Digital Services for the Aging Society:
The Impact of Previous Workplace Priviliges on Mature Adults' Use of the Internet

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***Abstract*—Developed economies face severe challenges from demographic change. A popular measure to counter this development is to empower the aging society for longer independent living. Digital services offered through the Internet are discussed as major enabling factor. However, although this seems the natural way to help this clientele, our knowledge on Internet usage habits of the elderly is still limited. Therefore, we conducted a quantitative study targeting the 50+ population to assess the effect previous Internet usage at work has on current private Internet use. Our findings underline the high importance which Internet self-efficacy and anxiety have on the actual use of Internet services.**

Keywords: Internet Use; Mature Adults; Computer Self-Efficacy; Computer Anxiety.

I. INTRODUCTION

Literally all developed economies face the problem of an adverse demographic structure [2]. Especially Europe has been struck by the challenge that the general population rapidly grows older and in the near future old people will have outnumbered the young ones [3]. The demographic change affects society in many ways. One of the most pressuring being a severe shortage of people working in the service industry to care for the aging generation. This applies specifically to health professionals [4] as older people tend to increasingly request health related services. But not only healthcare, also other service areas suffer from a lack of qualified personnel.

As widely propagated answer to counter this challenge is to provide digital services for the elderly to enable them to longer live autonomously. eHealth and telemedicine offerings are booming these days [5]. However, despite the numerous offerings the proof that these mechanisms are effective is still outstanding. Several studies point out that adoption rates for eHealth and telemedicine are low [2].

To a certain extent, this mismatch between supply and demand may arise from a lack of knowledge about the level of comfort elderly people have interacting with the Internet. This poses a severe challenge for current research, as there is certain ignorance about old people's attitude towards the Internet and the offerings presented via this channel. In fact, even the few IS studies that used the concept of age as a substantive variable have mostly relied on stereotypical accounts alone to justify their age-related hypotheses [6].

In order to provide digitalization to the aging society, we first need to understand more about the behavioral intention and attitudes of the elderly. This research aims to provide insights into these matters. As pointed out before, the elderly are not a homogenous group but in fact as heterogeneous as all other segments of the population. With respect to Internet use we see different shades of grey ranging from frantic users to total rejection. Reason for rejection could be that the person had no prior contact to the Internet during younger times. Therefore, we hypothesize that there is a positive relation between previous Internet experience and current use. To investigate this question we put forward the research question: What is the relationship between previous Internet usage at work and current Internet use in private life?

Our findings are assumed to help developing more suitable digitalization services for the aging society.

To shed light on this question we developed a theory-guided questionnaire that was tested with 148 participants 50 and above. As we were targeting the general population (including those who only make very limited use of the Internet) the research needed to be conducted as physical interviews to avoid bias towards those who use the Internet more frequently.

The paper is structured as follows. In Section 2, we briefly outline important individual differences found in prior literature on mature adults' technology use. In Section 3 we develop our research model and derive according hypotheses how mature adults' private Internet usage is influenced by prior workplace Internet usage. Thereafter, in Section 4, the research method is described in detail and participants' demographics, as well as results are discussed. Following that, the findings are presented and limitations explicated in Section 5. The paper closes with an outlook to further research and the conclusion in Section 6.

II. LITERATURE REVIEW

Research identified several sources of individual differences in IT related behavior. These are demographic factors (age, gender, income, level of education, etc.), situational variables (knowledge, expertise, etc.) or IT-specific individual characteristics [7][8]. Naturally, the latter are regarded as prime candidates in explaining and predicting individual differences in IT-related behavior [8][9]. Specifically Computer Self-Efficacy and Computer Anxiety

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have previously shown to assert a severe impact towards human behavior on IT-related matters, both, in general [8][9] and in the context of mature adults [10][11]. Within this section, we briefly outline these two distinct individual characteristics – Computer Self-Efficacy and Computer Anxiety– and their importance for mature adults.

A. Computer Self-Efficacy

Computer Self-Efficacy (CSE) is defined as the "judgment of one's capability to use a computer" [12, p. 192]. The concept originated from Bandura's Social Cognitive Theory [13][14] where general self-efficacy reflects "the belief in one's capability to organize and execute the courses of action required to manage prospective situations" [14, p. 2]. Self-efficacy thereby acts as a key determinant of behavioral control [14][15]. It has been consequently incorporated into the Theory of Planned Behavior (TPB) by reflecting internal control beliefs [16].

