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Women and Technology: How Far Have We Come in the Digital Age?

Women's Perceptions of Gendered Technology Stereotypes

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„Für mich ist das Wichtigste, sich Aufgaben zu stellen, Aufgaben zu begreifen

und danach zu streben, die verstandenen Aufgaben bestmöglich zu erfüllen"

Helmut Schmidt auf die Frage von Giovanni di Lorenzo, was das Wichtigste im Leben sei

"For me, what is most important is to set oneself challenges, to comprehend challenges

and to strive to fulfill the understood challenges in the best possible way"

Helmut Schmidt when asked by Giovanni di Lorenzo what is most important in life

For me, this dissertation is such a challenge, that I set myself, truly learned to understand throughout the research process and strove to fulfill in the best possible way.

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ZUSAMMENFASSUNG

Digitale Technologien bestimmen maßgeblich soziale Partizipation und haben damit einen enormen Einfluss auf die Gesellschaft. In diesem Zusammenhang hat vor allem das Zusammenspiel von Geschlecht, Alter und Technologien eine hohe Relevanz. Zum einen sind Frauen in der gemeinsamen Betrachtung mit Technologien durch negative Stereotype benachteiligt. Zum anderen beeinflusst das Alter einer Frau, inwieweit sie im Umgang mit digitalen Technologien als kompetent wahrgenommen wird: ältere Frauen werden stereotypisch als unbegabter wahrgenommen; jüngere Frauen, die mit Digitalisierung aufgewachsen sind, scheint der Umgang mit digitalen Technologien leicht zu fallen. Das Ziel der vorliegenden Dissertation ist es, die Intersektionalität von Geschlecht und Alter mit Technologien zu untersuchen. Konkret beschäftigt sich diese Arbeit damit, wie Frauen geschlechtsspezifische Technologiestereotype wahrnehmen und wie sich diese Wahrnehmung auf ihre Denkweise und ihr Verhalten in Bezug auf Technologien auswirkt.

Um auf meine Forschungsinteressen einzugehen, habe ich zwei Runden individueller qualitativer halbstrukturierter Tiefeninterviews durchgeführt. Die erste Gruppe bestand aus zwanzig Frauen im Alter zwischen 65 und 75 Jahren, die nicht mehr berufstätig waren. Die zweite Gruppe bestand aus Frauen, die zwischen 1995 und 2001 geboren wurden und somit die Altersgruppe der Generation Z repräsentieren.

Das zweite Kapitel der Dissertation befasst sich mit dem Einfluss des Lebensstils von Frauen im Rentenalter auf die Integration technologischer Geräte im Alltag. Ich konnte drei Typen von Frauen in Abhängigkeit ihres Lebensfokus filtern und zeigen, wie digitale Technologien zur Erweiterung ihres Lebensstils dienen. Ich habe meine Ergebnisse mit der Theorie des Anokritizismus (Maierhofer, 1999) in Verbindung gebracht, in der nach vielfältigeren Modellen der Altersidentität für ältere Frauen gefragt wird. Diese Studie

vermittelt ein Verständnis dafür, wie Technologien in einer bestimmten Lebensphase integriert werden.

Im dritten Kapitel wurde untersucht, wie ältere Frauen ihr eigenes Interesse an und ihre eigene Kompetenz im Umgang mit Technologien sowie anderer Personen wahrnehmen. Die Ergebnisse dieser Studie zeigten, dass die Bewertungen anderer Personen durch ältere Frauen alters- und geschlechtsstereotyp sind. Wenn sie ihr eigenes Interesse an Technologie erklären, bezogen sie sich auf ihre individuellen Vorlieben. Um ihre eigene Technologiekompetenz zu erläutern, bezogen sie sich auf Stereotype. Außerdem scheint die Wahrnehmung der Nutzung von Technologien geschlechtsspezifisch zu sein. Ich verbinde diese Ergebnisse mit Literatur zu sense-making (Pirolli & Card, 2005) und biases (Pronin, Gilovich, & Ross, 2004). Im Anschluss diskutiere ich die Notwendigkeit, soziale Kategorien bei der Entwicklung neuer digitaler Technologien zu berücksichtigen.

Im vierten Kapitel wird aufgezeigt, ob das Aufwachsen mit digitalen Technologien einen Einfluss auf die Wahrnehmung dieser durch Frauen hat. Ich interviewte die Frauen der Generation Z zu den technologiebezogenen Themen, denen sie in ihrem Bildungs- und Berufskontext (technologiebezogene Schul- und Studienfächer) und in ihrem Privatleben (soziale Medien) am häufigsten begegnen. Es zeigten sich geschlechtsspezifische Stereotype für das Interesse an diesen Fächern. Zudem wiesen meine Ergebnisse auf ein idealisiertes Schönheitsbild in sozialen Medien hin, was ich mit der Objektivierungstheorie von Fredrickson und Roberts (1997) verknüpfte. Meine Ergebnisse suggerierten, dass geschlechtsspezifische Stereotype im privaten und beruflichen Bereich Frauen davon abhalten, eine technologiebezogene Karriere einzuschlagen.

Basierend auf meinen Ergebnissen plädiere ich für einen integrativen Designansatz neuer digitaler Produkte, der einer ethischen und verantwortungsvollen Methodik folgt.

ABSTRACT

As digital technologies have increasingly played a pivotal role in our everyday life, it is essential to examine how they influence society. This dissertation analyzes the intersection of gender and age with technology, ultimately exploring the effects of digital technologies considering the age of users (Ball, Francis, Huang, Kadylak, Cotton, & Rikard, 2019). More precisely, it addresses the question how older women implement digital technologies into their day-to-day life (Ratzenböck, 2016). To answer this question, I interviewed women born between 1943 and 1953 about their perception of digital technologies. This demographic is stereotypically disadvantaged due to their gender and their age. The thesis furthermore addresses Wajman's (2007) idea whether digital technologies can change the stereotypically male association with technology by being more relatable for women. To address this question, I also conducted qualitative interviews on perceptions of technology in the private and the professional with women from Generation Z. Born between 1995 and 2001, they are the first generation who grew up surrounded by digital technologies. Altogether, this dissertation adds to the discussion about who, i.e. which individuals, are represented in technological products (Maass, Rommes, Schirmer, & Zorn, 2007) and how that can impact women's self-perception as well as their opinion on technology-related stereotypes.

In the first chapter, I present the research questions of this thesis and introduce the theories and body of literature it is based on. As the wording of gender and age can be a delicate topic for researchers, practitioners and readers alike, I provide a short – but not fixed – overview of definitions followed by an additional note on the sensitivity of such expressions.

In chapter 2, I portray the different ways in which older women implement digital technologies depending on their focus in life: either their family, their partner or themselves. These findings counteract the stereotypical portrayal of the digital technology uninterested

and unskilled older woman by showing how technologies can indeed be self-servingly incorporated in a certain life phase.

Chapter 3 provides examples of the intertwining relationships between gender and age with technology. Based on intersectionality, stereotyping and sense-making literature, this study explores how older women perceive their own interest in and competence with technology and that of their peers. It discusses the need for taking social categories into account when evaluating inclusiveness with new technologies.

In chapter 4, I analyze Generation Z women's perception of gendered technology stereotypes in the private and in the professional, reporting on the prevalence of gendered stereotypes and expectations that inhibit young women. This chapter provides recommendations for future research to look at the complex combinations and consequences of stereotypical and anti-stereotypical behavior, especially for women.

Concluding chapter 5 summarizes the findings and lists the main contributions for theory and practice. I argue for an inclusive design approach of new digital products in which people from different backgrounds are involved in the whole developmental process. In this context, I argue that the future of digital technology should follow an ethical and responsible methodology.

WOMEN AND TECHNOLOGY:

HOW FAR HAVE WE COME IN THE DIGITAL AGE?

WOMEN'S PERCEPTIONS OF

GENDERED TECHNOLOGY STEREOTYPES

Introduction

"I was pregnant and my male colleagues, one was a former innkeeper, a former

pastor, then office clerks, so they came from a wide variety of professions and nobody

really knew anything about programming. It was 'learning by doing' and then at the

beginning they wanted me – so they didn't take me seriously – they wanted to get rid

of me and so I had to push through with great difficulty, but as I wrote my first

program and which was also running, the guys were suddenly so proud as if they had

made me: "So we also have a woman who can do something as difficult as we can!"''

These words come from Renate Schmidt, former vice president of the Bundestag and former

Minister for Family Affairs, Senior Citizens, Women and Youth in the German government.

When I interviewed her in the context of this thesis, she recalled her starting days as one of

the first women in Germany to work in application programming in 1961. Her quote reveals

two linkages: first, a technology-related job is complicated and second, more accessible to

men, even to those with no professional background. How much has changed with regard to

gendered technology-related stereotypes between the days when computers were room-sized

and today's storage of data in clouds?

Although more and more people study STEM (science, technology, engineering,

math) subjects, there are still not enough students in those areas (Heinlein & Funk, 2017) and

companies tirelessly call for more skilled work forces in engineering and IT ("Verband",

2018; Wittenhorst, 2018). The German government has identified the need to follow a digital

agenda (Heide, 2018; Martus, 2018) as technology surrounds us in education, in economy, in

politics and in the media. In the past year alone, Forbes published "The 7 Biggest Technology Trends In 2020 Everyone Must Get Ready For Now" (Marr, 2019) and the MIT Technology Review lists the "10 Breakthrough Technologies 2020" (MIT Technology Review, 2020) while the German Zukunftsinstitut, a think tank on trend and future research, includes connectivity, new work and mobility in their list of upcoming mega trends (Zukunftsinstitut, n.d.). Moreover, the Zukunftsinstitut also identifies a disruption of gender stereotypes – titled "gender shift" – and a new age phase after retirement of the longer and healthier living elderly – named "silver society" – as future developments (n.d.). The focus of this thesis is located at the intersection of all of these trends. It addresses the broad question to what extent women in Germany align with the trends of gender shift and silver society in the context of digitization today.

Research on the relationship between gender and technology in the past thirty years has proclaimed technology to be "an essential part of male identity" (Hellman, 1996, p. 7) and in order to break that link, women's points of view on technological matters are needed (Harding, 1998). Gender and technology should be examined in combination: "Gender analysis illuminates our understandings of technology, and attention to technology illuminates our understandings of gender" (Lerman, Oldenziel, & Mohun, 2003, p. 5). The latter authors even go so far as to assert that people ultimately connect their technological usage to identity defining social categories such as gender and age (Lerman et al., 2003). Gendered stereotypes of ultimately linking technology to men have prevailed (Meßmer & Schmitz, 2007), leading researchers to question whether they have an influence on the ways technology is created: "Whose values and experiences are represented and what dichotomies and stereotypes are repeated in technologies and technological cultures?" (Maass et al., 2007). For example, information found online can be presented and perceived as objective material whereas it is actually subjective and political (Bath, 2013). For example,

Otterbacher, Bates and Clough (2017) found certain human characteristics typed in online search engines, which are used by millions every day, to be gendered: "photos of women are more often retrieved for warm traits (e.g., "emotional") whereas agentic traits (e.g., "rational") are represented by photos of men" (p. 6620).

The impact of digital technology is immense with its all-encompassing influence in politics, economy, media, health and society, especially in and probably also after the pandemic circumstances of 2020. For instance, digital technology influences politics in so far as political conventions are held entirely digitally, which does not only require access to a transmitting service from the consumer side but it also gives the people enabling a smooth broadcast from the producing side suddenly a crucial role (Corasaniti, 2020).

Further, digital technology also influences the economy. The Organisation for Economic Co-operation and Development states that in 2019, around every fifth job in Germany was at risk from automation and around 36% of jobs were affected by a significant change due to automatization (OECD, 2019) while it is expected that by 2030, nine million jobs will be lost to automatization in Germany (McKinsey Global Institute, 2019). However, 4 million completely new jobs due to the consequences of such automatization processes are expected to progress by 2030 in Germany and women could benefit from those to a similar extent as men. But women are held back by societal standards for females to take care of the household, raise children and do care work, which limits their time for additional qualifications, new job possibilities and hinders their local flexibility (McKinsey Global Institute, 2019). In support, the pandemic situation in 2020 has shown that women are more affected than men because of the double burden of work and care obligations as a result of home office or employment in the systemically important economic sectors (WIFO, 2020).

Looking at the influence of digital technology in the media, it is noteworthy that online news sites are the main news source in Germany for about a third of the population

(AudienceProject, 2020), which shows the popularity of online media. Print media has continuously lost in popularity with the total circulation of German daily and Sunday newspapers having gone down by more than 50% between 1995 and 2019 (IVW, 2020) and the sales of daily newspapers as well as weekly and Sunday newspapers also plummeting for years (BDZV, 2019).

Furthermore, in the field of health, we see that more and more remotely accessible digital health services are becoming increasingly important as approximately 10,000 doctors are currently missing in Germany, with around half of the general practitioners retiring by 2030 – especially in the countryside (PKV, 2019). More or less half of the digitally active people aged 65 and above in Germany can imagine to receive reminders for and make doctor's appointments online, to communicate with their doctors digitally, to be digitally monitored for health reasons and to use a digital patient record in the future (Bitkom, 2020). What is more, with around 5.700 vacancies, the HealthTech sector was the technology sector with the second most advertised job offers in Germany in 2018 (Joblift, 2018).

Regarding society under the impact of a pandemic, the aforementioned and previous mega trend of connectivity has tremendously gained momentum, especially with digital services as a connecting tool between people that have to stay at home and need to communicate for private or professional reasons (Gatterer, n.d.). A virus predominantly dangerous for the elderly can be linked to the mega trend of silver society, which has quickly come front and center as the need to protect older people revealed them to not be an integral part of society. Through digital technology, they could become more connected to society, especially in circumstances where online communication is the only form of connection possible. Whereas the last few years have been characterized by an anti-aging attitude, the future of an older society belongs to pro-aging (Gatterer, n.d.).

Altogether, technology is an enabler for social participation as it can function as an access to political, medial and medical information. Moreover, it has a vital influence on the economy, and hence on power, money and positional distribution. All the while, technological competence is stereotypically associated with men (Johansson, Asztalos Morell, & Lindell, 2020). Plus, they are also not hindered by social circumstances in the way women are to pursue further education in digital literacy in order to remain attractive on the job market. The above-mentioned reasons explain the necessity of enabling women to actively participate in technological processes.

Whenever a research project puts women in the center, there is the risk of tapping into stereotyping and simultaneously reproducing common assumptions about women and men. Instead, the constructions of gender in everyday life and society as a whole should be the focus of research on women (Paulitz & Prietl, 2014) – and both aspects are carefully kept in mind for this thesis. Furthermore, when age is part of an analysis, there is a danger of cliché reenactment, too, as "women have traditionally been doubly struck by aging" (Mosberg Iversen, 2015, para. 2.1). Through anocriticism, Maierhofer (1999) criticizes how age is a negative factor in the perception of women in society as with every year older, they lose attractiveness and relevance: "age-neutral, i.e. universal, is implicitly often male and young, and exclusive of the female and old" (Maierhofer, 1999, p. 256). Whereas age is on the one hand automatically and generally given for every person and is in itself neutral, it has a profound influence on people and how they are perceived by others. Therefore, age is not just a number but a social category people connect certain assumptions with. And in combination with gender stereotypes, older women can be discriminated against and become marginalized (Oktuğ Zengı, 2014). Thus, Maierhofer's (1999) anocriticism approach puts the spotlight on the influence of age on the perception of gender, specifically for women, when she argues that "the feminist concept that individual identity, both in literature and society, is culturally

constructed and tied to race, class, and gender can be extended to the notion of age" (p. 130).

This thesis aims at answering Kriebernegg and Maierhofer's (2013) call to showcase

women's point of views on the social depiction of age. Therefore, women's descriptions of

how they create their life at a certain age is of relevance in order to offer alternatives to the

notion of "old women as a dependent group with little to offer society and much to demand"

(Gibson, 1996, p. 435). I interviewed older women, born between 1943 and 1953, about their

lifestyle in retirement and their incorporation of technologies in their daily life. Older

women's perceptions are additionally of critical interest as the aforementioned vast influence

of digitization on people's everyday life and social interaction also questions our

understanding of and dealing with older people as they are not as digitally connected. Hence,

not only the representation of older women's individual lifestyles as told from their point of

view is lacking, but also their ways of operating digital technologies (Ratzenböck, 2016),

which, combined, forms a research gap addressed with this thesis by asking: *How does older*

women's lifestyle influence their incorporation of technological devices in everyday life?

There are not only pigeonholed connections drawn between gender and age but also

many between gender and technology. In a 1956 article about the different versions of

everyday life of the modern American woman, LOOK magazine ran a feature on physicist

Leona Woods: "Mother of two bright young sons, she is proof that the lady Ph.D. no longer

need be a spinster, and can blend an exacting profession with home life" (Bergquist, 1956, p.

51). Here, Woods is taken as an example to show that it is possible to be an intellectual

woman who can be interested in science while remaining attractive as a woman as to not end

up alone. With the rise of technology and its incorporation into professional and private areas,

women became more and more emancipated (Wajcman, 2006). The technofeminism

approach by Wajcman finds that "women's identities, needs and priorities are being

reconfigured together with digital technologies" (Wajcman, 2007, p. 295). Whereas Wajcman

(2007) finds industrial technology to be perceived as a men-only domain, it is digital technologies where she sees a chance for women to disrupt the masculine domination of technology as digital technologies do not necessarily require physical strength and consist of non-hierarchical connected systems. Therefore, Wajcman (2007) and Aschauer (1999) ask for studies that shed light on real life situations of women's technology use and also the twofold relationship between women and technology. Precisely, they seek explanations if and how technology is gendered (Aschauer, 1999). This is where this dissertation comes into place. To fill the research gap on whether digital technologies indeed have a gender equalizing influence, while simultaneously responding to the call to demonstrate actual touchpoints of female technology usage, I interviewed women who grew up with digital technologies, female Generation Z. They were questioned about gendered stereotypes and expectations in the professional and in the private areas through which they are connected to technology. Born between 1995 and 2010, they go to school or are in their first years after school, which is how they are confronted with the decision for or against a technology-related subject or career path, respectively. In regard to the professional area, statistics show that the number of women in the technology-related subjects of STEM is lower than that of men (Statistisches Bundesamt, 2019b). In the private, people of that age group dedicate their time to social media (ZDF & ARD, 2018), which they use to connect with their friends and people they are interested in (Mpfs, 2018a, 2018b). Therefore, Generation Z females are interrogated on the technology-related areas they encounter the most in the stage of life they are in: from a professional perspective it is the subjects at the respective educational institution they attend and for personal matters, it is their time consuming devotion to social media. This combined consideration gives way to a novel research gap of how the perspective on technology in one area such as the private can influence the relation to technology in another area such as the professional. In this thesis, I therefore ask: *How do Generation Z women perceive gendered*

technology stereotypes in the professional and in the private and how can they affect one another?

The mutual influence of social categories on women's identities and social perception has been introduced by Crenshaw (1989) with her initial article on intersectionality. In her work, she analyzes how black women's relegated experiences are multifarious as they are marginalized because of their race *and* because of their sex. Crenshaw's (1989) intersectionality disapproves of human struggles to be one-dimensional as with this singular view on human issues, systemic inequalities are reinforced. In 2017, she gave an updated definition of intersectionality, stating that it "is a lens through which you can see where power comes and collides, where it interlocks and intersects" (Crenshaw, 2017). In this thesis, intersectionality is applied in order to connect the social categories of gender and age with technology. As explained above, technologies are assigned an ever-growing importance in our societal setup, which gives them a powerful role, creating hierarchies (The Digital Divide, 2019). Further, technology and gender seem to mutually influence each other. Finally, gender and age marginalization seem to intersect through older women. Therefore, older women can be evaluated as a rather powerless group combining gender and age disadvantages in relation to technology (McLaughlin, Gandy, Allaire, & Whitlock, 2012). While studies show how technology stereotypes on gender (Balsamo, 2014; Girls Who Code, 2019; Starr, 2018) and age (Loe, 2010; Zeljko, n.d.) remain and while numbers on technology usage of older women are available (Bolle, van Weert, Joost, Loos, de Haes, & Smets, 2015; Initiative D21 e.V., 2016), their specific perceptions of these stereotypes – on themselves and on others – are lacking in the literature. To address this research gap, I again refer to the interviews conducted with women born between 1943 and 1953 on their viewpoint on technology by asking: *How do older women perceive stereotypes on gender and technology*

as well as age and technology? And how do they evaluate their and their peers' interest in and competence with technology? Is there a connection to gender and/or age?

Therefore, this thesis ties in a body of literature based on theories that look at various combinations of the social categories of gender and age with technology: anocriticism for the connection between gender and age (Maierhofer, 1999, 2007); technofeminism for the relationship between gender and technology (Wajcman, 2006, 2007, 2010); intersectionality for the mutual influence of gender and age with technology (Crenshaw, 1989, 2017).

Definitions

As explained before, the concepts of gender and age are viewed as social constructs in this thesis. To give a better understanding, I present definitions of the two terms in the following paragraph. Furthermore, the research interest revolves around women's perceptions. Oftentimes, the perception phrase is heedlessly used without explaining what is actually meant with it. This paragraph gives clarity on this phrase, too.

Gender

Gender is conceptualized as a hybrid of the social, the cultural and the physical (Bath, Meißner, Trinkaus, & Völker, 2013). To define gender, the difference between gender and sex is oftentimes highlighted, with sex as the biological and gender as the sociocultural categorization (Lucht, 2014). To divide gender only into the two categories of men and women is a restricted definition and not exhaustive. Paulitz and Prietl (2014) declare that men and women cannot be divided into two social groups with distinctly different preferences, needs and capabilities. Rather, they find reasons for such dissimilarities in society that creates these two groups and nourishes them with meanings (Paulitz & Prietl, 2014). Within such heteronormativity, power relations are grounded in hierarchical gender relations as well as in unquestioned assumptions about naturalized heterosexuality and a binary gender order (Winker & Degele, 2011).

In this thesis, I refer to the definition provided by Lerman, Oldenziel and Mohun (2003) who state that gender is "operating at different levels, in layers of function and meaning" (p. 4) and who make the following categorizations that work in parallel:

1. Gender is an *identity*, a part of how one sees oneself and presents oneself to the world

2. Gendered people navigate, create, and modify gender *structures* and *institutions*

3. Gender works in *symbolic and representational* ways, in assumptions about what men and women like, in images of manhood and womanhood, in styles and expectations and ideologies based on portrayals of gender difference (p. 4.).

Age

Social interactions are strongly influenced by people's age in terms of each individual taking into consideration one's own and the other's age and both in relation to each other. Identity construction is age influenced as a person's age determines to some extent their body and therefore, their looks. Here is where society holds up a mirror to a person, making the aging of the body a category of judgment, especially in connection with sexuality. The physical becomes part of others' perception of oneself and ultimately influences one's own identity construction (González, 2007). As North and Fiske (2013) state:

> Age differs from any other social category in its permeability: provided they live long enough, all people eventually join each group. Another way to think of this is that age groups take turns along a hypothetical age queue—with younger people entering, middle-agers enjoying, and elders exiting (e.g., retiring) (p. 707).

For this thesis I refer to age on the one hand as a number signifying the time an individual has been living on earth. On the other hand, I view it as a social category as someone's age is a factor in people making certain assumptions about a person. Thus, when talking about age, "a distinction should be made between chronological age and the cultural stereotypes associated with old people" (Maierhofer, 1999, p. 256).

Perception

Perception is ultimately tied to expectations (Seriès & Seitz, 2013) and as self-reflexivity, it relies on memories, experiences and the knowledge of an observer's perspective (Popoveniuc, 2014). Hustvedt (2016) explains that "perception is active and shaped by both conscious and unconscious forces. Expectation is crucial to perceptual experience, and what to expect about how the world works is learned, and once something is learned well, it becomes unconscious" (pp. 19–20). For this thesis, I also refer to Burge (2003) who explicates that people forming a perception fluctuate between learned convictions and knowledge of prejudices.

Technology

With digital technologies gradually taking on a societal role, in this thesis I consider technology to include not only technological devices (such as smartphones, laptops, notebooks, computers, wearables, e-readers, etc.) but also services (apps, streaming platforms, shared services, etc.), digital communication forms (social networks and social media), and data. This cataloging refers to the D21 Digital Index 2019/2020, an overview of the digital situation in Germany (Initiative D21 e.V., 2020).

Additional note

Having explained how gender and age are social concepts, I would like to add a further note: I am aware of the binary gender terminology in this thesis by speaking of women, female, feminine and men, male, masculine. Although this might reinforce such dualistic conceptions of gender, this is certainly not the goal of this dissertation. Quite the contrary, I would like to acknowledge here that every human being is free in their choice of gender and that there are multiple ways of gender identification. The participants of my studies all identified as women and the binary gender wording is used throughout the thesis not to emphasize it but to understand whether gendered stereotypes are still relevant. Further,

it is not my intent, either, to underpin heterosexual identification only. Everyone should be unlimited in their sexual identification. In my research, all of the older women interviewed have been or still are in heterosexual relationships with men. Within the interviews with the younger women, their sexual preferences did not play a role and were not noted. Regarding the age terminology of old, older and young, younger, I would like to reinforce that they are not meant discriminatory but only descriptive. These expressions were only used to distinguish the interviewees depending on the year they were born in.

Research Approach

To address the research questions I presented in the previous paragraphs, I conducted two rounds of individual qualitative in-depth interviews. One sample consisted of women between 65 and 75. These interviews build the basis to expand our understanding of the impact of the lifestyle in retirement age on women's incorporation of technological devices into their everyday life (chapter 2) and the (mis)conceptions of older women's interest in and competence with technology (chapter 3). The other sample was comprised of women born between 1995 and 2001 as they represent the Generation Z age group, having grown up with digital technologies. They were interviewed to grasp a better comprehension of Generation Z women's perception of gendered technology stereotypes in the professional and in the private (chapter 4).

Statistics on the technology usage of both age cohorts are plentiful (Initiative D21 e.V., 2016, 2019, 2020) and the numbers of women in technology-related studies and professions are well documented (Statistisches Bundesamt, 2019a, 2019b). Those studies do not provide insights on the perception of gendered technology stereotypes from a particularly female perspective. This dissertation goes beyond previous analyses by interviewing two cohorts: older women and Generation Z women. Older women are interviewed because they are considered un-fit in relation to digital technologies due to their age and due to their

gender. Generation Z women are interviewed because their relation to digital technologies is on one hand self-evident due to their age and on other hand, they lack participation in technology-related professions.

A qualitative approach was chosen because of its nature of aiming at the meaning behind a phenomenon in which the subject of research is the real field of an action, understood as a social construction. Here, reality is defined on the basis of a processual context (Hein, 2016). In other words, I want to understand how my interviewees perceive their surroundings, their reality and how they bridge their subjective perceptions with the environment they are confronted with. This bridge and interplay between an individual's comprehension and outer circumstances are of interest. Precisely because of this thesis' goal to display the perception experienced by women in relation to sociocultural aspects, a solely qualitative method was selected which makes room for subjective reasoning (Hein, 2016). With my interest in the women's perception, I did not want to present them with a restrictive and pre-defined set of questions but rather give them room for detailed explanations. Further, a qualitative approach was chosen because intersectionality can focus on many different combinations of social categories, and the involvement of technology as a component is a lesser explored field of study. The viewpoint of social construction allows related theories to be explored in the research area of interest as the uncovered themes can then be transferred to other contexts (Hein, 2016). This explorative method enables the development of new assumptions in which reality is understood on the basis of the above explained process-related context (Hein, 2016). Therefore, my qualitative interviews allowed me to explore so far limitedly studied research topics and to investigate whether and how theories of anocriticism, technofeminism and intersectionality apply to older and younger women in connection to technology. For future research avenues, the results of this thesis can be tested with a quantitative research approach.

With the older women, the interviews were held in the private setting of their homes, which gave me an additional impression of the women's social circumstances next to the information they shared with me. Also, this enabled a conversation closer to an unrestrained, informal exchange in contrast to a formal research setting where the interviewee thinks twice before answering. As stereotypes can quickly be voiced in thoughtlessness, I aimed for an immediate response by the interviewees. It should be kept in mind that most of the older women, due to their educational background, are not familiar with interview studies the same way, for instance, students are. Then, interviewing the older women in a qualitative manner without a strict set and sequence of questions made it possible to have the women casually showing the ways they use their digital device of choice. Furthermore, my qualitative approach had me leave the technology term open to be explained by the women, which in addition enabled the interviewees to share their personal opinion.

The Generation Z women were interviewed in an office environment. As most of them were students and almost all of them have a higher education, it was not expected that an interview setting would be unfamiliar to them. Having grown up with digital technologies, their handling with a digital device is probably not different whether they are at home or outside their home. It was therefore decided that there was no necessity to interview them at home.

All of the interviews were held in a qualitative semi-structured in-depth style because in a quantitative set-up of a strict set and sequence of questions, relevant statements could have been lost. I referred to the concept of semi-structured interviews (Whiting, 2008) to go loosely through the questions from beginning to end, while also opting for additional questions depending on the women's answers (Millwood & Heath, 2000). This gave me the opportunity to refer back to what the interviewees said (Whiting, 2008). As I wanted to go beneath the surface of the prepared topics, I aimed at an interview situation as close to a

conventional conversation as possible (Barriball & While, 1994). To comprehend the underlying reasoning for the interviewees' statements, I interpreted them with Braun and Clarke's (2006) theoretical thematic analysis approach and from a constructivist grounded theory perspective (Thornberg & Charmaz, 2014).

