factor of availability during formative years was not limited to younger generations. One participant, grown up in mechanical generation, reports that the availability of the telephone during his formative years shaped his perception of ease of use: *"as a kid, I already grew up with the telephone, there I do not have any restraints"* (4:22).

G4: miscellaneous

The last code was used to capture any perceived reasons for generational difference not yet described by literature. Being the code most frequently applied to the data, participants provided ample examples of factors not covered in literature.

First, one participant described that, due to the speed of technological innovation throughout the last decades, younger generations are generally facing a greater availability choices about the technologies they want to use: *"they have more choice, and they use that choice … perhaps, we do not do it like this and … do not buy as much"* (3:89).

Second, three participants ascribed generational difference to be a result of changing education: *"the difference partially laid in the education, making the step to further educate oneself"* (4:73) and *"perhaps much is a question of education"* (5:10). Most of the participants were unable to think of specific educational differences between the generations that contribute to generational difference, although one participant described access to language learning as a factor that helped her grandchild with technology adoption: *"when I think about my grandchild, from their second year in life, she has always been to America and successively learned the language more and more right from the start"* (5:107). Besides, older generations were thought to possess fewer possibilities for accessing technological education, especially since one participant described learning possibilities for the elderly as *"societally neglected, especially with this generation"* (5:102).

Third, some participants described age-related characteristics as generational effects, although these are rather historical conditions instead of genuine cause for generational difference. These were also captured in the G4 miscellaneous code:
As a first age-related phenomenon, a few participants perceived generational differences to occur through the perception of bodily barriers. One participant describes the younger generation to be less affected by bodily barriers: *"when I see how they all type on their smartphones and such … first, our hands are not as fit anymore, they cannot do this anymore, all of these are handicaps!"* (3:84) another stipulated *that "perhaps, the younger people can move faster"* (1:25). As a second age-related phenomenon, increased spontaneity and curiosity as naturalistic phenomena of younger age were often ascribed to younger generations, contributing to a greater openness to innovation: *"with certainty, the will rather be adept to try new things. Younger individuals are more curious to try new things by nature"* (5:109). Others confirmed this notion by ascribing that *"they are more spontaneous"* (1:23) and *"I think they try everything"* (6:105). In contrast, four participants described preferences for known technologies as a common occurrence in older generations: *"and others have said: 'I have always been doing it for 20 years … like this, it works well, why should I change myself?"* (2:88). Others saw such preferences to be motivated in their personal needs which seemed to be fully satisfied with already existing technologies: *"Because I get along with those things … that I have. For my needs. More I do not want"* (6:98).

However, it is unclear whether these miscellaneous factors indeed form own dimensions. It might well be the case that educational changes could represent another factor of socialization in a different technology style (G2); likewise, it seems possible that greater availability of choices might represent another factor of change of basic technology (G1). In the interviews, causes for differences not described in literature were most frequently described, while availability during formative years was least often described. Table 4 provides an overview over the code frequencies found in the data.

III. Continuity of adoption profiles

The third research question asked about how continuous adoption profiles were represented in the narratives of elderly individuals. During deductive coding, five codes were applied to the interview data. Nearly all participants described their profile of technology adoption as rather continuous and stable throughout life. Only in one case (Mrs. U) continuity

profiles have changed with the process of aging towards a more passive stance, a change likely as a result of a fulfilled need-assessment carried out during the aging process, which brought the insight that currently owned things fulfill all personal needs.

The data suggest an almost equal division of early (D2, D3) and late adopting (D3, D4) individuals (cf. Figure 3). In this sample, men exhibited early adoption profiles while woman seemed to be more prevalent in the late adopting categories. Since no individual acted as an innovator, it seems likely that the older individuals in the sample often require at least some degree of reduced uncertainty by means of peer evaluations. Only laggard was identified.

Table 5.

Frequencies of deductive codes for adoption profiles (DOI)

Code	Frequency
D1: innovators	0
D2: early adopters	7
D3: early majority	4
D4: late majority	4
D5: laggards	4

Note. More than one citation per case could be assigned to D1-D5

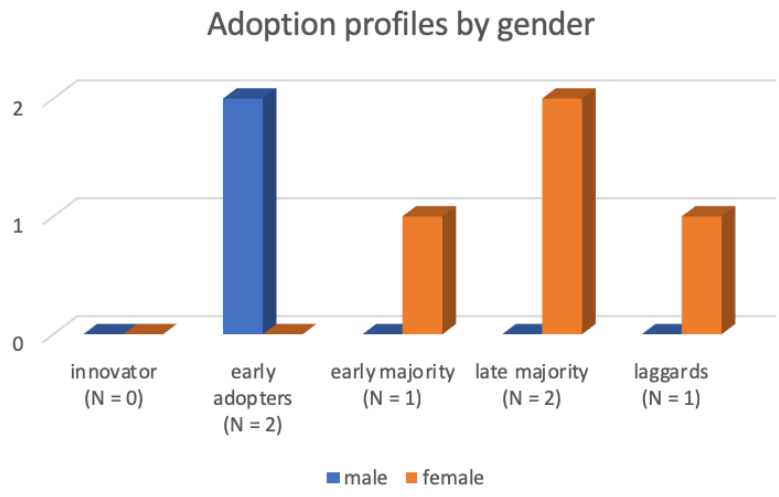

Figure 3. Frequencies of adoption profiles by gender

D1: innovators

Innovators exhibit strong tendencies to adopt innovations among the very first in society while possessing the capabilities to withstand the risks of failure and uncertainty.

No individuals from the sample fulfilled these criteria.

D2: early adopters

Early adopters serve as role models for adoption by inhibiting a central position in the social system; through their actions, early adopters decrease uncertainty about innovations by providing evaluations to peers.

Two individuals (both of which were men) were classified as early adopters. Both provided descriptions of high continuity by stating to have been *"always relatively early"* (2:85) in adopting innovations or fast adoption as soon as *"when I could eventually afford it"* (2:61). Both were classified as early adopters because adoption has occurred always relatively early after innovations became available, but without being among the very first. Combined with their strong desire to provide experiences of their use to others *("generally it was so that the technology was previously used by others, I wasn't the first who used it, but I recommend it further",* 4:77), the participant thereby fulfilled all central characteristics for early adopters.

D3: early majority

The early majority adopts innovations before other members of the majority; by fulfilling a middle position between early and late adopters, those individuals are seldom in leadership positions and are influenced by descriptions of peers that used the innovation before them. Only one case (female) fulfilled these criteria. Describing herself as a *"technology freak"* that has *"always been that"* (5:31) and possessing a multitude of smart devices, it became clear that she often required help from other individuals in the adoption process regardless of her self-evaluation. In fact, the individual often asked herself, *"whether I would come to terms with it."* (5:52). Clearly, such questions negate any leadership position. Asked about the continuity of her adoption behaviors, she states that *"I am always immediately in for it!"* (5:96), suggesting a degree of continuity in her adoption decisions.

D4: late majority

Late majority describes skeptical users who adopt technologies after the average member of the social system, thereby often responding to necessities or network pressure.

They require a high degree of reduced uncertainty about the innovation and only adopt technology after others have done so.

Two cases (both female) were classified as late majority. One participant clearly states that she adopted the telephone only after the majority had done so: *"I think we were lagging behind quite a bit, at the time where we moved in, the other people all had a telephone already"* (3:57). After all, adopting novel technologies, including the internet were *"not our thing." (3:79).* For her, adopting a mobile phone occurred as a response from network pressure within her family: *"and my son showed it to me … and said that he would buy it for me"* (3:68). However, it seems that she has not always been belonging to the late majority: when faced with innovations outside the communication realm (such use household devices), she comments that *"when there was something new, then we have bought it"* (3:77). This example signifies that continuity of technological adoption can be domain specific. The other participant likewise describes her continuity profile as *"always late"* (1:16), and especially so with the mobile phone: "*I believe I was one of the late bloomers concerning the mobile phone"* (1:15).

D5: laggards

Laggards were operationalized s the last members in a social system to adopt an innovation. Isolated in the network, their point of reference often lies in the past and is prone to traditionalism and suspicion about technology.

Only one case fitted these criteria. The participant declared a continuous habit of adopting technologies early but at the same time experiences the adoption process as passive: like a dinner, technology *"is simply served to me"* (6:90). It is illustrative that this participant described herself as *"conservative"* and "*consequentialist"* (6:82), placing high emphasis on the technological past and repeatedly stating that older devices would suit her needs equally well: *"but I could sufficiently come to terms with the other devices for my needs. I wouldn't need to have them."* (6:94). Also, the participant exhibited some degree of suspicion towards technology: for her, social media use is always equated to *"stripping in front of strangers"* (6:80). However, she has not always been a laggard but *"earlier in my life, I was way more active"* (6:97). This change of continuity was attributed to her process of life review: through realizing that one's current possessions are enough to fulfill the individual needs, she decided against adopting innovations.

Discussion

Main goal of the study was to investigate underlying meanings of communication technology adoption in elderly users. It was demonstrated that adoption of communication technology is informed by a multitude of different individual meanings for each person, involving pre-adoptive usefulness assessments, adaptation-barriers resulting from technology-inherent learning processes as a result of aging, external help seeking behavior, risk sensitivity and, ultimately, self-expression and participation in current society through technology. Second, the study investigated the perceived inter-generational differences in attitudes towards technology. Generations seemed to be differentiated by effects of aging and bodily functions and differences in technology socialization during formative years. Third, the study assessed the continuity profiles of elderly adults; here, the image of the older person abstaining from technology was clearly refuted despite the fact that no absolute innovators were found.

First, when it comes to the meanings underlying technology adoption, all concepts from the TAM model were found in the interview data. Concerning perceived usefulness (T1), older individuals engage in usefulness assessments when faced with novel technology informed by the general characteristics of their generation. It seemed that older individuals assess the value of an innovation through a comparison with already known technology prevalent in their own generation. In line with Davis (1989), doing so reduces the uncertainty about the innovation.

Second, it seems that generational differences are informed both by the effects of aging and, independent from that, aspects stemming from the process of growing-up with technology. Concerning the ***effects of aging***, perceived ease of use (T2) seemed to be influenced by age-related decline of bodily function. How the aging process was interpreted through self-perception impacted how individuals engage with technology inherent learning processes and more specifically their decision for internally-motivated (autodidactic learning, participation in course) and externally-motivated (perceiving learning as a requirement of current day society) means of learning. Dependence on help from others during such learning processes was a major, often shamefully occupied, barrier in the adoption processes of the interviewees; it is thus highly surprising that the authors of TAM excluded subjective norms as an influence on behavioral intentions to use despite the fact that actual system use was, in all interviews, mediated by some form of help seeking behavior, either through organized

courses or family members. It appeared to be the case that help-seeking behavior was an iterative process in which need-perception during the learning process was balanced with the shamefully-occupied emotional costs of asking for help. Technology adoption seems thus to be influenced by availability of learning opportunities for both internally and externally motivated types of learning older users and it is likely the case that availability of learning opportunities during the process of aging informs generative identity in the first place: learning opportunities influence the impression of what one is "still able do to" despite the self-perception of the aging process, and what one is able to do becomes part of the social identity of the individual ultimately informing generative identity. Multiple interviews gave the impression that technology enabled societal participation in older adults - but only after a successful learning process had occurred that resulted in the perceived self-efficacy of being able to operate the innovation despite aging. Even though all concepts of TAM were adequately found in the interviews, it seems that the model widely neglects the inherently social nature of the technology adoption process. The effects of aging demonstrate that the social identity of the individual is informed by their self-perception and aging and that both should be added as theoretical concepts informing system use in TAM, thereby re-including social norms into the model.

As a suggestion for further research, it is recommended to investigate how social processes (e.g. social referencing, social learning and social comparison) can be used to increase self-efficacy outcomes during the learning processes in older adults. Furthermore, products for older adults should be designed in such a way that they account for both physical barriers of the aging process (e.g. by using bigger operational controls) and psychological barriers (e.g. by avoiding overly complex functionalities that reduce the need for help-seeking); this might help to overcome fear-driven technological non-adoption. Further development of adoption theories should include the relevance of iterative learning and self-efficacy as possible extensions.

Another factor that seems to cause generational difference was identified as ***techno-socialization*** by growing up with a given technology. All constructs accounting for inter-generational differences between technology deducted from pre-existing technology generation theories could confirmed in the interview data. Often, socialization in a different technology style and change of basic technology were mentioned by the participants, highlighting the fact that technological life review includes the assessment of experienced technologies in relation to their socio-cultural context. It is likely the case that changing basic technologies alongside changing practices of socialization are perceived as generational

difference. Throughout many interviews, the participants showed high awareness of their techno-generational membership and the concept of socialization, often illustrated by formulating needs-assessment of current technologies in relation to these dominant at the time of their socialization. However, current models on technology generations lack the concept of generational awareness: an incentive for further research would be to assess in how far generational awareness influences the willingness to adopt innovations. Besides its influence in the self-perception of aging, the aforementioned choice of availability as a cause for generative identity also exhibits influence during the socialization process: it is likely that younger generations have, by default, more choice between technological products and thus experience a qualitatively different socialization manifesting itself in a different generative identity than the old generation. However, it would be possible to interpret these inter-generational differences as facets of the previously established concepts (e.g. greater availability of choices as a facet of G3 availability during formative years and changing education as a facet of G2 socialization in a different technology style). As a practical application of these findings, technology education for the elderly, e.g. in the forms of organized courses, should be adapted to the different styles of socialization of their target groups. How such adaptions could occur need to be subject of further research.

Third, the often-reiterated stereotypical prejudice of elderly people abstaining from technology was refuted by the assessment of DOI continuity profiles. Although no participants were in the social role of a technological innovator, all participants were engaging with at least one current-day digital communication technology on a regular basis. Remarkably, the Diffusion of Innovation theory proposed a roughly equal distribution of rather early and rather late adopting individuals with only minimal numbers of innovators (Rogers, 1983, p. 247) in the social system; our results confirm such a distribution by demonstrating a perfectly equal distribution among rather early and rather late adopters in the sample in the absence of innovator individuals. In our sample, all rather early adopting individuals were of male gender, while the late adopting individuals were exclusively female, although it is likely the case that this finding is biased due to the small sample size and unequal gender distribution within the sample. When it comes to the continuity of adoption profiles, the vast majority exhibited stable adoption profiles throughout their life narratives with only one participant expressing changes with aging. Continuity profiles seemed to be context-dependent in that older adults exhibited high levels of privacy concern and perceived need to separate private and work-related technology adoption. This brings the question whether a person may possess multiple adoption profiles at the same time that are activated

only in their respective contexts. Again, this might be a question for further research. Although the DOI theory itself abstains from making predictions about the continuity of adoption profiles, the finding of stable adoption profiles is in line with the notion that attitudes towards technology are thought to be fairly stable after the formative period in younger years has ended (Docampo-Rama, de Ridder and Bouma, 2001, p. 28). In addition, current findings on the five-factor model of personality psychology also suggest a relative stability of personality traits throughout the course of life (Cobb-Clark and Schurer, 2012), so that for future research it might be warranted to investigate to what degree personality dimensions correlate with characteristics of adoption profiles (e.g. preference for traditionalistic values as found in laggards as opposed to the dimension of openness to experience) and whether acceptance itself might constitute a dimension of personality.