IS researching utilizing CSE consequently theorized about the role of CSE as determinant of IT-related behavior from different perspectives [17][18][19]. Consequently, CSE has been found to play an important role in individual's technology-directed behavior by influencing adoption decisions and actual use both directly and indirectly [20][21][22]. For instance, CSE significantly influences ease of use and usefulness perceptions and thereby indirectly influences behavioral outcomes such as intention or actual use of a given technology [23]. Likewise, several direct effects of CSE have been reported in the literature, whereby CSE significantly individuals' intention to use or to continue using a technology [15][22][24][25].

With respect to Internet usage, Davis and Mun [26] revealed that CSE highly predicts the extent to which individuals utilize the web by means of how frequently certain functions such as online-shopping or social networks are used. Wang, Li and Hsieh [27] show that CSE acts as a strong contingent effect on how individuals found innovative uses of IT. In contrast to these findings Mcelroy, Hendrickson, Townsend and Demarie [28] found that general self-efficacy does not predict how often users surf the Internet or visit chat-rooms, but that it predicts whether users are willing to shop online or not, thereby reflecting an absolute measure of an extended use case.

In the realm of mature adults, research likewise emphasized the important role of CSE on elderly individuals' technology behavior. By drawing on Social Cognitive Theory, Lam and Lee [11] have shown how CSE among with outcome expectations predicts Internet use intentions. In a recent study investigating the predictive power of major technology acceptance models, Niehaves and Plattfaut [29] reported that CSE constitutes the strongest predictor by outperforming other important factors.

Given these insights about the importance of CSE in explaining general and mature adults' Internet behavior, it becomes important to understand how CSE is actually determined. Hereunto, Marakas, Yi and Johnson [30] identified in their literature review a broad variety of environmental, cognitive and behavioral influences on CSE, such as training, experience, social persuasion, but likewise individual factors, such as age, gender, emotional states, or personality.

B. Computer Anxiety

Computer Anxiety (CA) reflects the tendency of individuals to be uneasy, apprehensive or fearful when confronted with using computers. Typical fear comprises data loss or irrevocable mistakes by the user (e.g., deleting a file or formatting a hard drive) [31][32]. Individuals with computer anxiety often possess feelings of helplessness [33].

In a review of two decades of research on CA, Powell [34] found a variety of antecedents for CA. For instance, the broad trait of neuroticism and other emotional forms of anxiety have been found to predict one's CA while computer training and experience have been found to be countermeasures in decreasing –especially older– individuals' anxiety [11][35][36]. CA is an established, important anchor how individuals form ease of use perceptions and thereby indirectly influences technology-directed behavior [17][37].

The relationship between CA and CSE has been consistently reported to be negatively associated [8][10][12][30] indicating that individuals with higher anxiety tend to pose decreased self-beliefs in their ability to use a computer. Considering CA's relevance for mature adults' computer behavior, CA was commonly found to increase with higher age [34].

III. Research Model

Our study seeks to investigate the sources and effects of individual differences in mature adults' use of computer technology and in our specific case: the use of the Internet in private settings. Based on the aforementioned reflections on prior literature, we pose that CSE and CA as factors accounting for individual differences directly influence mature adults' Internet usage. Although these two factors have been found to be of importance for adults' technology use behavior, less is known how these factors are determined. Most of todays' available studies observed the impact of explicit training interventions [11][35][36] that are likewise generically applicable to other populations.

Consequently, existing studies fall short in explaining these differences with factors distinct to mature adults, leading researchers frequently to call for further unique studies how CSE and CA are determined for mature adults [6][29]. Therefore, our research seeks to investigate the effect of prior working environments on mature adults' current Internet use behavior. Our research model in Fig. 1 depicts our research model graphically. We elaborate on the constructs and hypothesized relationships between them in the following paragraphs.