Chapter 2 focuses on the impact of the lifestyle in retirement age on women's incorporation of technological devices in their everyday life. Therefore, twenty retired women between 65 and 75 years old and born between 1943 and 1953 were interviewed. They were chosen because women who had access to and used digital technology through an employer or a work place should be excluded in this analysis. Three types of lifestyles – as an umbrella term for relationship and family status – originated: The GrandMother focusses on her family and local community, directing her digital technology usage inwards, with her technological devices functioning as a facilitator of her daily duties and existing ties; the Half Couple emphasizes her husband and marriage, uses digital technologies sideways or not at all, so their phones are either nice to have or simply unnecessary; the Independent concentrates on herself, using digital technology outwards with a strong self-motivated interest to use apps as an entertainment platform and as an extension of her interests. I connected these findings to anocriticism theory (Maierhofer, 1999), which asks for more diverse models of age identities for older women. By linking to a cost-benefit analysis of product implementation by older people (Sharit, Czaja, Perdomo, & Lee, 2004), the current thesis presents an understanding of how technologies are incorporated in a certain life phase, especially by a social group with scarce representation of technology usage in research and in the media. My findings also show in which types of lifestyle the generational background has an influence on the implementation of digital technology and when individual factors seem to overtake. It implicates how women continue and potentially even intensify a certain lifestyle

after their professional life and how the smartphone is used as an extension of their personal lifestyle.

Chapter 3 showcases how gender, age, and technology stereotypes relate to one another and how this relationship reinforces or questions stereotypes. The qualitative semi-structured in-depth interviews with the twenty older women from my previous study were used as a foundation for the analysis. The focus of this study was, however, to understand how older women perceive their own interest in as well as their competence with technology and that of their peers. This study's findings indicate that older women's evaluations of others are age and gender stereotyped. When explaining their own interest in technology, they refer to their individual preferences, and when explaining their own competence with technology, they refer to social categories. Hence, I found a discrepancy between the perception of oneself and the perspective of others when it comes to gender and interest in technology, but a correspondence between the perception of oneself and that of others with regards to age and competence with technology. Plus, assumptions of technology usage seem to be gendered: whereas male use of technology is mechanical and physical, female use is communication and consumption related. I connect these results to descriptive stereotyping (Koenig, 2018) as well as sense-making (Pirolli & Card, 2005) and biases (Pronin, Gilovich, & Ross, 2004) literature. The findings imply that social categories should be taken into account when inclusiveness of new technologies is evaluated.

Chapter 4 presents Generation Z women's perception of gendered technology stereotypes in both the private and in the professional. Here, I sought to understand whether having grown up with digitization has an influence on women's perception of technology. For this matter, I interviewed twenty Generation Z women. They were born between 1995 and 2001 and were thus between 18 and 24 years old. The interviews were held in a qualitative semi-structured in-depth style and revolved around the technology-related topics

they encounter the most in their educational and professional context (STEM subjects) as well as in their private life (social media). My findings revealed that gendered stereotypes of interest in STEM are still prevalent. They also revealed an idealized beauty image for women on social media, which puts pressure on female Generation Z's appearance. Consequently, my findings indicate that gendered STEM stereotypes hold women back from pursuing a STEM career, while social media appears to reinforce this behavior by urging women to align with a feminine beauty norm. Linking objectification theory (Fredrickson & Roberts, 1997) to the interviewees' statements on felt online pressure on women's looks, I suggest to replace the *objectifying gaze* term by the term *online gaze*. Taken together, conflicting gendered stereotypes and expectations create challenges for Generation Z women in their everyday life and career track. This study encourages future research to look into the complex combinations and consequences of stereotypical and anti-stereotypical behavior, especially for women.

In the three chapters that follow, each study is presented in detail with the respective literature review, theoretical framework and method applied, followed by a results paragraph and discussion including limitations and implications. **Chapter 5** closes with an overall discussion of this dissertation's general contribution.

THE IMPACT OF THE RELATIONSHIP AND FAMILY STATUS IN RETIREMENT AGE ON WOMEN'S INCORPORATION OF TECHNOLOGICAL DEVICES IN THEIR EVERYDAY LIFE[1]

Introduction

A research project focusing on older women and how they are embedded in society can easily be caught in solely emphasizing women's problems, presenting them as a burden to society (Gibson, 1996). Even though older women are swiftly titled as "invisible" (Krekula, 2007, p. 158) and "the other" (Krekula, 2007, p. 159), their situations are not necessarily negative. Quite the reverse, they are better at "social networks and social support" (Gibson, 1996, p. 438) in comparison to men. Gibson (1996) notes that the setbacks women apparently face as soon as they are considered older – in terms of their health, their income and their housing situation – have always been there throughout their lifetime, not firstly emerging upon retirement. Thus, "we run the risk of reinventing and reinforcing a self-concept and a societal concept of old women as a dependent group with little to offer society and much to demand" (Gibson, 1996, p. 435). In this study, my focus is on older women's sole perception of their lifestyle.

In discussions about technology with older people, they are quickly presented as incompetent with a limited set of skills and knowledge. Loe (2010) argues that there is not enough emphasis on older women's actual capabilities and usage forms of technologies: "we do not have a sense of how elders creatively utilize, reject, and make sense of a wide array of old and new technologies in their lives" (Loe, 2010, p. 320). I aspire to address this gap with this study. In line with Loe's (2010) recommendation, I concentrate on how older women give sense, connotation and significance to technologies instead of only focusing on their

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[1] This chapter is based on a manuscript by Gales & Loos (2020) published in the *22nd HCI International Conference, HCII 2020, Part III, LNCS 12209* proceedings

utilitarian reasons for using technologies.

This study was conducted in Germany in 2018. It centers on women's lifestyle in retirement age and how it influences the incorporation of technological devices in everyday life. This cohort's handling with technologies becomes more and more relevant as the number of people in Germany aged 65 or older is estimated to rise: where in 2017, 21% of the population in Germany was aged 65 or older, presumably 27% of Germans will be 65 years old or older by 2030 (McKinsey Global Institute, 2019).

Where younger and middle-aged working women's technology use has been extensively analyzed, this study helps to fill the gap of research on how older women "utilize and ascribe meaning to technologies into their day-to-day lives" (Loe, 2010, p. 321). I am therefore wondering: How does older women's lifestyle influence their incorporation of technological devices in everyday life? In the following chapter, age in society, age and technology as well as anocriticism (Maierhofer, 1999) are presented in a literature and theoretical review. A method section follows presenting this study's sample and explaining how the qualitative in-depth interviews were conducted and analyzed. After the results section with representative quotes, a connection is made back to the aforementioned literature and theory, followed by the study's implications.

Literature and Theoretical Review

Age in Society

Age is a factor that we all carry with us, there is no way to escape or reject it, as for example the need for a birth date as a form of identification shows. Nonetheless, age is a social category strongly tied to assumptions, prejudices and associations. Even more so, self-identity is age influenced with a person's lifetime on earth determining to some extent someone's body posture and looks. In Western society, the individual's aging of the body is a point of judgment, especially in connection to attractiveness (Berdychevsky, 2017; Gewirtz-

Meydan, Hafford-Letchfield, Benyamini, Phelan, Jackson, & Ayalon, 2018). As other people directly view an individual's body, it becomes part of one's self-identity (González, 2007). Even though aging is naturally a human process every individual encounters, Western society has created a connection between someone's looks and identity. Depending on an individual's lifespan, everyone enters all age stages one after the other, from young to middle to old (North & Fiske, 2013). But, age is a cultural category connected to certain associations for each stage of life and primarily linked to decline when it is an opponent to youth (Gullette, 2004).

Expectations on older people by society to be more capable of independently managing their life can be connected to life expectancy continuously rising in Europe (World Health Organization, 2015). Rozanova (2010) states:

> "as 'successfully aging' stereotypes are connected to the notion that individual choices and attitudes play a role in aging well, they may possibly serve as further justification for giving increasing responsibility for their wellbeing to the old persons themselves. The larger social, institutional, and cultural issues that underlie economic and health inequalities among older persons […] constrain older adults' lifestyle choices" (p. 380)

See Mosberg Iversen (2015), Loos (2012a) and Loos et al. (2017) for more information on this position. For example, on websites for older people, they are oftentimes visualized as youthful, healthy, active and social with others (Loos et al., 2017), which also rings true for print media and television (Loos & Ivan, 2018).

Age and Technology

Technologies can play a crucial role in older people's lives, as they help them to "maintain social networks, intellectual growth and participation, and physical well-being" (Loe, 2010, p. 320). Therefore, technologies can support in general happiness and in

upholding cognitive, emotional, and physical abilities (Loe, 2010). The D21-Digital-Index of 2016 shows that people in Germany older than 60 have become more and more digitally active and have continually increased their Internet usage in the past years. Instant messaging services such as WhatsApp are the most commonly used communication forms on Internet providing devices in the age group of people aged 60 years or older, and social networks such as Facebook are used by a fifth of people in their 60s (Initiative D21 e.V., 2016). The motivation of people aged 65 to 80 to opt for traditional communication (personal or via telephone) or e-mail communication has been studied by Melenhorst, Rogers and Bouwhuis (2006). Apparently, older people need to find a benefit in using a device in order to be motivated to choose it. No apparent necessity or no understanding for digital technologies explains the lack of interest by older people (Melenhorst, Rogers, & Bouwhuis, 2006). This cost-benefit analysis conducted by older people when deciding for digital technologies is addressed by my study. For older people specifically, their capability of skillful usage is a crucial factor, too (Sharit et al., 2004).

The benefits for older people in using digital technologies can include enjoyments (Nap, de Kort, & IJsselsteijn, 2009) and functions or content they could not receive otherwise or not as fast, such as family pictures, for example (McLaughlin et al., 2012). Costs contain the acquisition of new skills (Nap et al., 2009), "learning and relearning of a product" (Sharit et al., p. 89) as well as "effort, frustration, time taken away from enjoyable activities, and monetary costs" (McLaughlin et al., 2012, p. 13). Moreover, digital technologies need to fit into the older people's lifestyle and daily routines (Nap et al., 2009).

Some forms of digital technologies can have distracting purposes for older women from their spouse's passing (Nap et al., 2009). Older people's reasoning to use digital technologies for social connectedness (Nap et al., 2009) can be linked to older women inheriting strong ties to family and friends when experiencing widowhood (Gibson, 1996). It

is therefore of relevance to grant older people access to (technology-related) information

(Loos, 2010, 2012b) in order to connect them to society. Bouwhuis (2000) found older people

to frame their activities with a main focus on social relationships with the younger generation

moving away from the place they grew up in, creating a spatial distance. The importance of

social activities especially for older women is backed by a longitudinal study conducted by

Hultsch, Hertzog, Small and Dixon (1999) who find that older women integrate more social

activities into their lives than older men. Also, in contrast to men, women keep their close

social contacts across lifetime without reducing them while getting older (Smith & Baltes,

1993).

A common classification of older people in relation to technology is the term "digital

immigrants" in contrast to the "digital natives" term, both coined by Prensky (2001). It is a

widespread practice to divide generations by their media usage in childhood and teenage

years, arguing that media is an influencing and socializing factor for each generation (Jandura

& Karnowski, 2015). In the case of this study, the interviewed women are born between 1943

and 1953 and can be assigned to "a generation of the household revolution (born 1939-1948)"

and "a generation of technological spread (born 1949-1963)" (Sackmann & Winkler, 2013, p.

494). These differences in technology generations are made with regards to the technologies

people grew up with during their so-called formative period, between 15 to 25 years old (Van

de Goor & Becker, 2000). Other scholars focus on individual experiences to have an impact

on a person's technology usage (Ratzenböck, 2017), asking: How is the form of media used

and what kind of meaning and identification get ascribed to it (Van de Goor & Becker,

2000)? The aforementioned division between digital immigrants and digital natives gets

questioned by Jandura and Karnowski (2015) stating that such wording has rather developed

from vernacular terms to taken for granted ones instead of being scientifically proven

expressions. They evaluate a medium's role to not be as groundbreaking in defining a

generation as oftentimes assumed and that there are rather differences in media usage because of class affiliation (Jandura & Karnowski, 2015). Ball, Francis, Huang, Kadylak, Cotten and Rikard (2019) underline this notion because they find older people to be the most dispersed in their digital technology usage. Moreover, older people seem to dislike the increasingly common consumption of digital technology in personal interactions; however, they find it to be a practical tool for connecting with closed ones living farther away (Ball et al., 2019). See also Bennett, Maton and Kervin (2008), Helsper and Eynon (2010) and Loos (2012b) for a further critical discussion of the distinction between digital immigrants and digital natives.

Altogether, for older women, technologies can "provide a respite from loneliness and boredom, and/or intensify these emotions. They can symbolize mortality and life, stimulation or stasis, isolation or connection, and continuity and change" (Loe, 2010, p. 328). For example, Ivan and Hebblethwaite (2016) discovered that grandmothers are willing to use Facebook if it helps them to keep in touch with and to be informed about their grandchildren who live far away from them (Ivan & Hebblethwaite, 2016). Here, grandmothers use social media and video chats to socialize and communicate with relatives (Ivan & Hebblethwaite, 2016).

Anocriticism

Viewing gender and age together as social categories comes from two research interests which developed in the 1960s and 1970s in parallel: feminist studies focused on gender-based disadvantages and social gerontologists examined aging as a social problem (Gibson, 1996). This led "to the emergence of the double jeopardy approach to the analysis of being old and female" (Gibson, 1996, p. 434). Linking to Maierhofer's anocriticism approach (2007), she asks scholars to examine how age identities for women are labelled by society.

Anocriticism was initially classified by Maierhofer (1999) to analyze the differences between how age is perceived by older people and how it is defined by society for them. She

argued that "the feminist concept that individual identity, both in literature and society, is culturally constructed and tied to race, class, and gender can be extended to the notion of age" (Maierhofer, 1999, p. 130). Maierhofer (1999) criticizes that there are certain stereotypes for old and female people in society that are exclusively held for them and that are neither questioned nor changed. Within such categorizations, older women are painted as "self-effacing, easy-to-handle, and uncomplaining" (Maierhofer, 1999, p. 132). In line with Ratzenböck's (2016) recommendation, I apply anocriticism as an "interpretational lens that emphasizes the individuality of older women's experiences" (Ratzenböck, 2016, p. 67).

Methods

Participants

For my study, I conducted one-on-one qualitative in-depth interviews with 20 women born between 1943 and 1953 living in the southwest of Germany. As I wanted to exclude women who were given access to technology through a job, I only interviewed retired women between 65 and 75 years old. Table 2 gives a summary of the participants' year of birth, age at the time of the interview, year of retirement, former occupation, the technologies they currently use, the technologies they used at their former job, their educational background, and relationship status. Table 2 can be found after chapter 3 as it is referenced there, too. At the point of the interview, all participants were aged between 65 and 75, and none of them was employed. All of the interviewees stem from the same region in order to guarantee a similar language practice and a comparable socioeconomic environment. Their year of entering retirement phase stretches from 1991 to 2017, and most of them are married, though some are widowed and a few are divorced or had never married. Their former job areas include administrative work, teaching positions, and manually operating professions. Where some occupations required the knowledge of distinguished computer programs, others used the computer only as a typewriter. Some of the participants did not use any form of

technology in their employment. Most of my interviewees owned a smartphone, only some had a cell phone, and a few also owned a computer or a laptop or a notebook.

In terms of digitization, this age group can be described by the following statistics: 51% of people aged 60 to 69 use smartphones and 25% of people aged 70 or older. Notebooks and laptops are used by 53% of people in their 60s and by 18% of people aged 70 or older. The least usage in these two age groups is of desk-top computers (38% by people in their 60s and 33% by people aged 70 years or older) as well as tablet PCs (19% by people in their 60s and 17% by people aged 70 years or older). When it comes to cell phones, which are older versions of smartphones, people aged 60 years or older are the strongest users with 49% of people in their 60s and 64% of people aged 70 years or older (Initiative D21 e.V., 2016). The Internet usage of people in Germany decreases with age: people aged 60 to 69 years old in Germany use the Internet 1 hour and 37 minutes daily and people aged 70 years or older use the Internet 34 minutes on a daily basis (Initiative D21 e.V., 2016). The D21-Digital-Index census of 2016 defines an index combining the categories of access and openness to, usage of and competence with digitization, which is at a score of 39 (of 100) for people in their 60s and of 24 (of 100) for people older than 70. The average German score is 51 (of 100) (Initiative D21 e.V., 2016).

This study's cohort is also being titled *outside skeptics*, a typology of digital technology users who have the lowest level of digitization in comparison to other groups (Initiative D21 e.V., 2016). The outside skeptic is 66 years old, female, has a low educational background, is not employed and has a below-average income. Their digital competence is almost non-existent and they are hardly open to digitization. Technology for them is oftentimes "electro-mechanical equipment" (Sackmann & Winkler, 2013, p. 494) and this age group has more difficulties than younger people born after 1960 with "multi-layered interfaces" of software driven technologies (Sackmann & Winkler, 2013, p. 494).

Generational Allocation

In the following, the generational background of my study's sample is presented as I want to understand in which types of lifestyle the generational background has an influence on the implementation of digital technology and when individual factors seem to overtake. I refer to descriptions mostly used in Germany; within other areas, the generational allocation might be different. As German participants are interviewed for this study, the terms 'War Children' for the German word 'Kriegskinder' and 'People of 1968' for the German label '68er' is used.

War Children

'War Children' are considered people with a birth demarcation between 1930 and 1947, which some of the interviewees fall into. They were born during World War II and/or raised during and have lived in post-war time (Jachertz & Jachertz, 2013). They have been confronted with skepticism about their potential traumas and this failed recognition gave way for sorrows (Jachertz & Jachertz, 2013). Unfamiliar to opening up, the interviewed women might have restraints talking about their personal opinion and sharing their thoughts. They have grown up with a need to make up for the absent parents – the working mother and the missing father – without speaking about their feelings (Hinrichsen, 2007). 'War Children' are often portrayed as a silent generation, not talking too much about their experiences in contrast to the public analyzing war time (Ermann, 2004). Although the experience of war can be seen as a significantly crucial event in life, psychotherapy has not produced a considerable body of work on that topic – silencing this generation's experiences even more (Ermann, 2004). The older they get, the more 'War Children' are confronted with their inner pain without seeing a therapist (Hinrichsen, 2007) or sharing their anxieties (Jachertz & Jachertz, 2013). These arising emotions in older age are mainly related to the war time (Hagenberg-Miliu, 2014). After retirement, without the distraction and occupation through a job, these people seek an

understanding of their history and of their families (Hinrichsen, 2007). Studies show that women born in Germany around 1940 are not in a good mental health state: they are socially isolated and missed out on developing a concept of self on their own (Fooken, 2004). It is no surprise that interviews with 'War Children' show how they longed for safety in their life – in their partners, in their living situation and in their jobs (Lamparter, Holstein, Thießen, Wierling, Wiegand-Grefe, & Möller, 2010).

People of 1968

The interviewees who were born after 1947 fall into the so-called 1968 era in Germany. In the 1960s in Germany, people grew up in a post-war mentality, which consisted of a conservative morality and strictly defined roles in society (Mair & Stetter, 2013). These strong rule sets initiated young people at the end of the 1960s to break through this system by proclaiming self-realization, free thinking, anti-authoritarian education, free choice of profession and living arrangements as well as an open-minded sexuality and emancipation (Mair & Stetter, 2013). This transformation of questioning the political status quo paved the way for a rising wave of "political extremism and terrorism" (Häberlen, 2014, p. 168) in connection with a worldwide protest mentality with demonstrations across the globe (Häberlen, 2014). In contrast to previous generations, the 'People of 1968' valued open communication about the private as well as the political – with people talking rather freely in the following years (Häberlen, 2014). Today, women born in Germany around 1950 are in a much better mental state than the women born during war time: they can critically assess their marriage, they are busy maintaining some form of independence and have developed and kept their own standards (Fooken, 2004).

Surrounding the reforms within the 1968 phase, the patriarchy – a "system of social structures and practices in which men dominate, oppress and exploit women" (Walby, 1989, p. 214) – in all aspects of life had been analyzed and criticized by female scholars. In contrast

to the former rather silent generation, the women of 1968 started conversations about their inner thoughts and problems (Schaeffer-Hegel, 2008). This sociohistorical wave has been framed as the second German women's movement and led women to work on their professional qualification, higher education and economical self-confidence. Even though these women were not necessarily politically aligned, they shared the goal of a better social positioning for women. For the first time, women did not focus on other people but solely on themselves (Onnen-Isemann & Bollmann, 2010). At the end of the 1960s, more and more mothers were working. Women started to express interests in their professions and did not justify their decision to work with the need for money alone. In the following years, women became more self-confident in the professional sector. To be a mother, a housewife as well as an employed person became more common in the 1980s (Onnen-Isemann & Bollmann, 2010).

Interviews

Some of the interview partners were contacted personally or through acquaintances, which led to a word-of-mouth connection to other participants. Opting for qualitative in-person interviews supported the findings in numerous ways: First, it strengthened a richer understanding of the women's social circumstances. Second, as the interviewees are not used to a conversation within a research setting, the familiar environment of their home would counteract that. Third, visiting the older women at home enabled an observation of their technology usage in a private setting, which, in contrast to a public or unknown sphere, comes closer to their actual relation to the devices. Fourth, thanks to the possibility to converse in dialect, the interviewees were not as restricted in their flow of speech. It was important to ensure that the social construction can be understood in a problem-oriented manner. This way, a deeper comprehension of the research topic's context was possible (Hein, 2016).

The interviews were 20–95 min long and took place in the participant's respective home. During the interview, interviewer and interviewee faced each other at a dining or kitchen table. The older women were made aware that the conversation gets recorded and transcribed. I assured to guarantee their anonymity and informed them that the exchange can be stopped by them at any time. All women audibly agreed to be recorded on tape. To ensure anonymity, the names of the participants in the results section are hidden behind the letter "A" followed by an allocated number. "A0" is the interviewer's abbreviation.

An interview guide (see Appendix A) gave directions in the interview but did not provide a strict set of questions. Based on the concept of semi-structured interviews (Whiting, 2008), I went loosely through the questions from beginning to end, while also opting for additional questions depending on the women's answers (Millwood & Heath, 2000). This gave me the opportunity to refer back to what the interviewees said (Whiting, 2008). The interviews have been kept as close to a conventional conversation as possible, which has been shown to enable an interview that goes beneath the surface of the prepared topics (Barriball & While, 1994). The interviews were transcribed in German orthography and language without considering the spelling of the dialect. I transcribed the exact spoken order of the words, even when contrary to German grammar. Following Höld's (2009) guidance on the verbatim transcription of audio data, the interviews were precisely transcribed, including all repetitions, hesitations, and disordered sentence structures. The representative statements for a category and those parts that should be included in the thesis were translated verbatim into English language.

After 20 interviews, I reached a point of redundancy because I found new interviewees to be repeating previously discovered concepts from preceding interviews (Cleary, Horsfall, & Hayter, 2014). In other words, my interviews reached a level of

saturation where "the collection of new data does not shed any further light on the issue under investigation" (Mason, 2010, p. 2).

Analysis

Braun and Clarke's (2006) thematic analysis approach of "identifying, analyzing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79) was applied in order to "code for a quite specific research question" (Braun & Clarke, 2006, p. 84): How does older women's lifestyle influence their incorporation of technological devices in everyday life? Here, coding aims at detecting repeatedly mentioned themes, with the goal to present the interviewees' statements, attitudes and comprehensions (Braun & Clarke, 2006). I was interested in understanding the contextual reasons for their statements. First, I took a deep dive into the transcriptions of the interviews and broadly coded all texts with the MAXQDA 2018 program. I opted for a theoretical thematic analysis (Braun & Clarke, 2006) in order to answer my research question and therefore, actively sought themes with research relevance. Following the thematic analysis idea, I aimed at laying bare the beliefs and understandings of the interviewed women. In my analysis, I wanted to highlight the women's lifestyle in relation to their digital technology. Having this in mind, initial themes such as "lifestyle creation" and "technology as tool to society" emerged from the data. Second, I applied open coding by analyzing the transcriptions line by line, moving within the data. Here, codes such as "alone versus together", "self-confidence", "no responsibility for others", "independence", "integration in social environment", "identification", "technology as tool to society", "connections", "affinity to technology", "access and handling", "relation to technology", "future of technology", "differences in usage", "application and competence", "knowledge", "differentiation", "technological term" came to light. Following the idea of constructivist grounded theory, I made sure to not be stiff but remain open within the coding process (Thornberg & Charmaz, 2014). Applying the most expressive, symbolic and condensed

codes, I went across the interviews again and conducted focused and selective coding. This allowed me to compare for relations and revealed similarities and dissimilarities between the interviewees. In this step, I also categorized my codes into the themes of "lifestyle creation" and "technology as tool to society". In the next step followed an "ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells" (Braun & Clarke, 2006, p. 87). In this study's case, codes such as "alone versus together", "self-confidence", "no responsibility for others", "independence", "integration in social environment", "identification" were connected to the "lifestyle creation" theme. The codes such as "technology as tool to society", "connections", "affinity to technology", "access and handling", "relation to technology", "future of technology", "differences in usage", "application and competence", "knowledge", "differentiation" were linked to the "technology as tool to society" theme. Table 1 gives an overview of how I linked the two themes together and reveal the main categories. In the results below, I present the participants' words signifying the main categories by referring to three types of women, which were chosen in order to answer the research question. Eventually, I linked my findings to the literature and theory depicted above (Braun & Clarke, 2006).

Results

I classify three types of women depending on their focus in life, which is comprised of their relationship and family situation. The analysis follows the women's approach to technological devices in their everyday life with respect to the corresponding typologies, namely the 'GrandMother', the 'Half Couple' and the 'Independent'. The GrandMother's focus in life is her family and local community, the Half Couple centers on her husband and friends and the Independent concentrates on herself. These various forms of attention seem to have an influence on the women's approach to digital technology in their everyday life. I am aware that these classifications do not define the women exclusively. Here, they are valuable

categorizations of the women's everyday life in retirement in contrast to the professional life phase where the job takes up most of people's time, mind and focus.

The GrandMother

The name GrandMother highlights both the responsibilities and duties they still have for their grandchildren and children albeit grown up. It also refers to their caring for the hometown's society that they join in social clubs and support with charitable time and effort. All of the GrandMothers are in their first marriage, have at least one child and at least one grandchild. Their identity is that of a matriarch with an umbrella function in which they are strongly involved in their overall family's lives: of the children, grandchildren, siblings, siblings' families and parents. Their role can be described as over-arching, protective, supportive and involved. They are closely tied to their local community as club members, event organizers, donating supporters or political volunteer. Thus, their involvement goes even beyond their immediate family as these women embrace a comparable role with their neighbors and village kinship, taking on voluntary work. Therefore, in contrast to the Half Couples, their non-independence is not just connected to their husbands (and his status or steps in work and life) but more to the family as a whole. Usually, their family members live either in the same house or at least close by, often just walking distance away. They have fulfilled the role of the family's caretaker since giving birth and have grown into the matriarchal position over the years. They can be allocated to the 'War Children' generation.

Their personality is mainly led by caretaking but can also be described with ease, comfort, self-possession, calmness, self-assurance and even casualness, which is transferred to their digital technology usage:

A0: And how are you feeling when it is so easy to you [to use technology]?

A6: How I'm feeling about it? Good! (laughs) no, yes […] I also try out some things! Something I have always done, that I tried it out, if it works

They are happy with what they know about their technological devices and what they can do with it:

A13: It [smartphone] can do a lot! It can do a lot, I am well served with it

A0: Do you see it as an enrichment since you have it?

A13: Yes, I like it a lot.

The GrandMothers' connection through digital technology is directed inwards: to their family, community and existing ties. Their husband might function as an initial access to digital technologies but his competence with smartphones and other technologies does not play a role or is even of notice. Talking to and observing the GrandMothers shows how the above description of their personality is represented in their usage of digital technology, as they appear content with it however strong or almost non-existent their actual usage, just as they rest within their way of life and their strong connection to nearby social ties:

A3: I feel, what I want to know, that I know and what is there, I cannot say that I am falling behind, I can't say that

Their technological devices function as a connection to and facilitation of their existing ties, hence an inwards direction:

A13: WhatsApp. Yes, you see, I always see, you can look yourself, I don't have it for too long now, you see, then they texted me, the neighbor: "I have saved your number, saved it for good", […] then I always take a look, if something came in […] and [name grand-daughter], she always texts me, you know, my little grandchild, she always texts and then I say: " [name granddaughter], come downstairs, it's only a couple of steps" but no, she has to text it.

Just as the women's children and grandchildren represent their focus in life, they are also the women's access to digital technologies and their main go-to point of help in case of problems with their devices. In their matriarchal role, they want to make the family system

work and are therefore strongly involved in most of the family members' lives – with the help of smartphones:

A6: Okay, we have, how can I say, from the private side and, yes [of course], it is only private. And then the children [means grandchildren], they have, they play soccer, both of them and we are in [WhatsApp] groups together, so that we know, when the dates are and we share our calendars all around, so that everyone knows, when the other […], where everyone shares their appointments […], texting or as in our [WhatsApp] group, with the, setting up appointments or when something is happening, right, that, yes […] yes, because, we also, for example, because we pick him [means grandson] up at school, if school finishes early and then he has to text me, so that we can pick him up earlier […] or when something is going on, he wants that to eat

The Half Couple

The Half Couple woman identifies as one half of her marriage because she mentions her spouse consistently and across topics as point of reference, continually involving him in her thought-forming processes. Whether these women have children or not, their identity is mainly formed by being one half of a couple and not necessarily a matriarch – at least that is how they present themselves. They frequently refer to their husband; in relation to their professional lives or when speaking of retirement phase. One of their duties next to their profession was directed at having their husband's back and providing a strong support system. They do not interact with their children and grandchildren daily, which is in contrast to the GrandMothers. Apparently, their children more or less live their own life with the Half Couples assisting them here and there. The local community is not as crucial to them as it is for the GrandMothers because some of the Half Couple women moved depending on their husband's job. In general, Half Couple women connected their career and life mainly to the husband's, with children being a factor, too but the initial and strongest impact came through

marriage and the husband's profession. Some of the women worked for and in their husband's business, performing as partners even in their professional life. These women are aware of their supportive and strong role, proudly talking about their work-related accomplishments. All of the Half Couples stem from the 'People of 1968' generation.

With these women regularly referring to their husband across topics, they also mention them when talking about their access to digital technology:

A10: And I often got a used-up computer from the [husband's company's] office, when they got some new ones, when they, when the volume wasn't right for the office or I don't know what, right

Plus, they connect to others through their husband's digital technology usage:

A8: But I ruffle against the computer and cell phone. The laptop, it's always with us on vacation, my husband always says: "come, just a little bit", but, ugh.