Prominent goal of the study was to investigate idiosyncratic meanings underlying adoption processes through narrative methods. Some generated themes clearly correspond to theoretical concepts of TAM and DOI, e.g. Theme 1 (generational preferences influence usefulness-assessments) resembling the concept of perceived usefulness in TAM. However, most themes and meanings were not found in the models, implying a wide gap between theoretical models and actual social processes driving adoption. The narrative approach demonstrated that technology adoption is a social process that is informed by learning processes and help-seeking ultimately yielding to self-expression and societal participation if executed successfully despite the hurdles of aging. The complexity of interpersonal learning processes and the different meanings of participation are hard to describe in theoretical models due to the highly differentiated subjective views involved in these concepts. Narrative approaches bridge the gap between theoretical models and idiosyncratic views by providing contextual information, bringing about a more holistic picture of the process.

When it comes to strengths and weaknesses, this study was able to fully replicate most of the concepts in the theoretical models and was able to enrich them with ideographic narratives of the individual, thereby bridging the gap between theoretical conceptualizations and the inner world of actual users. One specific strength lies in the fact that all subjects were previously unknown to the researcher. This reduced personal biases and inferences of meaning based on previous knowledge about the person; the professional distance also made the interviews easier to conduct, allowing for strict concentration on subject matter. However, it is typically so that unknown subjects disclose less personal information compared to known subjects. Concerning the coding process, the decision to engage in inductive prior to deductive coding is debatable since inductive coding is prone to confirmation bias. However,

the hybrid coding approach was also a clear strength since it allowed both theoretical confirmation and inductive theory building. The coding scheme was based on theoretical concepts of the theories and these clearly helped to develop personas from the interview transcripts by providing points of focus for the persona description. Other weaknesses relate to the small number of participants in the study, the unequal distribution of gender and socio-economic status as well as the issue of language barriers: interviews were conducted in German and translated non-professionally by the researcher. Also, the interview scheme was developed in English language and subsequently translated into German. According to Beauford, Nagashima and Hsun-Wu (2009, p. 78), translation of research instruments in social science might introduce the problem of lost conceptual equivalence, implying that questions might be translated using different words, added meaning or deletion of meaning. Such difficulties were addressed by applying the codes to the untranslated German transcriptions; conceptual equivalence was accounted for by back-translating the German interview scheme to the English original version to check for conceptual difference stemming from translation.

Conclusion

Purpose of this study was to investigate the underlying meanings of communication technology use in elderly individuals, their continuity of adoption profiles and the description of inter-generational differences. While we were able to identify all theoretical concepts of both technology generations, TAM and DOI in the data, this study demonstrated that technology adoption is an inherently social process that draws on various forms of social comparison, exchange and social norms. In contrast to Bagozzi and Warshaw (1989), who excluded subjective norms and interpersonal influence from their model stating statistical non-significance, it appears to be the case that technological life narratives of elderly individuals are highly characterized by such norms. Clearly, this gap between theory and field-research is a contrast that warrants further investigation: if socio-technical research continues to ignore the impact of subjective norms in adoption processes for the elderly merely based on such statistical assumptions, the successful adoption of technology into the elderly generations is at stake. It was demonstrated that technological learning processes in older people must always account for the social nature of the process without falling prey to technocratic theory building. In line with the earlier-cited quote of Bruner (1991) who argued for narratives as “a version of reality governed by convention … rather than by empirical

verification", subjective norms need to be considered as a such convention that places technology use into the individuals socially-constructed continuity. Indeed, people construct perceptions about continuity themselves through interaction with others. The narrative approach proved to be a suitable instrument for the inclusion of individually constructed experience as a guide to theory making, thereby closing the epistemic gap between concept and individual. Likewise, the narrative approach demonstrated that individual meaning is best captured at the level of stories that embed psychological behavior into concrete socio-technological contexts.

Technology acceptance research must abstain from disseizing the individuals experience of continuity by excluding their socially-constructed world from theory building.

Interview descriptions and labels

Interview 1 – Ms. W.

Persona

Ms. W is a 67-year old retired woman living with her partner in a shared private home. Belonging to the technology generation of analogous electronics, she has reported to have used the mobile phone, the personal computer, the internet and the smartphone. Throughout the entire narrative it is clear that Ms. W. has almost always autonomously decided for adoption of communication technology without external influence, although she has characterized herself as a continuous late-adopter of technology, especially so with her first mobile phone. Ms. W. has a strong value commitment to careful interaction with technology in order to do things right. This carefulness seems to be, however, also partially driven by fears of private data protection: she always ensures to only use those features of a given technology she fully understands. If she runs in situations where this understanding is not given, Ms. W. immediately suspends the use of the technology and asks for help by her children. Although her children frequently needed to help as a result of perceived increasing technological complexity, she presented a strong commitment to learning about the technologies by taking classes and asking for instruction. Her desire for technological learning is partially driven by her motive of "keeping up" with other individuals that use technology and her impression that the purpose of technology is to enable living independently from other people. This will for independent living is reflected in her smartphone usage including frequent maps navigation and her willingness to meticulously plan holidays on such computerized maps. When Ms. W. understands an innovation, she prides herself with feelings of achievement, explicitly under the condition of "her age". When asked about subjective impressions about her own technology generation, Ms. W. states an ambiguous view: many individuals would avoid to engage with technology, ascribing this to age-dependent decrease of interest in technology. Besides such occurrences, she also sees people in her generation who vividly use technology, not as intensive as younger generations, but limited to domains of personal interests.

Description of interview

The interview with Ms. W. was structured, focused and coined by openness. Ms. W. was able to fully understand and answer all questions, without much requirement for probing.

Technological case description

Ms. W. bought her first mobile phone at age 60, *"a very simple (device)"* (1:89), she uses in situations where she is outside alone so that she *"could call when something happens"* (1:4). Besides this pronounced need for personal security at hand, her high concerns for privacy and personal safety is reflected in the fact that she recognizes *"functions in which I would not like to use the mobile phone. There is banking-related things and such, I do not want to have on my phone"* (1:95), fearing loss of private data. Ms. W. also describes positive feelings of achievement when she used the mobile phone, especially *"in my age!"* (1:5). In fact, she does not assign any negative events to the use of her mobile phone and exhibits feelings of ownership and achievement if she operates the device right. The initial decision to adopt the mobile phone into her life was autonomous and without interpersonal influence. She sees herself as *"too old to be influenced"* (1:8) by outside individuals. When asked about her usability experience, Ms. W. highlights the simplicity of her first mobile phone to be of prime importance: *"It was simple, not too complicated. This was important at that time"* (1:92). It seems that her preference for simplicity of use was related to her ability to engage with the device: *"I wanted the simplest I could use"* (1:13), again drawing on her concerns for doing things right. Having first used the mobile at home, Ms. W. states that she *"was one of the late bloomers"* (1:15) with adopting the mobile phone, far after her friends had adopted such devices. Of paramount importance to her is the function of the mobile phone to bridge far away distances with friends living abroad. Ms. W. is keen to learn about technology use but has problems with forgetting things when the acquired knowledge is not regularly used: *"Learning a lot of new things, okay, I try it sometimes but I forget it sometimes when I have not used it for longer"* (1:97). However, her pronounced desire to learn seems also be motivated by the desire to keep up with others: *"That, I always considered very important. I am always happy when I have learnt something new and then can exchange with others"* (1:39).

When it comes to the computer, Ms. W. describes that as soon as her son left the house, she could use his old computer, which soon broke down. In this line, she first used the computer in her home. Aged 60, Ms. W. expressed an autonomously motivated desire for a

new notebook that was not as bulky as the old PC of her son: *"I wanted a notebook … I did not want to have such a bulky thing standing there"* (1:29). Again, her desire for learning about the technology was further underlined by the step of taking an introductory course to computing: *"I got my notebook and (did) a course at the Volkshochschule 'Introduction into computer use'"* (1:100), an action she has taken also as a consequence of having more time due to retirement, social pressure to not lag behind and doubts the own ability to engage with complex computer systems: *"Then I retired and thought: 'now, you have to do it!"* (1:33); *"Perhaps one had more time then. And perhaps because I wanted to join the conversation"* (1:31); *"You won't get it, ever! As there are some things in it, which were not present in the mobile phone"* (1:32). After having taken the course, Ms. W. expresses *" … joy that I could more or less get it. Not as you young folks, but it works … to me, it was like a new beginning"*. This new beginning, fostered by her autonomous decision to adopt the computer and engage in learning courses, ultimately brought her the consequence of independence from other people, which used to buy her the things she wanted from online shops: *"I always have other people had order things for me … I have always just looked and the others have ordered it for me"*. Just like the smartphone navigation, the computer has helped her to navigate in unknown geographic territory, again supporting her independence: *"That one can already look up the place, that was quite an event for me!"* (1:36). Overall, Ms. W. seems to be careful when interacting with the computer and prefers to ask others for help instead of engaging in trial-and-error: *"But I keep back when I do not know something … Pressing random buttons, no, I don't do it!"* (1:41); *"If I do not know how to continue at all, I have asked what I did wrong or what I needed to do"* (1:43). Her motivation to ask for help is grounded in a perceived increase of complexity and her concern for loss of private data: *"No, it is not only getting easier. That is why I think that one has a bit of fear about doing some things wrong"* (1:44); *"That my personal data goes around in the world … there, I have some respect for it."* (1:46). If – with help or not – Ms. W. was able to achieve what she wanted with the PC, she expresses feelings of achievement: *"when I got it done, then I am happy about myself"* (1:49).

After the computer, the internet was introduced in her life, which she again used first at home. As a key scene, Ms. W. describes sending her first e-mail, after which she described strong feelings of achievement and self-efficacy: *"When I wrote my first e-mail I thought: 'you've got it, and it also arrived!"* (1:103). For her, adopting an internet connection was the natural course of action to take after buying a notebook, that was not influenced by any external factors. The main cause for using the internet was an increased flow of information.

Accessing such information was always easy for her (1:59), mainly due to the fact that *"you only have to press keys and (the information) is there"* (1:60). Again, simplicity (just like with her mobile phone) fostered her interactions with the technology, although she, again, is very careful to not breach her personal data: *"Which is new, I let it be explained to me and then execute it. I do not simply approach things since I have fear that my whole data runs around the world. Maybe it is a bit stupid ... maybe I am a bit fearful."* (1:61); *"I would have never used it if it wasn't explained to me how to use it"* (1:63). However, Miss W. does not report any specific negative experiences with the internet.

Finally, Ms. W. describes the introduction of the smartphone into her life, which she used first at home (1:111) and once again as a means to bridge far away distances. As a key scene, she describes her grandson moving to another city to study: *"...an then I said: you have to send him a WhatsApp once in a while. And then we said: okay, then I am going to buy this smartphone!"* (1:68). Ms. W. was pleasantly surprised about the multitude of communicative features, ranging from WhatsApp to e-mail. Especially useful were the increased storage capacities of the smartphone: *"and to have a smartphone that does not go south but has some gigabyte and free SMS ..."* (1:72). Once again, her smartphone use is characterized by approach its use in a careful fashion: *"I would never pen something of which I do not know how it works. I try to use it always reasonably ... and if I do not know what to do, I do not do it."* (1:75). She generally perceives the smartphone to bridge distances to relatives, but is sometimes annoyed by the increased flow of information that emerged to her daily life after buying the device: *"I get a lot of WhatsApp messages from my relatives. Every morning I have a new picture on it, which sometimes annoys me as it is too much"* (1:76). As with the other technologies, her decision to adopt the smartphone was fully autonomous and without external influence. Interestingly, Ms. W.'s husband regularly asks her to retrieve information for him, which brings her in the dual role of both asking others for help and providing help to others herself: *"when he is interested in something, he sometimes says: 'look, get it for me from the internet"* (1:109). Having stated that the smartphone has increased her flow of information, Ms. W. clearly states that she *"does not want to be available all the time, but if necessary, I am."* (1:83), highlighting that being available to her both means being a passive recipient of received information and being an active participant that has the ability to call others in situations of emergency. As a concrete gain, the smartphone brought her the ability to move more freely: *"I think that the benefit is a more free movement ..."* (1:84). Just like with her first mobile phone, Ms. W. does not use all functions and values simplicity (1:110): *"I have advantages from the things which I can use,*

and those I cannot use are left out" (1:86). Amongst those functions she is able to use, she engages in safety behavior to navigate in unknown areas, which reassures her: *"you can look up where what is located, with streets etc. This is really important, not only here but foremost there where you don't know your way"* (1:88).

Continuity profile

Ms. W. describes herself as a continuously late adopter of technology throughout her life (1:16), and especially so for the first mobile phone. Throughout the narrative, Ms. W. states the autonomy of these late adopting decisions but (conflictingly) also recalls episodes where the motivation to "join the conversation" of others using the technology exhibited influence on her.

Description of own generation

Although she believes that, in her generation, *"many (people) are more advanced (...) there are also some who lack behind"* (1:18), Ms. W. thinks that her generation is characterized both my fast adopting and slow adopting individuals. When she compares herself to her son, who uses a multitude of smart home technology, she states with confidence that she *"does not want such things at all"* (1:21) in her life and describes this disinterest as a general lack of interest attributed to aging inherent to her generation: *"Perhaps since I got older now, and in that sense ... I do not deal with it, simply not deal with it"* (1:22), further specifying that *"as an older human, you have your own course of going about things."* (1:10). It is especially striking that Ms. W. characterizes her generation as generally using the internet *"maybe not so intensive, but for those things that people are interested in, well"* (1:64). However, when setting up the smartphone, she again asked for help due to fears of complexity: *"I honestly have to say that the smartphone was set up by my sons; on my own, I would not have made it, since it has to be done with the computer ... it has been explained to me by my son and I was really happy about it"* (1:73).

Younger generation

When asked to compare her own generation with the younger ones, Ms. W. sees *"huge differences"* (1:94), which are mainly characterized by a faster use of electronic

devices and a willingness towards more spontaneous interaction with technology (1:24). This generational difference is perceived as a result of different decision making: *"the young sometimes make detours in their head, and from that view I think that it is a difference, for both. When my grandchild uses it, he is much faster than I am"* (1:112).

Labels

1.1: learning new technologies fosters independence and self-efficacy

Four related inductive codes (independence from others, feelings of achievement, learning new things, feeling good about using technology) were merged to form the label of learning new technologies to enhance independence. This theme captures descriptions of self-initiated learning by means of courses and other media, whose outcomes were usually associated with increased feelings of independence from others, achievement, self-efficacy and pleasure.

"I am always happy when I have learnt something new and then can exchange with others" (1:39).
"What kind of feeling did I have? You've made it! In your age!" (1:5)
"I think that the benefit is a more free movement ..." (1:84).
„I was happy that I could achieve it somehow" (1:34)

1.2: age related decline of ability and interest

Two related inductive codes (forgetting, disinterest due to age) were merged to form the label of age-related decline of ability and interest. This theme describes hurdles to technology acceptance as a result of age-related decline in cognitive ability and other cognitive effects of aging, such as a somewhat reduced interest in innovative technology ascribed to old age.

"You forget it again if you have not used it for long. And that's it. The younger people can navigate faster" (1:25)
"Perhaps since I got older now, and in that sense .. I do not deal with it, simply not deal with it" (1:22)

1.3: privacy concerns while interacting with technology

One related inductive code that was mentioned often constitutes this label of fears relating to lass of private data. All statements regarding to data loss as a result of 'false' interaction with a given technology form add to this theme.

"I have the fear that my whole data runs around the world. Maybe it is a bit stupid ... maybe I am a bit fearful." (1:61)
"That my personal data goes around in the world … there, I have some respect for it." (1:46)

1.4: complexity of technology as a hurdle and needs for simplistic designs

Four related inductive codes (simplicity, doubts too complex, complexity, uses only basic functions) were merged to form the label of complexity of technology acting as a hurdle. If technology is perceived as too complex, doubts about the ability to engage with the technology were voiced, often followed by a desire for technology that fulfills only basic functions in a simplistic fashion.