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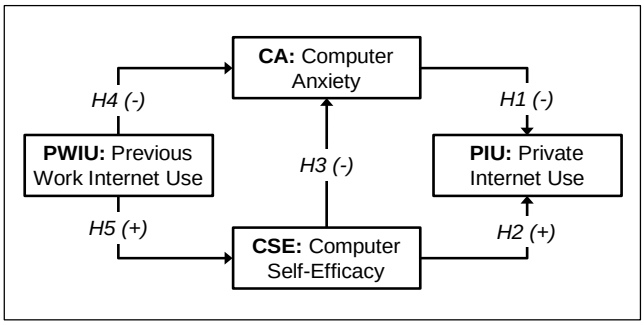

Figure 1. Research Model.

Private Internet Use (PIU) acts as the dependent variable in our research model and is hereunto defined as an individuals' utilization of the Internet in the last period (i.e., six months) in a private setting. Our PIU measure considers important dimensions of actual technology behavior [38] by incorporating the dimensions of duration (i.e., how much time spent), frequency (i.e., how often), and intensity (i.e., extent of Internet-related activities) [39][40].

The Internet has become an ubiquitous tool with the potential to support nearly all mature adults' life aspects. It serves not only as a knowledge base, but likewise as a handy tool for communication purposes, commerce activities or banking. Many mature adults only partially take advantage of the broad spectrum of features the Internet offers and remain at lower level uses, such as information retrievals. As such, we expect that especially the dimension of intensity is heterogeneously distributed among mature adults. To understand these differences in Internet usage, we draw on above outlined factors accounting for individual differences in technology behavior: CA and CSE.

As outlined, CA reflects the tendency of individuals to be uneasy, apprehensive or fearful when confronted with using computers, such as data losses and other mistakes by the user [31][32]. Individuals with computer anxiety often possess feelings of helplessness [33]. CA is a IT-specific derivate of the broad the broad trait of neuroticism and other emotional forms of anxiety [34]. Our review of prior literature in Section 2 indicated that CA both, in general and especially in cases of mature adults, directly and indirectly influences individuals' technology usage. It has been shown that mature adults generally possess higher anxieties towards technologies compared to younger counterparts [34]. Since our study is concerned with Internet usage, we adapt CA to this context and denote CA as the fear or apprehension that individuals experience when using the Internet [41][42]. Based on prior evidence, we expect that mature adults with high computer anxiety feel insecure and try to avoid using the Internet and vice versa. We consequently position CA as a direct determinant of PIU by hypothesizing:

H1: *Computer Anxiety negatively influences Private Internet Use.*

CSE generally reflects an individual's judgment about her/his capabilities to use a computer [12, p. 192].

As outlined above, CSE reflects an important individual differentiator of mature adults' technology use. For our study purpose we adapt CSE similar to CA to the Internet context by defining it as one's ability to make use of Internet websites. We assume that people with high degrees of CSE are more actively engaged in their Internet usage. Given the high importance and prior evidence for CSE's general role, we hypothesize that:

H2: *Computer Self-Efficacy positively influences Private Internet Use.*

According to Social Cognitive Theory [13][14], emotional arousal and self-efficacy are reciprocally determined; depending on which variable acts as a stimulus, an effect in the other variable can be observed [17]. Prior research on CSE and CA provides evidence that both effects also occur in the context of technologies [8][22][43]. CSE thereby might act as an important coping mechanism in dealing with negative emotions in technology use [37]. In our study context, we assume that mature adults with a higher degree of CSE have a lower degree of CA as they are more confident in working with computers and the Internet. Users who reached that status are usually not afraid of computers or the Internet as they know what to do and which actions to avoid. This level of security is assumed to decrease feelings of anxiety. Therefore, we hypothesize:

H3: *Computer Self-Efficacy negatively influences Computer Anxiety.*

Despite the reported important role CA and CSE play in mature adults' technology usage, little is known how these factors specifically for mature adults are determined leading researchers frequently to call for dedicated research [6][29].

Both factors –CA and CSE– are argued to be dynamic in nature, as that they be altered by dispositional and environmental factors [8][33]. As outlined in Section 2, especially computer training and experience have been frequently found to be of importance as that these factors are able to increase CSE and decrease CA of mature adults [11][34][36].

In a different, yet related research context of the digital divide among pupils, Wei, Teo, Chan and Tan [44] revealed that school IT access and usage "had a significantly stronger impact on CSE for students without home computers than students with home computers" (p. 179). The study indicates that IT-related behavior can be in part determined through distinct types of experience gained in dedicated environments giving greater insights into the causal, underlying mechanisms of individual differences in IT use.