A0: But do you take the laptop with you on vacation?

A8: He's always working on it, he's always in touch with several friends and they share with each other …

A0: So you're connected through him?

A8: Yes, right, or now the daughter is in [name country], she constantly sends photos and then he responds via e-mail

Oftentimes, they rely on their husband's technological competence:

A7: I was never interested, already from the beginning, that's what it is and then I always thought "oh well, he does it"

Remarkably, the relation to technological devices exemplifies the roles the Half Couple women and their husbands share on a daily basis, with the man as the main point of reference:

A0: And do you think you're missing out on something when you, because you don't have WhatsApp or a computer?

A7: No, no, no. [name husband] just made that last night, tomorrow we are having a voucher, where we go out to eat, in [name region] and he prepared the navigation system

A0: So you're happy that he

A7: Absolutely, that he's still up-to-date

The reference to the husband is even made when he is not using digital technologies either:

A5: I don't know, I can't really justify it, why I am against it in that way and fight against it, so, I don't know. Because my husband actually also isn't interested in such things, maybe [that's why].

In some cases, the Half Couple women know more than their husband when it comes to the computer and smartphones and they also highlight it – again, in contrast to the GrandMothers, where all of them are also in long marriages but the husband is not mentioned when talking about digital technology:

A10: Around us, people we know and friends and so, they are all sick and recently so many died and somehow, my husband says "stop with all this shit [talking about the computer and smartphone], come, we go for a ride with the bike, come on, let's have a good time!" or something like that (laughs), that's the intention for me.

With the Half Couples, their children are not the main reason to own a technological device, they might grant them access to it, though. The Half Couples who do own and use a smartphone stay in touch with the family through it, but it is also used to stay connected to friends and hobbies:

A18: We are also in other, we are also in other social clubs and so on and there, we are committed to nature conservancy and elsewhere and then it's very convenient, of course, right, to inform each other.

In contrast to the GrandMothers, where digital technologies are needed because of their responsibilities and obligations and different from the Independents, where technological devices are vital for entertainment reasons, for the Half Couple women, both of these aspects – the duties and the activities – are mainly directed at and fulfilled by their husbands in real life, perfectly so in the analog world. Regarding these women's judgements of digital technologies, some of them evaluate the benefits as nice to have, while others believe that they do not need them, assessing them almost negatively.

The Independent

The titling of these women illustrates how all of them are independent in multifarious ways: They are not in an active marriage (they are single, divorced, widowed, separated or in a long-distance relationship), their daily life does not evolve around their children and grandchildren (if they even have any), they live alone, and they stand financially on their own two feet because they mostly have worked full-time in well-paid jobs in which they actively made career choices on their own. Most of them particularly mention traveling as a recurring hobby, which some of them do on their own, making them even independent in their hobbies. They radiate a self-confident and strong personality with a substantial sense of self-fulfillment, taking their life into their own hands. Generationally, they stem from both the 'War Children' and the 'People of 1968'.

The above description explains their digital technology usage, which for them is a connection to the outside world: to family and friends but also to people who share similar interests and who they join in fulfilling them, such as travel or sports groups they would not know privately from their existing social ties:

A1: Yes, when we go hiking, we have an app on the smartphone and the smartphone app, two. One is for seniors till 50 years old and the others are, well, the others are, we actually have, I even have three. One is for seniors up to 50 years old, that's in the area around [name city]. The other one is for [name city], 50+, they are all younger than me.

The Independents' access to digital technology is self-motivated:

A15: I bought the iPad on my own, the laptop, no, the smartphone I bought on my own

as is the usage:

A12: I just bought a new smartphone

A0: Really? Which one?

A12: The iPhone 8. Yes and I have everything, now I'm advertising Apple, the iPad, the iPhone and the iMac, yes, and then, well it goes, when I take a photo here, it is on everything, yes.

They deal with their device by themselves in a steady learning process:

A0: And who thought you all of this?

A17: Well myself!

They mostly contact external experts when they have a problem with their technology of choice, in contrast to the GrandMothers and the Half Couples:

A1: I bought it myself, then it was broken, it is six months old now, then I went to [name city] in the repairing store, there is somebody in [name city] and they have, I can from home, when there's a mistake, I can write to them and they can from home, repair it from there

In contrast to the GrandMothers, where digital technologies are directed inwards, and different from the Half Couples, who see their husband as a sparring partner, the Independents direct their media usage outwards:

A15: [in retirement] I was utterly afraid, that I become depressed, that I become depressed but that wasn't the case. I was able to [follow] so many interests, yes, and it turned out that I

never have time, never! And that's still the case. And in the last couple of years, what I do a lot, do a lot, I travel. Six years ago my partner died and for those six years I am constantly on the go. And so, so you have to, you have to go with the times and then you can't, that you say "oh well, I don't care about it, I don't want anything to do with technology, I don't want to have this and I don't want to have that", no, that is wrong. You have to go with the times. And yes, therefore I, of course I also have that, a smartphone, I have an iPad and that, I have a laptop and I'm online.

The Independents use their digital product to be entertained:

A9: Yes, yes, I sometimes play games on it but only Majong. Or when you sit here in the evenings and there's something with music like "ah, why...?" then I look it up

as a resource for information:

A12: I read a lot, read a lot on the Internet, for example American politics, so, Huffing Post, HuffPost, and Politico, and I have it all at one glance, the breaking news, on the smartphone and then you're informed

and to enable communication to people not part of their daily life:

A15: And the iPad, I bought it to be able to phone my sister in the USA and my siblings in general, that is just a fabulous thing, you can phone someone on FaceTime and you see each other, that's fantastic!

Discussion

Having interviewed German women aged 65 to 75 years about their incorporation of technologies in their everyday life, I find that digital technologies such as smartphones, laptops and notebooks function as an extension of the women's day-to-day lifestyle. With this study, I aimed at giving answers to the request of showcasing older women's approach to technologies (Loe, 2010). The three typologies each present a corresponding adaption of

digital technologies, suggesting a link between the women's lifestyle and the role of digital technology.

For the three classifications, each refers to a different reasoning when applying the aforementioned cost-benefit analysis (Melenhorst et al., 2006): For the GrandMothers, the benefits are a quicker communication to their close circle (Ivan & Hebblethwaite, 2016) with digital technologies included in their existing family systems, as exemplified by Nap, de Koort and IJsselstein (2009). The Independents immensely value the possibility to have access to previously out of reach content (McLaughlin et al., 2012) as well as enjoyments (Nap et al., 2009), which outweighs the costs, as they can now connect to societal offers more easily. The Half Couples can be split in two subgroups: when granted access through their husband, they also use digital technologies while relying on their husband's competence. The other part does not use any digital technology product because the husband does not either and it seems like a waste of time and energy, as proposed by McLaughlin, Gandy, Allaire and Whitlock (2012) and Sharit, Czaja, Perdomo and Lee (2004). In both cases, the Half Couples conduct the cost-benefit analysis in dependence to the husband. In line with Ball et al. (2019), my study confirms that older people are dispersed in their digital technology usage. It also strengthens parts of Loe's (2010) assumption that technologies can act as a distraction of lonesomeness, which is the case for the Independents.

Within each of the three typologies, the women seem to be in charge of cultivating social relationships, which is in line with other studies, too (Gibson, 1996). With the GrandMothers, the maintenance of relationships is family related, which has been found by Ratzenböck (2017) in her interview studies with older women. For the Half Couples, it is focused on the husband and the Independents keep in touch with others through shared hobbies. As stated by Gibson (1996), the women's lifestyle since their retirement has not fundamentally changed compared to their employed life phase. Rather, the women's day-to-

day life has been slightly altered, as they do not need to go to work anymore – but the duties in their private life have not changed that much and might have been amplified. Here, I make a connection to the 'War Children' and 'People of 1968' generations.

Remarkably, the Independents are not tied to a specific generation as they are dispersed across the 'War Children' and the 'People of 1968'. In opposition, the GrandMothers can mainly be allocated to the 'War Children' generation, whereas the Half Couples can all be assigned to the 'People of 1968'. Acknowledging that the women's lifestyle has not necessarily changed excessively in comparison to their professional life, I find the reason for the GrandMothers to stem from the 'War Children' in how they were raised. Having grown up with a mindset that views women as the main caretaker of the household, they learned to focus on their family and extended network of closed ones. Here, digital technologies work as a facilitator of their communication stream. The reason for all of the Half Couples to stem from the 'People of 1968' could also be related to their upbringing. They experienced a shift from women's duties in family matters to relationships at eye level and therefore concentrate on their partnerships with digital technologies being laterally used. With the Independents, however, there is no definitive generational classification as they are dispersed across both the 'War Children' and the 'People of 1968'. The relationship status as non-partnered and the family responsibilities kept to a minimum seem to have such a strong impact that generational influence is insignificant. In the Independents' case, digital technologies are the strongest catalyst for external connections compared to the GrandMothers and Half Couples. Altogether, the generational background seems to be prominent when digital technologies work as an internal and lateral connection to people as with the GrandMothers and Half Couples, but to be not as relevant when digital technologies are mainly used for external connections as with the Independents.

As devised by Maierhofer (1999, 2007), anocriticism asks for a plurality in age identities which opens up discussions on how various versions of self are constructed especially in old age. I find this approach to be adoptable to my findings because the three typologies presented show, on the one hand, how older women are perceived by society depending on their gender. The GrandMothers and Half Couples are expected to perform and have grown into the roles of the typical caretaker and classic wife type, respectively. On the other hand, the Independents show how older women can just as well see themselves as self-confident, self-sufficient and autonomous individuals, independent of their age. Taken together, there seems to be a strong connection between the older women's focus in life – their family, their husband or themselves – and their incorporation of digital technologies in their everyday life.

Conclusions, Limitations and Implications for Future Research

In this study, I asked: How does older women's lifestyle influence their incorporation of technological devices in everyday life? For retired women in Germany, their focus in life determines the role a digital technology product plays: whether it is their family and community, their husbands or themselves. In general, their product of choice is used as an extension of their personal lifestyle. It can be concluded that the GrandMothers direct their digital technology usage inwards, the Independents outwards and the Half Couples are split between those who use it sideways or not at all. The GrandMothers make use of digital technologies as support systems for their daily duties and existing ties, judging them rather self-evident and neutral. The Half Couples find them to be either nice to have or simply unnecessary, evaluating them indifferently or negatively. The Independents' interest in using digital technologies is very self-motivated and has entertaining reasons; they highlight the benefits.

In this study, I did not include the older women's former education and career as a factor, even though both can influence digital technology usage in later life. This could be analyzed in future studies. Also, whereas my study focused on women aged 65 to 75 living in Germany, other research projects could have a look at this age group in different countries to see whether nationality plays a role, too. Moreover, a comparison to men in the same age group would be another way to fill some of my study's limitations.

Practitioners should consider different usage skills when creating new products of digital technology, depending on the respective lifestyle of older women. Also, younger people as the usual go-to point for older people when it comes to new technologies, should be aware of these different competencies people bring to the table. What is more, we need to view older women not from a stereotypical point of view but let them pronounce their own narrative. Apparently, older women's realities and identities are manifold and it is critical to acknowledge that an active life does not end with retirement. Quite the reverse, women's duties that have kept them busy next to their former job can strengthen in older age.

Table 1. Three Types of Women Depending on Their Focus in Life

	The GrandMother	The Half Couple	The Independent
Focus in life	family & community	husband & friends	themselves & hobbies
Digital technologies	facilitator of daily duties + existing ties	nice to have (or unnecessary	self-motivated interest + entertainment platform
Judgement	neutral + self-evident	indifferent (or negative)	positive
Usage	inwards	sideways (or none)	external
Generation	War Children	People of 1968	War Children + People of 1968
Explanation	women as the main caretaker of the household	relationship at eye level	relationship status as non-partnered + family status with minimum responsibilities

PERCEPTIONS OF THE SELF VERSUS ONE'S OWN SOCIAL GROUP: (MIS)CONCEPTIONS OF OLDER WOMEN'S INTEREST IN AND COMPETENCE WITH TECHNOLOGY[2]

Introduction: The Connections of the Social Categories of Gender and Age with Technology

Screening the connotations of the gender and technology relation, they are usually positively evaluated for men and negatively for women (Balsamo, 2014; Girls Who Code, 2019). Looking at associations with the age and technology relation, older people are typically presented to be not as skilled as younger individuals (Loe, 2010). With this in mind, how does a group of people apparently most affected by such stereotyping – older women – feel about these clichés? Even more so: How do older women view themselves when it comes to gender and technology as well as age and technology? A deeper understanding of perceptions of technology, especially in relation to gender and age, is needed in order to grasp the reasoning behind such stereotypical assumptions.

In this study, I investigate how older women perceive their own interest in and competence with technology as well as that of their peers, referring to intersectionality, stereotyping, and sense-making literature. Studies find women to seemingly self-stereotype more strongly than men (Cadinu & Galdi, 2012) and gender and technology stereotypes show a negative connection for women (Balsamo, 2014; Starr, 2018). Plus, age and technology stereotypes appear to portray older people with less competence (Zeljko, n.d.). Such assumptions can influence someone's biased perception about own interest in and competence with technology and that of others. Intersectionality refers to circumstances in

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[2] This chapter is based on a manuscript by Gales & Hubner (2020) published in *Frontiers in Psychology*

which certain combinations of social categories play together. Specific situations aggravate power relations and lead to particular forms of discrimination (Crenshaw, 2017). It is therefore crucial to understand how members of a group victimized by a combination of several categories of stereotyping make sense of their own experiences and behaviors in relation to these common opinions (Pirolli & Card, 2005).

To what extent does it matter how and why people use technologies? Technology is used and perceived in different ways by different people. Such individual usage yields different varieties of "action identification" (Bouwhuis, 2000, p. 908): People might opt for technologies for entertainment purposes, with a rational objective in mind or with emotions involved. In either case, one way of usage might appear intuitive, whereas another way can be rather challenging (Bouwhuis, 2000), and for some people more than for others. Drawing on qualitative in-depth interviews with women between 65 and 75 years old, I analyzed their statements on their interest in and perceived competence with technology as well as their subjective reasoning, particularly with respect to age and gender. As older women represent a group negatively judged with regard to technological interest and competence (Girls Who Code, 2019; McLaughlin et al., 2012), I interviewed women aged 65 to 75 years old. In this study, I reveal these women's remarks in which they repeat widespread assumptions about gender, age and technology and lay bare their sentiments deviating from clichés.

This study contributes to the literature in two ways: First, I present how older women seem to view their unique personal setup as reason for their interest in and use of technology. Their perceptions of others are likely to be based on either stereotypes and social norms (gender relates to interest) or on inferences from their own experiences (age relates to competence). Second, I disclose when older women repeat existing classifications in society of what is considered feminine and masculine interest in technology. While the older women handily refer to individual preferences as an explanation for their own behavior, some

categorizations can be practical to validate own behavior (age stereotypes for competence). This study can be a helpful tool for product designers of technology who have an impact on usage forms, influencing the type of users who find technologies to be challenging or not (Maass & Rommes, 2007).

Theory: Technology is Tied to Social Structures

Technologies have always been interwoven with people, which opens up possibilities to analyze them anthropologically and historically – keeping in mind the instruments of utility people have created and the respective progresses made with these tools (Lerman et al., 2003). Thus, words describing the handling with technology are all verbs of activity: "making, doing, using, designing, producing, consuming, repairing, recycling" (Lerman et al., 2003, p. 3). Technological products are no natural objects people utilize for whichever reasons – they rather are new creations by human beings and are consequently tied to a societal, historical, and economical context: "Technologies embody and advance political interests and agendas, the product of social structure, culture, values, and politics as much as they are the result of objective scientific discovery" (Wajcman, 2006, pp. 17–18).

Technology as an Additional Category of Intersectionality

In this study, I refer to intersectionality as a framework covering the mutual influence of the social categories of gender and age with technology. Originally coined by Crewnshaw in 1989, her updated definition states that "intersectionality is a lens through which you can see where power comes and collides, where it interlocks and intersects" (Crenshaw, 2017). Each social inequality has a different and unique form of inclusion and exclusion that is created in relation to a certain idea of 'normal', i.e., that of a socially accepted or powerful group of people. Power refers to the individual availability of the resources relevant to society, which are not equally distributed – and power relations depend on gender and on age. In this regard, older women can be viewed as a rather powerless group as they combine

gender and age disadvantages. For a social category to be analyzed from an intersectional point of view, individuals within the targeted group do not need to identify with it, nor does this classification need to be inherently given.

In this study, I argue for technology to influence power relations in social situations, which leads me to proclaiming technology a new component within intersectionality research. With technologies part of our everyday life – to whichever extent – they create hierarchies, felt or not (The Digital Divide, 2019). I align with Castells, Fernández-Ardèvol, Qiu and Sey's (2007) view that technology is "practiced" (p. 75) and can be viewed as an embodiment of society. Technology can be seen as a social component and as such has become an increasingly common research interest, also in connection to gender (Costa & Feltrin, 2016). The rise of digital technologies in recent years has created unlimited possibilities, developments, and scenarios and has resulted in a debate about the distribution of and decision-making behind technologies. Hence, when recognized as a power component, technologies can be viewed as an aspect of circumstances potentially creating intersectionality. A few scholars have already included technology as part of intersectionality research (Lykke & Hearn, 2010; McLean, Maalsen, & Prebble, 2019; Sutko, 2020). In this study I examine technology as a social category adding to intersectionality produced by age and gender, referring to De Vita, Sciannamblo and Viteritti (2016), who see "intersectionality as a dynamic site constructed in practice as well as in the tension between risks of discrimination and construction of opportunities" (p. 510).

Stereotypes as a Foundation for Perceptions of Technology Usage

As mentioned before, stereotypes can lead to certain (mis)conceptions of older women's interest in and competence with technology, which is why the related clichés of gender and technology as well as age and technology need to be reflected on. A stereotype serves as a handy position in daily exchanges. It is

"a summary characterization of a human group, usually arising from and fortifying prejudices for or against that group, and used as a template into which individual members of the group are made to fit. Stereotyping is probably a necessary element in any attempt to cope with groups of which one is not a member, but the possibilities of injustice to which it gives rise are now all too familiar" (Scruton, 2007, p. 665).

Stereotypes can be prescriptive, i.e., depicting what someone should do, and descriptive, i.e., depicting what someone typically does (Koenig, 2018). In this study, I focus on the descriptive form of stereotypes, which is illustrative of convictions how behavior typically is (Koenig, 2018) because I am interested in perceptions of typical technology usage. As elucidated by intersectional analysis, certain classifications are represented within stereotypes that can reinforce power relations. Significantly, stereotypes associated with a specific group of individuals might differ tremendously from the ways in which the people within that group identify themselves personally (Hentschel, Heilman, & Peus, 2019).

Stereotypes of gender and technology: Positively for men and negatively for women

"Men are traditionally identified as the idealized and most important agents of technological development, while women are cast as either unfit, uninterested, or incapable" (Balsamo, 2014, p. 20). This quote sums up the stereotyped and gendered perception of technology in society. Viewing technology as a reinforcement of persisting gender relations in society, Maass and Rommes (2007) claim that gender and technology cannot be separated from each other. This connection becomes visible through certain gendered characteristics represented within new technological products. Here, men are painted as inherently talented with anything related to math, science, and physics (Nurlu, 2017) and women are usually typecast in a communicative and caring role (Bauer, 2015; Wright, 2017). Moreover, even "if designers have been unaware of gender, or gender-blind, they may unconsciously design for

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the male norm in society, leaving out or making invisible feminine connoted elements of the work or of work done by women in general" (Maass & Rommes, 2007, p. 98).

Hence, gendered technology stereotypes are incised in technological products (Tallon, 2019) and do not just arise in people's minds. It can be concluded that the development of technology and the social shaping of gender with the aforementioned stereotypes have progressed in parallel (Paulitz & Prietl, 2014).

The numbers of the annual report on the level of digitization in Germany, D21 Digital Index (2016), show that women are much less equipped with digital literacy in comparison to men – up to 21 percentage points of difference. Also, women lack equal access and opportunities in the educational and professional realms of technology (BarNir, 2012). Female engineering students are confronted with suppositions to be less talented than men and feel stressed when talking about that cliché (Kronberger & Horwath, 2013). Women in Germany are socially integrated into degree programs in the areas of math, computer science, natural sciences, and technology, though an extensive study by Ihsen et al. (2014) finds that they continually have to prove themselves more than men when transitioning into a professional career (if not sooner) in order to be appreciated for their expertise by their peers. In technology-related jobs, women have a lower income and work in inferior positions than men (Ranga & Etzkowitz, 2010). Thus, perceptions of technology usage and competence differ according to gender (Kuchynka et al., 2018).

Stereotypes of age and technology: Positively for younger people and negatively for older people

Whereas younger people are quickly recognized as tech-savvy, older people are usually not linked to technological competence (Zeljko, n.d.). Strikingly, older people are not necessarily considered in the design process of new digital technologies (Loe, 2010). Furthermore, older people seem to replicate existing stereotypes about their estimated digital

literacy as a study by McLaughlin et al. (2012) demonstrates. They find older people to voice sentiments that they should not enjoy playing video games nor should they have the skill set to do so, because of their age. Stine-Morrow, Shake, Miles and Noh (2006) indicate that older people do not make use of their cognitive capacities as much as they are able to due to lesser "memory self-efficacy that limit[s] the recruitment of resources that are available ('what you believe you can do')" (p. 801). This might be related to older people learning about digital technologies later in life which could expose difficulties in getting access to and feeling comfortable with using those (De Schutter & Vandenabeele, 2008).

Statistics underline the opinion that older people have less experience with computers than younger people (Bolle et al., 2015). In the past years, more and more older people in Germany became users of the Internet (Initiative D21 e.V., 2016) but they do not appraise it to be that relevant: only 11–13% of people aged 60 or older in Germany assert negative consequences for their life if the Internet vanished (Initiative D21 e.V., 2016). Interestingly, the biggest supporters in Germany of digital literacy training in schools are people in their 60s (Initiative D21 e.V., 2016). It seems as if this age group recognizes a certain need for digital technology knowledge and competence. Taken together, someone's age influences to some extent how people estimate an individual's technological usage and competence (Ball et al., 2019). Plus, people's access to technology is connected to their age.

Stereotypes of gender and age with technology "reinforce existing understandings of old women as unimportant, old-fashioned, homebound, lonely and child-like" (Mosberg Iversen, 2015, para. 8), framing them as uncharacteristic users, experts, or owners of technology.

Sense-Making and Biases as a Basis for Evaluating the Self and Others

To organize and evaluate the complexity of information, people refer to perceptions and evaluations based on biases (Pirolli & Card, 2005). In sense-making processes, people

habitually relate to "existing schemas and existing expectations" (Pirolli & Card, 2005, para. 3.2) in order to form evaluations in line with common beliefs. Making confirming statements is easier than taking the effort to formulate negating sentences, which is why individuals readily base their choices on quick estimations of existing and common beliefs.

Pronin, Gilovich and Ross' (2004) research discovered that people believe to fall prey to biases less easily than others. People tend to think of themselves as free of biases in their judgments. Even more so, they are inclined to credit themselves as objective in comparison to others, to whom they attribute subjectivity (Pronin, Lin, & Ross, 2002).

When evaluating attitudes of others, the assessment is usually based on the other person's behavior, even when there is also contextual information about what could possibly influence that person's actions. In fact, people have a tendency to overly emphasize a person's behavior in evaluating that individual's attitude (Jones & Harris, 1967), underestimating external factors; this is referred to as correspondence bias (Gilbert & Malone, 1995). Then, the explanation for judging other people's behavior is connected to observations made over time. Hence, assessments of other people's interest in and usage of technology is supposed to be linked to a monitored behavior, neglecting the context of those observations.

People form beliefs about themselves built on a construct which is based on "their own attitudes, emotions, and other internal states partially by inferring them from observations of their own overt behavior and/or the circumstances in which this behavior occurs" (Bem, 1972, p. 5). Self-perception theory by Bem (1972) proposes that people judge their internal nature on their behavior. Thus, the self-perception of women's interest in and usage of technology is bound to their examinations of their own behavior, including interactions with their environment. One could assume that everyone can predict someone's

internal state by watching an individual's behavior. Yet, there is a difference between one's own perception of the self and the perspective of others.

In this study, I refer to an intersectional framework to analyze the connection between gender, age, and technology. The concepts of stereotyping and sense-making add to the theoretical foundation of this study's research interest. I aim to comprehend older women's perspective on technology usage, of themselves, and of their peers. I hereby answer the call by McCormick-Huhn, Warner, Settles and Shields (2019) to understand participants' profiles on a more thorough level by incorporating an intersectional point of view. More knowledge on older women's perspective is necessary in order to understand the social structures forming discriminative positions. In this study, I focus on the accessibility of digital technology for older women due to their gender and due to their age.

Methods

Participants

Through individual, qualitative in-depth interviews and observations on technology usage, I spoke with 20 retired women born between 1943 and 1953 living in the southwest of Germany. The methods paragraph of chapter 2 presents a detailed description of this age group's statistics on digitization as well as their generational background. You can also find a description of the sample there. Also, Table 2 gives an overview of the participants' year of birth, age at the time of the interview, year of retirement, former occupation, the technologies they currently use, the technologies they used at their former job, their educational background, and relationship status.

Interviews

As the participants and interview procedure are identical to the one of the previous study, please refer to the methods paragraph of the study presented in chapter 2, where I provide a detailed description of the interview procedure. It is added here that the identities of

the interviewees in this chapter 3 are protected by using the letter "G" followed by an allocated number. The interviewer is marked with "G0".

What is worth mentioning for this chapter is that the definition of the term technology was left open for interpretation by the participants. It was of interest to show their own understanding of technology, without encircling it beforehand. This way, it was possible to analyze the participants' personal opinion on technology. As part of the interview, participants were asked to show the interviewer a technological device of their choice (which was mostly their smartphone) and to demonstrate how they use it. For example, some presented the apps they frequently use or the photos they recently took. This helped me in getting information on the apps and services the participants use and in deriving implications.

Analysis

The analysis procedure is the same as presented in chapter 2. For this study of chapter 3, I focused on the role of gender and age for perceptions of technology. This means that the specific connections and relations for gender and technology as well as age and technology were sought after. Again, Braun and Clarke's (2006) thematic analysis approach was applied, which is thoroughly explained in the methods paragraph of chapter 2. In this study's case though, different codes emerged due to a different research interest. In a first step, I broadly coded the data and certain themes such as "interest in technology", "competence with technology", "gendered statements" arose. Then, I openly coded the data, going through the transcriptions line by line. What came to light were codes such as "technical set-up of objects", "media usage", "social media", "no interest in technology", "excuse", "no interest in change", "explanation", "men have more interest in tech", "women expected to do online shopping", "consequences", "something bad" and "going with the time". I applied those codes throughout the interviews. In search of uncovering similarities and differences across interviews, I categorized my open codes into dimensions of "relation to gender", "relation to

age" and "perspective", keeping in mind my research question: How do older women perceive stereotypes on gender and technology as well as age and technology? Then, I made connections back to the aforementioned themes as I wanted to know how older women evaluate their and their peers' interest in and competence with technology and whether there is a connection to gender and/or age. This allowed me to make the following distinctions: for "interest in technology", when the "perspective" was inward-looking, interest in technology is seen as something individual and there was no "relation to gender". For "interest in technology", when the "perspective" was on others, the "relation to gender" was that men are generally more interested in technology, so stereotypes of gender and technology seem to determine evaluation. For "competence with technology", whether the "perspective" was on oneself or on others, it seems to depend on age. Here, the "relation to age" for oneself is that age seems to be a justification for no motivation to learn and to explain a slower learning process. For others, the "relation to age" revealed that people older than oneself have no "competence with technology". Finally, I connected the "gendered statements" theme with the "interest in technology" theme, where stereotypes of gender and technology determine the evaluation of others: for men, the type of technology to be interested in is mechanical and electrical, for women the type of technology to be interested in is communicative and social. Tables 3, 4 and 5 give an overview of my analysis. Altogether combined, the main categories of the women's perceptions were revealed, which I present in the results paragraph of this chapter. The data best representing the topics answering the research questions were chosen as representations and are included in the results paragraph with more listed in Tables 3, 4 and 5.

Results

Evaluations of Interest in Technology Show a Discrepancy Between the Perspective of Oneself and Others

The older women named multiple reasons for their own and other people's motives for being interested in technology. Remarkably, when speaking of themselves, they referred to their individual preferences to explain their interest in technology: "That is solely my, my being, my nature, my way" (G9). Conversely, when talking about others, gender functions as an explanation: "The boys were more interested. It doesn't mean the girls didn't get it, just the interest wasn't there" (G12). In the following, I will elaborate on this discrepancy.

Own interest in technology is perceived to stem from individual preferences

The older women named their individual preferences to explain their interest in technology. This was the case however strong they assessed their interest in technology to be. They did not find a necessity to detail why they had an interest in technology or why not. So, the women labeled their own interest in technology as something that is entirely individual. When depicting their own interest in technology, they linked technology to individuality rather than to social categories such as gender and age: "As I said, technology is not my thing. I used to sit for many years, on the computer for many hours, did accounting, well financial accounting and payrolls and then I didn't want to do it any longer at home [in retirement]" (G8).

The interviewed women presented a wide array of applications when questioned on the ways they use their technological devices. Among others, they do online banking, solve crossword puzzles, buy medication online, read e-books, listen to music and use the smartphone or note pad for navigation support or for video chats. These examples imply that the women follow their interests through digital technologies and take ownership of their life

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in general. Table 3 presents quotes exemplifying the numerous ways how the women use technology.

Men in general are seen to be more interested in technology compared to women in general

For some of the interviewed women, men seemed to inevitably be interested in technology. Apparently, it already starts in childhood years, when certain interests in the sciences – and here, parallels to interest in technology were made by the women themselves – are seen as being more prevalent among boys: "Of course boys are more interested in science, in physics, let's put it like that, yes. How often is a girl interested, like, now, whatever, an engine works" (G12). Table 3 demonstrates quotes referring to the discrepancy between the perception of oneself versus the perspective on others.