"I wanted the simplest I could use" (1:13)
" … on my own, I would not have made it, since it has to be done with the computer … it has been explained to me by my son and I was really happy about it" (1:73).
"No, it is not only getting easier. That is why I think that one has a bit of fear about doing some things wrong"(1:44)
"No, such knick-knack I do not need, no." (1:23)

1.5: increased flow of information as a result of technology use

Three related inductive codes (communicative ability, bridging distances, information overflow) were combined to form the label of technology enhancing communicative flow. This theme captures notions of modern technology increasing the amount of information available to the individual, its ability to bridge long communicative distances, but also personal evaluations of this increased communicative flow.

"I do not want to be available all the time, but if necessary, I am." (1:83),
"I get a lot of WhatsApp messages from my relatives. Every morning I have a new picture on it, which sometimes annoys me as it is too much" (1:76)
"…an then I said: you have to send him a WhatsApp once in a while. And then we said: okay, then I am going to buy this smartphone!" (1:68).

1.6: accepting help from others

Two related inductive codes (asking others for help, children introduce technology) form the label of accepting help to others. In the narrative, multiple references point to the importance of accepting help from family members when being confronted with new technology.

"I would have never used it if it wasn't explained to me how to use it" (1:63).
"If I do not know how to do it, I stop and ask …" (1:43)

Interview 2 – Mr. K

Persona

Mr. K is a 66-year-old man living together with his wife and children. Mr. K. belongs to the analogous electronical generation and describes himself as an early adopter of technology throughout his entire life. His account on communication technologies starts with the description of language itself as a communicative tool, followed by letters, the telephone, the fax, the personal computer and ultimately the smartphone. Mr. K. can be characterized by a great desire to explore new technologies in a self-made, trial and error fashion. Having used multiple programming languages to realize own projects and ideas, he is a creative individual that would like to use innovative technology to automate work. In this process, he is not afraid of trying out new technological concepts and expresses joy if his self-realized ideas work out. When he communicates with family and friends, Mr. K. values a direct and immediate expression of his thoughts mediated by technology. For him, communication technology brings the advantage of faster transmission times and faster responses from his recipients, allowing for more flexible routines and planning both in making appointments

with friends and at work. Just as with his programming ideas, Mr. K. values to express his personal beliefs and opinions and is interested in the reflection of others. While he made most adoption decisions autonomously and informed by his desire to explore, he was somewhat influenced by peer pressure to adopt the smartphone into his social environment. When he uses his smartphone, he strongly underlines the fact that current smart devices share some common design paradigms allowing him to operate different operating systems without much effort. When asked about his technology generation, Mr. K. is convinced that while some people exhibit rather conservative, techno-pessimistic views, technological interest is clearly present. He attests the younger generation a higher degree of spontaneity, reduced risk perception, and early, effortless socialization with technology that occurs naturally with birth, *"just as learning to cycle"*. In the long run, he predicts that albeit all spontaneity and naturalistic tendencies, the younger generation will in evidently face the same problems with new emerging technologies as his own did: if fast changes of basic technology occur during adulthood of the current generation, they will likewise have problems to adopt in the future themselves.

Description of interview

Mr. K. appeared calm, focused and provided various illustrative examples relevant to the research questions. He was able to follow and understand the structure of the interview scheme with ease, so that probing was almost not required.

Technological case description

As the very first means of communication, Mr. K. names the aspect of language, which to him is *"the means of communication you are born with …"* (2:1), first used at home. As a high point, Mr. K. brings up the aspect of making himself understood as a child, to communicate his desires and needs: *"that one understood, what I wanted. That I could articulate myself as a child and that I could transmit it in such a way, that my conversation partner knew what I wanted"* (2:3). As the underlying meaning of language, Mr. K. names that language serves to participate in society (2:4). He considers his decision to use language as autonomous but states that it is *"just with every human has it, through parents"* (2:5). He highlights the autonomous decision in stating that he employed language *"… of course out of my own drive or that I wanted to make myself heard, to learn, and to be supported by parents,*

sisters and friends" (2:6). Generally, he considers language as useful: *"One can state his wishes. Speak about goals. You can reach everything, which you plan, by language. Without this means of communication, it would be difficult to make yourself heard"* (2:7). Generally, he sees language as important *"to be held in society, to join in"* (2:7). Using language was always easy for him, in fact *"once you learned it, it was very usable. You always had the entire equipment with you …"* (2:8).

When Mr. K. starts to talk about letters as a communication technology, he describes that he first used letters to communicate with his girlfriend (2:10) *"because I have been separated from my loved ones, over a longer period of time, and to stay in contact, I wrote letters"* (2:16) when he was serving the military. Mr. K. reports no external influences on his decision to write letters, but cites his interpersonal relationship as a source of subjective norms (2:18). Letters were important to him to *"convey the thoughts I had, or occurrences from what I lived through. And things that happened to me or were of importance to me"* (2:12). When it comes to positive episodes with letters, Mr. K describes positive emotions in reaction to responses from his girlfriend: *"This must have been positive, it was my girlfriend and I thought of her and was happy to writer her a letter … And I was happy about the reaction you get back, the answer-letter you then get. That was positive"* (2:13). Mr. K. does not mention any significant negative episodes with letters (2:14). When it comes to the ease of use, Mr. K. favors personal conversations over letters *"because it is simpler, when you look each other in the eyes and see the reaction about what is said"* (2:15). Generally, letters gave Mr. K the ability to be informed about *"what happens at home, this was the usefulness of it. Or that I know what would be planned in the feature so that you can eventually write 'I can participate or not'"* (2:19). Concerning the ease of use, Mr. K. describes that letters were *"more or less the only remaining means of communication available to me, despite using the telephone, which would have cost more money if you phoned longer; (letters) were the only mean to talk to each other"* (2:22), highlighting the cost efficiency of this means of communication. For Mr. K., writing letters was highly enshrined in the subjective norms of the time during his stay in the military barracks: *"At that time, everyone I knew wrote letters, more or less. There were some who wrote relatively few, and who got less feedback from home. At that time, letters were more or less publicly delivered. And there were some, who did not like it, or had no fun"* (2:23). Sending and receiving letters was a public event and Mr. K. was able to see which of his comrades did not enjoy writing and receiving letters. Mr. K. concludes that in current times, writing letters has ceased since *"there are other means, more simple means, faster means than doing it by postal mail, this is why it ceased"* (2:24).

After writing letters, the telephone was introduced into the life of Mr. K where he used it in public for the first time. He starts his narrative with a key scene on using public telephones since individual telephones were rare at this time: *"first of all, you didn't have your own telephone, but you always used public telephones, since nobody at home had a telephone cable …"* (2:25). In view of the succeeding developments, he states that: *"afterwards, it was easier, when you had one at home ... then you used it more frequently and you could directly be reached at home, that was positive."* (2:25). Mr. K associates merely positive episode with his use of the phone: *"when you made the connection, you had your talk and you could exchange with each other, then I was happy, yes. ... And then you could, when you reached your partner, talk about the grounds or solve what you wanted to solve … This was always good and I was happy"* (2:26). Mr. K does not remember specifically negative events associated with the telephone. When Mr. K. finally adopted a telephone at his home, his life was simplified: *"Yes, it simplified my life, you wouldn't have to go outside in the weather to make a call, if you wanted a direct solution, you could do it from home. It was easier and it worked directly …"* (2:29). This decision was clearly influenced by subjective norms, his clique and parents: *"Of course it was initiated by the circle of friends. My parents wanted one as well!"* (2:30). Besides these social factors, Mr. K. does not see any other external factors having influenced his decision. In terms of perceived ease of use, Mr. K. states that the telephone *"was always ease to operate. And when a connection was established, it was easy to use and fast … a faster medium than writing postcards or letters"* (2:32). Mr. K. reports his decision to use the telephone to be highly influenced by his peers: *"Then, everyone had such a thing, there has been phoning to make arrangements"* (2:37).

As a third communication technology, Mr. K. names the fax, which he first used at work. While he remembers no specific key scenes, he states to have used the fax at work when *"a letter had to go out that should be faxed, that should be as quick as possible, then it was faxed and it was good"* (2:39). Requiring quick communication at work, he judges the fax to be as a quick means to send business documents. His attitude to the technology seems purely functional: "*it was nice when it worked, and I was annoyed when it didn't. As long as it worked and all letters went right, there was enough ink in it, everything was good. I had no specific feeling of joy when I sent my first fax"* (2:41). For him it was negative *"when it didn't work out, then I was angry about the technology, cursed it, was angered."* (2:42). Generally, the fax had no specific impact on his life since he has purely used it for work. There, it *"was partially important as it accelerated the workflow when you used it. You could exchange quicker, get your plans faster …"* (2:44). The decision to use the fax was not personal but

influenced by his boss at work: *"in principle, it was a bureau-decision. It was delegated from above"* (2:45). Later on, Mr. K. also used the fax at home since *"there were situations, where I privately used the fax to send something to the insurance … because it was easier than doing it by phone"* (2:52). Using the fax at work was always easy since the fax resembled the telephone: *"… you only have to deal a number, it is as easy as to phone"* (2:47) and further: *"And when you understood how it worked then it was easy to use. And with a fax device, it is no great challenge"* (2:50).

As a fourth technology, Mr. K. introduces the personal computer, which he used at home for the first time. For him, owning a PC and using it to develop his own programs was always a personal desire which he vividly depicts as a key scene: *"I simply wanted to use it since it was interesting and I was interested in learning a programming language, the first one for me being BASIC. And I played a round a bit with it and later used it at work … it was fun*" (2:53). Right from the start, Mr. K. evaluated the PC as highly positive, especially when he was able to work on his own ideas: *"Great thing, its fun, everything works … that you can work on what you like … and then it works just so"* (2:54). Mr. K. only remembers positive episodes with the PC: *"First you were happy because you owned it, then you were happy that it worked how you intended it, it was a pleasant feeling, it was happiness …"* (2:55). However, Mr. K. clearly identifies the PC as a new medium, which required some learning effort before it could be used as he intended: *"And then it developed, and I spent much time with it. I used a lot of time also because it was fun and not because it was a duty ... The time that was used for it, for a new medium, had to be subtracted from something else"* (2:56). His intention to use the personal computer was driven by his curiosity, as he puts it: *"because I wanted to understand how it worked. Everything was freshly in its beginning. That was the focal point … the interest to see whether one would understand the technology."* (2:57). More specifically, he *"wanted to do programs, understand how they worked. And I wanted it to calculate or count things for me. To work on routines which repeat itself."* (2:59). Besides his desire to understand the technology, several interpersonal influences and subjective norms were at work in his decision to adopt the PC: *"and then I learned a programming language at the VHS. We went there with friends, together"* (2:70). *"Surely, we were many people, one already had bought one and then you watched … saved your bucks and bought yourself such a thing, and that was great."* (2:58). Saving your money to buy a PC was an important hurdle towards adoption since *"that I bought my first PC was only question of its price. When I could eventually afford it, I bought it."* (2:61). Later on, the PC also became adopted at his work where he was obliged to use it. Mr. K. describes the ease of use in terms of the

applications on his PC. According to *him "the ease of use of the programs should be so that those who use them can relatively easy interact with them"* (2:62). The first interactions with his PC were on the DOS command prompt, which he used to write simple programs: *"that you could write small programs and the PC executes them … that was easy when one had learned the programing language a bit. … Then you are happy if it works"* (2:63). Remarkably, he remembers no existence of readily available consumer software. Indeed *"there were no programs … it was so that you had to do everything yourself in the beginning"* (2:64). Mr. K reports a learning curve, where programming got gradually easier. Drawing on his previous knowledge of DOS programming, *"it was getting easier very fast … but also more complex, because different programming languages existed with different aspects of focus"* (2:66). With computers becoming more advanced, his focus of use shifted from programming himself towards using consumer-software. With that, his conception of the PC changed: *"and then you use it because it is a easy to use medium, especially when programs were properly composed"* (2:67).

Lastly, the smartphone was introduced in the life of Mr. K. In his key scene, he describes buying a smartphone as a result of peer pressure: *"It was so that buying it came from peer pressure, because everyone got one and if you did not have one, you were outside. All (friends) could make plans at short hand and you were outside. … A long time, I refused to carry it with me, being available 24 hours is a disgrace"* (2:71). When he used the smartphone for the first time, he reports to have been overwhelmed *"because I did not know at all how to navigate the menus … you have to get accustomed to it, and at the first time it was complicated, that's how I would call it. But later it got better."* (2:73). Most importantly, he believes that the adoption of the smartphone *"brought the biggest changes out of all technologies"*, with these changes being characterized as constant availability and a tendency to always carry the device around – indeed, *"sometimes I put it off, but this has become rather seldom"* (2:75). The decision to buy a smartphone was autonomous and motivated by its perceived usefulness: *"The will, it was my own will in principle after"* (2:76). When considering interpersonal factors of this process, Mr. K reports that both his kids, wife and fiends had smartphones, which resulted in *"comparisons regarding status, who had which phone, and for some this was important. For me it is still not important, when I use it, it has to work and then it is all right"* (2:77). When asked to describe what makes the smartphone so usable for him, Mr. K. states that it is small, handy, and easy to use. He goes on to explain that *"in principle there are two different systems … but if you got accustomed to one, then you can swap all of them among each other"*, thereby touching on shared design principles of

mobile operating systems. For him, it was important to stay with one operating system he knows best: *"If you have had one phone and worked with that operating system, then, in principle, I stayed with it in order to avoid getting accustomed (to another)"* (2:80). For him, perseverance of well-known usability interfaces is key. Although he acknowledges the rapid technological development in the smartphone domain, he notes that *"the basic principles of use did not change (by it), still only two systems exist"* (2:84).

Continuity profile

Mr. K describes that he adopted innovations *"always relatively early"* (2:85). Throughout his narrative, it is clear that Mr. K. was often eager to adopt innovations early, especially so in case of the personal computer: *"when I could eventually afford it, I bought it."* (2:61). However, since his description of smartphone adoption includes adoption after other members in his social cycle, he was not always in a leadership role. Therefore, Mr. K. is classified as an early adopter of technology.

Description of own generation

Mr. K. perceives his own generation to be characterized both by persons who are hesitant to adopt technology as well as people interested in technology: *"Often it so that I have the impression that people are reluctant against technological innovations. They say: 'don't bring up such things, I will stay as usual' … but then there are also people who say: 'this is interesting, I am going to learn it and it is opening up horizons for me'"* (2:87). When asked about reasons for such reluctance, Mr. K. states that some people of his generation would believe that *"through the introduction of new technologies, workplaces might get lost, that the own job becomes endangered"* (2:88). Besides this, he perceives many persons in his generation to be satisfied with the old technology, perceiving no need for further innovation: *"And others have said: 'I've always been doing it for 20 years, or 10 years, it is working well, why should I change?"* (2:88). However, once people of his generation grow accustomed to innovations, they perceive innovations as *"relief"* (2:89).