Adults in general or 'digital immigrants' today often receive dedicated computer training and gain thorough experiences in handling digital media at their working places, where working with computer technologies and the Internet has become a natural routine. In contrast to that, however, a lot of mature adults are naturally already in retirement. As Tams, Grover and Thatcher [6] state, most of those mature adults, received their, if any, computer education in times

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where information technologies were far less multifaceted than today.

Following the rationale that CA and CSE can be altered through environmental factors, the preliminary evidence of the effects from dedicated environments, and given that many workplaces increasingly relied computer and Internet use for the last two decades [10], some mature adults might have gained their computer and Internet experience during their last years of work affecting their CA and CSE.

Consequently, we propose the factor of Previous Work Internet Use (PWIU), defined as an individuals' utilization of the Internet in the last period at her/his workplace (time frame of six months) that encompasses the dimensions of duration and frequency of Internet use [adapted from 45]. For those being retired, this definition denotes the last six months before retirement. Based on the above outlined discussion, we hypothesize that:

H4: *Previous Work Internet Use negatively influences Computer Anxiety.*
H5: *Previous Work Internet Use positively influences Computer Self-Efficacy.*

Based on these theoretical considerations and hypotheses, we conducted our empirical research as described in the following Section 4.

IV. RESEARCH METHODOLOGY

A. Questionnaire Development

In order to test our research model, we conducted a quantitative survey-based research approach. We developed a questionnaire with measurement items drawn from previously published information systems research. The measurement instrument for our core constructs is depicted in Table 4 at the end of the paper. For CSE and CA, available items were carefully transferred from the context of general computer interactions, to the Internet use context.

CSE was measured with a 5-item version [21][46] based on the original CSE scale of Compeau and Higgins [12] and adapted to the context of using a new Internet service. Measures for CA were taken from Compeau and Higgins [12] and adapted to using the Internet. PWIU was assessed with two items along the dimensions of duration and frequency [45]. Duration of PWIU measures the average amount of time a person spent using the Internet (i.e., how long) in a typical week in her/his last period at work [adapted from 45]. Frequency, in contrast, asks respondents how often one used the Internet at work in a typical week in her/his last period at work. PIU asked respondents about their Internet use in a private context and was assessed along three dimensions of duration, frequency and intensity. While duration and frequency are assessed similar as to those of PWIU, we additionally measured intensity by asking respondents typical Internet offerings they use, such as (e.g. information search, communication, online shopping, etc.). Based on binary values (yes/no) of features used, we calculated intensity with values ranging from 1 to 7.

As most items were originally published in English they have been translated in to German first. In several iterations, we validated the instrument with a total of 18 respondents from the target group to ensure readability, clarity and proper wording. The questionnaire was modified until the pre-tests did not bring up any new suggestions for improvement.

B. Data Collection

Access to the target group has been frequently shown to be difficult [e.g. 2] and using an online-survey might attract rather technology-savvy adults causing potentially biased results. Therefore, we employed a convenience sampling method using a paper-and-pen based field survey approach that has been shown to be successfully in gathering data from the target group [e.g. 47]. Like other studies before [e.g. 36], we collected data at public places such as pedestrian zones, libraries, gyms, adult schools, and senior citizen centers.

Three independent researchers conducted the field study from May to October 2015 in southern Germany by randomly asking people (who appeared to be 50+) to participate in the survey. The researchers ensured the participants for anonymity and that there are no 'wrong' or 'right' answers for the survey questions asked while collecting data [48]. We only addressed participants that actually used the Internet at least once in their lifetime. The reason for this was that only people who had seen the Internet before are able to answer the questions correctly.

To motivate participation, a tablet computer was raffled amongst all participants who provided contact details. The latter data were kept on a separate sheet and destroyed after the winner received the price.

C. Participants' Demographics

In total, we collected 165 surveys, whereby 19 surveys were incomplete and needed to be dropped from the dataset. The remaining 146 surveys constitute the dataset of our analysis. Table 1 outlines the demographics of our dataset.