Men in general are associated with an interest in mechanical and electrical types of technology

The associations between men and technology made by the interviewed women can be interpreted as mechatronic, electronic, mechanical, electrical, and such – therefore mainly in technical terms (see examples in Table 4). In this framework, technology refers to tools and machines that were initially designed to aid or replace the physical power formerly needed by men. Here is where the women interviewed created the strongest link to men, entirely leaving out the likelihood of women being interested in this kind of technology. Thus, interest in technology in relation to men was connected to the technical aspect thereof, which women are not perceived to be a part of: "I don't know if a woman, for example, could repair a washing machine, right? That is, or a TV technician, I don't know, are there women who are TV technicians?" (G6). Remarkably, there seems to be a differentiation made between speaking about the repair versus the use of technology; repair seems to be perceived to be male and rather questionable for women.

Women in general are associated with an interest in communicative and shopping-oriented types of technology

Contrary to the remarks about men, women's interest in technology was linked to the social and communicative aspect, in which men are not considered (see examples in Table 4). Here, the caring and worrying characteristics of women were emphasized, which were linked to a stronger interest in smartphones and laptops or computers. Here as well, technology seems to be representative of gender stereotypes in society: where it is the technically oriented man on one side, it is the socially charged technology for women on the other side, e.g., writing e-mails and using apps for instant messaging like WhatsApp or social networks like Facebook. Communicating with friends and family members seems to be a women's task and something they enjoy doing more, which is coupled to a stronger interest in making phone calls or texting others: "But my impression is, that the women, that I know, are more active than the men, because they don't find it that important. They [men] don't need to see from morning till evening messages sent from their children, if they see it [the next] morning, it's also [fine]" (G17).

Another point that was frequently mentioned was buying clothes on the internet, which was presented in two ways: First, some of the women mentioned online shopping as something they specifically do not do even though the interviewer did not ask them about it, which shows that online shopping has been a topic of conversation for the women before: "I don't want to, look up fashion or watch that or, I don't want to. And I don't order anything online" (G3). Second, some women even specifically noted that the possibility of buying clothes on the Internet was proposed by other people to them: "He says "just take a look, you can look up clothes and shoes" and he tried to persuade, I said "no, I don't need it"" (G7). Once more, technology is representative of the female stereotype in society that women seemingly enjoy shopping sprees.

When talking to the interviewed women about other people's interest in technology, they resorted to existing gendered stereotypes of technology. In this context, it seems as if technology is an extension of the conventional classifications of women and men in society. In Table 4, the types of technology people appear to be interested in, depending on their gender, are presented.

Evaluations of Competence With Technology Show a Correspondence Between the Perspective of Oneself and Others

Evaluating an individual's technology competence, age plays a role (see Table 5). The women interviewed indicated that age was included in their identity formation and that age stereotypes can function as an explanation for their perceived lack of technological skills. It seems to be a practical justification for the women because using technology can be challenging: "And then I always used to say "oh no, then I have to learn something all over again!"" (G4). On this basis, an association of age-related technology stereotypes is formed by the women, which is used to evaluate other people's competence with technology: "She is eight years older than me, she's never had a computer […] she doesn't know anything on the computer" (G10).

Age as a justification for a lack of motivation to learn and as an explanation for a slower learning process

For the interviewed women, it seems as if their seemingly advanced age is an explanation or even a justification for a lack of motivation to learn something new and generally explains a slower learning process (see examples in Table 5). Apparently, being older equals a resistance to challenges, which is why the older women shy away from those or at least need more time to adjust to something new: "I always need some more time, to get into it. It apparently came with age, that it doesn't work that easily, that you're not as capable to learn, I always think" (G4).

The perception of others' competence with technology depends on age

'Old' meant inept as soon as the women talked about other people's competence with technology in relation to age. Here, age-related technology stereotypes are mentioned uniformly. However, I did not find a discrepancy between the women's perception of themselves and their evaluation of others, but rather a correspondence. The women seemed to link their own understandings to the experiences they think even older people have. To justify other people's lack of competence with technology, they referred to age: "My sister, she's 17 years older than me – she can hardly make a phone call" (G2).

In the interviews with the older women about competence with technology, there were many references to stereotypes connected to age and technology, especially when providing reasons for their own behavior and that of others. Age and technology stereotypes were used to rationalize one's own competence with technology and that of others. Table 5 presents exemplary quotes of how age is a legitimization for resistance to challenges and new learnings.

Discussion

In this study, I have showed the circumstances in which older women base descriptions of themselves and others on their own specific being and experiences (Bem, 1972) and when they use social categories as a reference or an explanation (Kelley, 1973).

My study contributes to the current literature twofold. First, when judging interest in technology, I present how older women differentiate between themselves and other people. On the one hand, I find that older women see their individual preferences as reasons for interest in technology, but, when speaking of general female interest in technology or that by other women, they refer to stereotypes. Hence, for themselves, they see the perception of their selves as an influential factor for their interest in technology. For others, though, interest in technology is perceived to depend on gender. On the other hand, connecting age and

technology, older women seem to infer from their own experiences when articulating their perceptions of others. They recognize competence with technology to diminish with age both for themselves and for others. In total, older women seem to view their allegedly very individual self as reason for why they use technology or not, and their perceptions of other older women seem to be based on either stereotypes and social norms (gender relates to interest in technology) or conclusions from their own experiences (age relates to competence with technology).

Second, reasons for technology usage seem to replicate existing stereotypes of women and men: with men, interest in and competence with technology appear to come from natural competence and physical power. In this case, technology is mostly documented as electronic, mechatronic, technical, and mechanical. Quite the reverse can be deducted for female-gendered technology stereotypes: here, technology is inevitably looked at in terms of social interaction (digital communication) and consumption (online shopping). When it comes to age stereotypes, older women refer to their age once the topic surrounds their lack of willingness to adapt their present use of analog technology to a digital one. Evaluating willingness to change, older women noticeably distance themselves from younger individuals. Thus, age stereotypes function as factors clearly influencing judgments of technological competence, not only for others but also for oneself.

The Gender and Technology Connection Shows a Discrepancy Between the Perception of Oneself and Others

The contrasting evaluations of interest in technology by the interviewed women exemplify how technology can be reviewed within numerous possibilities: the interviewees named individual preferences when speaking of themselves and mentioned multiple points of interest, such as searching for solutions to crossword puzzles, online banking, listening to music, buying medication online, using it for navigation or for video chats, as mentioned

above. Quite the contrary, the older women referred to stereotypes when discussing the relationship between gender and technology in general as well as with respect to other people. It seems as if they differentiated between an inner and an outer view, i.e., a perspective derived individually or on a societal level. They seem to connect the liking or disliking of technology to perceptions of their selves, but, when thinking of other women, there was a strong conviction of a gender-related interest in technology based on beliefs reproduced time and again by society (Nurlu, 2017).

Moreover, technology was pictured as a replication of gender clichés, whereby usage by men comes from natural competence and physical power. In this context, technology is mainly connected to objects of the technical, mechatronic, electronical and mechanical kind, which I have related to other studies on male stereotypes (Bieg, Goetz, Wolter, & Hall, 2015; Nurlu, 2017). Quite the reverse, when discussing technology and women, technology is automatically tied to communication and consumption. In this case, the social aspect of digital technology is underlined as enjoying to communicate is keenly associated with women's use of technology. This is in line with stereotypes portraying women as communal and social beings (Hentschel et al., 2019). Again, technology is an expansion of gendered stereotypes as other studies have demonstrated that, usually, women are painted as individuals who enjoy communicating with each other but also taking care of others (Bauer, 2015; Wright, 2017). Another aspect in which technological usage seems to be gendered is online shopping, which has been proposed to the women by others as a potential incentive to go online and activate an interest in technology. Based on my findings, I can reiterate the conclusions of other scholars who have also found that gendered stereotypes of men being assertive and women being communal are still prevalent (Hentschel et al., 2019). My analyses show how these stereotypes are portrayed in technology usage and its perception.

The Bias Blind Spot as a Reason for Differing Evaluations of Interest in Technology in Oneself and in Others

My findings on the bilateral viewpoints of older women regarding themselves and others accord well with studies on biases which state that

"… individuals have faith in the "realism" or objectivity of their own views, and are thus likely to assume bias on the part of those who fail to share those views. And it is this tendency to view others as influenced by bias that leads individuals to the conclusion that their opponents hold extreme and dogmatic points of view" (Pronin, Lin, & Ross, 2002, p. 379).

When talking about their own interest in technology, older women take an inner look, accentuating their individual perspective and understanding their self to be the only reason for their declarations. My finding that older women view themselves as lacking any of the biases others might perceive them as having or they see others as having are in line with the idea of the bias blind spot, whereby we see ourselves as being unassailable to biases (McPherson Frantz, 2006). I find indications that there is a blind spot for the gender relatedness of own interest in technology, but knowledge of the age affiliation of competence with technology.

The Connection Between Age and Technology Shows a Correspondence Between the Perception of Oneself and of Others

I found that older women see their age as a confirmation for their (comparatively low) competence with technology. Hence, older women seemingly do take biases into account when assessing their competence with technology. They find digital technologies to be not as intuitive to them because they watch younger people apparently using them easily. The older women look for a justification for their challenges, which they locate in their age. Other studies also revealed older people's resistance to digital technology usage (Ball et al., 2019).

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Furthermore, I set this in connection to other studies showing how older people use age as a rationalizing aspect for challenges they are confronted with when using digital technologies (Stine-Morrow, Shake, Miles, & Noh, 2006). This is why I conclude that, contrary to the gender biases for interest in technology, there is not a discrepancy between the perception of themselves and others but rather a correspondence in relation to competence with technology.

Sense-Making as a Reason for Corresponding Evaluations of Competence with Technology in Oneself and in Others

My findings can be aligned with the sense-making process, in which a person connects other people's attitude and behavior ultimately with each other (Jones & Harris, 1967). With regard to themselves, people refer to their self-perception, therefore making suppositions about themselves based on their explicit behavior (Bem, 1972). From their self-perception, the women find their interest to stem from their individual innate state; this self-perception arises from self-examination of one's own behavior including exchanges with the environment. In this regard, interest is a self-perception formed over time and is different from the perception of others. Assessing others, personality models (Hassabis, Spreng, Rusu, Robbins, Mar, & Schacter, 2013) are created. Brain researchers have found that, when people form hypotheses about other people's behavior, a "mental simulation" (Hassabis et al., 2013, p. 1979) takes place in which the evaluating person makes a link between personal experiences and future expectations:

> "Both the construction and application of personality models are a key component of social processing, because these models are essential for predicting and comprehending the behavior of others. Identifying trait tendencies in others relies on an ability to accurately read and interpret social cues, then linking these to broader cognitive and behavioral tendencies" (Hassabis et al., 2013, p. 1979).

I found this interpersonal correspondence with the interviewed women, who immediately imagined that women older than themselves must be less experienced in using technology because of the correlation they form between technological competence and age. Other likely facets – which could include interest in and talent for technology usage – were left out of the consideration. The interpretation of other people's possible behavior is closely tied to one's own reasoning for a certain behavior; in this case, people's age is used as an explanation for their technological competence.

Limitations

As the author of this study, I am fully aware that the social categories of gender and age are not the only realities for these women. Empirical research cannot include countless directions of complexity, which is a known methodological problem, and the selection of certain categories is in itself a deliberate evaluation process chosen for research purposes (Schnicke, 2014). In this study, I was aware that "any analysis of sexuality, power and gender must recognize the importance and interactive nature of their local, national and global contexts and the multiple and intersecting nature of the power relationships that can shape our identities, beliefs and behavior" (Jónasdóttir, Bryson, & Jones, 2010, p. 2). Therefore, future research might include more or other social categories in combination with technology to gain a more profound understanding of the impact of technology on social realities.

What is more, to decipher how the categories of gender and age in relation to technology work for combinations other than the ones used here, interviews with younger women, older men, or younger men could deliver further valuable insights. Analyzing the perspectives of the aforementioned groups of people would be a rich contrast to my study – in relation to gender and/or in relation to age. Yet, this study has the potential to reproduce gender stereotypes and spread them in a research context (Bruckmüller, Hegarty, & Abele,

2012). I would like to mention here that any academic interpretation should clearly state the nature and influence of stereotypes versus actual behavior and competence.

In these two studies of chapter 2 and 3, as it is common in interview studies, the participants' sentences, responses, and statements are influenced by the interview questions being asked (Morrow, 2005). Additionally, the sample size is smaller than in most quantitative studies. Future research is needed to replicate and test the generalizability of my findings.

Implications: Technologies Need to Be More Inclusive

For older women, the stereotypes of their gender and of their age are incongruent with stereotypes of both technological interest and technological competence. With my study, I present a better understanding of older women's perspectives on technology usage and competence.

The older women repeat and reinforce stereotypes when it comes to gender and interest in technology. By reproducing stereotypes – on themselves and on others – other people and future generations can be impacted to copy these stereotypes as well. The influence can evolve beyond the social category of older women: reinforcing the gender perspective could affect younger women to feel they are not expected to be interested in technology – or specific forms of technology – because it does not fit the gender stereotype; underpinning the age perspective could persuade older men to feel they are not expected to put effort in studying new technologies because they would not be competent enough. With their stereotypical ascriptions, the women interfere with a more differentiated perception of interest in and competence with technology, which influences the relationship between discourse and behavior, especially for women and the older generation.

I aim to contribute to stereotype and self-perception literature by showing how a social group being negatively stereotyped taps into the repetition and eventually reproduction

of the stereotypes discriminating them. My findings on technology-related stereotyping can inspire future research within intersectionality. I intend to promote the discussion to include technology as a social component influencing the intertwining of social categories. My study proposes to view technologies as an illustration of prevalent gendered stereotypes. Therefore, I support more social science studies with technology-related research questions that can potentially give a better understanding of the role technology can play within intersectionality. What could be of particular interest is the influence of Artificial Intelligence on society as a whole and on human beings individually. I hope my findings and ideas on the intersecting influence of technology with social categories can encourage future research on the mutual influence of the various aspects of digitized systems and people.

My research also has important implications for practice as an interdisciplinary approach of gender studies and technology can pave the way for an inclusive development of technology (Buchmüller, Bath, & Henze, 2018). Whether someone feels discriminated against or not, an inclusive society needs to involve everyone. The more digital technologies assist or even authorize people's connection to society, the more relevant it will become to enable availability for older women. This can be achieved by sparking interest in new technologies and by tolerating the competence level thereof. Older women can get help and obtain skills for using technology via digital literacy guidance. Herrmann, Adelman, Bodford, Graudejus, Okun and Kwan (2016) have demonstrated how role models in technology can have a positive impact and that people identify best when the role model strikes similarities to themselves. My findings go beyond previous ideas for actions: If the goal is to encourage older women's interest in technology, they should be addressed individually rather than with reference to their gender and age as the older women interviewed see their individual preferences as explanations for their interest. With the aim to improve competence of technology, age-related role models could indeed be valuable because the older women

named age stereotypes as a justification for their perceived level of competence of technology. Consequently, a role model in their age may convince them that they could be competent, too.

My study wants to give older women's voices a wider audience and underline that their voices have to be respected in technology development and policies. Given the ever-evolving process of automation and digitization, all kinds of people should not only be guaranteed access to technology but should also have impact on technological development. My research informed about numerous examples how technology is used by older women. These various ways of usage can be viewed as a starting point for future developments of digitized products. To warrant an inclusive technology development, technological products need to be accessible and intuitive to older women. With smartphones functioning as an augmentation of our body and mind, their features need to consider the specifics of the end-user, including gender and age. Programmers should respect discrete gesture and motor skills of older women, and taking into account their particular use of new technology as well as their diverse types of interests and competence levels.

Conclusion

What kind of person do programmers have in mind when designing something that should be intuitively usable? And who decides how technology should be built so that it can be used intuitively? At this junction is where technology adjoins to the intersectionality of gender and age: digital technologies are powerful, and the people with authority on the designing end and competence on the user side are closer to that power. This power sequence of technological influence affects the development of technology; and older women neither control the direction of new technologies nor are they taken into account of shaping it. By considering gender and age in the development of digital technology, we can facilitate a more inclusive society.

Appendix A

Interview Guide

1) Introductory questions
    - How old are you and in what year were you born?
    - In what kind of relationship are you and since when?
    - What is your educational background?
    - What exactly was your job title?
    - Since when are you retired / in pension?
    - What does your everyday life look like today?
    - Do you have a volunteering position?

2) Familiarity with technology
    a. General
        - How would you describe your knowledge about technology?
    b. On the job
        - What technological equipment did you use in your job?
        - Who taught you how to use it?
    c. In everyday life
        - What kind of technology do you use in everyday life?
        - Who taught you that?
        - Since when?
        - Where did you get the technology?
        - What kind of technology do you use for your hobbies / leisure / volunteering?
    d. Personal opinion
        - How do you personally evaluate technologies, and specifically digital technologies?

3) Device of their choice
    a. Presentation
    b. Purpose
    c. Demonstration
    d. Clarifications
        - What position does this device have in your life?
        - What do you think about the device you chose?
        - Which applications/programs on the device do you use?

4) Situational questions
    - How do you think your environment perceives your technological behavior? And the technological behavior of your husband / partner?

- What role does technology play in conversations within your circle of acquaintances?
- What differences do you see in how men versus women deal with technology?
- What stereotypes about women and technology are you aware of?
- How do you feel as a woman your age in relation to technology / society / your partner?
- How does society perceive people your age? And women your age?

Table 2. Participants Overview and Details

Birth year	Age	Retirement	Relation-ship status	Educational background	Former occupation / profession	Technology at former job	Technology used today at home
1948	70	2011	widowed	secondary school certificate	seamstress and later a world-wide trainer for other seamstresses	technical machines + mobile phone usage	smartphone, laptop
1951	67	2001	married	minimal/compulsory school certificate	secretary in a bank	computer work	smartphone, computer
1946	72	1997	married	minimal/compulsory school certificate	hair stylist / hair dresser / hair colorist	none	smartphone
1950	68	2013	married	minimal/compulsory school certificate	learned in a bank, then worked as a market researcher	different technical machines	smartphone, computer
1950	68	2007	married	minimal/compulsory school certificate	worked in husband's farm	none	smartphone
1950	68	2010	married	minimal/compulsory school certificate	office secretary	different computer programs	smartphone, laptop, tablet
1950	68	2011	married	minimal/compulsory school certificate	worked as a sales person in a clothing store	none	cell phone
1948	70	2008	married	minimal/compulsory school certificate	assistant tax consultant	computer work	cell phone
1952	66	2017	single	higher education: 'Abitur' with a teacher education	teacher	laptop for school projects	smartphone
1950	68	2015	married	secondary school certificate	first pharmaceutical technical assistant, then administrative support in husband's company	computer work	smartphone, laptop

1947	71	1991	married	minimal/compulsory school certificate	learned dressmaker, then worked in a kitchen	none	cell phone
1951	67	2015	married but separated	higher education: 'Abitur' with a teacher education	maths and physics teacher	physical & mathematical understanding of technology	smartphone, note pad and computer
1949	69	2011	married	minimal/compulsory school certificate	worked on her father's farm & then in a gardening & florist company	none	smartphone
1948	70	2009	married	minimal/compulsory school certificate	administrative tasks in family owned business	computer as typewriter	smartphone, e-reader
1945	73	2005	divorced	higher education: 'Abitur' with a teacher education	elementary school teacher	computer as typewriter	smartphone, note pad and computer
1943	75	2008	widowed	secondary school certificate	trained bank administrative, then secretary	computer as typewriter	smartphone, laptop
1952	66	2016	single	secondary school certificate	trained bank administrative, then secretary and self-employed	computer programs	smartphone, laptop
1952	66	2012	married	higher education: 'Abitur' with a teacher education	music teacher	computer as typewriter	smartphone and medical devices
1953	65	2015	married	minimal/compulsory school certificate	worked in a lab in a producing company	for calculating only	smartphone and laptop
1951	67	2016	widowed	minimal/compulsory school certificate	worked as a board assistant	computer work	smartphone and laptop

Table 3. Interest in Technology: Discrepancy Between Perceptions of Self Versus Others

Quotes	Relation to gender	Perspective	Aggregate dimension
G9: My attitude, my own, that result from my personality | G9: That is solely my, my being, my nature, my way G8: As I said, technology is not *my* thing. I used to sit for many years, on the computer for many hours, did accounting, well financial accounting and payrolls and then I didn't want to do it any longer at home [in retirement] [G0: And do you sometimes sit at the laptop?] G7: No, no interest G3: Maybe that's it, but on the computer itself I'm not really interested			
G9: There is one thing, that is, yes, that is to say, that is known as "medikamente-per-klick.de" G2: And sometimes, when I, I go to Google, when I sometimes do a crossword puzzle and don't know something, I look it up G4: I also do for example, online banking, printing out account statements and so, once a month, I do that G18: I listen to music with my head phones G14: I now have my e-book […] then I can read, in bed G1: With coordinator and if there are no roads, they are entered, I have to put them in, into my navigation system and then I drive to the point G15: You can phone via FaceTime and then you see each other, that is fantastic	'none': inward-looking to determine interest in technology	perception of self: interest in technology is individual	bias blind spot
DISCREPANCY			
G12: Of course boys are more interested in science, in physics, let's put it like that, yes. How	men:	perception	biases

| often is a girl interested, like, now, whatever, an engine works. The boys were more interested. It doesn't mean the girls didn't get it, just the interest wasn't there.

G12: It's true, boys are more interested in the sciences.

G17: I think that, well, my personal impression or opinion is that, because I start from myself, I'm not interested in it but a man I think, maybe more. | generally more interested in technology | of others: stereotypes of gender and technology determine evaluation | |

Table 4. Type of Technology to be Interested in, in Relation to Gender

Quotes	Relation to gender	Perspective	Aggregate dimension
G18: She can calculate everything, but, well, if she can also execute it, I think that's more what her husband does G4: My father was a manual workman, he did everything by himself G11: Well it is like that, that, men are more technical or well, crafting G2: Men used to be more of the technicians, right. G6: Yes, I don't know if a woman, for example, could repair a washing machine, right? That is, or a TV technician, I don't know, are there women who are TV technicians? I'm asking you. [G0: I don't know] G6: No, I think, men are more skillful, maybe women don't even try it, because it used to be a men's profession. This morning, there was a technician for [daughter's name's] ceramic hob, it was broken for the third time, I don't know if a woman could do that	men: type of technology to be interested in is mechanical and electrical	perception of others: stereotypes of gender and technology determine evaluation	biases
G17: But my impression is, that the women, that I know, are more active than the men, because they don't find it that important. They [means men] don't need to see from morning till evening messages sent from their children, if they see it [the next] morning, it's also [fine] G17: Well, yes, but, however, these are, I say communication systems and there, women are	women: type of technology to be interested in is	perception of others: stereotypes of gender	biases

Quotes		Perspective	Aggregate dimension
more interested that men I think, yes, […] women are way more interested in such a device [meaning communication device] than men. G10: Texting on WhatsApp or so, sending something, sending photos, he doesn't do that, I do all of it, I also have to arrange all the appointments and everything G19: Women do more there, that is, they also have more WhatsApp groups or so than men. [talking about smartphones and laptops] G6: How can I say that. Emotionally, maybe. Men are not as interested […] It's also technology, yes, but somehow a different technology. Yes, I think, that men are not as interested as women, I think […] because men also call less than women, I think that men are just not as interested here [G0: Because it's communicative?] G6: yes exactly	communicative and social	and technology determine evaluation	
G9: well I don't buy online because I don't want clothes from the racks G3: I don't want to, look up fashion or watch that or, I don't want to. And I don't order anything online G15: People try to tell me "you can get it on the Internet" and so, I don't want to, that's it. G7: He says "just take a look, you can look up clothes and shoes and" he tried to persuade, I said "no, I don't need it"	women: type of technology to trigger interest for is consumption and shopping orientated		

Table 5. Competence with Technology: Correspondence of Perceptions of Self and Others

Quotes	Relation to age	Perspective	Aggregate dimension
G14: I have my age, when, let's say, I wouldn't know what I should change. G10: I'm too lazy, too sluggish, too sluggish! That's the age, that's exactly the age, I'm too idle	age is a justification for no motivation to	perception of self: competence with	self-perception

G4: And then I always used to say "oh no, then I have to learn something all over again!" G4: I always need some more time, to get into it. It apparently came with age, that it doesn't work that easily, that you're not as capable to learn, I always think. G15: besides, they will not admit that. Nobody will admit to you that they'd also like to do that, I could imagine, that, they just say "I don't need it" […] or maybe also, because they are scared of technology? Scared, that they don't get it or to destroy something G18: I also believe, in our age, women don't really get it [technology] G7: no, now I don't want it anymore, don't need to do it anymore, at that age.	learn and explains a slower learning process	technology depends on age	
CORRESPONDENCE			
G10: She is eight years older than me, she's never had a computer […] she doesn't know anything on the computer G7: And there are people, that are even older, I see it next door, our neighbor, she is 85, oh lord, she can't keep up with anything, at all. G0: How would you say is society perceiving older people and technology? G2: Not at all, I think […] I mean, my sister, she's 17 years older than me – she can hardly make a phone call	old: always older than me and no competence at all	perception of others: competence with technology depends on age	personality model

CONFLICTING TECHNOLOGY STEREOTYPES IN THE PROFESSIONAL AND IN THE PRIVATE: A CHALLENGE OF GENDERED EXPECTATIONS FOR GENERATION Z WOMEN[3]

Introduction

"I find it sad that [as a woman] you can't show it openly, that you can't openly say: "hey, I like physics, I'm really good at it, I can be pretty, blonde *and* smart"" (M04).

Why is it that a 22 year-old woman wonders why another young female in her peer group cannot show her affection for physics while also adhering to the general standards for beauty by describing her as "pretty"? It seems as if a woman interested in a STEM subject, short for "Science, Technology, Engineering, and Mathematics" (Heyder & Kessels, 2013, p. 606), like physics contradicts the stereotype that women are not interested in science and technology – especially if she is good-looking. Could it be that gendered stereotypes can hold women back from expressing their interest in a STEM subject?

Today, the current generation of people in Germany still in school but also already in their first years after finishing school is called "Generation Z" and includes those born between around 1995 and 2010. They are constantly online and connect with their friends through social media. Generation Z (in the following referred to as "Gen Z") as a generational cohort is still not very well studied (Chillakuri & Mahanandia, 2018) although they are the first growing up in a digitized environment. Most of the existing research on Gen Z has focused on their relation to the workforce (Chillakuri & Mahanandia, 2018; Fratrièová & Kirchmayer, 2018; Iorgulescu, 2016; Lackner, 2018; Lanier, 2017; Maioli, 2017). What is special about Gen Z's technology usage and skills is that they might not be bound to the dominant digital products of their adolescent years compared to previous generations as they

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[3] This chapter is based on a working paper by Gales (2020) currently under review at *Feminist Media Studies*

have grown up with ever moving and transforming digital products and can probably adapt to new ones throughout their life (Prakash Yadav & Rai, 2017).

Corporate studies show a heightened chance for gender equality following the age of automation, Artificial Intelligence and digitization, especially in the workplace through skills in handling digital products (Accenture, 2016; McKinsey Global Institute, 2019). Other studies find an increased chance for digitally active women to become entrepreneurs (Ughetto, Rossi, Audretsch, & Lehmann, 2020). Also, the feminist study's branch of technofeminism sees digital technology as an opportunity for women to appropriate historically male connoted technology (Wajcman, 2007). Gen Z women grew up with digitization as a part of their educational context and the professional sector as well as of their private everyday life; so, they can be viewed as a cohort of women that could perceive such positive changes in the direction of gender equality. The numbers of the men/women ratio in STEM subjects (Statistisches Bundesamt, 2019b) as well as the consequences of social media usage, especially for women, tell a different tale, though (Brown & Tiggemann, 2016). Gendered STEM stereotypes and female-specific pressure on how women feel that they need to present themselves prevail, as exemplified by one of my interviewees: "it was just the fulfilled cliché, that somehow both is not possible: that a woman, who is focused so completely on her appearance and then also does mechanical engineering or engineering studies" (M10).

This study focusses on female Gen Z's perception of the two technology-related areas they encounter the most: First, they are either still in school and confronted with STEM subjects or in a phase after school where they recently decided for a higher educational degree or an apprenticeship – and whether this career path is technology-related or not. Second, they are constantly online and spend a lot of time on social media, more than any other age group. But: the numbers of women in STEM fields are still lower than those of men

(Statistisches Bundesamt, 2019a, 2019b) and social media usage seems to have negative consequences on women's self-image (Brown & Tiggemann, 2016). It is therefore of interest to get insight into female Gen Z's perspectives, who grew up with digital technology, asking: How do Generation Z women perceive gendered technology stereotypes in the professional and in the private and how can they affect one another? Combining female Gen Z's viewpoints on STEM as well as on social media gives way to a discussion on conflicting gendered stereotypes for younger women.

Based on qualitative in-depth interviews with twenty women born between 1995 and 2001, I analyzed their statements on gendered interest in STEM and on expectations they feel pressured by on social media. I question whether growing up with digital technologies influences women's professional positioning in relation to technology, which a few corporate studies (Accenture, 2016; McKinsey Global Institute, 2019) and technofeminism approach (Wajcman, 2007) suggested. Moreover, I link my findings of the women's perceived pressure on an idealized female beauty image to objectification theory by Fredrickson and Roberts (1997), proposing to change their "objectifying gaze" (p. 176) term to an *online gaze* expression.

This study contributes to the ongoing discussion of a lower number of women in STEM areas in comparison to the amount of men, connecting it to the reproduction of dominant gendered stereotypes. Perceptions of STEM seem to still be gender-stereotyped although men and women have equal rights, access and decision-making opportunities when it comes to STEM-related subjects. With my study, I also show in what way Gen Z women perceive pressures laid upon them by social media. It adds to the literature on the consequences of social media consumption for women by shifting objectification theory into the digital age. I find that the digitization wave of the past years did not erase perceived gender inequalities for women, as some studies have proposed. The pressures 'in real life'

have simply been replicated online or have become even more explicit and present via social media. Plus, this study weighs in on works on contradicting stereotypes, especially those related to gender and technology. Largely, it answers the call to understand where women see obstacles of realizing their life's interests and where they experience discrimination (Degele & Winker, 2011).