Younger generation

When asked about inter-generational differences, Mr. K. states that *"the shyness (about technology) completely changed"*. This loss of shyness is perceived as a result of socialization in a different technology style. *"They use it without prejudices, they do not have fears of making mistakes or to destroy something, no, they use it completely unprejudiced and start using it as kids, because they have grown up with it."* (2:91). His own generation would hold more prejudices because, at that time, the emerging technologies *"were not as mature"* (2:91), and would regularly face the danger of breaking. Today, however, *"everything is so secured that nothing breaks when it falls down, that errors in handling to not break it and kids use it completely unprejudiced."* (2:91). For Mr. K., the younger generations perceived loss of shyness is clearly a result of technology being present in the formative years of current youth: *"In their development, it was there right from the start … Since they can speak or see, mobile phones, PCs, televisions etc. existed and its normality. They have grown up with it and learn to use it by the way"* (2:92). In his own generation, technology socialization was not as pronounced as today: *"now it is normality, but back then it simply joined in during the course of life ... the technology did not exist, but developments only successively built up"* (2:94), whereas today *"it is the same as learning to cycle"* (2:93). Another reason for this changed socialization is perceived to be a result of rapid changes in basic technology: *"when you get older and changes of technology occur, which surely will be the case, also in everyday life, then it is going to be a thoughtful process on whether and how to use it and if there are any dangers involved?"* (2:95). When talking about dangers, Mr. K. perceives the younger generation as less concerned with providing private data using technology: *"but the kids do not see a risk I dare to say"* (2:96), whereas his own generation is characterized as *"more careful. More reluctant. ... in my generation, they take more precautions with their data than our generation afterwards"* (2:97). Mr. K. predicts that the younger generation would be affected by rapid changes in basic technology just like his generation was in their middle years: *"I believe that they will have exactly such a problem, just like we had with the technology, because they will be confronted with an entirely new technology in an equal age, mid twenty or thirty"* (2:99).

Labels

2.1: technological innovations allow for immediate expression

Three inductive codes (immediate expression, resonance, articulate oneself) were merged. Throughout the entire text, Mr. K. used technological innovation for the immediate expression and articulation of himself in an attempt to generate ad-hoc resonance from other persons. Beginning with the telephone, it was important for Mr. K. to get an immediate response. Later at the job, Mr. K. described the main advantage of the fax as a means to immediately send documents to another business. When talking about the smartphone, it was important for Mr. K to use it to coordinate ad-hoc meeting among friends.

"Yes, it simplified my life, you wouldn't have to go outside in the weather to make a call, if you wanted a direct solution, you could do it from home. It was easier and it worked directly …" (2:29)
"And when a connection was established, it was easy to use and fast … a faster medium than writing postcards or letters" (2:32)
„Because there were other means, more simple means, faster means than doing it by post" (2:24)

2.2: peer pressure and peer comparison drive technology adoption

Only one code (peer pressure) was used to form this label due to its exhibited position in the interview. Especially with the smartphone and the telephone, Mr. K. described peer pressure. With an increasing number of telephones in the private home and, later in life, the emergence of smartphone both with is kids and work colleagues, an increasing peer pressure was noted. Although Mr. K. states some autonomy in his decision to adopt the technology, it becomes clear that peer pressure and the fear to drop behind common practices in his circle of friends played an enabling role in the decision to adopt.

"It was so that buying it came from peer pressure, because everyone got one and if you did not have one, you were outside. All (friends) could make plans at short hand and you were outside. … A long time, I refused to carry it with me, being available 24 hours is a disgrace" (2:71)
"Later on it became common that such thing was in every household, it took a while, because the price was just not right" (2:60)

2.3: developing own ideas through technology

Three inductive codes were merged to form the label of developing and expressing own ideas through technology (developing own ideas, learning by doing, wanting to understand). It became clear that Mr. K. used the computer to develop his own ideas by means of programming driven by a strong curiosity about how the technology worked. This also served the practical purpose of simplifying tasks and calculations where the practical ideas were materialized by interacting with the technology. Driven by his desire for exploration, Mr. K. engaged with a multitude of programming languages, also due to the fact that early computers only allowed for textual command line interaction. It is remarkable, that programming was also a social occasion for him, when he engaged in a programming course together with friends.

"there were no programs ... it was so that you had to do everything yourself in the beginning" (2:64).
"that you could write small programs and the PC executes them ... that was easy when one had learned the programing language a bit. ... Then you are happy if it worked" (2:63)
"I wanted to do programs, understand how they worked. And I wanted it to calculate or count things for me. To work on routines which repeat itself." (2:59).
"and then I learned a programming language at the VHS. We went there with friends, together" (2:70).

2.4: technology to participate in family and society

Four inductive codes (participate in family, participate in society, changed life circumstances,
showing affection) were merged to form this label. It stands out that Mr. K. has used technological innovations to participate in his family and society at large. Starting with his time in the military, where he used letters to learn about his wife, Mr. K. consistently used technology to plan his actions both in the family and societal domain.

"Getting to know what happens at home, this was the usefulness of it. Or that I know what would be planned in the future so that you can eventually write 'I can participate or not'" (2:19).

"That you were with your clique, that you know what occurs in your clique, on the one hand, what happens to me ... and what happens at home with my parents, sisters, children, the clique, friends" (2:20)

2.5: technological socialization and changes of basic technology

This theme is constituted from both an inductive code (technological socialization) and the deductive categories socialization in different technology styles, availability in formative years and change of basic technology). For Mr. K., socialization with technology in the early formative years is key to lifelong behavior of acting unprejudiced towards technology. Technological socialization in an early years would cause young individuals to naturally co-evolve and grow with the technology, allowing more spontaneous interaction with the technology with reduced fears of making mistakes. For younger people, interacting with technology would not a conscious developmental process but rather a natural, co-evolving learning-by-doing process. However, Mr. K. warns that even the younger generation might face difficulties to interact with newer technologies later in life, as he expects the same generational effects to become active as with his generation now.

"They use it without prejudices, they do not have fears of making mistakes or to destroy something, no, they use it completely unprejudiced and start using it as kids, because they have grown up with it." (2:91).
"In their development, it was there right from the start … Since they can speak or see, mobile phones, PCs, televisions etc. existed and its normality. They have grown up with it and learn to use it by the way" (2:92).
"when you get older and changes of technology occur, which surely will be the case, also in everyday life, then it is going to be a thoughtful process on whether and how to use it and if there are any dangers involved?" (2:95).
"it is the same as learning to cycle" (2:93).

Interview 3 – Mrs. G.

Persona

Mrs. G. is a 85 year old woman living alone in a private home. Mrs. G. belongs to the mechanical technology generation and has used letters, the telephone and a special mobile phone for seniors throughout her life, while at the same time abstaining from any additional communication technologies. Mrs. G. reports to have adopted novel technologies fairly early during her live, but only in case she expected concrete increases of usefulness for carrying out daily chores; now, however, she seems to belong to the late majority of adopters, showing a skeptic and traditionalistic stance towards innovation, characterized by the need for social network pressure motivating the adoption of innovations.

Having grown up during the years of world war II, Mrs. G. describes early memories of receiving a letter from the city council, forcing her to leave her home under threat of capital punishment as a result of the war. When Mrs. G. complied with the order and moved to another city, her father soon became prisoner of war under the allied forces. Separated from her father, Mrs. G. and her family exchanged a multitude of letters to keep in contact with him and to ensure his wellbeing while imprisoned. Later, after the war, she used letters to write to her younger kids when they were on holidays alone. For her, these letters served the purpose to both emotionally reassure her kids and strengthen their wellbeing while separated from their parents but also to emotionally reassure herself when reading her kids replies from far away.

When asked about the telephone, Mrs. G. describes that she had adopted the telephone fairly late, just after her neighbors owned one, and this mainly as a requirement of the job of her husband, who worked as a coal miner. Mainly, she used the telephone to communicate about family intrinsic reasons, but also in her role as a woman, who, at that time, mostly had to stay at home and cook. Being isolated at home, the telephone helped her to exchange cooking recipes with her fellow female peers and to participate in their lives. After the death of her husband, Mrs. G. - now grown older and more fragile – was bought an emergency device that could be attached to her telephone. In case of health-related emergencies, the device allows her to rapidly contact an emergency assistance line for senior citizens with the simple push of a red button.

With her eyesight rapidly decreasing, Mrs. G. realized that she was increasingly unable to use her phone as it had small printed numbers. In response, her son decided to buy her a mobile phone specifically tailored to the needs of elderly persons, that allowed her to independently engage in daily chores (e.g. shopping outside in town or visiting the graveyard) with the reassurance of being enabled to call for help in case emergency situations should arise. Mrs. G. reports that she is able to operate the devices basic functionalities without help

from others as a result of its elderly-centric design. However, when Mrs. G. tries to use more than its basic calling functions, she constantly seeks assistance from her son. Just as the emergency device attached to her normal telephone, the senior mobile phone possesses an alarm button, that automatically calls her children if pressed. Mrs. G. reports an episode where she accidentally pressed this button and was unable to stop the cascade of calls to her family, which again required external help. When Mrs. G. was asked to describe her own technological generation, she states that her generation mostly consists of "simple people" without pronounced interest in technology. For her generation, technology use seems to be associated with a steep learning curve that would require careful explanations by other family members. Coined by the experience of war and associated ideals of independent living, asking others for help would be perceived as burdensome to the helping parties and is thus avoided in her generation. Besides this, widely prevalent physical handicaps in her generation would prevent its members from engaging with the (often filigree and small) interfaces of current technologies. Overall, she describes a generational preference for practical solutions, most often realized by means of analogous interactions instead of using technology as a result of lacking socialization with technology during the war.

Interview description

Mrs. G. was, throughout the entire conversation, talkative, open and personally interested in the research. She was able to follow the interview scheme with a minimal need for probing and gave appropriate, illustrative and sometimes extensive descriptions.

Technological case description

Mrs. G. first came into contact with letters as a consequence of war: *"we received an important letter from the city. We had to leave the city, since it was evacuated during the war in 1944"* (3:8). This event was of focal importance to her since *"It changed our entire life! We had to flee the city, it was our home, we lived there, were born there, it was war and we were not allowed to live there anymore"* (3:11), and even more so since *"we had to carry everything we could carry and then we were not allowed to stay … everyone had to go, and those who staid, were punished by death according to this letter"* (3:11). Mrs. G. had no opportunity to react to this order: *"we could not react on it, it was evacuation by force …*

nobody could react on it." (3:93). After the end of war, her father became prisoner of war in France, during a time where letters were the only means to communicate: *"my father was imprisoned in France and then we communicated with him, by letter. … the telephone and so forth was not used at the time, it did not exist …"* (3:9). When she received answers from her father, she was *"happy"* (3:15), especially under the condition of the long transmission times of letters: *"I mean, there were always weeks in between, where you did not come to know anything about him"* (3:15). For her, letter writing during war constituted a negative connotated event, especially given her limited agency to change the situation: *"you had to deal with it, you could not really show your feelings"* (3:17). For her, writing letters did not change much in her life, rather *"it was really normal that, when you wanted to communicate with someone, no other means existed, you had to write"* (3:19). Another key episode she remembers about writing letters occurred with her children: *"there were always letters I wrote when my kids went away on holiday, alone. And then one wrote to them in advance so that the kids would not get homesick"* (3:20). In this sense, letters served the purpose *"so that the communication continued to exist"* (3:94). In all these cases, her decision to write letters was influenced by other persons and subjective norms: her husband *"pressured me write! Write! They are homesick!"* (3:21), although today, this influence by subjective norms is not as strong since *"today, it is only called"* (3:33). Letters served the function of mutual affective reassurance both for the kids, *"so that the kids were pacified"* (3:23), and herself: *"when we got a response, it was calming, so that you knew all were well"* (3:24). Mrs. G. does not perceive any other external factors motivating her use of letters. Writing letters has always been easy, indeed natural, for her: *"we did not know anything else, writing letters was self-evident, that is why it was of use for us."* (3:25). Besides, being able to write letters in the same way a person thinks was a factor that enabled the usefulness of letters to her: *"you do not think for long, you write just like you talk"* (3:27). When communicating with official entities, writing letters becomes more difficult for Mrs. G: *"when you write a letter to the civil service, an agency, then it is different. … then I rather ask our kids"* (3:30) because *"I do not know this style of expression so well"* (3:31).

When asked about the key scene with the telephone, Mrs. G. describes a situation where her child fell into a river and had to be hospitalized, a situation in which she was notified via the telephone: *"the only thing was that I now knew that he was well"* (3:95). Most predominantly, telephone use was associated with the work of her husband in a coal mine: *"it was also occupational, my husband worked in mining and when he got a call about a fire in the mine, he had to go there to extinguish it. It was horrible … and then I waited for a call!"*

(3:38). Asked about positive situations with the telephone, Mrs. G describes the birth of her grandchild of which she was notified via telephone: *"it was via the telephone, at 1am at night … it went through the whole family!"* (3:39). Negative situations were concerned with death notifications of relatives, which, again, were transmitted via the telephone. When her father experienced a stroke, her mother wanted her care for her father, to whom she also communicated on the telephone daily. She describes that her father was repeatedly unable to deal her number correctly, so that a different family was called by him every night *"until a woman came to me and said that she had traced the calls and got to know that my father was calling her every night during half a year … and he could not really understand that he twisted those four digits, resulting in calls to a different line"* (3:42). This situation fostered a somewhat negative attitude towards using the telephone *("I had always so much stress because of the telephone …"*, 3:43), although she rates its perceived usefulness as high: *"without the telephone, nothing could be done anymore. At that time, it was self-evident and nothing worked without one"* (3:44). Her initial decision to adopt a telephone was also informed by her self-understanding of her role as a woman: *"As a woman, one is always at home and is unable to talk to someone external … we shared cooking recipes on the telephone. … We have always just worked! We were working, married and had to know how to cook, and this we also did via the telephone"* (3:49). In this notion, the telephone also was a medium used to learn new skills from fellow female peers across spatial distances. However, she adopted the telephone fairly late to her home: *"I think were lagging behind quite a bit, at the time where we moved in, the other people all had a telephone already"* (3:57). Using the telephone caused her *"no difficulties. The telephone is easy to use"* (3:51), although reading on the devices display is of focal importance to her: *"for me the bottom line is always when I have to read things. When I need to read things on this thing, I cannot read it!"* (3:55). When Mrs. G. grew older, she bought an emergency device that is connected to her telephone, allowing her to speak to an emergency line for elderly people *"when I press the emergency button, then someone would pick up on me and ask what is going one and if I am in need for help."* (3:53). When her home experienced power blackout, this device verbally notified her about the lost connection – a situation she did not understand at first: *"And when there is a power blackout, then a cassette starts playing. And I did not know that it is a cassette. I just thought that someone is there! I thought that I could speak to someone, but it didn't work."* (3:53). It is remarkable that she perceives the computerized voice of the device as a *"cassette"*, being in line with her generation of mechanical electronics.