V. RESULTS

To validate our research model, the data was analyzed as structural equation model using the partial least squares (PLS)

TABLE I. PARTICIPANTS' DEMOGRAPHICS (N=146)

Age		Gender		Retired		Marital status		Household's (net) income p.m.	
40's	4%	Male	33%	Yes	65%	Single	12%	< 1 k Euro	1%
50's	22%	Female	67%	No	34%	Married	65%	1–2 k Euro	20%
60's	42%			n.a.	1%	Divorced	8%	2–3 k Euro	23%
70's	26%					Widowed	13%	3–4 k Euro	23%
80's	6%					n.a.	1%	4–5 k Euro	7%
n.a.	1%							> 5 k Euro	10%
								n.a.	16%

TABLE II. MEASUREMENT MODEL VALIDATION

Construct	Mean	S.D.	AVE	CR	CRA	1	2	3	4
1 CA	1.84	1.29	0.613	0.888	0.842	**0.783**			
2 CSE	5.07	2.46	0.689	0.917	0.887	-0.307	**0.830**		
3 PWIU	3.13	2.65	0.918	0.957	0.912	-0.075	0.159	**0.958**	
4 PIU	3.50	1.66	0.637	0.840	0.715	-0.536	0.321	0.134	**0.798**

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method with the software package SmartPLS 3.0 [49]. Although the dataset with 146 responses seems to be small, it is sufficiently large to analyze the model according to the rule of ten [50]. Following the two-step procedure as proposed by Chin [1], we first analyzed the measurement model, followed by an assessment of the structural model.

The measurement model represents the relationships between the observed data and the latent variables. Table 2 reports the results of the measurement model that can be interpreted as follows.

All item loadings are above 0.70 and each item loaded on its construct significantly ($p < 0.001$); items with insufficient loading have been dropped [51]. To ensure further construct quality, we assessed whether values for composite reliability (CR) and Cronbach's Alpha (CRA) are above 0.70 [52], values for average variance extracted (AVE) are at least 0.50 [53]. Sufficient discriminant validity is given since construct correlations are smaller than the square root of the AVE [53][54]. In sum, the results demonstrate adequate psychometric properties of the measurement model allowing us to proceed and test the structural model.

The structural model represents the relationships between the latent variables. To evaluate the structural model we assessed the coefficients of determination (R^2) and the significance levels of the path coefficients [1]. For our dependent variable the model explains 31.5% of the variance in private Internet use. The results on all hypothesized relationships are illustrated in Table 3 and Fig. 2 below.

Finally, we checked typical control variables. We controlled for effects of gender and age on Internet use. No effects of age (-0.118; p=0.140) or gender (-0.104; p=0.187) were observed.

TABLE III. STRUCTURAL MODEL RESULTS

Path	Path Coefficient	t-value	Effect Size[a]	Result
PWIU → CA	-0.026	0.303	–	Not supported
PWIU → CSE	0.159*	2.015	0.026 (small)	Supported
CSE → CA	-0.303***	3.922	0.099 (small)	Supported
CA → PIU	-0.483***	7.244	0.309 (medium)	Supported
CSE → PIU	0.172*	2.417	0.039 (small)	Supported

*** p < 0.001; ** p < 0.01; * p < 0.05
a. Effect size interpretations according to Chin [1]

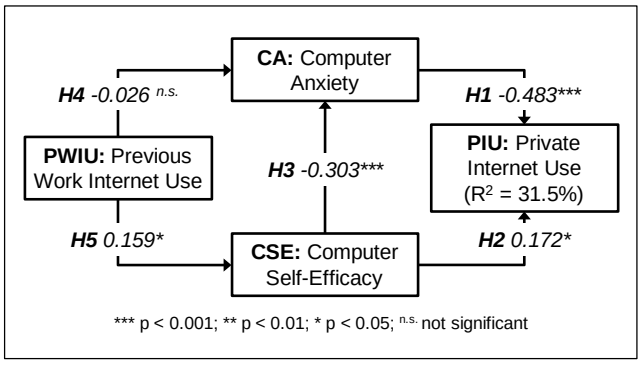

Figure 2. Research Model Results.

VI. DISCUSSION

A. Findings

Our research model is able to explain about 30% of the variance in mature adults' private Internet usage. Although these values might seem to small, the results correspond with research that relied on such factors related to individual differences in explaining technology use with reported R^2 values of 20% [11], 25% [26], or 34% [22].