Generation Z: The Digital Natives

As with every work on a generational group, there is not one definite birth date demarcation of one cohort from the other, which is true for Gen Z, too. In this case, the decision was made to focus on those born in 1995 and later (Fratrièová & Kirchmayer, 2018; Kick, Contacos-Sawyer, & Thomas, 2015; Maioli, 2017). Gen Z grow up with an emphasis on globalization, digitization, multi-culturalization and academization and tend to strive for autonomy, flexibility and transparency (Lackner, 2018). They have a desire for individuality, whereas they have no problem connecting with other people or devices instantly. More than any generation before them, they can smoothly collaborate with people of different and diverse backgrounds. They are challenging the status quo and demand an explanation and legitimation for certain principles in society and in the work place. Easily bored, they enjoy doing multiple things at once and perform their research online for whatever knowledge gap they want to fill. They are determined to fulfill their aspirations and place a strong emphasis on their educational background (Chillakuri & Mahanandia, 2018).

Gen Z Women and STEM: Not Quite Appealing (Yet)

Already at elementary school age, teachers assume that boys are naturally more gifted at math, and girls believe themselves to be less skilled in that subject (Heyder, Steinmayr, & Kessels, 2019). And, as children grow older, gender differences of interest in STEM subjects become even stronger (Barth & Masters, 2020). In addition, elementary school teachers are predominantly female and, if they have a fear of mathematics themselves, they will transfer

their anxiety to the students (Ruef, Willingham, & Sweeny, 2020). In general, many studies

have concentrated on the stereotypical association between STEM subjects and men and how

this association influences the lack of women in those subjects (Heyder & Kessels, 2013). In

society at large, there appears to be a link between being good at math and being utterly

smart, while the latter is also associated with something inherently male, the combination of

which leads to a lack of self-confidence by women regarding math careers (Chestnut, Lei,

Leslie, & Cimpian, 2018). An extensive study by Ihsen et al. (2014) finds that even though

women are socially integrated in degree programs in the areas of STEM, at the latest when

they have a job, they have to prove themselves more, especially at work, in order to be

accepted by their peers and for their professional knowledge. Moreover, we have apparently

not yet overcome the ultimate association of a sense of innovation with men (Ranga &

Etzkowitz, 2010), with researchers still wondering: "can we be innovative in science and

technology while furthering the education and career advancement of women of all

backgrounds in these fields?" (Perez-Felkner, 2020, p. 357).

Looking at the number of bachelor and PhD students in areas that commonly seem to

require an innate intelligence, fewer women decide for an academic endeavor in these areas

(Storage, Horne, Cimpian, & Leslie, 2016). Referring to the number of students in STEM

fields in Germany during the winter semester of 2018/2019, there were 1,094,544 students in

total, 756,412 (ca. 69%) of whom were male and 338,312 female (ca. 31%) (Statistisches

Bundesamt, 2019b). To cater to Perez-Felkner's (2018) criticism about higher education

research on the STEM gender gap, in which context she finds many studies to lump all

STEM subjects together, the numbers vary in Germany for the individual subjects, too. For

example, of all university graduates in Germany in 2018, in biology 65.1%, in chemistry

39.4%, and in process engineering 37.7% were female respectively (Statistisches Bundesamt,

2019a). Furthermore, the low female percentage of all employed STEM academics and

STEM professionals in Germany from 2011 to 2016 has hardly changed during this period: it was between 20.2% and 21.7% for STEM academics and 11.6% to 11% for STEM professionals (IW Köln, 2019).

Gen Z Women and Social Media: Constant Occupation and Decisive Consequences

In a recent report about the digitization status of the German population, the D21 Digital Index of 2018/2019 gives the following numbers for the age group covering people from Gen Z in Germany: 98% to 99% of them are surfing online, with 89% to 93% doing so on their mobile devices as almost all of them use at least one social media app. In comparison to the average German population, whose digitization degree is 55 (of 100), they have a high digitization degree of 72 (Initiative D21 e.V., 2019). Also, this age group spends the most amount of time online compared to any other age group: 344 minutes on a daily basis (ZDF & ARD, 2018). 83% of them state that they try to stay up to date with technology, and 75% cannot imagine life without the Internet (Ipos, 2017). The reasons for their social media usage can be outside factors happening in the world and are mostly individual factors (Prakash Yadav & Rai, 2017).

With regard to their online activity, influencers on Instagram seem to play a role in Gen Z's social media usage (DIVSI, 2018); so do make-up tutorials on YouTube (Appinio, 2018). However, a formerly successful influencer on Instagram who quit the app criticized "the staged and contrived nature of social media, and society's overemphasis on women's appearance" (Fardouly & Holland, 2018, p. 4312). It is not only influencers who receive attention from Gen Z, it is also their friends they have great interest in online: 86% frequently watch Snaps from people they know personally on Snapchat (Mpfs, 2018a), and 82% follow people on Instagram who they know directly (Mpfs, 2018b). On these apps, they are also satisfying their desire for attention, self-promotion, and self-marketing (Lackner, 2018).

Many studies have described a variety of negative social media effects, especially for women: Women equally compare themselves to famous people on Instagram as well as to content posted by their peer group (Fardouly, Willburger, & Vartanian, 2017), all the while pictures uploaded on social media can be unrealistic and appear flawless (Fardouly & Vartanian, 2016). In addition, viewing skinny women – famous or unknown – on Instagram leads young women to have unpleasant feelings and experience unhappiness with their own body (Brown & Tiggemann, 2016). This is especially true for so-called fitspiration photos, in which people show their work-out routine or muscular bodies (Prichard, Kavanagh, Mulgrew, Lim, & Tiggemann, 2020). Both one's body image and satisfaction with one's face can become negatively influenced by Instagram, particularly if a photo is marked as non-edited (Tiggemann & Zinoviev, 2019). This is linked to young women having the tendency to post more selfies than men and older people (Song, Han, Lee, & Kim, 2018). Fardouly and Vartanian (2016) analyzed the literature on the connection between social media and body image and found that using social media, especially engaging in comparisons to other people, causes worries with one's own body image. The body image term includes "body dissatisfaction, drive for thinness/muscularity, and self-objectification" (Fardouly & Vartanian, 2016, p. 1). Also, looking at unrealistic photos of other women enhances disappointment with one's own body more than watching something unrelated to physical appearance, such as travel images (Fardouly & Holland, 2018). Furthermore, being present on social media can give way to eating disorders (Holland & Tiggemann, 2016), and frequent Instagram usage is linked to orthorexia nervosa, in which a person is fixated on eating healthily (Turner & Lefevre, 2017). It comes as no surprise that brain researchers found a link between young adults viewing their own photo receiving a lot of 'likes' on Instagram and a connected reaction in the rewards area of the brain. In this context, people gain an understanding of their peer milieu through popular pictures on social media (Sherman,

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Greenfield, Hernandez, & Dapretto, 2017), which can in turn influence their own behavior online.

Theory

Studies continuously highlight how gender and technology stereotypes prevail (Balsamo, 2014; Girls Who Code, 2019; McLaughlin et al., 2012) and that these stereotypes are positive for men and negative for women (Balsamo, 2014; Ihsen et al., 2014; Kronberger & Horwath, 2013; Kuchynka et al., 2018; Maass & Rommes, 2007; Nurlu, 2017; Tallon, 2019). Stereotypes are defined as "a summary characterization of a human group, usually arising from and fortifying prejudices for or against that group, and used as a template into which individual members of the group are made to fit" (Scruton, 2007, p. 665). With Gen Z women taking part in STEM classes at school or having recently decided on an educational or professional career path connected to STEM or aimed in a different direction, they might have come across STEM-related statements, due to their age and the life phase they are currently in. Having been surrounded by digital technologies their whole life, does growing up in a digitized environment have an influence on the perception of gendered stereotypes of technology? This question led me to the following literature.

Digitization as an Opportunity for Gender Equality?

Given the rise of automation technology, there is potential for women to take an active role in their jobs against previous structures that have kept them from striving at work, which, according to the McKinsey Global Institute (2019), could lead to "more gender equality in the workforce" (p. 21) and "can help tackle concerns about inbuilt gender bias in AI algorithms" (p. 25). Also, there is potential for digitally skilled women to become entrepreneurs (Ughetto, Rossi, Audretsch, & Lehmann, 2020). Other corporate studies also disclose how the digital transformation can function as an equalizer for women at work with digital skills enabling women for a better positioning in their job (Accenture, 2016). The

foundation for a certain level of digital literacy is grounded in opting for STEM subjects in school and/or at university, which is the reason to focus in this study on Gen Z as they are in the relevant age group to make the respective decisions.

The technofeminism branch within feminist studies by Wajcman (2007) also implies possibilities in the direction of gender equality through digital technology. She annotates that feminist research sees new technologies as a chance to diminish power relations of technology as gender does not seem to play a role in the creation and usage of digital technology (Wajcman, 2006). This idea got extended through the cyberfeminism wave stating that digital technologies equalize society and genders because in front of the digital product, one is anonymous and does not inherently object societal definitions of gender (Wajcman, 2006). Wajcman (2007) proclaims that "digital technologies, based on brain rather than brawn, on networks rather than hierarchy, herald a new relationship between women and machines" (p. 291).

However, technologies are not inherently built in an objective manner; quite the contrary, they contain social values, prejudices, and the judgments ascribed to them by their respective designers, even unintentionally (Simon, 2016). This is one of the many reasons why experts in algorithm research are shining a spotlight on how algorithms in decision-making systems can only obey to one quality measure, which is why it is recommended to use multiple algorithmic systems in order to guarantee for manifold ideas and opinions (Zweig & Krafft, 2018). Here, the question would otherwise be: who makes the decision on that one quality measure?

Objectification Theory: Women Are Constantly Aware of Others' Scrutinizing Eyes

As Gen Z spends an average of almost six hours online every day in Germany (ZDF & ARD, 2018) – other statistics even say that the Gen Z cohort spends more than eleven hours online each day (Abramovich, 2019) – their presence is not only experienced by

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interactions with other people 'in real life'; they also undergo social contacts and communication online. They are equally subjected to opinions, judgements, expectations and, quite literally, views online. This is where I make a link to objectification theory by Fredrickson and Roberts (1997), which spotlights how women and girls internalize the gaze and the notice of others on their appearance. The authors identify implications when women's bodies fall prey to sexual objectification, which they define as "the experience of being treated *as a body* (or collection of body parts) valued predominantly for its use to (or consumption by) others" (Fredrickson & Roberts, 1997, p. 174). Importantly, they recognize the consequences for women of constant and continual remarks by other people – mainly other men – objectifying their body: women adopt the spectator's view. In short, women learn to look at their bodies in the way that men do. The reasons why women follow the viewpoint of men are manifold: having an appearance which is commonly referred to as attractive helps women at school, on the job, in romantic relationships, and in the realm of socioeconomic power. Therefore, women might unconsciously or deliberately adapt to their environment's beauty standards in order to control or enhance their individual positioning within society and their current stage of life (Fredrickson & Roberts, 1997). The authors conclude that this "is of peculiar perspective on self, one that can lead to a form of self-consciousness characterized by habitual monitoring of the body's outward appearance" (Fredrickson & Roberts, 1997, p. 180). As a result, there is a reinforcement for women to maintain a specific beauty ideal as the norm and, moreover, to internalize it in the way they view themselves. Objectification theory provides a theoretical background for "understanding the psychology of women" (Fredrickson & Roberts, 1997, p. 180), and, given that social media is such a dominant component in Gen Z women's lives, I find a connection between the two. Whereas Fredrickson and Roberts (1997) name examples of how print, visual, and mass media recreate the sexually objectifying gaze, I propose the term *online gaze* with Gen

Z constantly being online. Here, they are exposed to countless images of women and additionally have an insight into other people's opinions on those photos and videos through 'likes' or comments. What is more, where in print, visual and mass media, the curators of sexualized images of women consisted of a limited group of (mostly male) people, it is now women themselves who are the content creators. These women can be celebrities and influencers, comparable to the stars of print, visual and mess media or they can just as well be Gen Z's peer group and friends. Thus, where Fredrickson's and Roberts' (1997) *objectifying gaze* is a male one, I give the *online gaze* the addendum of being a collective one because the originators are not necessarily men.

Gendered Stereotypes and Expectations in Connection to Technology-Related Areas Influence Gen Z Women

Taking the aforementioned literature and theoretical review together, the two technology-related fields Gen Z women encounter in their current life phase in the professional and in the private – STEM and social media – make way for a peculiar connection that could indirectly influence gendered technology stereotypes. Apparently, the amount of women deciding for a STEM directed path is still lower than the amount of men even though there are initiatives such as the Girls'Day. Since its initial start in 2001, the Girls'Day annually encourages young women to peek inside professional areas with low numbers of women, specifically in the areas of STEM and technology (Girls'Day, 2020). Furthermore, expectations sensed through social media will probably not diminish in the next couple of years with 35% of social media users in Germany in 2017 stating that they would like to be successful influencers and 56% finding influencer to be a normal job (Bitkom, 2018). The explanation for the ongoing lack of women in the educational, academic and professional sectors of STEM must have more underlying reasons, which could origin in deeply rooted gendered technology-related stereotypes that interfere with other societal

expectations posed upon women. This study wants to explore how the combination of the perception of gendered technology stereotypes in the professional and in the private affect one another and influences Gen Z women in their career choices.

Methods

Participants

One-on-one qualitative semi-structured in-depth interviews were conducted with 20 women born between 1995 and 2001 and living in the southwest of Germany. At the point in time of the interview, the women were between 18 and 24 years old and none of them was fully employed. They were, variously, in school and at the end of their secondary education, in a gap year between school and the next step in their education, in an apprenticeship, or enrolled as students. As I am interested in women who grew up with digital technologies, requirements to participate in my study comprised a year of birth between 1995 and 2001, identifying as a woman, speaking German, living in Germany, having fulfilled or currently attending a German school system without being a full-time employee yet. These were posted and shared on my social media accounts, which is how I reached a total of 20 women through a snowball system (Noy, 2008). Table 6 gives an overview of the participants' year of birth, age at the time of the interview, educational background and current occupation.

Interviews

The interviews were held in the back office of a café located in the middle of the city which was easy to reach and regularly frequented by most of the interviewees. The interviewee and interviewer sat at a table in the back office, thus guaranteeing a private exchange. Before the conversations, the interviewees were informed that the interaction would be taped and later transcribed verbatim. The participants were ensured of their anonymity and reminded that they were able to pause or stop the interview altogether at any time. All interviewees were read a consent form followed by an acknowledgement of their

agreement. The interviews lasted between 30 and 56 minutes and took place in the beginning of 2020.

The interview procedure follows the one presented in the methods paragraph of chapter 2. A brief outline of the process shall be presented here: Based on semi-structured interview formats (Whiting, 2008), I as an interviewer wanted to remain flexible when going through the interview guide (see Appendix B) and I did not necessarily ask questions in a linear manner. This way, I wanted to have room for open-ended questions (Millwood & Heath, 2000). Through this qualitative in-depth interview approach, I aspired to share a somewhat regular interaction with my interviewees. This includes the integration of ad-hoc questions depending on the interviewees' remarks (Whiting, 2008), which enables a deep-dive conversation (Barriball & While, 1994). As I followed a constructivist view of grounded theory, my interaction with the participants was crucial and guided in forming further interview questions (Thornberg & Charmaz, 2014). Of course, "self-reflexivity is not, and cannot be, an entirely individualized project […] because even in its self-consciously self-fashioning form it is nonetheless enabled and constrained by social context, cultural resources and relations with others" (Jackson, 2010, p. 26). For my study on the Gen Z women, I also opted for a qualitative interview approach because I was again interested in the participants' perceptions. I wanted to understand their subjective perspective, how they grasp and explain their reality in connection to their environment. Specifically, the interaction of subjective reasoning and outside impressions was of interest. A strict quantitative set and sequence of questions would have prevented the possibility to delve into the women's statements and to reveal their perceptions.

Having interviewed 20 women, a level of both saturation (Mason, 2010) and redundancy (Cleary et al., 2014) was approached, which caused me to stop data collection. Some researchers have made the case for not shying away from smaller sample sizes,

especially in the realm of parity in the STEM fields (Pawley, 2020). Afterwards, the interviews were transcribed following Höld's (2009) principles of verbatim transcription of audio data, which is shown in the English translation of the representational quotes in the results and the tables. Whereas German orthography was considered, the grammar used by the interviewees was not corrected. In the quotes, the interviewer is referred to via "M0" whereas the Gen Z women were given the letter "M" and an assigned number from 1 to 20.

Analysis

For the analysis, I referred to Braun and Clarke's (2006) thematic analysis approach, which I presented in the methods paragraph of chapter 2. Using this approach, I made an active decision before deep diving in the transcriptions of the interviews so that "the theoretical framework and methods match what the researcher wants to know" (Braun & Clarke, 2006, p. 80). In line with the theoretical thematic analysis approach of "less a rich description of the data overall, and more a detailed analysis of some aspect of the data" (Braun & Clarke, 2006, p. 84), I looked for repetitions of topics within the interviews in relation to the research interest regarding Gen Z women's perceptions of gendered stereotypes about STEM. Furthermore, motives related to female Gen Z's perceived expectations placed on them by social media because of their gender were searched for. The themes that came to light were "interest", "expectations" and "handling". In the next step of open coding, going through the transcriptions line by line and moving within the data, codes emerged such as: "explanations for interest", "female interest in technology", "male interest in technology", "dealing with expectations", "expectations on women", "expectations on the young", "assessment of personal handling of technology", "technology = difficult", "proportion of men and women", "influence on young women", "social media = social link", "handling technology old versus young". In the following step of focused and selective coding I aimed at the most expressive and symbolic codes and searched for similarities across

interviews. I also related my codes to the already found themes and connected them to my research interest of how Gen Z women perceive gendered technology stereotypes in the professional (STEM) and in the private (social media). Here, I grouped the codes in relation to "male gendered STEM stereotypes" and "female gendered STEM stereotypes" together to describe Gen Z's perception of gendered stereotypes of interest in STEM. An overview of this main category "gendered stereotypes of interest in STEM" and the respective data can be found in Table 7. Furthermore, I collected the codes that could be grouped to "social media as a source of (unrealistic) lifestyle inspiration" and "pressure to post content and to follow exaggerated beauty and body ideals" to explain the interviewees' perceived perfectionism on social media. An overview of this main category "perceived perfectionism on social media" and the respective data can be found in Table 8.

Results

Gendered Stereotypes of Interest in STEM Prevail and Makes STEM Interested Women Seem Particularly Passionate

Gendered stereotypes about interest in STEM present men as interested and women as not as interested

The interviewed women referred to gendered stereotypes of STEM interest which paints men as inherently interested or talented in STEM subjects: "it is just, with the boys, they are mostly just, yes, I would not say, just more talented in math, but somehow they have more of this, this, sometimes I have the feeling, they have this basic understanding" (M17) and "it is also the case that men often have more skills for math and computer science somehow, they may have more skills, already at school" (M10). For women, it is quite the opposite – they seem to be not as interested in STEM: "it is just like that, women are not that interested in it [STEM], I have the feeling, it was like that already at school" (M06) and "there are also girls who are interested in it, but just, I think, yes, the number of girls who are

interested in that [STEM] and also, let's say, are good in such [STEM] subjects, I think, are low" (M12).

STEM interested women appear to be extraordinarily passionate

Some of the interviewed women acknowledged awareness of such categorizations: "because it is actually a prejudice that boys are better at science subjects or are more talented there" (M09) and "it is more expected from men because people know that it is, that more men study such [STEM] subjects or are good at such [STEM] subjects because, I also know a lot of men who do not like science subjects, who also like linguistic subjects. That is why, I know that there is this prejudice" (M15). It appears as if these gendered stereotypes lead the interviewees to find women who do follow an interest in STEM fields to be particularly enthusiastic about it: "but I always had the impression that these are always people who are really passionate about it, especially as a woman [...] and the women I know now who study math and physics are like "oah, I want math", they want exactly that, yes" (M13) or "she always wanted to do that, that's her topic, that is, she also still has, she is also not a dropout, there are many who then start physics or computer science, math and then drop out, "no, it is not [the right thing]", but she does it with passion" (M08). For more quotes on gendered stereotypes of interest in STEM, please refer to Table 7.

Young Women Feel Pressured by Perceived Perfectionism on Social Media

Social media as a source of (unrealistic) lifestyle inspiration

The content the women who were interviewed consume on social media is manifold but mainly revolves around lifestyle inspiration. This includes fashion (M16: "inspiration for outfits") as well as interior design (M12: "also a bit interior design, I follow relatively many pages"). Food and sustainability also play a role: "that I try to take over something, be it recipes or this zero waste thing, also a lot" (M13). However, the interviewed women were aware of the unrealistic depiction of life thereby, be it from influencers who earn money on

Instagram or from people they know personally. One of them summed it up by covering both: "I have unfollowed a lot of influencers lately because I think it is not real life and sometimes it makes you so sad when you sit on the couch at home and you think "my life is so boring and they all look so good"" or "Instagram is typically that you can show everyone something, that actually, that you do maybe once a month and otherwise life is also dreary!" (both M10).

Pressure to post content and to follow exaggerated beauty and body ideals

The participants noted that they and their female friends feel pressured to produce content on Instagram, especially in their Instastory: "But all of my friends, I have really bad ones, who are, wherever I go with them, they take a photo of everything, [make a] boomerang, when we, every, when we make a toast somewhere" (M01). What is more, they mention a strong emphasis on exaggerated beauty ideals, with regards to the overall look and also by referring to body images that are unrealistic: "I think Instagram is also difficult with respect to, because so many body ideals that are constantly shown, for example the Kardashians and then, I have no idea, Victoria Secret Angels. I just heard a podcast about it […] she talked about it being so difficult because whenever she's on Instagram, she's actually unhappy because she only sees pictures of people who are thin and have so much fun and are always on vacation and she's like "huh, why not me?"" (M17). Or: "I don't like pictures of me. So I hate pictures of myself, I don't take pictures of myself and I don't feel like being under the pressure of constantly having to post any pictures of myself where I look perfect or anything and I think my self-esteem would suffer when I always had to look at all the models and perfect pictures of others, who are also not perfect and I don't know how often they are edited, but I think that would give me a bad feeling, yes, that's why I don't like it" (M11). M20 sums it up by saying "I also have the feeling that women also totally compare themselves to each other, it's always about who is more beautiful, and that's also when we come to digitization, which is also a huge problem through Instagram, because you see

always these ridiculous Victoria's Secret models who are even thinner, who look even better, who have more money, you know? So even more money is not difficult [laughs] but you know how I mean that, there is always, you always have this comparison, principally". For more quotes on the perceived perfectionism on social media, please refer to Table 8.

Discussion

It appears that stereotypes regarding gender and technology are still prevalent for young women in the respective environments these categorizations come into play. Seemingly, an exposure and familiarity to digitized products – and having grown up in a digitized environment – does not protect women from gendered and unequal judgement. For STEM subjects, the old notion of the technology-interested man versus the technology-incompetent woman (Maass et al., 2007) still exists and might be influential in holding Gen Z women back from pursuing a STEM-led career path. An aspect of such stereotyping are assumptions that it is somewhat inherently given that women are not as good and comfortable in science, technology and math-related studies and working areas (Horwath, Kronberger, & Appel, 2014). Women using typical male behavior are not celebrated (Marsden, Link, & Büllesfeld, 2014) and apparently need to be extraordinarily passionate if they contradict their gendered stereotype. With regard to social media, the previous pressure of beauty ideals for women in real life as well as in mass media are being replicated on and transmitted to online platforms. This is where I make a link to the objectification theory by Fredrickson and Roberts (1997), which proclaims that women learn to look at their bodies the way that men do. When applied to the sentiments regarding the beauty ideal made by the Gen Z women in this study, it appears as if social media has paved the way for them to internalize not only the *objectifying (male) gaze* but also the *(collective) online gaze*. Young women notice how their peers are presenting themselves on social media and what they get admired and receive 'likes' for. As a result, they repeat these beauty standards by way of the photos they are

themselves posting since they are looking for online praise as well. Social media plays such a dominant role in the life of Gen Z, and they spend many hours each day looking at the content their peers post – which stands in contrast to the mass media, the content of which was not created by young people. Therefore, Gen Z women have an immediate insight into the output uploaded by their peers while also receiving direct feedback through reactions and 'likes' about their own content. Where Fredrickson's and Roberts' (1997) *objectifying gaze* is a predominantly male one, I give the *online gaze* the addendum of it being a collective one. On Instagram, we see the amount of 'likes' someone receives for a photo and that number is representative for this collective approving the picture. This collective is an imperceptible mass without distinguishable characteristics – the only thing we know about it is the amount of 'likes' it accumulated and that is exactly from which it draws its power.

Gen Z Women Face Conflicting Expectations With Interest in STEM and Through Social Media

When connecting these two findings regarding gendered stereotypes about STEM and expectations felt through social media, I think back to the quote at the very beginning, in which one of the interviewees talked about a young woman who was afraid to voice her affection for physics while making sure to being perceived by others as beautiful. This is where the two stereotypes, or expectations, collide: if a Gen Z woman is interested in STEM and therefore overlaps with the male stereotype of being fascinated by STEM, her perceived level of attractiveness seems to then also follow the stereotype of the STEM-interested man as someone who is not bothered by any beauty ideals. A representative quote by M10 gives an example of women who choose a STEM subject in university without caring too much about their looks: "and the girls, they didn't look like they were utterly interested in fashion or anything else, [they] just tied up their hair kind of, without [putting on] make-up and [just wearing a] sweater". Hence, in order for a woman to be interested in STEM while also

remaining attractive as a woman per se, she needs to obey to a double standard: she can be interested in STEM but, to also be accepted and praised by her (online) peers who are influenced by the *online gaze*, she needs to be good-looking and take care of her appearance in accordance with celebrity-like beauty norms.

Does contradicting a female stereotype in a male-dominated area mean that women need to emphasize the existing female expectations in a female-dominated area in order to be accepted by their peer group? The continued example given by interviewee M04 highlighted these contrasting directions of male gendered stereotypes versus female-led expectations:

"there was this girl, she was absolutely fancy, just how you would imagine a typical girl to be, long hair, always make up on, never differently, always dressed up nice, mostly high heels, skirts and something and she also acted like that with the boys and everyone else. So it was okay for her to be like that. And she also somehow never let it show that she is actually super intelligent. She then took physics major and she never told her grades or so, she always acted like "oh yes, I don't understand it" or so and then preferred to party with them and then still in every physics test had 15 points [A+]" (M04).

Limitations & Avenues of Research

Gender still plays a crucial role in the two technology-related areas closest to Gen Z women in the professional and in the private, STEM subjects and social media respectively. A variety of factors play into the interwoven net of gendered stereotypes, in this case where female interest in STEM is rather noteworthy than left uncommented, and where young women feel the pressure of conforming to an idealized beauty standard on social media. I am aware that the stereotypes focused upon in this study are not the only ones young women face in their everyday life, and that many other social categories influence their realities. My study

is limited to Gen Z women living in Germany and future research could include more or a combination of other social categories.

What are the consequences for young women on a daily basis if they have to face variously stereotyped judgements for their behavior and actions, depending on whether they become positively or negatively evaluated for women? Generally, gendered stereotypes need to be reduced in order for women to have free choice – whether that means a subject in school and a related profession, or expressing themselves without expecting judgments by others on their looks. Future research might focus on further consequences affecting STEM-interested women in other aspects of life in order to show their lived experiences of contradicting the stereotype.

Additionally, with regard to the *(collective) online gaze*, new studies could shed more light on body positivity accounts, which a few of this study's interviewees mentioned. How is the perspective of women who contradict the idealized beauty norms? The intersectional aspect of gendered experiences (Crewnshaw, 2017) still has a lot to offer since lived realities are individually complex and give endless food for discussion.

To gain another viewpoint, the perspective of Gen Z men on typical female career paths in combination with their perception of pressures on masculine looking ideals could give meaningful insights on conflicting gendered stereotypes for men. Such a study could present different findings than the ones I reported as an analysis by Hentschel, Braun, Peus and Frey (2018) discovers how it can have positive effects for men to show communal characteristics that usually align with female gendered stereotypes. Moreover, as within this qualitative study "individuals can experience a situation in question in very different ways" (Hancock, 2016, p. 111), a quantitative approach with a bigger sample size could test this study's generalizability.

Implications: Individual and Societal Changes are Necessary

To reduce the prevalence of gendered stereotypes of interest in STEM, parents and educators could reduce the voicing of assumptions conforming the social standard of male interest in STEM and include female interest in STEM as a given condition just as well. Moreover, teachers in school could encourage girls to pursue STEM subjects. An overview of different ways of effectiveness and sustainability analyses on such STEM projects with regard to gender can be found in Schneider and Ihsen (2014). In media, women in STEM could get more coverage and have therefore more representation, which would then become part of general cultural consumption. This way, young women might find it more socially acceptable to follow a STEM path, which could eventually increase the numbers of female STEM students and professionals. It could become more common to have women in STEM-related areas, making gendered stereotypes appear obsolete. The United Nations digital gender equality report also generally calls "for reshaping deeply ingrained social norms and practices (such as gender stereotypes)" (Sey & Hafkin, 2019, p. 19) in order to reduce digital inequality.

With regard to the aforementioned *online gaze* with which young women are confronted on social media, there seems to be a general need for society to get rid of unrealistic beauty standards for women. But action is needed on the part of women, too. As they echo the idealized version of such beauty norms for women, they repeat and reinforce a form of beauty perfection that puts pressure on other women. By maintaining this beauty ideal, it becomes normal and a point of reference that is impossible to conform for everyone. It can additionally create pressures which could lead to depressed mental states. How can this vicious cycle be passé if women still get praised and receive 'likes' for a pre-defined look?