Third, Mrs. G. describes her mobile phone, a device designed specifically for the needs of the elderly. Equipped with an emergency button on the back of the device, she explains a key scene in which she accidently pressed that button without knowing about is function: *"I touched it while I was in a store … and it screamed throughout the whole store, a jingling! I did not know at all how to quite it down. And then I had all my kids call me, one after another, asking: 'Mom, what's happening?'. … Luckily, a young man was there and I asked him whether he knew how to turn it off?"* (3:58). The decision to adopt the mobile phone was underlined by the loss of her husband: *"Because you live alone! I am 7 years alone now, and without it, it wouldn't work out."* (3:60). She perceives the device to be especially usable *"because this one has big letters! Everything is saved in it, I just have to press and see the big letters"* (3:61). For her, big letters on the mobile phone are *"the most important. Prior, I had an old, different (one)"*, on which reading was not as easy: *"and then I realized that it can't go on like this … at first I used magnifying glasses, but now it works again without them"* (3:68). Her decision to adopt the mobile phone was inspired by her son, who bought the device for her when she had eye surgery *"and could not read on the phone"* (3:67). While she is able to operate on the device's basic functions, *"all that technical stuff in it, my kids do that, e.g. when a new number has to be saved, I do not do it. These things are not my thing"* (3:64). Indeed, *"every time something new must be entered, they will have to do it again"* (3:65). Influenced by subjective norms she now knows *"many elderly people, I know a few who bought it"* (3:62). Asked about positive episode with the device, she mentions her role as an innovator for others: *"everyone who sees it is positively astonished. It is indeed positive if others say: 'I will have to get one as well'. And some people even went with me to the store and we bought it"* (3:70). When asked about the impact of the device on her daily life, she states that the device *"always needs to come with me, it never stays home"*, increasing her safety: *"I always feel secure when I have the mobile phone with me, that is important if I want to go out for a walk or to the graveyard"* (3:71). Again, Mrs. G. describes her position as a single woman to motivate her safety needs: *"If you are outside as a single woman and do not know where to go, do not come home anymore, you feel sick or so, then I call my kids to pick me up."* (3:72). Asked about the external factors influencing her adoption decision, she recalls that *"you live far away from the city, or if you would fall down, then I always have my mobile phone in the pocket. I can possibly fall down outside since I have a walking frame and always something can happen!"* (3:75).

Continuity profile

When asked about her continuity of technological adoption throughout life, it seems that Mrs. G. exhibits a changing and partially conflicting profile of technology adoption throughout her life. Stating that *"when there was something new, we have bought it. I mean, one was happy when new things emerged"* (3:77), Mrs. G. herself claims to be an early adopter of technology. However, buying new things was restricted to technologies that *"would make something more comfortable"* (3:78).

However, this view seems contrasted given the fact that she adopted the telephone only after all of her neighbors possessed one: *"I think were lagging behind quite a bit, at the time where we moved in, the other people all had a telephone already"* (3:57). Concerning the Internet, she concludes: *"technology, with the internet and such things … this was not our thing.*". With the mobile phone, it was her son who decided that she would need a special phone with big buttons, and it was him who finally bought it. Given these pretenses, Mrs. G. is considered to show a "late majority" profile of adoption, fitting her tendency to adopt things only after the average member of society has done so or as a result of social network pressure from family members.

Description of own generation

Mrs. G describes her own generation as *"simple people, who have always worked in an office"* (3:80), which would not be interested in technology anymore. She perceives internet usage to be low *("I repeatedly got to know that, generally, my generation, they do all not have internet access"*, 3:80). For her, adopting new technologies would be associated with a learning process since *"the technology is not always easy to learn"* (3:81). Such learning processes would be associated with increased help seeking behavior in the form of consultations with other family members: *"how often will they have to look and help, that he comes to terms with it! That's why I wouldn't have liked to adopt it."* (3:81). It seems that she perceives her generation as hesitating to ask for help since doing so could be perceived as burdensome to the helper; a thought that might possibly be influenced by the generative upbringing during the war years, most often highlighting values of individual independence.

Although she and peers of her age cohort tried to engage in technology learning outside of the family in an organized course for older individuals, she did not receive the help she would have needed: *"the teacher of the course was unknowledgeable and could not explain us all the devices … he didn't teach us anything! I instantly thought that this is the*

biggest nonsense ever! Everyone wanted to write SMS, but nobody has learned something!" (3:82).

In addition, Mrs. G. describes physical barriers to technology use in her generation. Less flexibility in fingers and joints and decreased eyesight were thought to be incompatible with the somewhat small-printed and filigree design choices of current technology: *"First of all, our hands are not as fit, they cannot do it anymore, and all of this are handicaps! … In stores, where one has to key in his PIN number, I do not come to terms with those tiny things (keypads). And this is so with every old individual*" (3:85).

Overall, it seems that her generation is affected by a lack of qualitative educative resources, psychological barriers to help seeking behavior, lack of interest in novel technologies and physical handicaps, together resulting in reduced technology adoption.

Younger Generation

Asked about the younger generation, Mrs. G. describes less physical barriers hindering technology use. For her, the younger generation is characterized by increased buying behavior on the internet, which she disapproves of due to handling of shipments: *"I prefer to go to the store … and then it has to be mailed back and forth … this is not comfortable to me"* (3:87). According to her, the younger generation has lost a sense of quality in things and prefers buying cheap things: *"We look more for quality and do not buy as much"* (3:89). She believes that due to increasing socialization with smart technologies in schools and increasing computer usage, current generations would lose their ability to write and calculate: *"And I believe that the smartphone and such things are used so increasingly that one can watch many kids who cannot write right anymore."* (3:90).

Labels

3.1: bodily function as barriers to technology adoption

Three codes (bodily function, cognitive decline, natural to do) were merged to determine the label of bodily function determining technology adoption. Throughout her entire narrative, Mrs. G. repeatedly touches on the topic of bodily functions and the loss thereof. First, decreased eye capacity led her to realize, that further interaction with her phone would no longer possible. When caring for her father, who repeatedly dialed the wrong phone

number as a result of cognitive decline, Mrs. G. realized that cognitive abilities were focal for understanding interaction with technology, and that this might be at stake.

"The bodily barriers are really big" (3:86)
"... I am way to slow, I cannot react as fast on these keys, because I see so badly" (3:97)

3.2: adaptive technological design decreases dependence from others

Six codes (external help, learning curve, insufficient knowledge, adaptive design, social requirement, convenience) were merged to form the label of technology use requiring help from others. Throughout her narrative, it becomes clear that Mrs. G. perceives technology use to be associated with a certain learning curve, that is often accompanied with help seeking behavior from external individuals. It becomes clear that her sometimes insufficient knowledge on how to interact with technology is sharply contrasted with an increasingly perceived social requirement of using technology. From this contradiction, multiple attempts to learn about technology use, such as her mobile phone course, were undertaken without effect. This highlights the need for adaptive design choices that allow for social participation through avoidance of steep learning curves and clear design choices to reduce the need for external help and enable self-sufficient technology operation even with insufficient knowledge.

"My son always needs to to the technical things when they arise ..." (3:73)
"The technology is not always easy to learn" (3:81)
"I did not at all know how this thing worked" (3:101)
"I know how I work with it and that is the most important thing." (3:63)

3.3: using technology for the management of emotions

Four codes (reassurance, affect modulation, uncertainty, suppressing emotions) were merged to form this label. Throughout the entire narrative, it becomes clear that Mrs. G. engages in technology use to both manage the emotions of herself and of others. In writing letters to her children, she manages their emotions by calming them, while at the same time reassuring herself that her children are well off. Another emotional aspect is the reduction of uncertainty through technology. Mrs. G. uses her mobile phone to avoid the possibility of

becoming helpless while being outside her home; the mobile phone provides her with reassurance that she might call for help any time. From her descriptions of writing letters during war, it is evident that not all emotions can be expressed in using certain types of technology.

"when I press the emergency button, then someone would pick up on me and ask what is going on and if I am in need for help." (3:53).
"when we got a response, it was calming, so that you knew all were well" (3:24)
"… if you would fall down, then I always have my mobile phone in the pocket. I can possibly fall down outside since I have a walking frame and always something can happen!" (3:75).
"you had to deal with it, you could not really show your feelings" (3:17).

3.4: gender perspectives influence the assessment of technology

Only one code (women) constitutes this label that was thought to be of high importance. Mrs. G. described her female identity both in terms of uncertainty (being a woman outside and alone) and in relation to her situation at home (being isolated in the home's kitchen with the telephone to reach the outside world).

"If you are outside as a single woman and do not know where to go, do not come home anymore, you feel sick or so, then I call my kids to pick me up." (3:72)
"As a woman, one is always at home and is unable to talk to someone external … we shared cooking recipes on the telephone. …" (3:49)

3.5: preference of analogous behavior as a generative characteristic

Two codes (analog behavior, skill loss) were merged to form this label. Mrs. G., born in the mechanical generation, shows clear preference for analogous behavior instead of technology driven solutions. Preferring to buy things in local stores instead of buying online is perceived as more convenient as it represents a more direct means of exchange. Furthermore, she attributes a loss of basic skills, such as calculating, as a result of increasing technologizing, which further serves to underline her preferences.

"I prefer to go to the store … and then it has to be mailed back and forth) this is not comfortable to me" (3:87).
And I believe that the smartphone and such things are used so increasingly that one can watch many kids who cannot write right anymore." (3:90).

3.6: availability of technology as a normality of zeitgeist

In this label, four codes (unavailability of technology, communication in war, unilateral communication, obsolete technology) were merged, highlighting that availability of technology in any given epoch is constituting for what is perceived to be the normality of the zeitgeist. While, during war, letters were the only available and thus normal means of communication, usage of the telephone subsequently replaced letter writing and became social normality as it increased the speed of information transmission, giving in to the demand of that times changed zeitgeist.

"it was really normal that, when you wanted to communicate with someone, no other means existed, you had to write" (3:19).
"My sisters, we wrote each other sometimes, when one was traveling or so. Today, we do not do it anymore. Today is only called." (3:33).

Interview 4 – Mr. F.

Persona

Mr. F. is an 84-year-old man belonging to the mechanical generation, who lives together with his wife in a private home in a rural area. Having worked as a former head of the local police department, Mr. F. has used the telephone, the typewriter, the computer and the iPad in his life.

Throughout the entire interview, it is important for Mr. F. to repeatedly highlight the differences of using technology in work-related and private contexts. Especially when using smart devices for both occupational and private tasks, he underlines the importance to not mix data from these two domains when working on a single device. Technological developments (most predominantly the typewriter and personal computer) have simplified the work

processes of Mr. F., through supporting faster typing and information exchange in conducting criminal investigation. In his position as a head of police department, Mr. F. often introduced lower-ranking coworkers to novel technologies. Before doing so, Mr. F. continuously judged technologies by means of their practicality and usefulness and only implemented innovations in the police department when he was fully convinced about these qualities. This behavior qualifies him as an early adopter of technology: all characteristics (introducing technologies to others by providing evaluations, having a central position in a social system) are fulfilled in his case.

When asked about his technology generation, he draws a picture of a rather hesitant and skeptical generation. However, he believes that people of his generation would, just like him, often engage in judgments about usefulness and practicality of innovations prior to adoption. He believes that, while his generation was most often exposed to technology at the work place for the first time, younger generations experience technological change more often outside the work place but are hindered in adopting them due to a lack of financial resources in younger years.

Interview description

Throughout the entire interview, Mr. F. was cooperative, interested and eager to share his experiences with technology use. It seemed that the distinction between private and work-related technology use was of utmost importance for him, so that he repeatedly told about similar aspects relating about these domains. Probing was not always helpful since he continued to talk about private/work-distinction even after several probing attempts. From the middle of the interview, he showed signs of tiredness and exhaustion, again expressing itself in repetitive verbal statements, interrupted sentences, incongruent and sometimes contradictive narratives.

Technological case description

Mr. F. begins his narrative with stating his openness and positive attitude towards technology: *"Back then, I have used everything"* (4:1) and *"I am happy that I have these new technologies"* (4:2). The first communication technology he remembers was the telephone, which he used to *"uphold a connection"* to his relatives and kids (4:7). His attitude towards

the telephone was formed as a result of perceived usefulness: *"And my kids, they have called us, and we were happy that this contact was established"* (4:8). Mr. F describes that he simultaneously started using the telephone at work and in his home: *"I had this closeness to the telephone right from the start, despite my telephone at work"* (4:10). For him, the telephone was perceived as useful to *"keep the contact. With the kids, with the relatives, with my office. It was a constant contact, which I kept upright"* (4:11). Although his work-related use of the phone has decreased since his retirement, it is *"important for me, even today, that I have this connection to relatives and the police office"* (4:12). He associates no negative events with the telephone, in fact he has *"always been very pleased with it"* (4:75). When asked about the influence of the telephone on his life, he states that it helped him to establish *"a mutual connection … which we still keep today"* (4:15). His decision to adopt the telephone was not influenced by subjective norms, the device simply *"has always been there and we have used it"* (4:17), in fact, they *"were dependent on it to have a telephone with multiple lines"* right from the start. His attitude towards usage of the telephone was predominantly shaped by his experience with it at work: *"where it was work related, it was very important … to pass on things at work"* (4:18). He has always perceived the telephone as easy *"without having limitations"* (4:20) resulting from its usability and also because, as a child, *"I have already grown up with the telephone"* (4:22).

Concerning the typewriter, Mr. F. states that it was *"firmly attached"* to his life right from the beginning: *"I knew when the first typewriter came into service, there, I was one of the first who adopted it"* (4:36). He cannot remember any specific key episode concerning the typewriter but remembers to have witnessed the technological development of the typewriter through various stages, all of which he *"adopted thankfully"* (4:26). As a specifically positive memory with the typewriter, he remembers that *"I could work on the topics faster … and wasn't dependent on my finger system"* (4:27), so that for him, adopting the typewriter was a *"relief"* (4:27). He *"wanted to use this (kind of) typewriter, that simplified my work"* (4:35). The typewriter simplified his work where *"we all had typewriters and I knew in advance that I would not have any difficulties"* (4:29). His decision to privately adopt a typewriter was *"autonomous"* and motivated by his previous experiences with it at work: *"and so, the technology swapped from the work domain into the private domain … so that it was a gratification for me to engage with it"* (4:31), also being a result of "exporting knowledge from the private to work and vice versa" (4:32). This exchange between private and work-related domains was driven by his judgments of attitude towards the technology: *"And when*

it was pleasant for me in the private domain, when I perceived it as a relief, then I adopted it. Only these distinction criteria were … for us a sign of development" (4:37).

Third, Mr. F. describes his computer usage first encountered first at work: *"this development, which I stumbled upon at the work domain, mostly motivated me to privately adopt it. And from that, I transferred it to our writing table"* (4:38). Concerning the ongoing development computer, he *"realized that this development occurred on a big scale forward so that I could reproduce that, what was recognized as progressive, in the private domain"* (4:39). Because of this progressive development, Mr. F. exported the usage of the computer from the office to his private life. He remembers positive consequences of computer adoption at work, mainly concerned with simplifying the typing of police work, but cannot provide specific key scenes anymore: *"it was this practical side and with that aid at hand, a simplified and more flexible work (process) set in"* (4:41). In his position as chief of police department, he was the one introducing the computer to other member of staff: *"all were very thankful that I bought this machine"* (4:42). Equipped with personal computers in the police office, *"it was a relief to the colleagues and this relief was greeted with approval; some where there who were frightened, but most of the time, I could convince all so that the majority was positive"* about the innovation (4:43). With police work requiring fast data transmission, it was important for him that *"this transfer was getting fast to the decision makers"* (4:44). Mr. F. denies negative experiences with computer usability, although he recognizes learning processes in which *"sometimes, you had to familiarize, but when this was done, it was most often positive"* (4:46).