We see that CA has a highly significant negative effect on private Internet use, thereby supporting our hypothesis (H1). This forges the obvious explanation that mature adults who are more anxious of the Internet do not like to use it. In the same vain, we see a significant positive effect going from self-efficacy towards private Internet use as hypothesized (H2). Although we would have expected this relationship to be stronger and higher in significance, the hypothesized relationship still finds good support: mature adults with a higher level of self-confidence towards an action are likely to perform it. Moreover, we found a highly significant negative path from self-efficacy towards anxiety giving support for the hypothesized negative effect of CSE on CA (H3). Hence, mature adults with higher confidence in their own abilities significantly decrease their fears towards the Internet.

We further sought to unravel the distinct influence of prior exposure to IT from a workplace (i.e., PWIU). Our underlying hypothesis is that the influence is positive, i.e., people who used the Internet as part of their (previous) work routines have a higher CSE and lower CA.

In this study, we did not find a significant relationship between PWIU and CA leading us to reject our hypothesis (H4), yet we found solid support for the effect of PWIU on CSE supporting our hypothesis (H5). Given the strong effect of CSE on CA, in turn, our results indicate that CSE acts as a mediator between PWIU and CA as that PWIU poses indirect effects on CA.

B. Implications

In this study, we sought to unravel the effects of individual differences on mature adult's Internet usage. In our research model, we incorporated CA and CSE as direct antecedents of Internet usage and positioned PWIU as a novel and distinct determinant for these differences in mature adults. We empirically tested our model with 146 adults aged 50 and above. Drawing on these results, we can derive the following contributions and implications.

First, prior research highlighted the role of self-efficacy beliefs and emotional fears as predictors for mature adults' technology behavior. Our results indicate, that CA and CSE solely account for 30% of the variance in mature adults' Internet usage. Our study thereby supports prior research and highlights again that these two factors must be taken into account to understand mature adults' technology behavior. Prior research that likewise solely on individual differences as predictors of Internet usage frequently observed younger adults. Comparing our results with those studies, we observe that CA is indeed of higher relevance for mature adults than

for younger adults. In sum, our study supports prior research about the importance of CSE and CA for mature adults.

Second, given the importance of CSE and CA for mature adults, less is known about the sources for these individual differences of mature adults. Although training interventions and general experience have been found to be of predictive relevance, researchers frequently urged for further research on distinct sources as outlined in above. Given this gap in research, we conceptualized PWIU as a distinct source of mature adults' CA and CSE. In contrast to explicit training interventions, PWIU reflects a rather salient source of 'mastery experience', an important source of one's self-efficacy. Our results demonstrate that PWIU indeed determines CSE meaning that people who used the Internet on the job are likely to have a higher self-confidence towards using the Internet. In contrast, we did not found support for PWIU's impact on CA. The absence of the direct effects of PWIU on CA is, however surprising and contrary to our hypotheses. A potential explanation is that PWIU poses rather indirect effects of CA with CSE serving as a mediating factor; PWIU increases mature adults' CSE, which, in turn, decreases their anxieties towards the Internet.

Another potential explanation for the insignificant relationship between PWIU and CA might be the frequent media coverage on the dangers of using the Internet could play a role. Especially in the last years, several threats in the dynamic Internet environment emerged, such as fraud, scams, and phishing. Given that most of our study's participants are already retired, we suggest that they gained their experiences in interacting with the Internet in times were such dangers were less wide spread or of less great concern than today. As such, our results suggest that mature adults' anxieties towards the Internet are frequently adapted to novel and emerging threats of the Internet and that their prior experiences are not supportive in dealing with such endangering situations of the Internet. This issue might further amplify the longer individuals have left the working environment respectively the longer they are retired.

Based on our findings and discussion, the derived implications of our research are manifold. We were able to show that the ageing generation is by far not Internet-adverse. On the contrary, the behavioral mechanisms are very similar to those of other age clusters. We see that people need a certain level of self-efficacy in order to use the Internet and when they possess this confidence then they are more actively using it. Practice needs to be aware that although the Internet became widespread already 15 years ago, most individuals of higher ages started using the Internet at a far later time. While some of those 'senior surfers' got in touch with the Internet already during their working time that resulted in higher self-confidence in their abilities to navigate through the Web, others did not have the chance to gain earlier experience. Thus, practice needs to be aware of these differences and should either provide Internet-based solutions that do not require sophisticated Internet skills or policy makers that are in charge to foster Internet education for the elderly. Prior research has shown that even rather simple computer and Internet training interventions are highly effective for mature adults in increasing their CSE and significantly decreasing their CA [11][36]. However, given that not all mature adults are necessarily willing or have the chance to take part in dedicated training interventions, we further suggest that media should not only cover the threats of the Internet but should likewise offer educational material on countermeasures in dealing with those issues in a format that is easily understandable and applicable for older individuals.