Gendered Stereotypes are Not One-Dimensional But Rather Affect One Another

Gen Z women still find that gendered stereotypes of interest in STEM are widespread. This is in line with Kent, John and Robnett (2020) who found that female undergraduates name stereotypes and a lack of confidence to explain the lower number of women in STEM. The latter can be linked to the participants' remarks that women who are interested in STEM appear to be extraordinarily passionate about it. Von Keyserlingk, Becker and Jansen (2020) also found girls in Germany to be more critical about their own accomplishments in math. Being faced with male gendered stereotypes in one area, such as STEM, is not a one-dimensional problem, but rather a complex issue which also has consequences for Gen Z women in other aspects of life: As if to make up for the missing femininity due to an interest in STEM, young women can feel the need to make sure they care about their womanly appearance in order to avoid being regarded as nerdy and not feminine-like. The pressure on women to fulfill a certain beauty and body ideal is multiplied by social media and the women's alertness of the *online gaze*. Therefore, it is crucial to bear in mind how Gen Z women's handling of simultaneous alignment and disobedience with stereotypical expectations tremendously influences their private life and career path.

Appendix B

Interview Guide

1) Introductory questions | Current status
   - How old are you and in what year were you born?
   - What are you currently doing?
   - What job do you want to work in?
   - Do you want to pursue a career? What do you think you will need for that? In what way is it connected to digitization?
   - How technologized would you describe your school / university / apprenticeship / work place? From institutional side and the related people but also your personal side, the work you have to do?
   - Would you wish here for more or less?

2) Digital Native vs. Digital Immigrant
   a. Digital Native
      - Have you heard of the term "Digital Native"?
      - What do you make of it?
      - When media talks about "Digital Natives", do you identify yourself with it or see yourself represented?
      - How do you think will digitization influence our lives in the future?

   b. Digital Immigrant
      - Have you heard of the term "Digital Immigrant"?
      - What do you make of it?
      - How do you perceive the digital technology usage of older people?
      - How do you perceive the digital technology usage of older women, your mom or your grandmother?
      - Is there something regarding the smartphone / laptop / computer that your grandparents could teach you? If yes, what would that be?

3) Technology
   a. Technology usage
      - How much time do you spend on your smartphone?
      - How much time do you spend on your laptop / iPad?
      - What kind of apps do you use most?
      - Are there apps you would not use if it was not for your friends using them?
      - Do you sometimes talk about some apps with your friends? If so, which ones?
      - How do you perceive the smartphone usage in your friends circle?

- Do you find differences between boys and girls?
- How would you rate your competence in handling digital technologies?

b. Numbers in current occupation
- How is the distribution between men and women?
- Do you see differences between men and women?
- In Germany, about 30% of people studying STEM subjects are female: how come?
- Do you have female friends that study in any STEM subject and what do they tell you about it?
- Do you come across stereotypes on women and tech or men and tech in your everyday life?
- How do you evaluate them?

4) Female Gen Z
  a. Age-related expectations
  - How do you see society in Germany perceiving people your age?
  - Are there any expectations posed on young people in Germany nowadays?
  - Are there any expectations posed on you from your environment as a young person?
  b. Gender-related expectations
  - Are there any expectations posed on you from your environment as a woman? … as a young woman?
  - What do you think of the women's quota?

Table 6. Participants Generation Z Overview

Birth year	Age	Educational background	Current occupation
1995	24	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	bachelor student
2001	18	higher education, aiming for the 'Abitur'	high school student
1998	22	higher education ('Abitur')	in apprenticeship
1998	21	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	jobbing
1997	22	higher education ('Abitur')	bachelor student
2001	18	higher education, aiming for the 'Abitur'	high school student
1998	21	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	bachelor student
1995	24	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	jobbing
1996	23	higher education ('Abitur')	bachelor student
1998	21	higher education ('Abitur')	bachelor student
2000	19	higher education, aiming for the 'Abitur'	high school student
1999	20	higher education ('Abitur')	bachelor student
1995	24	secondary school certificate ('Realschulabschluss')	in apprenticeship
1998	21	higher education ('Abitur')	bachelor student

Table 7. Gendered Stereotypes of Interest in STEM

Description	Quotes
	gendered stereotypes of interest in STEM present men as interested and women as not as interested
male gendered STEM stereotypes	M15 but otherwise I tend to know more men who were interested in such science subjects M12 I think it's something more for boys, it was like that at school already, in chemistry the proportion of boys was way bigger, so, yes, so I would now, yes, I think that for them, such subjects are more for boys than for girls, I also think the interest is even greater with boys and such subjects, yes M09 yes, that they [the girls] might also think, "the boys know better anyway" or something, yes. M03 so it is often counted on that the men [with technology] somehow have a little more knowledge than the women M19 I just think that something like that [math and physics] is often more something for men than women M17 it is just, with the boys, they are mostly just, yes, I would not say, just more talented in math, but somehow they have more of this, this, sometimes I have the feeling, they have this basic understanding M10 well it is a technical university, it's just a lot of mechanical engineering, electrical engineering, computer science and there are more men M10 it is also the case that men often have more skills for math and computer science somehow, they may have more skills, already at school M04 I have a few people, mainly guys from my circle of friends, who have actually studied computer science, math or mechanical engineering or something M01 apart from that it is only men around me who study that [STEM] M07 my sister, she is in training as an orthopedic technician and there, I think there are definitely more boys there, because it still has a lot to do with machines and technology M02 but he also does physics and there are more guys with him again M12 there are a lot of science subjects, so, like math, physics, chemistry, so, these are the biggest, also computer science, are definitely the largest departments, also mechanical engineering or something, that's something way more boys do M16 it is always said that boys study mechanical engineering rather than girls M17 boys are more interested, they go more in the technical direction and build and, don't know ... computer games is also more technical, girls don't do that so often, so maybe we do a bit of Sims, but we don't really do gaming actually so bad. I think that's where it comes from, because we also have in physics a lot of electrical engineering and electronics

female gendered STEM stereotypes	M17 you do hear a lot of, that many just, a lot of the girls don't understand it, the math and physics stuff. When I say that I have physics major, the reaction is still "what?! Oha!" and you can see with that a little bit that girls don't get it that much, they are probably just not that interested
	M09 maybe, I don't know, maybe women don't enjoy it as much as men? I don't know, just don't really care about it in general, simply because, for example, women don't play that much PS4 and stuff or computer games
	M06 it is just like that, women are not that interested in it [STEM], I have the feeling, it was like that already at school
	M20 a [female] friend of mine, she studies civil engineering, very funny, here in [name city] I think you can, think business, no civil engineering I think and she also somehow thought that somehow the women who are, they are somehow lesbian. I don't know if she just said that, but it fits a little bit into the picture again, you know what I mean? So, as I said, I say it again so stereotypically, I personally don't feel it that way, I always find it difficult, if you assume that – she just said it like that and then I thought, yes ... that could be, it's something kind of masculine, right?
	M17 I think girls are a little bit more astonished [about my choice of STEM major in school] because they can't really relate to it themselves, the boys are more likely like "oh yes, I didn't expect it, but ..."; the girls "really? Oh god, no, I directly cancelled physics [in school]"
	M10 in my class, there were, don't know, it was the way you would imagine a girl [only] class to be, no one was enthusiastic about a crafting job or simply thinking about it
	M07 I could only imagine that it's still, not weird, but that it is rare that a girl has something to do with technology and standing on the polisher machine
	M12 there are also girls who are interested in it, but just, I think, yes, the number of girls who are interested in that [STEM] and also, let's say, are good in such [STEM] subjects, I think, are less
	M12 that you could perhaps give more examples that girls can relate to more, than if I now have a 60-year-old physics professor at the front, who explains to me how the engine of this and that car, of that car works, I don't think that's so interesting now. I look at a car, which color it has and don't know, I can't tell you more than that, maybe bring examples that were more interesting for girls or so
	M16 then it's those girls who do something with science, they study biology with or just a little bit with chemistry, but otherwise not at all. One is studying business informatics, but I think that's the exception with us
	M16 well my other [female] friends don't like it at all, so most of them have nothing to do with science, math; the boys do more

STEM interested women need to be extra-ordinarily passionate	M13 but I always had the impression that these are always people who are really passionate about it, especially as a woman [...] and the women I know now who study math and physics are like "oah, I want math", they want exactly that, yes
	M10 and she always liked to do math and she had chemistry as a major and she really wanted to study chemistry
	M08 she always wanted to do that, that's her topic, that is, she also still has, she is also not a dropout, there are many who then start physics or computer science, math and then drop out, "no, not really", but she does it with passion
	M02 she's just way more interested in it [computer science] and she enjoys it
	M03 yes, one a little bit, but also because, she plays a lot on the computer and then when you have to download something or install Windows or something, I think it just happens that you develop an interest in it
	M10 and she's really good at it [biochemistry engineering] actually and she enjoys it, has way more interest in it
	M06 those who were good in physics, they simply enjoyed it, well to calculate it and so and just, I have to say, I have enjoyed it, too actually
	M16 you do notice that people think that really only boys study it, so you get that a little bit and that these then, there's this feeling in the air of "yes, assert yourself between all those guys"
	M05 when you have had a conversation with boys, and for example, the [female] friend who is now studying biochemical engineering, when she said that, the boys immediately said "really? I wouldn't have expected that" and so or "do you really like it?" and so questioning, that actually, so you, if a boy had said that, they would have said "ah okay, cool", but because it was a girl, they are so amazed, I would say and yes, I think it shows that, so it's more of a male-dominated profession

Table 8. Perceived Perfectionism on Social Media

Description	Quotes
social media as a source of (unrealistic) lifestyle	M06 with one [female] of them, you see those beautiful rooms
	M10 so I'm a lot on Instagram, so looking and scrolling, also for inspiration, so no idea, fashion or anything or interior
	M07 I also know some people who use Pinterest a lot, just for inspiration like how you decorate your room
	M10 and especially with all these influencers, where you might get some impressions, especially with fashion

inspiration	and travel
	M16 inspirations for outfits or something like that
	M19 yes, sometimes, if they somehow like, I still remember that one [female] advertised something like, how do you say, hair drying brush, and she advertised it like that and I always thought about getting one and then she advised it and then I thought "come on, I'll try it out now" and then I ordered it, too
	M13 no, in any case always so that I try to adopt something, be it recipes or this zero waste thing, also a lot, sort of a bit, sort of to see what is going on with the things, that you can adjust to little by little, but never to just look at it
	M16 because I was a vegetarian and I switched to vegan in October and I sometimes search like, I tend to follow some influencers who upload recipes or something, just, that you can have a little look, a little inspiration for clothes and food
	M10 so I think that you definitely get pressure through Instagram, also preferably in our age group or a little bit younger … just because all the influencers often lead such a perfect life, have perfect bodies and that, that you just [see] a lot of women, like, that correspond to this perfect ideal picture
	M13 it always depends, of course sometimes I think "oh, that would be really good, that would be really good", but I also know that this is unrealistic for me
	M10 I think you get way too much influenced by these perfect blogger [Instagram] pages and so where you feel bad at some point. I have unfollowed a lot of influencers lately because I think it is not real life and sometimes it makes you so sad when you sit on the couch at home and you think "my life is so boring" and they all look so good
	M20 I also have the feeling that women also totally compare themselves to each other, it's always about who is more beautiful, and that's also when we come to digitization, which is also a huge problem through Instagram, because you see always these ridiculous Victoria's Secret models who are even thinner, who look even better, who have more money, you know? So even more money is not difficult (laughs) but you know how I mean that, there is always, you always have this comparison, principally
	pressure to post content and to follow exaggerated beauty and body ideals
pressure to post content	M20 because it's kind of like, it's such a, it's a part, it's kind of, totally stupid, but it's kind of a part of me, because I regularly post something, I am there regularly
	M10 I don't go out to make an [Insta]story, some do that, I guess
	M10 I don't say "I have to post an [Insta]story", but when it's just cool, then I make an [Insta]story
	M01 but all of my friends, I have really bad ones, who are, wherever I go with them, they take a photo of everything, boomerang, when we, every, when we make a toast somewhere

	M11 I also don't feel like being under the pressure of constantly having to post any pictures of me where I look perfect
	M11 I'm also never the one to get out her phone and say "we have to take a group picture now"
	M11 she's a friend of a friend, she's with us, she constantly takes pictures, I hate it, like "come one, let's take pictures" and that is so annoying and then we take, I don't know how many, 100 pictures and there's always something that's not right and then the nose is stupid and then I think to myself "man, just stay at home if you don't like it anyway!"
	M12 they're like "oh, I'd like to put that in my [Insta]story" and then you have to wait, until they, for example, when we go out to eat or so, then you have to wait, till everything [dish] arrives, so that you can take a photo for the [Insta]story or so, yes, but also when we go out and then they also want to, that you, to take a photo of us together, that they can post in their [Insta]story or so
pressure to follow exaggerated beauty ideals	M09 individuality has become more difficult nowadays, also through Instagram, because you just see all the beautiful people and everything and then you just want to be like that, yes
	M10 when men scroll through it, they only see perfect women and then they may not see you as pretty as you actually are, in real life, and I think that's a pressure
	M09 in any case, yes, that appearances are important, so you should be sporty, look as good as possible and so, yes, just so, nutrition has become more important and so than before
	M10 I have partly unfollowed all of it, because at some point it makes you sad, like, if you say "yes, they can afford it, such a facial", like, and can somehow, are sponsored, also with sport things, and are all sporty and great jobs and travel a lot and you yourself do nothing, well you do something, but in relation to that it just looks like nothing. Yes and then, well there is pressure, which I now also feel, for example
	M08 back then it had something to do with the time, with liking pictures and, you are at a young age and I was very much or I think a lot of girls have it, who then only pay attention to the outside and beauty ideals and so and then it was always when you've posted a picture, I'm actually ashamed to tell the story like that, but when you've posted a picture it was always cool to get as many 'likes' as possible and at some point it got me pretty tired and everything and too emotional and then I just didn't want to go through with it anymore and then I deleted it and didn't have anything for a while
	M10 well I have a friend, she goes to the gym every day and she says, her face, her body has to, her body has to balance out her face because she doesn't think her face is pretty and therefore has to have a perfect body and one or two guys have told her that, too, which I personally think is blatant and that's not going to be better with all the bloggers who have a perfect face
	M08 there are also, I say, stronger people who have a lot of 'likes' because they find so many followers,

because it is more natural and so on, but that was another topic, with ethics and platform, and, yes ... and bulimia and anorexia is also there because of that subject, but yes. I, Instagram is not easy. I have girlfriends, I have a girlfriend who still has really psychological problems and finds herself so ugly and blah-blah and you can't listen to it anymore, and that's really just because of Instagram because she just likes the wrong pages
M10 and I think that this just reinforces it and that men say something like that, especially those were, those were no 18-years-olds, they were older. And I think that comes mainly from social media, where you can see that being-perfect, pretty much
M08 I only started using it properly when I was 20 and then I was mentally strong enough to think clearly and was no longer 16 and thought "Oh God, that's so great when you look like this" and now I can, I think, decide who I follow or what is good for me, what I see
M01 I see it with my girlfriends - at the best moment showing myself from the best side, that is the optimal thing and what is wanted but it just isn't reality ... just to feel better a bit also
M11 I don't like pictures of me. So I hate pictures of myself, I don't take pictures of myself and I don't feel like being under the pressure of constantly having to post any pictures of myself where I look perfect or anything and I think my self-esteem would suffer when I always had to look at all the models and perfect pictures of others, who are also not perfect and I don't know how often they are edited, but I think that would give me a bad feeling, yes, that's why I don't like it
M20 but when you're 21, you're at the point, okay, I've been on a diet for 6 years now, it's just the way it is, no, it's just okay now, no, exactly, that's why and I also deleted some Instagrammer, which is good, I try to do less, to be on any pages, of some models and so on, I now only follow 2 bloggers who are somehow down to earth, because that does not make sense somehow, I don't know, following Kendall Jenner or something or always seeing how awesome she is, no, so I mean, if you invest millions of dollars in your looks, everyone looks good, but something you don't realize, you only see what you don't have and what you are not
M18 well my boyfriend is a bit older than me, that's when it started, that there's certain pressure from the media, I think with us it's extreme compared to what it should be and I think, the younger they are, the later the generation came, those who were born around 2002/2003, somehow it gets more and more extreme with how they present themselves, so I notice that because my brother, for example is 3 years younger and then when he is out with girlfriends, they are 3 years younger than me, they put on make-up more than I do, where I think "hey, you don't really need that" and, I don't know, I watched a movie with my friends at the age of 15 and they kind of go out partying and putting on make-up and yes, somehow the interest for, or the children, or the young people are always trying to get more mature with the time, although they're actually younger and yes ... that's the pressure I find, which is also enhanced by the media, because if the parents also give the

	children, who are 12 or 13, cell phones and who then register on Instagram or something, they already see everything, even though they may be influencers who are already 23 and where that is actually normal and they also take a look at it, yes
pressure to follow exaggerated body ideals	M10 when you scroll through Instagram, you only see perfect bodies M06 I have the feeling that on Twitter, for example, I always notice that women have to fight so much more with themselves, because of the body image than men do. So that's it, with men, is it that they don't show it like that, for example with hair loss or something like that, that's always such a big thing and that it really gets them, but they don't show it so much, but that, women write [tweet] more about it than men and men write [tweet] more about something else. Nothing about their problems, but what they believe to be great and so and the women talk more about their problems M10 well I have a friend, she goes to the gym every day and she says, her face, her body has to, her body has to balance out her face because she doesn't think her face is pretty and therefore has to have a perfect body and one or two guys have told her that, too, which I personally think is blatant and that's not going to be better with all the bloggers who have a perfect face M20 but when you're 21, you're at the point, okay, I've been on a diet for 6 years now, it's just the way it is, no, it's just okay now, no, exactly, that's why and I also deleted some Instagrammer, which is good, I try to do less, to be on any pages, of some models and so on, I now only follow 2 bloggers who are somehow down to earth, because that does not make sense somehow, I don't know, following Kendall Jenner or something or always seeing how awesome she is, no, so I mean, if you invest millions of dollars in your looks, everyone looks good, but something you don't realize, you only see what you don't have and what you are not M10 so I think that you definitely get pressure through Instagram, also preferably in our age group or a little bit younger ... just because all the influencers often lead such a perfect life, have perfect bodies and that, that you just [see] a lot of women, like, that correspond to this perfect ideal picture M12 women, for example, they rather tend to do cosmetic surgeries or so and I think that it's not so, so much about their appearance, but rather about their body, yes I think more like that, yes ... but I think that it is less than in girls, so that girls are more concerned about it M09 and of course, if you do not do sports and do not pay attention to your diet and are not skinny, then it is true, that you encounter a lot of prejudices, so you can tell that fat people are sometimes talked about and as if they were which is also simply stupid, although that has nothing to do with it, just because you work more, you are not stupid, so M03 I follow body positive account, I follow a few, and I follow another YouTuber who is quite ambitious and I think that motivates you a little bit when you are simply told "yes, these are good learning methods and

you don't have to be too stressed to achieve something"

M16 with many it's that, that all of these, most influencers are very very very skinny and then everybody wants that

M17 I think Instagram is also difficult with respect to, because so many body ideals that are constantly shown, for example the Kardashians and then, I have no idea, Victoria Secret Angels. I just heard a podcast about it, well I mean about it, but she talked about it being so difficult because whenever she's on Instagram, she's actually unhappy because she only sees pictures of people who are thin and have so much fun and are always on vacation and she's like "huh, why not me?"

M12 I would say half, half ... positive, because I also think "ah, that looks cool" and then you are happy when you have discovered something cool or something, but also negative, because sometimes you think "oh, they are so much better or they look so much better in it", or where you think "oh, she's much thinner than me" or "that's more beautiful than me", exactly, but, yes, so I, that's why I would say half, half, yes ...

M18 I don't know, I think it's a girl's thing that you always compare yourself to others, for boys it's always like, I also know a lot of boys who just get along well with everyone and so and I don't know, when you join a group where you first might be alone as a girl and another group of girls is there, that you get stupid looks or are whispered about, yes, it's kind of different with girls in general than with boys, and I think that's also reflected in Instagram. If she has skinny legs, I would also like to have skinny legs, but she also has a big butt and a flat tummy, yes ... these are the standard things

M16 I remember that a [female] friend of mine also had an Instagram account that was private because she was abroad and there she really only had the closest friends, so also from the boys only the closest and she had a picture in a bikini on the beach and it was then in the group, so it was screenshot, sent to the group and something [a picture] like that came never again, so it's just a little bit or if I now, I was at Loolapalooza last year and I had a picture of me, so I wore a backless top and you saw that on the picture and I really thought about posting it for an hour because I knew it would end up in this group

M18 and sometimes also now for example with my boyfriend or with boys or something, where you somehow want to look a bit good and then I believe through the media when you see what other girls post on Instagram and then you think "oh no, does he think she's pretty, she has a flatter tummy" and then you want that, too, then you put pressure on yourself that somehow you improve there, even though the person is probably not like you because you just have a flat stomach, but simply because you are likeable and the character's fine, you only compare yourself with what you can notice on others and I notice that with my best male friend, where I don't care what I look like and with friends and if there are friends of him who I don't know very well, then, I don't know, I'll go and, I put on normal pants rather than sweat pants

General Conclusion

Summary of Findings

Statistics on technology usage and time spent on technological devices are plentiful. But, there is a lack of qualitative studies on the perception of social assumptions still associated with technology. It is therefore of interest to depict the perspective of stereotypically marginalized groups. This thesis strives to fill that void and investigates how older and younger women perceive themselves in regards to their interaction with technologies. In chapter 2 and 3, the focus is on older women. Both their gender *and* their age are negatively stereotyped. In chapter 4, the focus is on younger women as it is of interest whether gendered stereotypes are still relevant for a group of women grown up with digital technologies.

In **Chapter 2**, the implementation of technology by older women was explored through the question: *How does older women's lifestyle influence their incorporation of technological devices in everyday life?*

Three typologies could be derived, depending on the women's focus in life: the GrandMothers focused on their family and community, the Half Couples focused on their husband and the Independents focused on themselves. Each group interacts with technologies in a unique manner determined by their lifestyle. The GrandMothers incorporated devices as an accelerator for communicating with their existing ties within their community, either their immediate family or their village kinships. In doing so, they did not worry about digital devices as such. The Half Couples linked their digital products to their spouses as they either get access through them or do not see a need in owning a smartphone as their husband does already or precisely because the husband does not. Therefore, these women can further be segmented into those who evaluated digital technologies indifferently and those who made rather negative comments – always with the husband as a sparring partner for forming their

opinion and generally in their everyday life. The Independent women, on the other hand, emphasized the benefits of their digital devices as they helped them to connect to people outside of their direct environment as their closest ties might not live nearby. These findings presented examples of older women's cost-benefit analysis when opting for a technological device (Melenhorst et al., 2006). This study gave ways for a differentiated view upon older women's lifestyles in a certain age phase and to view their technology usage above generational allocations.

In **Chapter 3**, older women's perceptions of interest in and competence with technology was of relevance. Here, I focused on the perception of stereotypes by a social group cast into those stereotypes and asked: *How do older women perceive stereotypes on gender and technology as well as age and technology? And how do they evaluate their and their peers' interest in and competence with technology? Is there a connection to gender and/or age?*

Through the perspective on clichés by the older women as a group of people negatively affected by technology-related stereotypes, different findings came to light. Evaluations of interest in technology showed a discrepancy between the perspective of oneself and others: Own interest in technology is perceived to stem from individual preferences, whereas they referred to gendered stereotypes of interest in technology when talking about other people. Thus, they described men to generally be more interested in technology compared to women. The findings also revealed that male interest in technology is of the mechanical and electrical type whereas women are coupled with a communicative and shopping-oriented interest in technology. I linked the discrepancy between the perception of oneself and others regarding interest in technology to the bias blind spot (Pronin, Lin, & Ross, 2002). When women evaluated competence with technology, the findings were different from the ones regarding interest in technology. Precisely, when women evaluated

the competence with technology, there is a link between the perspective of oneself and of others. Here, age lent a justifying factor for the older women to explain their lack of motivation to build competence with technology or at least to defend a slower learning process. Similarly, describing their peer group's competence with technology, the older women referred to age as the justifying factor for a lack of competence, too. Here, I found sense-making (Jones & Harris, 1967) to be the reason for the women to make corresponding statements of their own and their peer group's competence with technology.

Finally, to receive a better understanding of the aspect of familiarity with digital technology, I interviewed women born after 1994 who grew up with digital technologies. For **Chapter 4**, it was of interest to gain information on whether gendered stereotypes of technology are still relevant, raising the following question: *How do Generation Z women perceive gendered technology stereotypes in the professional and in the private and how can they affect one another?*

The study presented in chapter 4 revealed that stereotypes regarding gender and technology were still prevalent for Generation Z women in their professional (education) and private (social media) environments. It is within her technofeminism approach that Wajcman (2007) sees possibilities in the direction of gender equality through digital technology. Seemingly, an exposure to and familiarity with digitized products – and growing up in a digitized environment – did not protect women from gendered and unequal judgements. For STEM subjects, the old notion of the technology-interested man versus the technology-incompetent woman still exists and might be influential in holding Generation Z women back from pursuing a STEM-led career path. Women using typically male behavior are not applauded (Marsden et al., 2014) and apparently appear to be extraordinarily passionate if they contradict the stereotype. With regard to social media, the pressure of beauty ideals for women in real life as well as in mass media are being replicated on and transmitted to online

platforms. This is where I made a link to the objectification theory by Fredrickson and Roberts (1997), which proclaims that women learn to look at their bodies the way that men look at women's bodies. The sentiments that Generation Z women in this study made in regard to their beauty ideal revealed that social media paved the way for them to internalize not only the *objectifying (male) gaze* but also the *(collective) online gaze*. Consequently, young women noticed how their peers are presenting themselves on social media and what they were admired and received 'likes' for. Together, this study showed gendered STEM stereotypes might hold women back from choosing a STEM-related career. This was further reinforced by gendered expectations on social media. Therefore, this study was an exemplary of the many complex challenges young women face due to the combination of gendered stereotypes in technology-related areas – socially, educationally and professionally.

Main Contributions for Theory and Practice

In this thesis, the relationship between gender and technology is presented from a female viewpoint as perceived by women from three generational backgrounds. It contributes to the interdisciplinary body of literature intersecting the fields of aging studies, psychology, gender studies and technoscience.

First, this thesis provides answers to the call to understand "*when* and *under which precise circumstances* generational or individual experiences have a stronger influence on usage of and ascription of meaning to [technologies]" (Ratzenböck, 2016, p. 68). Within the interviews with the older women, I found that generational ascriptions could be linked to the GrandMother type (as most of the interviewees were 'War Children') and most of the 'People of 1968' participants could be connected to the Half Couples type. Here, generational influences are prevalent whether women focus on their family or their partner which in turn affects the situations they use their digitized product of choice in and the meaning they assign to it. On the other hand, under certain circumstances, individual reasons seem to have a

stronger impact than the generational background. With the interviewed women who live their lives independently, the year of birth could not be connected to their lifestyle choices and therefore, their individual motivation for technological products was the dominant reason for ascribing meaning to them. This thesis therefore contributes to a varied and differentiated understanding of older women's lifestyles in retirement age.

Second, this thesis adds to analyses on marginalized groups by showing how certain downgrading stereotypes can get reinforced by the affected group, referring to the viewpoint of older women on technology stereotypes. The women's differentiating perspectives of their own interest in technology is of particular relevance as they base this on their individual preferences whereas they base others' interest on gender stereotypes. In contrast, they base their and their peers' competence with technology on age stereotypes. It is therefore of significance how for older women, the gender and technology connection shows a discrepancy between the perception of oneself and others. However, the connection of age and technology shows a correspondence between the perception of oneself and others. Causes of the women's behavior to refer to the stereotypes differently could lie in the bias blind spot and sense-making.

Third, by connecting the findings of both samples, I recognize gendered technology stereotypes to still be prevalent, even for women who grew up in a digitized environment. Nonetheless, I contribute to technofeminism theory as well as literature that views equalizing potential in digital technologies. The older women put more emphasis on a gendered interest in technology that pictures men as more interested in mechanical and electrical types of technology and women as more interested in communicative and shopping-oriented types of technology. Although such findings could not be derived from the younger women, they do repeat gendered stereotypes in the field of STEM with depicting men as more interested in it than women. However, female Generation Z individuals are aware of such prejudices. This

reflective state of mind can be seen as a development in comparison to the older women, which could originate in female Generation Z's generational background of having grown up within a digitized environment.

Fourth, this thesis extends objectification theory by Fredrickson and Roberts (1997) as I shift the eye of the beholder that is addressed within: I change their discovery of the *objectifying gaze* to the *online gaze* term. The findings of my interviews with Generation Z women strongly advocate that young women are aware of and have internalized men's observations and judgements of their appearance. They have also adopted the scrutinizing eyes of the people as a collective behind their smartphones watching the young women's content through their social media accounts.

Fifth and finally, this thesis would like to contribute to intersectionality research by proposing to view technology as an additional category within this area of studies. So far, only a few researchers (Lykke & Hearn, 2010; McLean et al., 2019; Sutko, 2020) supported the idea of assessing technology as a social category to affect power relations. With my findings on gendered technology-related stereotypes as well as the impact digitized products such as social media can have on women's self-perception, I provide more evidence on technology's role in the judgement of individuals by each other. This in turn can affect someone's positioning within society – on educational, professional or social level. Future research could further analyze the intersection of technology with other social categories.

Implications for Practice

In an interview with the German newspaper DIE ZEIT, Christiane Floyd, the first female professor of computer science in Germany, says the agenda in software development should be to "meet the users at eye level". The people should be focus, not mathematics. She makes the point to involve the user in the development of programs right from the beginning (Nezik, 2020). This can have fundamental consequences as Bath (2013) worries that inserting

human like characteristics into products of Artificial Intelligence can foster the current status of gender inequality represented in society by reinforcing gendered stereotypes already present. This thesis makes a strong point related to such concerns and addresses practitioners and decision-makers in product development of digital technology: for digital products to be accessible to a greater variety of people, different types of users need to be involved in the developing process.