Lastly, Mr. F. describes his use of the iPad, which he used to keep in touch with his coworkers. When talking about the iPad, Mr. F. highlights the importance to keep private and police work related data separate when using such tablet devices: *"private things could be passed on, work-related things not. … This is why I had to make the distinction between private and work related"* (4:78). Just like with the other technologies, Mr. F. was among the early adopters of the iPad: *"many people at that time did not have it, and when I started using it, only a few had started using it and slowly joined the others"* (4:50). While he cannot remember the occasion, he first used the iPad, he remembers *"only positive occurrences"* without being able to remember details. Asked about the influence on his life, he describes a positive development within his family: now, he was able *"to keep the private things alive"* (4:53) despite all work-related phenomena. Mr. F. identifies several usefulness-related attributes of the iPad, that were not present in the telephone: *"you cannot compare them, it worked very differently than with a telephone, which was a personal conversation, and with*

the iPad, things could be passed on" (4:54). It is remarkable that he thereby assigns the iPad to sharing data that would not have been possible on the phone. Generally, he used the iPad for writing and messaging, stating that faster data transmission would be an advantage of using the iPad: *"I did my writing with it ... I wrote letters and directly sent them, and they immediately arrived, not via post but immediately! I got answers right away without big delays"* (4:57). The ease of use of the device lies for him in its flexibility: *"yes, the usability was always given because it provided a greater flexibility by it ..."* (4:58). It seems that he was able to transfer his typewriter skills onto the iPad: *"it worked very well since I had previous knowledge with the typewriter ... and then I transferred it from the typewriter to it ..."* (4:59). Concerning subjective norms, he reports that the iPad was gradually adopted into his circle of friends but only to those for which adopting the iPad *"did not have financial implications, negative ones, then they adopted it"* (4:62).

Continuity profile

Mr. F. exhibits continuous characteristics of early adopters. Right at the beginning, he describes a general openness towards early technology adoption: *"when there was a new technology, I have adopted it"* (4:9) underlined by being *"friendly towards it ..."* (4:25). Early adoption of new technologies was for him related to the perceived usefulness of the innovation: *"I was happy when there was something new that supported me in my tasks"* (4:26). New technologies were so readily accepted by Mr. F. because he has *"always judged them to be an advantage"* (4:30) throughout his life.

The continuity of his adoption profile seems to be driven by ongoing evaluations of usefulness, which he readily passed on to his coworkers: *"when it was a relief and I realized that, then I transferred (the technology) it. And when it was a burden, which eventually occurred, then I rejected it"* (4:76). In his central role as chief of police, Mr. F. introduced novel technologies, most notably the PC, towards his fellow workers, again being a sign of early adopters who most often decrease uncertainties about innovations by providing evaluations to peers.

In contrast to innovators, who exhibit somewhat different functions in introducing innovations to social systems, Mr. F. describes himself as not belonging to these very first adopters: *"Generally it was so that these technologies were previously used, I wasn't the first who used them, but I recommended it so that these technologies could then be (further)*

established" (4:77) and *"no there were certain circles, which already had it, and then I perceived it as good and then I have imitated it"* (4:64).

Description of own generation

Mr. F. describes that his own generation as highly evaluative towards technology. According to him, novel technologies would be assessed and only adopted if they were judged as positive by members of his generation: *"Every time there was a novelty, and it was deemed as positive, then it was adopted"* (4:81). Generally, he perceives his generation to be rather hesitant: *"they were hesitant and first had to encounter that they could realize and foremost positively evaluate the technology unless they wished for it and also bought it"* (4:65).

Younger generation

Asked about the younger generation, Mr. F. describes that members of these generations would evaluate and accept technology only *"successively".* Realizing that *"the development (of technology) is positive and that its expansion is to be desired, that only came little by little"* in the younger generations. He attributes this slower decision-making process to the decreased availability of money in younger persons: *"this was caused by its link to money"* (4:67). Although younger generations would need to evaluate a technology as positive and useful prior to adoption, just like in his own generation, he believes that *"the younger were not about to this right away, they could not begin with it because they were lacking the financial preconditions"* (4:70). Although possessing fewer resources, Mr. F, believes that the overall decision-making process has changed: *"the decision totally changed. In our times, it was rather slow and one could not decide for it from today to tomorrow"* (4:83). While in his generation, introduction to novel technologies occurred almost exclusively at work, the younger generation *"does not have to take this step, today it is self-evident",* thereby indicating that younger generations have increased access to technology also outside of work.

Labels

4.1: technology acceptance is governed by contextual use

Three codes (private use, work use, data sharing) were merged to form this label. It became clear that how technology is used is dependent on its contextual placement. The case demonstrated that technologies used work related contexts may diffuse into private contexts and vice versa. If this happens, careful differentiation between private and work-related use of devices is to be obeyed in order to preserve data integrity and data protection.

"private things could be passed on, work-related things not. … This is why I had to make the distinction between private and work related" (4:78)
"this development, which I stumbled upon at the work domain, mostly motivated me to privately adopt it. And from that, I transferred it to our writing table" (4:38).

4.2: technology introduction as a social process

Three codes (passing to colleagues, explaining to colleagues, deciding for other people) characterize this label. Our case demonstrated that some people are introduced to innovative technologies by other members of the social system that provide explanations and help to others. By providing these evaluations, people may engage with innovation technology as a result of shared information within a social system.

"it was a relief to the colleagues … greeted with approval; some were there, who were frightened, but most of the time, I could convince all so that the majority was positive" (4:43)
"... and when I fully understood it, I was able to recommend it further" (4:45)
"… my coworkers, I have equipped them with computers and most of them were very positive about it" (4:48)

4.3: evaluations of usefulness determine technology adoption

Six codes (usefulness evaluation, practicality evaluation, peer evaluation) form this label. Stipulating that for some individuals, evaluations of usefulness and practicality both by peers and by themselves, inform their decisions to adopt innovative technologies, attitudes towards technology seem to be actively shaped by how one self and others judge a given technology to be of practical use.

"when it was a relief and I realized that, then I transferred (the technology) it. And when it was a burden, which eventually occurred, then I rejected it" (4:76).
"Because I have approved of this development when I assessed that it was a relief and practical, then I have also adopted it" (4:33)

Interview 5 – Mrs. J.

Persona

Mrs. J. is a 74-year-old retired woman, who is living together with her husband in a shared private home. Belonging to the early electromechanical generation, she has used the telephone, the mobile phone, the personal computer as well a multitude of smart devices, most predominantly the smartphone. Mrs. J. describes herself as a "technology freak". Continuously, Mrs. J. was eager adopt a broad variety of innovative technologies, including mobile payment, mobile streaming and online shopping. Although she expresses interest in sharing her experiences with innovation to peers, she has not continuously taken the position of a role model with her peers, thereby allowing her to be classified as early majority adopter.

Throughout various moments in the interview, it became clear that Mrs. J. perceives communication technologies as a necessity and form of normality, while, at the same time, the design of technological devices had equal value to her: having bought telephones according to color in her youth, Mrs. J. now expresses a strong preference for Apple products that in her opinion combine both design and functionality.

For her, smart technologies are a means for selective information retrieval: having abolished traditional television altogether in favor of streaming services and social media on her phone, she actively retrieves political information relevant to her preferences using smart devices. While she values that smart technologies bring about increased and interest-specific access to information, she characterizes digital devices as "time killers".

In various descriptions, the aspect of mobility was highlighted. Mrs. J. integrated communicative technology into her car in order to enhance her availability on the road. Likewise, she uses technology to feel safe in case emergencies should occur outside.

Mrs J. perceives her generation to be troubled by the fast development of innovative techniques, causing them to experience problems to keep up with the speed of current

developments. In response, Mrs. J. calls for politically organized programs that help older people adopt to technology. Asked about the younger generations, she sees a different, more accepting socialization with current technologies and ascribes that younger people exhibit a natural tendency towards technological exploration.

Interview description

Throughout the entire interview, Mrs. J. exhibited a talkative and open attitude. She presented a multitude of sometimes extensive personal stories, mostly illustrated by examples from her family. When Mrs. J. mixed narratives of different technologies which each other, a high degree of probing was required to adhere to the interviews semi structured nature. In two instances, she departed to political opinions, again requiring some probing to return the interviews technological content.

Technological case description

Mrs. J. starts the description of her technological life story with the telephone, which to her was *"simply important during that age"* of puberty between 16 and 17 years. She is unable to describe a specific key scene with the telephone but notes that in her rural village *"there were not many people who had a telephone"* (5:7); her grandparents however, who owned a small business, were among the few people possessing such a device. After her puberty, she bought her first own telephone when she moved together with her husband into a new flat, a process for which owning a telephone was *"a precondition"* (5:15). Asked about her attitude towards the telephone, she describes it as *"totally amazing"* (5:8), mainly *"because one was able to communicate fastly and didn't have to run two kilometers through the village"* (5:9) in order to make calls. Asked about positive high points with the telephone, she describes an episode where her boyfriend invited her to a skiing vacation via the telephone: *"I was really delighted about that he called and noticed me that on Saturday, we would go to (city) with a special train"* (5:11). Her negative low point with the telephone relates to an episode in which her child was being caught with driving a vehicle not (yet) owned by him: *"... and suddenly I received a call from the police office that I should go pick up my son"* (5:13). Mrs. J. perceives the impact of the telephone on her life as of such great magnitude that *"without the telephone, I could not image it anymore"* (5:14). Even though she perceives the telephone as a device for everyday use, she found the design of the device of

paramount importance: *"the only thing I had as a condition was its color!"* (5:17) and *"I always wanted a red one … which I finally got. For that, I paid an extra amount of money …"* (5:18). Later, she bought a telephone fitting her maraghoni-wood interior design of the house: *"… and for that, I explicitly wanted a fitting telephone"* (5:19). Her preference for extravagant designs has persisted to the present day, describing herself as *"a convinced fan of Apple"* (5:20) phones. She describes the perceived ease of use of the telephone as *"totally simple"* (5:22). Mrs. J. custom equipped her first telephone with an extra-long cord in order to avoid the fact that *"one could not walk around with it"* (5:23). For her, using the telephone has always been normality in her life: *"As said, the telephone has always been normal"* (5:27).

Second, the mobile phone was introduced into her life. Asked about a key scene, she describes an episode in which her husband integrated a hands-free speaking system to her car, an innovation *"which was highly expensive at that time"* (5:28). When her car broke down during a cold winters day, the hands-free system with the mobile phone helped her to get recovery services to the scene. In line with this notion, she continued to integrate her mobile phone with the car, using a multi-function steering wheel equipped for calling. While she appreciated these calling functionalities at that time, today *"I do not want it anymore, it distracts me"* (5:32), since for her *"one is continuously approachable"* as a result of owning a mobile phone. Mrs. J. perceives being approachable as a consequence of being a mother: *"it belongs somehow to it! … it was important because I am a mother"* (5:35), also because her oldest son is *"permanently traveling throughout the entire world"* (5:37) due to his job. Generally, she describes the ease of use of her mobile phone as *"simply down-to-earth"* and *"always easy"* (5:45) to operate, thereby characterizing the decision to buy it *as "rather autonomous"* (5:38) and without any external factors. The mobile phone was *"a normal, daily, item of use"* (5:44). Concerning subjective norms, it seems that mobile phone use in her circle of elderly friends is associated with social referencing: *"a friend of mine has always waited until I bought something. And then she looked at it and noticed: Oi, Mrs. J. is able to operate it, then I am able to do it as well"* (5:46). In terms of perceived usefulness, the mobile phone served the function to provide safety: *"when I was outside with the car, I was on the safe side. One could call the policy, or an ambulance … that was important, of course."* (5:47).

Third, Mrs. J. describes the computer chapter of her life narrative. As a key scene, she describes using the computer as a requirement of her job as a desk clerk, perceiving herself *"was a simple user"* (5:48). Compared to other technologies in her life, first using the PC

required *"some more thinking into it … one hat to think a bit further"* (5:49). When she bought her first private PC in 2004, she was faced with similar problems, requiring external help: *"I called my son, and when he was in New York, then he sometimes sat there with a red head and did not know what to do …"* (5:50). With her son failing, she highlights doing *"much autodidactic"* (5:51) learning about the device, albeit asking herself *"whether I would come to terms with it. But it worked out well."* (5:52). Generally, she used the PC to organize her pictures from holidays. Negative experiences relate to system failure without providing any specific episodes. Asked about the consequences of PC usage on her life, she describes the PC as a *"time-killer"* (5:54): *"Now that I am retired, I increasingly sit in front of it! Yesterday, I made the plan to reduce it"* (5:55) in order to have more time for household chores. After all, *"today, I cannot image life without such a thing"* (5:56). Soon, her PC use was extended by the internet: *"what I do today is being active on Facebook, Instagram and Twitter; there is no medium where I am not active at, because I have contact to many individuals abroad …"* (5:57). For her, social media use with the PC was associated with a learning process: *"in the beginning, one had to exercise ones brain a bit … all of these were new media, and, as an elderly human, one has to think into the matter"* (5:62).

Lastly, Mrs. J. considers her use of smart devices, including her iPhone, iPad and Apple Watch. As a key scene, she remembers her husband buying the very first iPhone for her grandchildren in America, after which she was able to *"communicate without complications and problems"* with her grandchildren. Right from the start, she perceived the smartphone to be *"very nice"* (5:73), especially its music functions: *"we do not need CDs anymore … we have our smartphone and play music to each other in the garden … This is a superb thing!"* (5:75). Besides, she *"would consider myself stupid if I wasn't possessing a mobile phone … you may access the internet instantly …, which for me makes it highly important as I am very politically interested, …, and the first thing I do at morning in my bed is to look what new has occurred"* (5:43). Just like with her use of social media with the PC, she uses the smartphone to share pictures of her cat and plants after which *"likes come in immediately"* (5:78). Asked about negative events, she both dislikes the noises of people talking on their smartphones in public transportation (5:80) and that the smartphone is, just like the PC, a *"time killer"* (5:81). Having integrated the smartphone closer into her life, she reports changed shopping habits: *"I buy, I do not want to lie, 80 percent of my items, … over the internet"* (5:85). After this, a switch to online banking, including the use of ApplePay, soon followed because *"it was unnerving for quite while … at the supermarket I was asked to get my cards out and sign, (now) you put your phone on top and its done!"* (5:87). Another innovation she adopted after

getting her smartphone was using video streaming, which caused her to abolish traditional television altogether: *"I only watch goal-directed"* (5:89).

Continuity profile

Mrs. J. describes her continuity profile of technological adoption as *"always early"* (5:39). In fact, she describes herself as a *"technology freak, always been that"* (5:31). Throughout her narrative, it becomes clear that Mrs. J. has always adopted technological innovations early (e.g. non-linear TV and smartphone payment), albeit it is not entirely clear whether she did so from an innovator-leadership position in her social system. At least in case of her mobile phone, she has served as a role model to her peers and thereby stimulated adoption of innovations in others. In other cases, Mrs. J. required extensive help from others to operate novel technologies and could thus not serve as a role model. Therefore, Mrs. J. is considered to belong to the early majority: she deliberately and enthusiastically adopts innovations before the average member of the majority but lacks a constant leadership position.

Description of own generation

Mrs. J. describes her own generation as strongly impacted by the fast development of technology in recent years: *"there are many which are not able to fully keep up"* (5:98). Additionally, members of her generation would be *"driven by uncertainty on inexperience"* (5:86), especially when faced with the internet. As a consequence, she beliefs that for people from age 60 upwards, interventions should be offered: *"there ought to be done more politically for people from 60 upwards, to offer them … help"* (5:99). Although she somewhat recognizes the current existence of interventions for her generation in the form of organized technology-courses, she is convinced that many of her age *"simply do not want"* to engage with technology anymore (5:100) as a result of previously existing knowledge gaps: *"it is always easier when you know how something works; if one does not know it … then it is rejected on the inside"* (5:104). In this notion, unwillingness to engage with technology might be both *"a question of educational level"* (5:101) as well as a result of political failure: *"maybe something was societally neglected, especially with this generation"* (5:102).

Younger generation

Mrs. J. describes the younger generation as impacted by the availability of technology during their formative years: *"they grow up with it, the younger ones. … for them, it is self-evident, they have never witnessed a telephone with a cord! … there are worlds in between"* (5:105). She beliefs that the younger generation would exhibit more openness to engage with novel technologies as a mere result of adolescent curiosity: *"certainly they will be more open to try something totally new. A younger person is more curious to try something new by nature …"* (5:109). In addition, the younger generation is *"going to decide way quicker towards innovations"* (5:111) as a result of socialization: *"It is how these younger people are socialized. It starts in kindergarten …"* (5:110).

Labels

5.1: innovative and custom design choices make technology desirable

Three codes (apple, design, customizing) were merged to form this label. Technology adoption seems to be partially influenced by external characteristics such as the design of a device: extravagant coloring or other pregnant design characteristics may differentiate a product from its competitors and serve as a motivation towards adoption on grounds of perceived uniqueness influencing attitude towards usage. In the example of Mrs. J., especially Apple products were thought to fit these criteria. Besides, the ability to customize a technological product to one's own needs (e.g. adding a longer cord to the telephone), to "make it yours" could serve as a supporting factor.

"the only thing I had as a condition was its color!" (5:17)
"We have had extra long cords being attached to it" (5:24)
"I am a convinced fan of apple, nobody could convince me about a different mobile phone" (5:20)

5.2: smart technologies allow selective consumption of information

Two codes (shopping, TV streams) were selected to form this label. Throughout the entire case of Mrs. J., it became evident that smart technology allows to selectively consume information that is coherent with one's own beliefs and preferences. With personalized

shopping, personalized video streams and personalized political information that is accessed on social media, smart technologies might become adopted because they provide a personalized user-experience that is perceived as useful.

"I buy, I do not want to lie, 80 percent of my items, … over the internet" (5:85).
"I only watch goal-directed" (5:89).
"you may access the internet instantly …, which for me makes it highly important as I am very politically interested, …, and the first thing I do at morning in my bed is to look what new has occurred" (5:43).

5.3: increased consumption of information and its role as a time killer

Three codes (timekiller, increased flow of information, retrieving information) were merged to form this label. It is thought that novel communication technologies increase both the general amount of information that is presented to the individual as well as the individuals ability to access information in nearly every situation. In the case of Mrs. J., integration of her phone to the car increased her availability but was soon perceived to be a disturbance. Likewise, her heightened use of social media on the computer was perceived as a "time killer", that caused Mrs. J. to extensively access online information resulting in time lost for household chores.

"I have to contest that all these systems are time-killers! … I think that this is one of the negative things." (5:81).
"Now that I am retired, I increasingly sit in front of it! Yesterday, I made the plan to reduce it" (5:55)
"This is very aggravating. … You cannot go to the toilet anymore without being constantly available!" (5:33)

5.4: technology supports personal mobility

Two codes (mobility, rural living) were combined to form this label. It became clear that technology plays a role in enhancing personal mobility, either by integration into current

technological systems, such as the car, or by decreasing communicative barriers often found in rural areas, such as physical distances.

"And I was completely excited, he had a hands-free kit installed, which was very expensive at that time" (5:28)
"because one was able to communicate fastly and didn't have to run two kilometers through the village" (5:9)

5.5: technology adoption as a result social referencing and social reinforcement

Three codes (social networks, social referencing, sharing from life) were merged to form this label, highlighting the importance of social interactions in technology uptake and adoption. At the example of Mrs. J., social networks served to provide a reward in the form of likes for interaction with the technology. These likes serve to reinforce the persons desire to interact with a social technology. In another example, social referencing was demonstrated: by providing evaluations to peers about a technology, mechanisms of social comparison are likely to support an individual's decision to adopt.

"And when I place the best pictures of my cat or from my plants or from my vacations online, likes come in immediately" (5:78).
"a friend of mine has always waited until I bought something. And then she looked at it and noticed: Oi, Mrs. J. is able to operate it, then I am able to do it as well" (5:46).

5.6: fast technological development requires specialized learning interventions for older people

Eight codes (too fast, educational level, elderly politics, skill sufficiency, skill transfer, autodidactic, helping, learning aging) were merged to form this label. While fast technological developments bring changes of basic technology that are thought to increase inter-generational difference, the case of Mrs. J. demonstrated that elderly individuals both engage in autodidactic learning and learning mediated by help from other individuals in order to cope with those changes of basic technology; often, elderly individuals assess whether their technological skills are sufficient for successfully interacting with a novel technology before a decision for adoption is taken. If this evaluation turns out negative, help is often sought.

Based on the narrative of Mrs. J., it is likely that structural deficits in technology education for elderly individuals exist.

"there are many which are not able to fully keep up" (5:98)
"there ought to be done more politically for people from 60 upwards, to offer them … help" (5:99).
"it is always easier when you know how something works; if one does not know it … then it is rejected on the inside" (5:104).

Interview 6 – Mrs. U.

Persona

Mrs. U. is a 82 year old woman living alone in her private home situated in a rural area. Belonging to the mechanical technology generation, she has used the typewriter, telegraph, telephone and smartphone.

Throughout the entire narrative, it is clear that Mrs. U. is strongly influenced by her mechanical generational membership: half of the technologies she has used during life are operated by manual means (such as the typewriter and the telegraph). During this period of her life, Mrs. U. describes herself as a person who readily adopted novel technologies. With the digital era approaching later in her, she seems to have turned to a rather "conservative" and "passive" person that does not explore novel technologies by herself but rather excepts them after they are introduced by others. Although she has accepted modern digital technologies, her story provides evidence that she does so with suspicion and fear of losing the human quality in communicating with each other as a result of increasing technological availability. These aspects of passiveness, conservatism and suspicion characterize her as a laggard.

Furthermore, multiple quotes indicate that Mrs. U. engages in needs-assessment prior to technology adoption. Before new technologies are adopted, she assesses whether the new technology brings added benefit in terms of personal need satisfaction in comparison to the technologies she already owns. In most of the cases, she perceives older technologies as sufficient for her, thereby often deciding for non-adoption.

Mrs. J. characterizes her own generation as rather hesitant towards technology and attributes this to a preference for already known technologies within her age group, decreased curiosity as a result of aging and an unwillingness to engage in learning processes, which are often required for elderly people to successfully interact with novel technologies. She perceives the younger generation to be affected by a different, highly smartphone-mediated style of communication associated with increasing loss of facial communication. Even though she attests them with a greater openness to innovation and a natural drive for curiosity in younger years, her view of the younger generation remains pessimistic.

Interview description

Throughout the entire interview, Mrs. U. was welcoming and open, answering to questions adequately and concise. Nearly no probing was required since her narrative was always focused to the questions. She quickly grew accustomed to the repetitive nature of the interview schedule and soon anticipated following interview questions, overall leading to a well-structured narrative.

Technological case description

Mrs. U. begins her narrative with the typewriter. As a requirement of her job in a large electronics firm, her tasks involved the transcription of technical documents. Therefore, she used the typewriter right from the beginning*, "as soon as I entered my apprenticeship, because using the typewriter was self-evident and could not be avoided"* (6:27). Mrs. U. learned using the typewriter in an organized course (6:27). Her key episode is concerned with the importance of producing tidy documents, a task that not always went well with the typewriter: "making carbon copies was ugly and making typing errors! That one, if writing tidy letters, had to repeatedly begin from the start" (6:9); *"and if something didn't work out, one had to do it again"* (6:10). To avoid this, using the typewriter required her to be *"highly concentrated on the work"* (6:11). Besides these efforts, Mrs. U. first used the typewriter with 10 years of age, when she, as a child, secretly accessed the typewriter of her father: *"I felt great with 10 years of age when I reached the typewriter of my father and was able to write, put the letters after each other, big, small letters and all this, everything of which was mechanical"* (6:12). Even when she continued to use the device at her job, she remembers the typewriter as a *"desirable thing"* (6:15), that became further improved by the subsequent

introduction of the electronical typewriter: *"but later one had electric typewriters, first the simple mechanical ones, then the electric ones with the ballhead"* (6:15). Overall, the typewriter helped her to combine writing fast and tidy, resulting in a positive attitude and perceived usefulness: *"Yes, I was happy that it was faster and more tidy, because one did not have to write tidy anymore by hand … it was really fast when one could operate it properly"* (6:13). A consequence of using the typewriter was that she *"wrote less by hand"* (6:14). Later, she also privately adopted an electronical typewriter in her home, mainly help her husband write letters for his business. Asked about its usefulness, she describes the advantage of making multiple carbon copies and the function of the tabulator, allowing her to make aligned tables: *"this technology of the tabulator, that existed already. That one could make tables tidily and such, that was important"* (6:18). Her decision to adopt the typewriter was entirely motivated by the requirements of her job without presence of any other external factors. Operating the typewriter has always been easy for her, mainly because the machine was *"always ready, always standing there for use"* and that *"writing with ink would have been more difficult, I assume"* (6:25).

Second, Mrs. U describes her purely work-related use of the telegraph. It is unclear whether she ultimately meant the telegraph, because she only remembers the operation of the device (from which it was identified as a telegraph attached to a telephone cable*): "it was a big machine and one typed text in; just like with the post, stripes came out"* (6:29) and *"I do not fully remember it but one dealt a phone number and then it worked"* (6:30). Again, the issue of tidiness seems to have influenced the ease of use: *"and when one made a mistake, the whole thing had to be declared invalid. It could not be deleted, since it was already sent, and then one had to write the whole thing anew"* (6:29). As a key episode, she remembers social occasions co-occurring with the use of the telegraph: *"It was always in this small bureau, where the device was placed. There was always a meeting of all woman, who had to operate it and it was rather the communication occurring besides using the apparatus; often, we just ranted"* (6:31). She goes on the explain that this small bureau *"was a meeting point, where men could not come in. We mostly had men in technical positions, and they did not enter there. That was the reason why one went there sometimes"* (6:32). Mainly she used the telegraph to send written confirmations to business partners, with her main concern being the fast automation of the task: *"and then we always thought: 'how do we get it done fastly'?"* (6:33). Asked about her feelings when first operating the device, she describes them as *"scary"* (6:34) and *"somehow anxious because I did not know it, it was new for me"* (6:35). This anxiety seemed to be informed by her desire for tidiness: *"when it was written, it was*

final. One could not correct it. A letter could have been written anew or corrected." (6:36). No external or interpersonal factors influenced her use of the telegraph, despite its use being prescribed by her company. Overall, she considers the telegraph as *"not user-friendly"* (6:42) at all, as the technology did not allow for making corrections to the written text, leading her to the evaluation that *"it was stupid, simply stupid. One has always seen that it wasn't a desirable device"* (6:45) and *"for me, it wasn't a good device"* (6:50).

Third, Mrs. U. goes on to share her experiences with the telephone. Her key experience with the telephone was a specific call which notified her about having appeared on television (6:51). Mrs. U. mostly remembers positive experiences with the telephone, where using the device allowed her to engage with narratives of relatives more closely. Her overall attitude towards the telephone has always been positives: *"I still like it today"* (6:54). The telephone had the impact that *"no letters were written anymore"* (6:55), again an example of how manual technologies become replaced. Furthermore, she reports that the telephone has allowed her to communicate difficult topics: *"it was quicker to say on the phone than doing it personally. Sometimes, there is a barrier in-between. And I still do it today, that, if I know that it is going to be a difficult conversation, I first call to speak about it"* (6:56). In this sense, the telephone has removed the immediacy of difficult conversations: *"I do not stand in front of it, I can say it to begin with"* (6:58). Deciding to adopt the telephone was, for her, not a conscious decision: *"I have never decided that I want one. We always possessed one"* (6:59). However, external factors, such as the work of her husband, had some impact in her decision to use it. She first used the telephone at home, where it *"was the only telephone in our street … There, we had the only telephone. So I had to notify my neighbor that is son was recently born"* (6:61). Possessing the telephone was not only important for her, but also for her neighbors on the street who used to make important calls using her device, mainly because they were not possessing one themselves. For her, using the telephone has always been easy, *"because one was connected fastly"* (6:62). For her, it is important to manage the usage of the telephone: at certain times, she deliberately chooses not to answer the telephone *"and let it ring"* (6:66), describing interactions with the phone as *"a conscious decision"* (6:67). Accordingly, she describes the answering machine as the most important feature of the telephone that allows her to consciously interact with incoming calls (6:68).

Lastly, Mrs. U. describes the use of her smartphone, a device she bought as a consequence for her hobby of providing guided city tours: *"I do city tours, and when an emergency occurred there, I could reach out for help"* (6:71), *"it was a condition to carry such a device with you"* (6:84). In that sense, adopting the smartphone was *"not a conscious*

decision" (6:86) for her. Generally, she considers the impact of the smartphone of society as negative: *"I recognized the development over the last 20 years. There are seldom people, who talk to each other in the train, foreigners. … Mostly, everyone has his device in their hands."* (6:69). Just like with her telephone, Mrs. U. engages in cautious interaction management: *"I do not have an emotional connection to the thing except that I introduced my quite time, that was the most important thing I did"* (6:70). As a key scene, she describes an episode where her SIM card expired, an experience that *"did not interested"* (6:73) her; instead, she reached out for help by her sons. Her disinterest towards the smartphone is also rooted in her desire to manage interactions: *"because I do not want to be constantly reached by someone. … when someone wants to tell me something, he may gladly come to me …"* (6:74). As a key scene, she describes putting up pictures of her children onto the smartphone, which for her was *"pleasant"* (6:75) since *"one could participate in how the kids grew up and see how they have developed"* (6:76). However, interacting with the smartphone was not always easy for her. When she crossed the border to Austria, her smartphone kept notifying her about the network changed with a loud noise: *"there I was absolutely angry and couldn't hide it … later, I went to the hotel reception where a young man helped me mute the ringer"* (6:77). Although Mrs. J. is aware of the smartphones social networking capabilities, she just uses basic functionalities, again engaging herself in interaction management towards the device: *"I do not want all these. I consciously excluded … what I do not like to do"* (6:79). For her, using social networks on the smartphone equates to *"stripping in front of others"* (6:80). The amount of social-networking information she receives by her contacts is not relevant for her: *"I have an acquaintance who always sends things around, all her pictures from vacation, and I instantly close them and do not look at them at all" (*6:81). Overall, she describes her smartphone use as *"conservative",* explicitly stating that nothing has changed in her life as a result of smartphone use: *"but did something change in my life by it? No, I am consequentialist, not snoopy, not loquacious"* (6:82). Although she notices benefits of smartphone use, such as using it on holidays, the adoption process for her private smartphone (that emerged after the smartphone she used for making city tours) seemed to be a result of influence from her children: *"they gave it to me as a gift. And then they bought me a new one and simply removed the SIM card from the old one"* (6:89). It is remarkable that Mrs. U. exhibits a rather passive stance towards smartphone usage: *"It is served to me and I would never buy it myself"* (6:93). Using the smartphone was mostly easy for her but she is keen to state that: *"now I know that it is useful, but I also could serve my needs with other devices. I would not need to have it"* (6:94).