Older women have been left out of the development process of technologies even though there is a need to include their so far unheard voices in discourses (Saetnan, 2000) to give way to "build self-awareness of competence and relevance among underrepresented groups" (Saetnan, 2000, p. 22). By not including older women, a certain group of people is not represented in technological developments and innovation processes. In order for digital products to be intuitively usable by as many people as possible, a diverse array of individuals need to be included right from the start of their development: "We must listen to what people want from technology, how it can support and augment our lives" says Martha Lane Fox, Founder and Executive Chair of Doteveryone (2018), a think tank about the social impact of technology. My findings showed that the older women referred to their age to explain their and their peer group's difficulties in using digital technologies easily. Meanwhile, my findings presented different kinds of approaches by older women to implement digital technologies in their day-to-day life. If these varied forms of motivations and incorporations by older women were taken into account in the development of digital technologies, they might not voice such age-related constraints in the future.

With an involvement of younger women in the development process of digital technologies, the replication of gendered stereotypes could be prevented. Even though my findings showed how Generation Z women repeated gendered stereotypes on interest in STEM, they were aware of their prejudiced assumptions. For this reason, it is essential to

involve women – of all ages – in processes of technological language and digital literacy. Further, including women in the development of technological products opens up ways for new innovations and has therefore also economic reasons (Ihsen, 2017). However, it should be noted here that an involvement of so far underrepresented groups in the future design process can also give way for depreciating them as soon as their input does not add to increased financial growth (Ronen, 2018).

Furthermore, the findings of my study with the Generation Z women provide opportunities to change the narrative on gendered technology stereotypes. Here, the implications of my thesis addresses practitioners in the decision-making of representational matters: In the educational context, young women could be encouraged to pursue STEM subjects to counteract the lacking number of females in STEM subjects at school and on university level. Moreover, a bigger media representation of women with technology-related skills could reduce gendered technology stereotypes and increase the chances for younger women to choose a STEM-related professional career. The positive influence of representational matters such as female imagery and feminine linguistic forms in advertisements on women's attitude towards a male-dominated field like entrepreneurship has been shown by Hentschel, Horvath, Peus and Sczesny (2018).

This thesis calls for ideas aimed at "redesigning technologies for gender equality" (Wajcman, 2010, p. 147). The latter could be achieved when digital technologies are built from a female viewpoint, considering women's perspective in the actual usage. My findings showed how the way social media applications are built can reinforce an *objectifying (male) gaze* and create a *(collective) online gaze*. With these findings in my thesis, I encourage announcements made by Instagram to hide 'likes' (Yurieff, 2019), which could lead to a decrease of the manifestation of the *online gaze*. Furthermore, other examples of possible developments that speak to women's needs come from the field of entrepreneurship. There

are already a few promising Femtech applications specifically designed for and targeted at women (Mühlhausen, n.d.). Although this industry is expected to be valued at $50 billion dollar by 2025 (Jaramillo, 2020), the question remains whether it will be as successful as other technological advances led and perceived to be consumed primarily by men. In the past, investors have shied back from investing into companies founded by women as in 2019, only 3% of all capital investments were placed on those (Thygesen, 2019). Based on the findings of my thesis, I strongly encourage investors to see the potential of Femtech. It might not only have economic reasons with an armada of tech-savvy women waiting to use digital technologies aimed at their needs. With more and more Femtechs finding sponsors, they get more media representation, which in turn makes them economically and socially more accessible. Then, other women could be motivated to either become a (technology-related) entrepreneur or to study a STEM subject. With more women fluent in digital literacy, there is a higher chance for female entrepreneurship (Ughetto et al., 2020). A responsible and feminist design of technologies needs a strong collaboration of gender studies and technology design (Bath, 2013). If women's voices are given a platform, they can indeed be a valuable source of inspiration.

REFERENCES

Abramovich, G. (2019, February 5). 5 consumer trends that are shaping digital content consumption. *CMO by Adobe*. Retrieved from https://cmo.adobe.com/articles/2019/2/5-consumer-trends-that-are-shaping-digital-content-consumption.html#gs.16w2yn

Accenture. (2016). *#GettingToEqual. How digital is helping close the gender gap at work.* Retrieved from https://www.accenture.com/us-en/gender-equality-research-2016

Appinio. (2018, January 9). *Welche Videos schaust Du Dir auf YouTube an?* [What videos do you watch on YouTube?]. In Statista. Retrieved on February 11, 2020 from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/795709/umfrage/youtube-nutzung-der-generation-z-nach-inhalten-in-deutschland/

Aschauer, A. B. (1999). Tinkering with technological skill: An examination of the gendered uses of technologies. *Computers and Composition, 16,* 7–23. doi:10.1016/S8755-4615(99)80003-6

AudienceProject. (2020, February 18). *Umfrage zur genutzten Hauptnachrichtenquelle nach Medium in ausgewählten Ländern weltweit im Jahr 2019* [Survey about the main news sources used in selected countries worldwide in 2019, by medium]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/1101310/umfrage/umfrage-zur-hauptnachrichtenquelle-nach-medium-weltweit/

Ball, C., Francis, J., Huang, K.-T., Kadylak, T., Cotten, S. R., & Rikard, R. V. (2019). The physical–digital divide: exploring the social gap between digital natives and physical natives. *Journal of Applied Gerontology, 38*(8), 1167–1184. doi:10.1177/0733464817732518

Balsamo, A. (2014). Gendering the Technological Imagination. In W. Ernst & I. Horwath (Eds.), *Gender in science and technology. Interdisciplinary approaches* (pp. 19–39). Bielefeld, Germany: Transcript Verlag. doi:10.26530/oapen_463250

BarNir, A. (2012). Starting technologically innovative ventures: reasons, human capital, and gender. *Management Decision, 50*, 399–419. doi: 10.1108 00251741211216205

Barriball, K. L., & While, A. (1994). Collecting data using a semi structured interview: A discussion paper. *Journal of Advanced Nursing, 19*(2), 328–335. doi:10.1111/j.1365-2648.1994.tb01088.x

Barth, J. M., & Masters, S. (2020). Changes in math and science interest over school transitions: Relations to classroom quality, gender stereotypes, and efficacy. *International Journal of Gender, Science and Technology, 12*(1), 4–31. Retrieved from https://www.researchgate.net/profile/Stephanie_Masters3/publication/340872065_Eff ects_of_Classroom_Quality_Gender_Stereotypes_and_Efficacy_on_Math_and_Scien ce_Interest_over_School_Transitions/links/5ea2fa46458515ec3a03299e/Effects-of-Classroom-Quality-Gender-Stereotypes-and-Efficacy-on-Math-and-Science-Interest-over-School-Transitions.pdf

Bath, C. (2013). Semantic Web und Linked Open Data. Von der Analyse technischer Entwicklungen zum "Diffractive Design" [Semantic web and linked open data. From the analysis of technical developments to "Diffractive Design"]. In C. Bath, H. Meißner, S. Trinkaus, & S. Völker (Eds.), *Geschlechter Interferenzen. Wissensformen - Subjektivierungsweisen - Materialisierungen* [Gender interferences. Forms of knowledge - types of subjectivisations – materializations] (pp. 69–116). Münster, Germany: LIT Verlag.

Bath, C., Meißner, H., Trinkaus, S., & Völker, S. (2013). *Geschlechter Interferenzen. Wissensformen - Subjektivierungsweisen - Materialisierungen* [Gender interferences.

Forms of knowledge - types of subjectivisations - materializations]. Münster, Germany: LIT Verlag.

Bauer, N. M. (2015). Emotional, sensitive, and unfit for office? Gender stereotype activation and support female candidates. *Political Psychology 36*(6), 691–708. doi: 10.1111/pops.12186

BDZV. (2019, September 17). *Umsätze der Zeitungen in Deutschland in den Jahren 2013 bis 2018 (in Millionen Euro)* [Revenue of newspapers in Germany from 2013 to 2018 (in million euros)]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/204864/umfrage/umsaetze-der-zeitungen-in-deutschland-nach-segmenten/

Bem, D. J. (1972). Self-perception theory. *Advances in Experimental Social Psychology 6*, 1–62. doi:10.1016/s0065-2601(08)60024-6

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775–786. doi:10.1111/j.1467-8535.2007.00793.x

Berdychevsky, L., & Nimrod, G. (2017). Sex as leisure in later life: A netnographic approach. *Leisure Sciences, 39*(3), 224-243. doi:10.1080/01490400.2016.1189368

Bergquis, L. (1956). The American woman. Scientist, wife and mother. *LOOK*, 51.

Bieg, M., Goetz, T., Wolter, I., & Hall, N. C. (2015). Gender stereotype endorsement differentially predicts girls' and boys' trait-state discrepancy in math anxiety. *Frontiers in Psychology. 6*, 1404. doi: 10.3389/fpsyg.2015.01404

Bitkom. (2018, March 16). *Welchen Aussagen zum Thema soziale Netzwerke und Influencer stimmen Sie zu?* [Which statements about social networks and influencers do you agree with?]. In Statista. Retrieved from https://de-statista-

com.eaccess.ub.tum.de/statistik/daten/studie/817888/umfrage/zustimmung-zu-aussagen-zum-thema-soziale-netzwerke-und-influencer-in-deutschland/

Bitkom. (2020, August 18). Streaming, Online-Banking, Telemedizin: So nutzen Senioren digitale Technologien [Streaming, online banking, telemedicine: This is how seniors use digital technologies]. *Bitkom*. Retrieved from https://bitkom.org/Presse/Presseinformation/Streaming-Online-Banking-Telemedizin-So-nutzen-Senioren-digitale-Technologien

Bolle, S., van Weert, J. C., Joost, G. D., Loos, E. F., de Haes, H. C., & Smets, E. M. (2015). Online health information tool effectiveness for older patients: a systematic review of the literature. *Journal of Health Communication. 20*, 1067–1083. doi: 10.1080/10810730.2015.1018637

Bouwhuis, D. G. (2000). Parts of life: Configuring equipment to individual lifestyle. *Ergonomics, 43*, 908–919. doi:10.1080/001401300409107

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. doi:10.1191/1478088706QP063OA

Brown, Z., & Tiggemann, M. (2016) Attractive celebrity and peer images on Instagram: effect on women's mood and body image. *Body Image, 19*, 37–43. doi: 10.1016/j.bodyim.2016.08.007

Bruckmüller, S., Hegarty, P., & Abele, A. E. (2012). Framing gender differences: linguistic normativity affects perceptions of power and gender stereotypes. *European Journal of Social Psychology, 42*(2), 210–218. doi: 10.1002/ejsp.858

Buchmüller, S., Bath, C., & Henze, R. (2018, May). To whom does the driver's seat belong in the future? A case of negotiation between gender studies and automotive engineering. *Proceedings of the 4ᵗʰ conference on gender & IT,* New York, NY, 165–174. doi: 10.1145/3196839.3196866

Burge, T. (2003). Perception. *The International Journal of Psychoanalysis, 84*, 157–167. doi:10.1516/WJX2-5CV1-X83F-JRGH

Cadinu, M., & Galdi, S. (2012). Gender differences in implicit gender self-categorization lead to stronger gender self-stereotyping by women than by men. *European Journal of Social Psychology, 42*(5), 546–551. doi: 10.1002/ejsp.1881

Castells, M., Fernández-Ardèvol, M., Qiu, J. L., & Sey, A. (2007). *Mobile communication and society – A global perspective; A project of the Annenberg Research Network on international communication*. Cambridge, MA: Massachusetts Institute of Technology. doi:10.5860/choice.44-5464

Chestnut, E., Lei, R., Leslie, S.-J., & Cimpian, A. (2018). The myth that only brilliant people are good at math and its implications for diversity. *Education Sciences, 8*(2), 65. doi:10.3390/educsci8020065

Chillakuri, B., & Mahanandia, R. (2018). Generation Z entering the workforce: the need for sustainable strategies in maximizing their talent. *Human Resource Management International Digest, 26*(4), 34–38. doi:10.1108/HRMID-01-2018-0006

Cleary, M., Horsfall, J., & Hayter, M. (2014). Data collection and sampling in qualitative research: Does size matter? *Journal of Advanced Nursing, 70*(3), 473–475. doi:10.1111/jan.12163

Corasaniti, N. (2020, August 17). The M.V.P.s of this year's conventions? The digital and I.T. teams. *The New York Times*. Retrieved from https://www.nytimes.com/2020/08/17/us/politics/streaming-convention.html

Costa, M. C., & Feltrin, R. B. (2016). Challenges of intersectionality in gender, science and technology. *Cadernos Pagu 47*. doi: 10.1590/18094449201600470018

Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *u. Chi.*

Legal *f.*, 139–167. doi: https://heinonline.org/HOL/LandingPage?handle=hein.journals/uchclf1989&div=10& id=&page=

Crenshaw, K. (2017, June 8). *Kimberlé Crenshaw on intersectionality, more than two decades later.* New York, NY: Columbia Law School. Retrieved from https://www.law.columbia.edu/pt-br/news/2017/06/kimberle-crenshaw-intersectionality

Degele, N., & Winker, G. (2011). Intersektionalität als Beitrag zu einer gesellschaftstheoretisch informierten Ungleichheitsforschung [Intersectionality as a contribution to a social theory informed inequality research]. *Berliner Journal für Soziologie, 21*, 69–90. doi:10.1007/s11609-011-0147-y

De Schutter, B., & Vandenabeele, V. (2008, May). *Meaningful play in elderly life*. Paper presented at the 58th annual conference of the International Communication Association, Montreal, Canada. Retrieved from https://convention2.allacademic.com/one/ica/ica08/index.php?click_key=1&cmd=Mu lti+Search+Search+Load+Publication&publication_id=233804&PHPSESSID=bf7sf1j rd5utnnvlqguutvbcu7

De Vita, L., Sciannamblo, M., & Viteritti, A. (2016). Re-thinking intersectionality through science and technology studies: Trajectories of women in technoscientific fields. *Rassegna Italiana di Sociologia, 57*(3), 503–524. doi.:10.1423/84375

DIVSI. (2018, November 19). *Anteil der 14- bis 24-Jährigen, die folgenden Aussagen bzgl. Influencern voll und ganz oder eher zustimmen, nach Bildungsstand in Deutschland im Jahr 2018* [Percentage of 14- to 24-year-olds who fully or entirely agree with the following statements regarding influencers, by level of education in Germany in 2018]. In Statista. Retrieved from https://de-statista-

com.eaccess.ub.tum.de/statistik/daten/studie/943828/umfrage/einstellung-unter-jugendlilchen-gegenueber-influencern-nach-bildungsstand-in-deutschland/

Doteveryone. (2018). *People, power and technology: the 2018 digital attitudes report*. Retrieved from https://www.doteveryone.org.uk/wp-content/uploads/2018/06/People-Power-and-Technology-Doteveryone-Digital-Attitudes-Report-2018.compressed.pdf.

Ermann, M. (2004). Wir Kriegskinder [Us war children]. *Forum der Psychoanalyse, 20*, 226–239. doi:10.1007/s00451-004-0196-3

Fardouly, J., & Holland, E. (2018). Social media is not real life: The effect of attaching disclaimer-type labels to idealized social media images on women's body image and mood. *New Media & Society, 20*(11), 4311–4328. doi:10.1177/1461444818771083

Fardouly, J., & Vartanian, L. R. (2016). Social media and body image concerns: current research and future directions. *Current Opinion in Psychology, 9*, 1–5. doi:10.1016/j.copsyc.2015.09.005

Fardouly, J., Willburger, B. K., & Vartanian, L. R. (2017). Instagram use and young women's body image concerns and self-objectification: Testing mediational pathways. *New Media & Society, 20*(4), 1380–1395. doi:10.1177/1461444817694499

Fooken, I. (2004). "Späte Einsichten" bei "späten Trennungen": plötzlicher Konsensbruch, trügerische Konsens-Illusion oder langjähriger Dissens? Subjektive Repräsentationen biografischer Verlaufsmuster und seelische Gesundheit im zeitgeschichtlichen Kontext ["Late insights" in "late separations": sudden consensus break, deceptive con-sensus illusion or long-term dissent? Subjective representations of biographical patterns and mental health in a historical context]. *Zeitschrift für Familienforschung, 16*(3), 289–304. Retrieved from https://www.ssoar.info/ssoar/handle/document/32391

Fratrièová, J., & Kirchmayer, Z. (2018). Barriers to work motivation of Generation Z. *Journal of Human Resource Management, 21*(2), 28–39. Retrieved from https://ideas.repec.org/a/cub/journl/v21y2018i2p28-39.html

Fredrickson, B. L., & Roberts, T. A. (1997). Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psychology of Women Quarterly, 21*(2), 173–206. doi:10.1111/j.1471-6402.1997.tb00108.x

Gales, A., & Hubner, S. V. (2020). Perceptions of the self versus one's own social group: (Mis)conceptions of older women's interest in and competence with technology. *Frontiers in Psychology, 11*(848), 1–15. doi: 10.3389/fpsyg.2020.00848

Gales, A., & Loos, E. (2020). The impact of the relationship and family status in retirement age on women's incorporation of technical devices in their everyday life. In J. Zhou & Q. Gao (Eds.), *Human Aspects of IT for the Aged Population, Technology and Society, Proceedings of the 6th International Conference, ITAP 2020, Held as Part of the 22nd HCI International Conference* (pp. 207–225). Springer International Publishing. doi: 10.1007/978-3-030-50232-4_15. doi:10.1007/978-3-030-50232-4_15

Gatterer, H. (n.d.). Unsere neue Zukunft – Mit den Megatrends in die Post-Corona-Zeit [Our new future – with the mega trends into the post-Corona-time]. *Zukunftsinstitut*. Retrieved August 20, 2020 from https://www.zukunftsinstitut.de/artikel/mit-den-megatrends-in-die-post-corona-zeit/

Gewirtz-Meydan, A., Hafford-Letchfield, T., Benyamini, Y., Phelan, A., Jackson, J., & Ayalon, L. (2018). Ageism and sexuality In: L. Ayalon L., & C. Tesch-Römer (Eds.), *Contemporary perspectives on ageism. International perspectives on aging* (pp. 149–162). Cham, Switzerland: Springer. doi.org/10.1007/978-3-319-73820-8_10

Gibson, D. (1996). Broken down by age and gender: "The problem of old women" redefined. *Gender & Society 10*, 433–448. Retrieved from http://www.jstor.org/stable/189680. doi:10.1177/089124396010004005

Gilbert, D. T., & Malone, P. S. (1995). The correspondence bias. *Psychological Bulletin, 117*(1), 21–38. doi:10.1037//0033-2909.117.1.21

Girls'Day. (2020). *Daten + Fakten* [Dates + facts]. Retrieved from: https://www.girls-day.de/daten-fakten

Girls Who Code. (2019). *Applying for internships as a woman in tech*. Retrieved from: http://girlswhocode.com/wp-content/uploads/2019/08/GWC_Advocacy_InternshipApplicationExperiences_PDF_z 6.pdf

González, C. (2007). Age-graded sexualities: The struggles of our ageing body. *Sexuality & Culture 11*(4), 31–47. doi:10.1007/s12119-007-9011-9

Gullette, M. M. (2004). *Aged by culture*. Chicago, USA: University of Chicago Press.

Häberlen, J. C. (2014, March). Review of the book 1968 und die 68er: Ereignisse, Wirkungen und Kontroversen in der Bundesrepublik [1968 and the 68ers: Happenings, impacts and controversies in the Federal Republic], by G. Dworok & C. Weißmann. *German History, 32*(1), 168–171. doi:10.1093/gerhis/ght085

Hagenberg-Miliu, E. (2014). *Unheiliger Berg: Das Bonner Aloisiuskolleg der Jesuiten und die Aufarbeitung des Missbrauchsskandals* [Unholy mountain: The Bonn Aloisiuskolleg of the Jesuits and the processing of the abuse scandal]. Stuttgart, Germany: Kohlhammer Verlag.

Hancock, A.-M. (2016). *Intersectionality*. Oxford, UK: Oxforrd University Press. doi:10.1093/acprof:oso/9780199370368.001.0001

Harding, S. (1998). Women, science, and society. *Science, 281*, 1599–1600. doi:10.1126/science.281.5383.1599

Hassabis, D., Spreng, R. N., Rusu, A. A., Robbins, C. A., Mar, R. A., & Schacter, D. L. (2013). Imagine all the people: how the brain creates and uses personality models to predict behavior. *Cerebral Cortex, 24*(8), 1979–1987. doi:10.1093/cercor/bht042

Heide, D. (2018, June 27). Bundesregierung startet mit ihrem Fahrplan für die Digitalisierung [German government starts with its roadmap for digitization]. *Handelsblatt*. Retrieved from https://www.handelsblatt.com/politik/deutschland/digitalpolitik-bundesregierung-startet-mit-ihrem-fahrplan-fuer-die-digitalisierung-/22740950.html

Hein, R. (2016). Forschungsmethode: Design, Instrumente, Durchführung [Research method: design, tools, implementation]. In R. Hein (Ed.) *Erfolg im Compliance Management* [Success in compliance management], (pp. 155–192). Wiesbaden, Germany: Springer Gabler. doi:10.1007/978-3-658-12848-7_4

Heinlein, S., & Funk, L. (2017, September 13). Mehr Studenten in MINT-Fächern, „Man darf sich nicht darauf ausruhen" [More students in STEM subjects, "One should not rest on it"]. *Deutschlandfunk.* Retrieved from https://www.deutschlandfunk.de/mehr-studenten-in-mint-faechern-man-darf-sich-nicht-darauf.694.de.html?dram:article_id=395735

Hellman, H. (1996). A toy for the boys only? Reconsidering the gender effects of video technology. *European Journal of Communication, 11*, 5–32. doi:10.1177/0267323196011001001

Helsper, E.J., & Eynon, R. (2010). Digital natives: where is the evidence? *British Educational Research Journal 36*(3), 503–520. doi:10.1080/01411920902989227

Hentschel, T., Braun, S., Peus, C., & Frey, D. (2018). The communality-bonus effect for male transformational leaders - leadership style, gender, and promotability. *European*

Journal of Work and Organizational Psychology, 27(1), 112–125. doi:10.1080/1359432X.2017.1402759

Hentschel, T., Heilman, M. E., & Peus, C. V. (2019). The multiple dimensions of gender stereotypes: a current look at men's and women's characterizations of others and themselves. *Frontiers in Psychology*, *10*(11). doi:10.3389/fpsyg.2019.00011

Hentschel, T., Horvath, L. K., Peus, C., & Sczesny, S. (2018). Kick-starting female careers. *Journal of Personnel Psychology, 17*(4), 193–203. doi:10.1027/1866-5888/a000209

Herrmann, S. D., Adelman, R. M., Bodford, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. (2016). The effects of a female role model on academic performance and persistence of women in STEM courses. *Basic and Applied Social Psychology, 38*(5), 258–268. doi:10.1080/01973533.2016.1209757

Heyder, A., & Kessels, U. (2013). Is school feminine? Implicit gender stereotyping of school as a predictor of academic achievement. *Sex Roles, 69*(11–12), 605–617. doi:10.1007/s11199-013-0309-9

Heyder, A., Steinmayr, R., & Kessels, U. (2019). Do teachers' beliefs about math aptitude and brilliance explain gender differences in children's math ability self-concept?. *Frontiers in Education, 4*(34). doi:10.3389/feduc.2019.00034

Hinrichsen, P. (2007). Kriegskinder ohne Väter: Ein persönlicher Bericht [War children without fathers: a personal report]. *Bildung und Erziehung, 60*, 465–480. doi:10.7788/bue.2007.60.4.465

Höld, R. (2009). Zur Transkription von Audiodaten [Transcribing audio data]. In R. Buber, & H. H. Holzmüller (Eds.), *Qualitative Marktforschung* [Qualitative market research] (pp. 655–668). Wiesbaden: Gabler. doi:10.1007/978-3-8349-9258-1_41

Holland, G., & Tiggemann, M. (2016). A systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. *Body Image, 17*, 100–110. doi:10.1016/j.bodyim.2016.02.008

Horwath, I., Kronberger, N., & Appel, M. (2014). Similar but different? Cognitive differences in the discussion of women in science and technology. In W. Ernst & I. Horwath (Eds.), *Gender in science and technology. Interdisciplinary approaches* (pp. 205–233). Bielefeld, Germany: Transcript Verlag.

Hultsch, D. F., Hertzog, C., Small, B. J., & Dixon, R. A. (1999). Use it or lose it: Engaged lifestyle as a buffer of cognitive decline in aging? *Psychology and Aging, 14*, 245–263. doi:10.1037/0882-7974.14.2.245

Hustvedt, S. (2016). *A woman looking at men looking at women. Essays on art, sex, and the mind*. New York, USA: Simon & Schuster Paperbacks.

Ihsen, S. (2017). Gender meets Technik – Technik meets Gender. Über gegenseitiges Stören und Anregen [Gender meets technology – technology meets gender. About reciprocal disturbance and stimulation]. In C. Bath, G. Both, P. Lucht, B. Mauss, & K. Palm (Eds.), *Rebooting. Handbuch Gender-Lehre in den Ingenieurwissenschaften* [Rebooting. Manual of gender teaching in engineering science] (Vol. 4, pp. 237–258). Münster, Germany: LIT Verlag.

Ihsen, S., Schiffbänker, H., Holzinger, F., Jeanrenaud, Y., Sanwald, U., Scheibl, K., & Schneider, W. (2014). *Frauen im Innovationsprozess* [Women in the innovation process]. Retrieved from https://www.e-fi.de/fileadmin/ Innovationsstudien_2014/StuDIS

Initiative D21 e.V. (2016). 2016. *D21-Digital-Index. Jährliches Lagebild zur Digitalen Gesellschaft* [D21-Digital-Index. Annual report of the digital society]. Retrieved from https://initiatived21.de/app/uploads/2017/01/studie-d21-digital-index-2016.pdf

Initiative D21 e.V. (2019). *D21 Digital Index 2018/2019. Jährliches Lagebild zur Digitalen Gesellschaft* [D21 Digital Index 2018/2019. Annual report of the digital society]. Retrieved from https://initiatived21.de/app/uploads/2019/01/d21_index2018_2019.pdf

Initiative D21 e.V. (2020). *D21 Digital Index. 19/20. Jährliches Lagebild zur Digitalen Gesellschaft* [D21 Digital Index. 19/20. Annual report of the digital society]. Retrieved from https://initiatived21.de/app/uploads/2020/02/d21_index2019_2020.pdf

Iorgulescu, M. C. (2016). Generation Z and its perception of work. *Cross-Cultural Management Journal, 18*(01), 47–54. Retrieved from https://www.ceeol.com/search/article-detail?id=531928

Ipsos. (2017, December 7). *Welche der folgenden Aussagen trifft auf Sie zu?* [Which of the following statements applies to you?]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/791971/umfrage/technologien-im-alltag-unter-millennials-im-vergleich-mit-der-generation-z/

Ivan, L., & Hebblethwaite, S. (2016). Grannies on the net: GrandMothers' experiences of Facebook in family communication. *Romanian Journal of Communication and Public Relations, 18*(1), 11–25. doi:10.21018/rjcpr.2016.1.199

IVW. (2020, January 17). *Verkaufte Auflage deutscher Tages- und Sonntagszeitungen in ausgewählten Jahren von 1975 bis 2019 (in Millionen Exemplaren*) [Sold circulation of German daily and Sunday newspapers in selected years from 1975 to 2019 (in millions of copies]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/3746/umfrage/auflage-deutscher-tages--und-sonntagszeitungen-seit-1975/

IW Köln. (2019, May 21). *Anteil erwerbstätiger weiblicher MINT-Akademikerinnen und MINT-Fachkräfte an allen erwerbstätigen MINT-Akademikern und MINT-Fachkräften in Deutschland von 2011 bis 2016* [Proportion of employed female

STEM academics and STEM professionals of all employed STEM academics and STEM professionals in Germany from 2011 to 2016]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/946493/umfrage/frauenanteil-in-mint-berufen-in-deutschland/

Jachertz, N., & Jachertz, A. (2013). Kriegskinder: Erst im Alter wird oft das Ausmaß der Traumatisierungen sichtbar [War children: Only in old age does the extent of trauma often become visible]. *Deutsches Ärzteblatt International, 110*(14), A656–A658. Retrieved from https://www.aerzteblatt.de/archiv/136946/Kriegskinder-Erst-im-Alter-wird-oft-das-Ausmass-der-Traumatisierungen-sichtbar

Jackson, S. (2010). Materialist feminism, the self and global late modernity. Some consequences for intimacy and sexuality. In A. G. Jónasdóttir, V. Bryson, & K. B. Jones (Eds.), *Sexuality, gender and power. Intersectional and transnational perspectives* (pp. 15–29). New York, NY: Routledge. doi:10.4324/9780203834916

Jandura, O., & Karnowski, V. (2015). Digital Natives vs. Digital Immigrants – fruchtbares empirisches Konzept für die Kommunikationswissenschaft oder populärwissen-schaftliche Fiktion? [Digital natives vs. digital immigrants – fruitful empirical concept for communication science or popular science fiction?]. *Publizistik, 60*(1), 63–79. doi:10.1007/s11616-014-0221-5

Jaramillo, E. (2020, January 8). Femtech in 2020: Investors share trends and opportunities in women's health technology. *Forbes*. Retrieved from https://www.forbes.com/sites/estrellajaramillo/2020/01/08/femtech-2020-investors-trends-and-opportunities-in-womens-health-technology/#536c2a487d54

Joblift. (2018, November, 7). *Top Tech-Branchen in Deutschland nach Anzahl der ausgeschrieben Jobangebote 2018* [Top tech industries in Germany by number of job

offers advertised 2018]. In Statista. Retrieved on August 20, 2020 from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/997969/umfrage/top-tech-branchen-in-deutschland-nach-anzahl-der-ausgeschrieben-stellen/

Johansson, J., Asztalos Morell, I., & Lindell, E. (2020). Gendering the digitalized metal industry. *Gender, Work & Organization,* 1–25. doi:10.1111/gwao.12489

Jónasdóttir, A. G., Bryson, V., & Jones, K. B. (2010). Editors' introduction. Power and politics. In Authors (Eds.), *Sexuality, gender and power. Intersectional and transnational perspectives* (pp. 109–111). New York, NY: Routledge. doi:10.4324/9780203834916

Jones, E. E., & Harris, V. A. (1967). The attribution of attitudes. *Journal of Experimental Social Psychology*, *3*(1), 1–24. doi:10.1016/0022-1031(67)90034-0

Kelley, H. H. (1973). The processes of causal attribution. *American Psychologist, 28*(2), 107–128. doi.org/10.1037/h0034225

Kent, S. R., John, J. E., & Robnett, R. D. (2020). "Maybe these fields just don't interest them:" Gender and ethnic differences in attributions about STEM inequities. *International Journal of Gender, Science and Technology, 12*(1), 49–121. Retrieved from http://genderandset.open.ac.uk/index.php/genderandset/article/view/667

Kick, A. L., Contacos-Sawyer, J., & Thomas, B. (2015). How Generation Z's reliance on digital communication can affect future workplace relationships. *Competition Forum, 13*(2), 214–222. American Society for Competitiveness. Retrieved from https://econweb2012.econ.kuleuven.be/public/u0071727/How%20Generation%20Z's%20Reliance%20on%20Digital%20Communication%20Can%20Affect%20Future%20Workplace%20Relationships.pdf

Koenig, A. M. (2018). Comparing prescriptive and descriptive gender stereotypes about children, adults, and the elderly. *Frontiers in Psychology, 9*, 1086. doi:10.3389/fpsyg.2018.01086

Krekula, C. (2008). The intersection of age and gender: Reworking gender theory and social gerontology. *Current Sociology 55*, 155–171. doi:10.1177/0011392107073299

Kriebernegg, U., & Maierhofer, R. (2013). The ages of life: Living and aging in conflict? In Authors (Eds.), *The ages of life: Living and aging in conflict?* (pp. 9–17). Retrieved from https://www.transcript-verlag.de/978-3-8376-2212-6/the-ages-of-life/?number=978-3-8394-2212-0. doi:10.14361/transcript.9783839422120

Kronberger, N., & Horwath, I. (2013). The ironic costs of performing well: Grades differentially predict male and female dropout from engineering. *Basic and Applied Social Psychology, 35*(6), 534–546. doi.org/10.1080/01973533.2013.840629

Kuchynka, S. L., Salomon, K., Bosson, J. K., El-Hout, M., Kiebel, E., Cooperman, C., & Toomey, R. (2018). Hostile and benevolent sexism and college women's STEM outcomes. *Psychology of Women Quarterly, 42*(1), 72–87. doi:10.1177/0361684317741889

Lackner, K. (2018). Millennials und Nexters. Gruppe. Interaktion. Organisation. *Zeitschrift für Angewandte Organisationspsychologie (GIO), 49*(4), 361–378. doi:10.1007/s11612-018-0433-7

Lamparter, U., Holstein, C., Thießen, M., Wierling, D., Wiegand-Grefe, S., & Möller, B. (2010). 65 Jahre später [65 years later]. *Forum der Psychoanalyse, 26*, 365–387. doi:10.1007/s00451-010-0053-5

Lanier, K., (2017). 5 things HR professionals need to know about Generation Z. *Strategic HR Review, 16*(6), 288–290. doi:10.1108/SHR-08-2017-0051

Lerman, N. E., Oldenziel, R., & Mohun, A. P. (2003). Introduction: Interrogating boundaries. In Authors (Eds.), *Gender & technology. A reader* (pp. 1–9). Baltimore, MD: The Johns Hopkins University Press.

Loe, M. (2010). Doing it my way: Old women, technology and wellbeing. *Sociology of Health & Illness*, *32*, 319–334. doi:10.1111/j.1467-9566.2009.01220.x

Loos, E.F. (2010). *De oudere: een digitale immigrant in eigen land? Een verkenning naar toegankelijke informatievoorziening.* [Older people: Digital immigrants in their own country? Exploring accessible information delivery] [PowerPoint slides]. Boom Lemma, The Hague.

Loos, E. F. (2012a). Designing for dynamic diversity: Representing various senior citizens in digital information sources. *Observatorio, 7*(1), 21–45. doi: 10.15847/obsOBS712013639

Loos, E. F. (2012b). Senior citizens: Digital immigrants in their own country? *Observatorio 6*(1), 1–23. doi:10.15847/obsOBS612012513

Loos E. F., & Ivan L. (2018). Visual ageism in the media. In: L. Ayalon L., & C. Tesch-Römer (Eds.), *Contemporary perspectives on ageism. International perspectives on aging* (163–176). Cham, Switzerland: Springer. doi:10.1007/978-3-319-73820-8_11

Loos, E. F., Ivan, L., Fernández-Ardèvol, M., Sourbati, M., Ekström, M., Wilińska, M., … Schiau, I. (2017). Ageing well?: A cross-country analysis of the way older people are visually represented on websites of organizations for older people. *Journal of Comparative Research in Anthropology and Sociology, 8*(2), 63–83. Retrieved from https://www.ceeol.com/search/article-detail?id=624093

Lucht, P. (2014). Usability und Intersektionalitätsforschung - Produktive Dialoge [Usability and intersectional research - productive dialogues]. In N. Marsden & U. Kempf (Eds.), *Gender-UseIT: HCI, Usability und UX unter Gendergesichtspunkten* [Gender-UseIT: HCI, Usability and UX with regards to gender] (pp. 37–52). doi:10.1515/9783110363227

Lykke, N., & Hearn, J. (2010). Editors' foreword. In A. G. Jónasdóttir, V. Bryson, & K. B. Jones (Eds.), *Sexuality, gender and power. Intersectional and transnational perspectives* (pp. xi–xii). New York, NY: Routledge. doi:10.4324/9780203834916

Maass, S., & Rommes, E. (2007). Uncovering the invisible: Gender-sensitive analysis of call center work and software. In I. Zorn, S. Maass, E. Rommes, C. Schirmer, & H. Schelhowe (Eds.), *Gender designs IT: Construction and deconstruction of information society technology* (pp. 97–108). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Maass, S., Rommes, E., Schirmer, C., & Zorn, I. (2007). Gender research and IT construction: Concepts for a challenging partnership. In I. Zorn, S. Maass, E. Rommes, C. Schirmer, & H. Schelhowe (Eds.), *Gender designs IT: Construction and deconstruction of information society technology* (pp. 9–32). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Maierhofer, R. (1999). American studies growing old. In B. Kettemann & G. Marko (Eds.), *Crossing borders. Interdisciplinary intercultural interaction* (pp. 255–268). Tübingen, Germany: Gunter Narr Verlag.

Maierhofer, R. (2007). An anocritical reading of American culture: The old woman as the new American hero. *Journal of Aging Humanities and the Arts, 1–2*, 23–33. doi:10.1080/19325610701410890

Maioli, D. E. (2017). New generations and employment – an exploratory study about tensions between the psycho-social characteristics of the Generation Z and expectations and actions of organizational structures related with employment (CABA, 2016). *Journal of Business, 2*(1), 1–12. doi:10.18533/job.v2i1.53

Mair, B., & Stetter, J. (2013). Wenn 68er 68 werden [When 68er turn 68]. *GDI Impuls, 3*, 104–107. Retrieved from https://www-wiso-net-de.eaccess.ub.tum.de/document/GDI__7B884427AD0F4F5D37F508882E0378A2

Marr, B. (2019, September 30). The 7 biggest technology trends in 2020 everyone must get ready for now. *Forbes*. Retrieved from https://www.forbes.com/sites/bernardmarr/2019/09/30/the-7-biggest-technology-trends-in-2020-everyone-must-get-ready-for-now/#673f40562261

Marsden, N., Link, J., & Büllesfeld, E. (2014). Personas und stereotype Geschlechterrollen [Personas and stereotypical gender roles]. In N. Marsden & U. Kempf (Eds.), *Gender-UseIT: HCI, Usability und UX unter Gendergesichtspunkten* [Gender-UseIT: HCI, Usability and UX with regards to gender] (pp. 91–104). doi:10.1515/9783110363227

Martus, T. (2018, November 14). Warum für deutsche Behörden digital immer besser ist [why being digital is always better for German authorities]. *NRZ*. Retrieved from https://www.nrz.de/politik/warum-fuer-deutsche-behoerden-digital-immer-besser-ist-id215791711.html

Mason, M. (2010). Sample size and saturation in PhD studies using qualitative interviews. *Forum: Qualitative Social Research, 11*(3), 8. doi:10.17169/fqs-11.3.1428

McCormick-Huhn, K., Warner, L. R., Settles, I. H., & Shields, S. A. (2019). What if psychology took intersectionality seriously? Changing how psychologists think about participants. *Psychology of Women Quarterly, 43*(4), 445–456. doi:10.1177/0361684319866430

McKinsey Global Institute (2019). *The future of women at work. Transitions in the age of automation*. Retrieved from https://www.mckinsey.com/featured-insights/gender-equality/the-future-of-women-at-work-transitions-in-the-age-of-automation

McLaughlin, A., Gandy, M., Allaire, J., & Whitlock, L. (2012). Putting fun into video games for older adults. *Ergonomics in Design: The Quarterly of Human Factors Applications*, *20*(2), 13–22. doi:10.1177/1064804611435654

McLean, J., Maalsen, S., & Prebble, S. (2019). A feminist perspective on digital geographies: activism, affect and emotion, and gendered human-technology relations in Australia. *Gender, Place & Culture, 26*(5), 740–761. doi:10.1080/0966369X.2018.1555146

McPherson Frantz, C. (2006). I am being fair: The bias blind spot as a stumbling block to seeing both sides. *Basic & Applied Social Psychology, 28*(2), 157–167. doi:10.1207/s15324834basp2802_5

Melenhorst, A.-S., Rogers, W. A., & Bouwhuis, D. G. (2006). Older adults' motivated choice for technological innovation: Evidence for benefit-driven selectivity. *Psychology and Aging, 21*, 190–195. doi:10.1037/0882-7974.21.1.190

Meßmer, R., & Schmitz, S. (2007). Bridging disciplines: Gender studies and computer science in an e-learning course. In I. Zorn, S. Maass, E. Rommes, C. Schirmer, & H. Schelhowe (Eds.), *Gender designs IT. Construction and deconstruction of information society technology* (pp. 135–147). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Millwood, J., & Heath, M. R. (2000). Food choice by older people: The use of semi-structured interviews with open and closed questions. *Gerodontology, 17*(1), 25–32. doi:10.1111/j.1741-2358.2000.00025.x

MIT Technology Review (2020, February 26). 10 breakthrough technology 2020. *MIT Technology Review*. Retrieved from https://www.technologyreview.com/10-breakthrough-technologies/2020/

Morrow, S. L. (2005). Quality and trustworthiness in qualitative research in counseling psychology. *Journal of Counseling Psychology, 52*(2), 250–260. doi: 10.1037/0022-0167.52.2.250

Mosberg Iversen, S. (2015, June). *"Not without my kitties": The old woman in casual games*. Paper presented at the Foundation of Digital Games, At Pacific Grove, CA. Retrieved from

https://www.researchgate.net/profile/Sara_Iversen/publication/281447662_Not_witho ut_my_kitties_The_old_woman_in_casual_games/links/55e823d808ae65b63899707c /Not-without-my-kitties-The-old-woman-in-casual-games.pdf

Mpfs. (2018b, November 27). *Wofür nutzt Du Instagram?* [What do you use Instagram for?]. In Statista. Retrieved from von https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/946644/umfrage/schwerpunkte-der-nutzung-von-instagram-durch-jugendliche/

Mühlhausen, C. (n.d.) Sechs Beispiele für zukunftsfähige FemTech-Anwendungen [Six examples of promising femtech applications]. *Zukunftsinstitut*. Retrieved September 5, 2020 from https://www.zukunftsinstitut.de/artikel/sechs-beispiele-fuer-zukunftsfaehige-femtech-anwendungen/

Nap, H. H., de Kort, Y. A., & IJsselsteijn, W.A. (2009). Senior gamers: Preferences, motivations and needs. *Gerontechnology, 8,* 247–262. doi:10.4017/gt.2009.08.04.003.00

Nezik, A.-K. (2020, February 13). Mit ihr muss man rechnen [You have to count on her]. *DIE ZEIT*. Retrieved from: https://www.zeit.de/2020/08/christiane-floyd-professorin-informatik-agiles-arbeiten

North, M. S., & Fiske, S. T. (2013). A prescriptive intergenerational-tension ageism scale: Succession, identity, and consumption (SIC). *Psychological Assessment, 25*, 706–713. doi: 10.1037/a0032367

Noy, C. (2008). Sampling knowledge: The hermeneutics of snowball sampling in qualitative research. *International Journal of Social Research Methodology, 11*(4), 327–344. doi:10.1080/13645570701401305

Nurlu, Ö. (2017). Developing a teachers' gender stereotype scale toward mathematics. *International Electronic Journal of Elementary Education, 10*(2), 287–299. doi:10.26822/iejee.2017236124

OECD. (2019, April 25). *Anteil der potentiell stark und signifikant gefährdeten Arbeitsplätze durch die Automatisierung in den OECD-Ländern* [Proportion of potentially high and significantly endangered jobs through automation in the OECD countries]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/999256/umfrage/gefaehrdete-arbeitsplaetze-durch-die-automatisierung-in-oecd-laendern/

Oktuğ Zengı, M. (2014). Being old and being a woman: A research on the age and gender relationship in the award-winning actors and actresses of the Turkish cinema. *The Turkish Online Journal of Design, Art and Communication, 4*, 72–84. Retrieved from http://dergipark.gov.tr/tojdac/issue/13017/156829. doi:10.7456/10402100/005

Onnen-Isemann, C., & Bollmann, V. (2010). Studienbuch Gender & Diversity. Eine Einführung in Fragestellungen, Theorien und Methoden [Studybook gender & diversity. An introduction to questions, theories and methods]. In P. Nitschke & C. Onnen-Isemann (Eds.), *Aktuelle Probleme moderner Gesellschaften* [Contemporary problems of modern societies]. Frankfurt am Main, Germany: Peter Lang Internationaler Verlag der Wissenschaften.

Otterbacher, J., Bates, J., & Clough, P. D. (2017, May). Competent men and warm women: Gender stereotypes and backlash in image search results. *Proceedings of the CHI*

Conference on Human Factors in Computing Systems, Denver, CO, 6620–6631. doi:10.1145/3025453.3025727

Paulitz, T., & Prietl, B. (2014). Geschlechter- und intersektionalitätskritische Perspektiven auf Konzepte der Softwaregestaltung [Gender and intersectionality critical perspective on concepts of software design]. In N. Marsden & U. Kempf (Eds.), *Gender-UseIT: HCI, Usability und UX unter Gendergesichtspunkten* [Gender-UseIT: HCI, Usability and UX with regards to gender] (pp. 79–90). doi:10.1515/9783110363227

Pawley, A. L. (2020). Shift the default in "broadening participation" in STEM equity research. *International Journal of Gender, Science and Technology, 11*(3), 365–373. Retrieved from http://genderandset.open.ac.uk/index.php/genderandset/article/view/668

Perez-Felkner, L. (2018). Conceptualizing the field: Higher education research on the STEM gender gap. *New Directions for Institutional Research, 2018*(179), 11–26. doi:10.1002/ir.20273

Perez-Felkner, L. (2020). Surpassing STEM's gender limitations: structures, interventions, and systems change. *International Journal of Gender, Science and Technology, 11*(3), 357–360. Retrieved from http://genderandset.open.ac.uk/index.php/genderandset/article/view/713

Pirolli, P., & Card, S. (2005). The sensemaking process and leverage points for analyst technology as identified through cognitive task analysis. *Proceedings of the International Conference on Intelligence Analysis, USA, 5,* 2–4.

PKV. (2019, November 4). Darum wollen Ärzte nicht aufs Land ziehen [That is why doctors do not want to move to the countryside]. *Verband der Privaten Krankenversicherung.* Retrieved from https://www.pkv.de/presse/meldungen/darum-wollen-aerzte-nicht-aufs-land-ziehen/

Popoveniuc, B. (2014). Self-reflexivity. The ultimate end of knowledge. *Procedia - Social and Behavioral Sciences, 163*, 204–213. doi:10.1016/j.sbspro.2014.12.308

Prakash Yadav, G., & Rai, J. (2017). The Generation Z and their social media usage: a review and a research outline. *Global Journal of Enterprise Information System, 9*(2), 110. doi:10.18311/gjeis/2017/15748

Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the Horizon 9*(5), 1–6. doi:10.1108/10748120110424816

Prichard, I., Kavanagh, E., Mulgrew, K. E., Lim, M. S. C., & Tiggemann, M. (2020). The effect of Instagram #fitspiration images on young women's mood, body image, and exercise behaviour. *Body Image, 33*, 1–6. doi:10.1016/j.bodyim.2020.02.002

Pronin, E., Gilovich, T., & Ross, L. (2004). Objectivity in the eye of the beholder: divergent perceptions of bias in self versus others. *Psychological Review*, *111*(3), 781–799. doi:10.1037/0033-295X.111.3.781

Pronin, E., Lin, D., & Ross, L. (2002). The bias blind spot: Perceptions of bias in self versus others. *Personality and Social Psychology Bulletin, 28*, 369–381. doi:10.1177/0146167202286008

Ranga, M., & Etzkowitz, H. (2010). Athena in the world of Techne: The gender dimension of technology, innovation and entrepreneurship. *Journal of Technology Management & Innovation*, *5*(1), 1–12. doi:10.4067/S0718-27242010000100001

Ratzenböck, B. (2016). Examining the experiences of older women with ICTs. Interrelations of generation-specific media practices and individual media biographies. *Nordicom Review 37*, 57–70. doi:10.1515/nor-2016-0023

Ratzenböck, B. (2017). Everyday life interactions of women 60+ with ICTs: creations of meaning and negotiations of identity. In J. Zhou, & G. Salvendy (Eds.), *Human aspects of IT for the aged population* (pp. 25–37). doi:10.1007/978-3-319-58530-7_3

Ronen, S. (2018). The postfeminist ideology at work: Endorsing gender essentialism and denying feminine devaluation in the case of design work. *Gender, Work & Organization, 25*(5), 514–530. doi:10.1111/gwao.12221

Rozanova, J. (2010). Discourse of successful aging in The Globe & Mail: Insights from critical gerontology. *Journal of Aging Studies 24*(4), 213–222. doi:10.1016/j.jaging.2010.05.001.

Ruef, J. L., Willingham, J. C., & Sweeny, S. P. (2020). Re-envisioning "good at math:" A case study of positive transformation. *International Journal of Gender, Science and Technology, 11*(3), 383–393. Retrieved from http://genderandset.open.ac.uk/index.php/genderandset/article/view/624

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

Saetnan, A. R. (2000). Women's involvement with reproductive medicine: Introducing shared concepts. In A. R. Saetnan, N. Oudshoorn, & M. Kirejczyk (Eds.), *Bodies of technology: Women's involvement with reproductive medicine* (pp. 1–30). Columbus, OH: Ohio University Press.

Schaeffer-Hegel, B. (2008). ‚Sozialistische Eminenzen',‚Busen-Attacken' und ‚Weiberrat' – geschlechterpolitische Impulse von 1968 ['Socialist eminences', 'breast-attacks' and 'women's council' - gender political impulses of 1968]. *Neue Soziale Bewegungen, 21*(3). doi:10.1515/fjsb-2008-0309

Schneider, W., & Ihsen, S. (2014). *Wirksamkeits- und Nachhaltigkeitsanalysen von MINT-Motivationsprojekten aus der Genderperspektive* [Effectiveness and sustainability analyses of STEM-motivation projects from the gender perspective, Handout]. Professorship of Gender Studies in Science and Engineering, Technical University of Munich, Germany. Retrieved from

https://www.gender.edu.tum.de/tl_files/TUM_GSI/Handreichung%20GSing%20final.
pdf

Schnicke, F. (2014). Grundfragen intersektionaler Forschung [Basic questions of intersectional research]. In C. Klein & F. Schnicke (Eds.), *Intersektionalität und Narratologie. Methoden – Konzepte – Analysen* [Intersectionality and narratology. Methods – concepts – analyses] (pp. 1–32). Trier, Germany: Wissenschaftlicher Verlag Trier.

Scruton, R. (2007). *The Palgrave Macmillan dictionary of political thought* (Ed. No. 3). doi:10.1057/9780230625099

Seriès, P., & Seitz, A. R. (2013). Learning what to expect (in visual perception). *Frontiers in Human Neuroscience, 7*, 668. doi:10.3389/fnhum.2013.00668

Sey, A., & Hafkin, N. (2019). *Taking stock: Data and evidence on gender equality in digital access, skills, and leadership* (Report of Equals research group, led by the United Nations University). Retrieved from: https://i.unu.edu/media/cs.unu.edu/attachment/4040/EQUALS-Research-Report-2019.pdf

Sharit, J., Czaja, S. J., Perdomo, D., & Lee, C. C. (2004). A cost-benefit analysis methodology for assessing product adoption by older user populations. *Applied Ergonomics, 35*, 81–92. doi:10.1016/j.apergo.2003.12.003

Sherman, L. E., Greenfield, P. M., Hernandez, L. M., & Dapretto, M. (2017). Peer influence via Instagram: effects on brain and behavior in adolescence and young adulthood. *Child Development, 89*(1), 37–47. doi:10.1111/cdev.12838

Simon, J. (2016). Value-sensitive design and responsible research and innovation. In S.-O. Hansson (Ed.), *The ethics of technology - methods and approaches* (pp. 219–236). London, England: Rowman & Littlefield International.

Smith, J., & Baltes, P. B. (1993). Differential psychological ageing: Profiles of the old and very old. *Ageing and Society, 13*, 551–587. doi:10.1017/S0144686X00001367

Song, J., Han, K., Lee, D., & Kim, S.-W. (2018). "Is a picture really worth a thousand words?": A case study on classifying user attributes on Instagram. *PLOS ONE, 13*(10), e0204938. doi:10.1371/journal.pone.0204938

Starr, C. R. (2018). "I'm not a science nerd!": STEM stereotypes, identity, and motivation among undergraduate women. *Psychology of Women Quarterly, 42*(4), 489–503. doi:10.1177/0361684318793848

Statistisches Bundesamt (2019a, October 29). *Studienabschlüsse: Anteile der weiblichen und der männlichen AbsolventInnen bei ausgewählten Studiengängen an Hochschulen in Deutschland im Jahr 2018* [Degrees: Proportions of female and male graduates in selected courses at universities in Germany in 2018]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/876209/umfrage/studienabschluesse-geschlechterverteilung-bei-ausgewaehlten-studiengaengen-an-hochschulen-in-deutschland/

Statistisches Bundesamt (2019b, October 3). *Anzahl der Studierenden in MINT-Fächern in Deutschland nach Geschlecht in den Wintersemestern von 2009/2010 bis 2018/2019* [Number of students in STEM subjects in Germany by gender in the winter semesters from 2009/2010 to 2018/2019]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/1050875/umfrage/studierende-in-mint-faechern-in-deutschland-nach-geschlecht/

Stine-Morrow, E. A., Shake, M. C., Miles, J. R., & Noh, S. R. (2006). Adult age differences in the effects of goals on self-regulated sentence processing. *Psychology and Aging*, *21*, 790–803. doi:10.1037/0882-7974.21.4.790

Storage, D., Horne, Z., Cimpian, A., & Leslie, S.-J. (2016). The frequency of "brilliant" and "genius" in teaching evaluations predicts the representation of women and African Americans across fields. *PLOS ONE, 11*(3), e0150194. doi:10.1371/journal.pone.0150194

Sutko, D. M. (2020). Theorizing femininity in artificial intelligence: a framework for undoing technology's gender troubles. *Cultural Studies, 34*(4), 567–592. doi:10.1080/09502386.2019.1671469

Tallon, T. (2019, September 3). A century of "Shrill": how bias in technology has hurt women's voices. *The New Yorker*. https://www.newyorker.com/culture/cultural-comment/a-century-of-shrill-how-bias-in-technology-has-hurt-womens-voices

The Digital Divide. (2019, September 15). Retrieved from https://cs.stanford.edu/people/eroberts/cs181/projects/digital-divide/start.html

Thornberg, R., & Charmaz, K. (2014). Grounded theory and theoretical coding. In U. Flick (Ed.) *The sage handbook of qualitative data analysis* (pp. 153–169). Los Angeles: SAGE. doi:10.4135/9781446282243.n11

Thygesen, T. (2019, August 23). The state of venture capital - female-founded companies secure only 3% of investments. *Forbes*. https://www.forbes.com/sites/tinethygesen/2019/08/23/the-state-of-venture-capital-female-founded-companies-secure-only-3-of-investments/#72bb90fd51d4

Tiggemann, M., & Zinoviev, K. (2019). The effect of #enhancement-free Instagram images and hashtags on women's body image. *Body Image, 31*, 131–138. doi:10.1016/j.bodyim.2019.09.004

Turner, P. G., & Lefevre, C. E. (2017). Instagram use is linked to increased symptoms of orthorexia nervosa. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity, 22*(2), 277–284. doi:10.1007/s40519-017-0364-2

Ughetto, E., Rossi, M., Audretsch, D., & Lehmann, E. E. (2020). Female entrepreneurship in the digital era. *Small Business Economics, 55*, 305–312. doi:10.1007/s11187-019-00298-8

Van de Goor, A. G., & Becker, H. A. (2000). *Technology generations in the Netherlands: a sociological analysis*. Maastricht, Netherlands: Shaker Publishing.

Verband: Deutschland fehlen jährlich 10.000 Ingenieure [Association: Germany lacks 10,000 engineers annually]. (2018, November 12). *Merkur*. Retrieved from https://www.merkur.de/leben/karriere/verband-deutschland-fehlen-jaehrlich-10-000-ingenieure-zr-10551886.html

Von Grafenstein, B. (Director). (2013). *Helmut Schmidt – Lebensfragen* [Helmut Schmidt – Life questions] [Film]. Trebitsch Entertainment.

Von Keyserlingk, L., Becker, M., & Jansen, M. (2020). Do social comparisons matter for university major choices? A longitudinal study from a gender perspective. *International Journal of Gender, Science and Technology, 12*(1), 46–64. Retrieved from http://genderandset.open.ac.uk/index.php/genderandset/article/view/676

Wajcman, J. (2006). TechnoCapitalism meets TechnoFeminism: Women and technology in a wireless world. *Labour & Industry: A Journal of the Social and Economic Relations of Work*, *16*, 7–20. doi:10.1080/10301763.2006.10669327

Wajcman, J. (2007). From women and technology to gendered technoscience. *Information, Communication & Society, 10*, 287–298. doi:10.1080/13691180701409770

Wajcman, J. (2010). Feminist theories of technology. *Cambridge Journal of Economics, 34*, 143–152. doi:10.1093/cje/ben057

Walby, S. (1989). Theorising patriarchy. *Sociology, 23*(2), 213–234. doi.org/10.1177/0038038589023002004

Whiting, L. S. (2008). Semi-structured interviews: Guidance for novice researchers, *Nursing Standard, 22*(23), 35–40. doi:10.7748/ns2008.02.22.23.35.c6420

WIFO. (2020, April 22). COVID-19: Ökonomische Effekte auf Frauen [COVID-19: Economical effects on women]. *WIFO*. Retrieved from: https://www.wifo.ac.at/wwa/pubid/65897

Winker, G., & Degele, N. (2011). Intersectionality as multi-level analysis: Dealing with social inequality. *European Journal of Women's Studies, 18*, 51–66. doi:10.1177/1350506810386084

Wittenhorst, T. (2018, April 21). Fachkräftemangel: Deutscher Mittelstand sucht Ingenieure und IT-Experten bereits im Ausland [Skilled labor shortage: German medium sized businesses are already looking for engineers and IT experts abroad]. *Heise online*. Retrieved from https://www.heise.de/newsticker/meldung/Fachkraeftemangel-Deutscher-Mittelstand-sucht-Ingenieure-und-IT-Experten-bereits-im-Ausland-4029027.html

World Health Organization (2015, September 30). Number of people over 60 years set to double by 2050; major societal changes required. *World Health Organization*. Retrieved from: http://www.who.int/mediacentre/news/releases/2015/older-persons-day/en/

Wright, M. F. (2017). The role of technologies, behaviors, gender, and gender stereotype traits in adolescents' cyber aggression. *Journal of Interpersonal Violence, 35*(7–8), 1719–1738. doi:10.1177/0886260517696858

Yurieff, K. (2019, November 14). Instagram is now testing hiding likes worldwide. *CNN Business*. Retrieved from https://edition.cnn.com/2019/11/14/tech/instagram-hiding-likes-globally/index.html

ZDF, & ARD. (2018, October 23). *Durchschnittliche tägliche Nutzungsdauer des Internets nach Altersgruppen in Deutschland in den Jahren 2017 und 2018* [Average daily usage of the Internet by age group in Germany in 2017 and 2018]. In Statista. Retrieved from https://de-statista-com.eaccess.ub.tum.de/statistik/daten/studie/935319/umfrage/taegliche-nutzungsdauer-des-internets-nach-altersgruppen-in-deutschland/

Zeljko, N. (n.d.). *Shorts cuts. Do we really have to talk about age?* Retrieved on October 7, 2019 from: https://femaleonezero.com/worklife/short-cuts-2/

Zukunftsinstitut (n.d.). Megatrends. *Zukunftsinstitut*. Retrieved on September 5, 2020 from https://www.zukunftsinstitut.de/dossier/megatrends/

Zweig, K. A., & Krafft, T. D. (2018). Fairness und Qualität algorithmischer Entscheidungen [Fairness and quality of algorithmic decisions]. In R. Mohabbat Kar, B. E. P. Thapa, & P. Parycek (Eds.), *(Un)berechenbar? Algorithmen und Automatisierung in Staat und Gesellschaft [(U)npredictable? Algorithms and automation in state and society]* (pp. 204–227). Berlin: Kompetenzzentrum Öffentliche IT.