Continuity profile

Mrs. J. describes herself as a person who has always adopted technologies early (6:96). However, she reports that technology nowadays is passively *"served"* to her by other individuals (6:93) and although she recognizes the value of novel technologies, she describes herself as *"conservative"* and *"consequentialist"* (6:82), referring to the idea that older devices would suit her needs just as well (6:94), therewith limiting her need for innovation. By equating social media use with a *"striptease"* in front of strangers, it is evident that Mrs. J. exhibits some degree of suspicion towards technology. These points justify Mrs J. to be described as a laggard: her point of reference lies in the past and is accompanied by suspicion and traditionalistic values, resulting in late adoption after the average individual in society. However, she describes that this has not always been so: *"earlier in my life, I was way more active"* (6:97) concerning technology. When Mrs. J. grew older, she increasingly experienced that *"those things that I own … are sufficient for my needs. More, I do not want."* (6:98).

Description of own generation

Mrs. J. describes the typical use of technology in her generation as hesitant: *"I experience a lot of woman of my age, who do not want to engage with it. They say: 'leave me alone with it' and such things"* (6:100). At the same time, however, she perceives some individuals of her age who engage more with technology, but *"most of my age say: no"* (6:100).This hesitant interaction with technology is, according to her, motivated by the fact that the older individuals would most often be able to do the things they want with those things they already possess: *"because it is sufficient for them"* (6:101). Second, she believes that novel technologies require learning processes that are thought to be off-putting: *"perhaps also because one has to learn it anew. To concern oneself with it. There are, I think, a lot who say: 'no, we do not want that'"* (6:102). In fact, not wanting to engage with technology in her generation is attributed to a decreased drive for curiosity co-occurring with age: *"and I think we have already explored so much things, that we know: not everything, that is new, is good."* (6:108).

Younger generation

Mrs. J. describes the younger generation as unselective when it comes to new technologies: *"they do not sort out things and take everything"* (6:104) and *"they try everything"* (6:105). This decreased selectivity, for her, results from increased smartphone use in current generations*: "for me it looks as if they do not have any other interests anymore than the smartphone. ... the human perspective is lost, because technology takes it away."* (6:106). Impacted by increasingly technology-mediated communication, younger generations would engage in pseudo communication that looses human qualities: *"and this communication ... like viewing pictures where one has spent his vacation, this is not communication"* (6:106). Mrs. J. goes on to describe the younger generation as having been socialized in a different technology style: *"... because with these things, they are accustomed and have grown up with it; they wait for more"* (6:107). Mrs. J. shares her fears that, in view of the current younger generation, human communication faces the danger of getting lost: *"and I have the fear that human exchange gets lost. And that they, when they talk do not look at each other anymore. This contact is completely lost"* (6:112). In this pessimistic notion, she ascribes to the younger generation a flattened affectual style of communicating: *"when you look at someone, their mimics, all this is not recognized anymore"* (6:113).

Labels

6.1: communication technology requires proactive interaction-management

Two codes (interaction management, reduced interactions) were merged to form this label. Throughout the entire narrative, it becomes clear that Mrs. J. actively tries to manage the information that is incoming on her phone and smartphone by setting time aside, in which she deliberately chooses not to react to calls. It could likely be the case that older individuals perceive the need to reduce their interactions with technology in order to not be overladen with information. On the other side, Mr. J. beliefs that younger generations lack the skill of proactive interaction-management, resulting in increased smartphone usage at the cost of losing face to face interactions in the real world.

"I introduced my quite time, that was the most important thing I did" (6:70)

"for me it looks as if they do not have any other interests anymore than the smartphone. ... the human perspective is lost, because technology takes it away." (6:106)

6.2: technology improves work-related processes

Four codes (tidiness, manual task, task automation, making mistakes) were merged to form this label. The case of Mrs. J. demonstrated that advances in technology were associated with increased outcomes of accuracy and tidiness, especially improving work related products such as written letters. Furthermore, it was demonstrated technological progress reduces the need for communication based on manual methods: specifically, the typewriter reduced the amount of handwritten letters, while, at the same time, increasing its tidiness. Mrs. J. provided ample evidence that through using the typewriter, mistakes in documents could be reduced by means of tabulation.

"I was happy that it was faster and more tidy, one didn't have to write so tidy by hand (...) now it was really quick ..." (6:13)
"no letters were written anymore" (6:55)
"I had to do technical writings with these column-things, that they were nicely above each other, that all was good" (6:10)

6.3: technological non-adoption as a result of needs assessment

Three codes (old is sufficient, learning effort, novelty anxiety) were merged to form the label. It seems that elderly individuals engage in needs assessment prior to technology adoption in which technological innovations are assessed in terms of their added benefit compared to previously used technologies In case of Mrs. J., she often judged previously used technologies to fully satisfy her needs, causing her to abstain from innovation since there was no perceived benefit in terms of needs-fulfillment. Another factor in this assessment process seems to be the judgment of expected learning effort: if novel technologies require extensive learning prior to usage, continuation of older technologies seems sometimes to be preferred by elderly adults.

"now I know that it is useful, but I also could serve my needs with other devices. I would not need to have it" (6:94).

"those things that I own … are sufficient for my needs. More, I do not want." (6:98).
"perhaps also because one has to learn it anew. To concern oneself with it. There are, I think, a lot who say: 'no, we do not want that'" (6:102)
"It really was simply scary, somehow afraid, and I did not know it beforehand, it was new to me" (6:35)

Appendix A: Interview Scheme for technological life story interviews

Based on McAdams, 2008

Introduction

This is an interview about the story of your life with an emphasis on changes in communication technology you have experienced. I will ask you to think about how you have used communication technology throughout your life by means of key scenes, meanings and ideas. In this interview, there are no wrong answers – I ask you to tell me the most significant encounters with technology in your life and what they meant for you. I will record your answers for research purposes and analyze how technology use has contributed to who you are. Approximately, this interview will take an hour.

01 Do you have any questions about the procedure?

Life chapters

We start with a short overview on the different chapters of technology use throughout your life. You can think about it just like different chapters of a book or episodes of a TV series, and keep in mind which technologies you have used for communication the most, what it was like and your reasons for using them.

02 Please describe the title of the technological main chapters in your life.

Key Scenes

You have described me several chapters of your life in relation to the key communication technologies you have used. Now, please think about key scenes: specific events in a given chapter of your life relating to communication technology story that stand out: because you have good memories of that episode, thought that technology use was important or has

influenced you in a way. For every key scene you decide to tell about, I will ask a few more questions for further clarification.

03 Please tell me what you were thinking and why you think that this scene was important to you?

Sub questions for each key scene:

04 Please describe how you felt when you used the specific technology for the first time?

05 Did you feel excited, happy? (high points)
06 Did you feel unpleasant emotions, fear or uneasiness? (low points)

07 What impact did the adoption of this specific technology have on you?

08 Why did you feel that adoption of this technology was important to you?

09 Who was involved with your decision to use the technology?

10 Were there factors in your environment that have influenced your decision to use/not use the technology?

11 Did you perceive the technology to be useful?
11a If so, how did its usability influence your decision to start using it?

12 How easy was it for you to use the technology?
12a Did its ease of use influence your decision to start using it?

13 Where did you use the technology?

14 Did you see that others were accepting or rejecting the technology?

Technology Generations

Now that you have told me some chapters and key scenes about your life, I want to ask you a few questions on the technology generation you were born in and how you think about your as well as younger generations.

15 When you were ask to summarize your behavior in taking up new technologies, have you always been a person that has accepted technology early or late?

16 How would you describe the use of technology within your generation?

17 Do you think that there are differences between your generation and that of younger ones?

18 How do you perceive the younger generations technology use?

19 Do you think that the younger generations behave differently in adopting new technologies than you did?

Appendix B: Coding scheme for deductive coding

Table 6.

Category	Definition	Coding rules
D1: innovators	Willing to try new ideas first; withstand risks of failure and uncertainty; have a complex understanding of technology; introduce new ideas into the social system from outside	Individual statements must relate to: • A desire to use innovations among the very first in their social system Optionally accompanied by • Presence of strong technological knowledge • A desire to introduce new innovations from the outside to their own social system
D2: early adopters	Role models for adoption inspired by innovators; have a central position in the social system; decrease uncertainty about innovation by providing evaluation to their peers	Individual statements must relate to: • Early desire to use innovations; but not among the very first users Optionally accompanied by: • A desire to provide their use experience to peers • Descriptions of interpersonal influence from innovators
D3: early majority	Deliberate innovation adoption before the other members of the majority; middle position between	Individual statements must relate to: • Somewhat early desire to use innovations before most of the majority Optionally accompanied by: • Descriptions of not being in a leadership role

	early and later adopters; seldom in leadership positions	• Descriptions of peers that used the innovation earlier than the participant
D4: late majority	Skeptical adoption of innovations occurring after the average member; respond to economic necessity or network pressure; require reduced uncertainty about the innovation	Individual statements must relate to: • Skepticism concerning adoption • Adoption decidedly after the average member in the participants social system Optionally accompanied by: • Expressions of influence from social or network pressure
D5: laggards	Last members to adopt an innovation; isolated in the network; point of reference lies in the past; traditional and suspicious; must have absolute certainty; require highly reduced uncertainty about innovation	Individual statements must relate to: • Adoption among the last individuals in the participants social system Or: • Non-adoption Optionally accompanied by: • Expressions of suspicion • Expressions of traditionalistic values • Expressions of past time point-of-reference • Expressions highlighting need for reduced uncertainty prior to adoption
T1: perceived usefulness	The subjective probability that using an innovation is likely to	All statements relating to • probable performance increases in either private or work contexts • actual performance increases resulting from innovation adoption

	increase the users performance in a given context (Davis, 1989, p.4)	• subjective evaluation of usefulness or personal gains deriving from the use
T2: perceived ease of use	"The degree to which the prospective user expects the innovation to be free of effort" (Davis, 1989, p. 4)	All statements relating to • the degree of effort required for innovation adoption • required learning processes prior to innovation adoption • the perceived hurdles to the adoption of innovation • the subjective evaluation of the innovations usability
T3: attitude toward using	Exclusively affective - positive or negative - evaluations of the individual about innovation use	All statements relating to • evaluations of attitude as a result of perceived usefulness • evaluations of attitude as a result of perceived ease of use • evaluations of attitude as a result of both PU and PEU
SN: subjective norms	Subjective norms and interpersonal influence as an external concept outside of TAM	All statements relating to • other people involved in the decision to use and adopt an innovation • normative factors in the socio-cultural environment that were involved in the decision to use and adopt an innovation
G1: change of basic technology	Experience with technology is differentiated by changes basic technology, perceived as generational difference	All statements relating to • fast, sudden or rapid changes of basic communication technologies

G2: socialization in different technology style	Generational differences as a result of socialization in technology style dissimilar than that of subsequent generations	All statements relating to • concepts of technological socialization between generations
G3: availability during formative years	Generational difference as a result of technological availability during formative years	All statements relating to • accounts about the formative life stage (<= 25 years) • missing opportunities to obtain technological skills during this time • perceived differences as a result of different skillset-learning early in life
G4: miscellaneous	All other perceived causes for generational difference	

References

Atkinson, R. (1998). *The Life Story Interview* (Vol. Thousand Oaks): SAGE Publishers.

Atkinson, R. (2006). The Life Story Interview as a Bridge in Narrative Inquiry. In D. J. Clandinin (Ed.), *Handbook of Narrative Inquiry: Mapping a Methodology* (pp. 224-241). Thousand Oaks: SAGE Publications.

Atkinson, R. (2012). *The Gift of Stories: Practical and Spiritual Applications of Autobiography, Life Stories, and Personal Mythmaking*. Westport: Greenwood Publishing.

Beauford, J., Nagashima, Y., Hsun Wu, M. (2009). Using Translated Instruments in Research. *Journal of College Teaching & Learning, 6*(5), 77-82.

Bohlmeijer, E., Westerhof, G. (2011). Reminiscence Interventions: Bringing Narrative Gerontology into Practice. In G. Kenyon, Bohlmeijer, E., Randall, W. (Ed.), Storying Later Life: Issues, Investigations, and Interventions in Narrative Gerontology (pp. 273-289). New York: Oxford University Press.

Bruner, J. (1991). The Narrative Construction of Reality. *Critical Inquiry, 18*(1), 1-21. doi:10.1086/448619

Butler, R. (1974). Successful Aging and the Role of the Life Review. *Journal of the American Geriatrics Society, 22*(12), 529-535. doi:10.1111/j.1532-5415.1974.tb04823.x

Cobb-Clark, D., Schurer, S. (2012). The stability of big-five personality traits. *Economics Letters, 115*(1), 11-15. doi:10.1016/j.econlet.2011.11.015

Czaja, S., Charness, N., Fisk, A., Hertzog, C., Sankaran, N., Rogers, W., Sharit, J. (2006). Factors Predicting the Use of Technology: Findings From the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging, 21*(2), 333-352. doi:10.1037/0882-7974.21.2.333

Davis, F., Bagozzi, R., Warshaw, P. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003. doi:10.1287/mnsc.35.8.982

Docampo-Rama, M., de Ridder, H., Bouma, H. (2001). Technology generation and age in using layered user interfaces. *Gerontechnology, 1*(1), 25-40. doi:10.4017/gt.2001.01.01.003.00

Iyengar, K. M. (2014). Holistic content analysis of narratives written by Asian Indian American students. *European Journal of Research and Reflection in Arts and Humanities, 2*(2), 62-75.

Johnson, J., Finn, K. (2017). Designing User Interfaces for an Aging Population (pp. 119-136). Burlington: Morgan Kaufman. doi:10.1016/B978-0-12-804467-4.00007-4

Lieblich, A. (2011). The Holistic-Content Perspective. In A. Lieblich, Tuval-Mashiach, R., Zilber, T. (Ed.), Narrative Research. Thousand Oaks: SAGE. doi:10.4135/9781412985253

Maier, C., Laumer, S., Eckhardt, A. (2011). Technology Adoption by Elderly People – An Empirical Analysis of Adopters and Non-Adopters of Social Networking Sites. In A. Heinzl, Buxmann, P., Wendt, O., Weitzel, T. (Ed.), *Theory-Guided Modeling and Empiricism in Information Systems Research*. Heidelberg: Physica-Verlag.

Mayring, P. (2000). Qualitative Content Analysis. *Forum Qualitative Social Research, 1*(2). doi:10.17169/fqs-1.2.1089

McAdams, D. (2001). The Psychology of Life Stories. *Review of General Psychology, 5*(2), 100-122. doi:10.1037/1089-2680.5.2.100

McAdams, D. (2008). The Life Story Interview. Retrieved from http://www.urbanlab.org/articles/McAdams_2008_LifeStoryInterview.pdf

McAdams, D. (2015). *Life Story* S. K. Whitbourne (Ed.) *The Encyclopedia of Adulthood and Aging* doi:10.1002/9781118521373.wbeaa141

McAdams, D., Guo, J. (2015). Narrating the Generative Life. *Psychological Science, 26*(4), 475-483. doi:10.1177/0956797614568318

McQuail, D. (1983). *Mass Communication Theory: an Introduction*. Thousand Oaks: SAGE Publications.

Pinnegar, S., Daynes, J. (2007). Locating narrative inquiry historically: thematics in the turn to narrative. In D. J. Clandinin (Ed.), Handbook of Narrative Inquiry: Mapping a Methodology (pp. 3-34). Thousand Oaks: SAGE. doi:10.4135/9781452226552

Rogers, E. M. (1983). *Diffusion of Innovations* (3 ed.). New York: The Free Press.

Sackmann, R., Winkler, O. (2013). Technology generations revisited: The internet generation. *Gerontechnology, 11*(4), 493-503. doi:10.4017/gt.2013.11.4.002.00

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity, 52*(4), 1893-1907. doi:10.1007/s11135-017-0574-8

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing, 22*, 960-967. doi:10.1016/j.promfg.2018.03.137