From a theory perspective we were able to increase our knowledge on Internet-related behavior of the aging society. Our results first of all underline the general applicability of individual differences in explaining technology-related behavior and highlight the importance these factors play for the aging segment of the population. Second, as outlined, we offered a novel source accounting for these individual factors that is distinct to mature adults: previous work Internet use. We thereby enriched our understanding on the important behavioral factors of mature adults' Internet usage and a novel, yet salient, source accounting to the digital divide.

C. Limitations

Our research is not without its limitations and these must be taken into account when interpreting the results. First, we had to rely on a convenience sampling approach given the difficulties in access to the target group. Therefore, we surveyed mature adults at public places and institutions thereby potentially mitigating those individuals, which are less outgoing or have severe issues forcing them to stay at home. Although our sample size of 146 responses is sufficiently large to calculate our research model, these can be no means be regarded as representative for the general population. Consequently, our results and contributions are limited in their generalizability. Moreover, we measured all independent and dependent factors at one time, which might have primed the participants about the purpose of our study [48]. We further employed self-reported usage measure that involve subjective judgments and individuals often tend to over- and underestimate their actual usage behavior [38]. This poses a problem specifically in previous work Internet use as in some cases (the older population) the work experience dated back several years (sometimes decades).

Second, although our explained variance of about 30% for mature adults' correspond with those of related studies drawing primarily on factors accounting for individual differences [11][22][26], we acknowledge that there are obviously further influential factors causing for mature adults' Internet usage. We only relied on two important individual factors accounting for variance and left out technology-related beliefs about usefulness or ease of use.

Third, given that –to the best of our knowledge– our research is one of the first that sought to understand the effects prior Internet exposure at the workplace, our study is best positioned as exploratory in nature. We only observed the direct effects of PWIU on CA and CSE and left out potential moderating effects such as the length of retirement.

Fourth, since our technology under investigation was the Internet, we adapted the measurements to the Internet context, which consequently limit our results to the specific Internet context.

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To address these shortcomings of our study, we outline our further steps and additional potential avenues for further research next.

VII. Conclusion and Future Work

This research elaborated on the influence of previous work Internet usage on current private Internet usage. We selected computer anxiety and computer self-efficacy as mediating constructs. In a quantitative research with 146 valid responses, we targeted an audience of 50+, i.e., people who did not grow up with widespread Internet experience.

Our findings underline the strong influence of the chosen constructs, CA and CSE. We were able to show that "the elderly" are not a homogenous group of people not using the Internet. However, digital services need to be presented in a way that mature adults feel they possess the right skillset to use it and do not fall for anxiety. This calls for easy solutions and creative training mechanisms.

However, taking the stated limitations into account, our future goal is to enlarge the interview base and recruit informants on a global basis. We expect novel insights when comparing national differences in elderly's Internet use.

Furthermore, we suggest that more research is needed to elaborate on the mechanisms accounting for mature adults' technology behavior. In a recent review on mature adults' technology usage, Chen and Chan [55] outlined literature on studies of that draw on the well-known Technology Acceptance Model (TAM) [56][57] and reflect that usefulness and ease of use perceptions constitute important factors for older adults' technology use as they often consider novel technologies as irrelevant and unnecessary for their daily life leading them to reject technologies. The authors echo that these usefulness beliefs are likewise derived from their perceptions about the efforts with which the technologies can be used (i.e., perceived ease of use) [55]. Given that, as outlined in Section 2, CA and CSE both act as important anchors of these traditional TAM factors, incorporating CA and CSE among TAM factors should consequently lead to greater explanations in terms of explained variance (i.e., higher R^2 values). However, TAM-based models are likewise generically applicable in other research contexts and for other target groups. We suggest that other, rival theories are needed to derive distinct insights into mature adults' technology behavior. We suggest that age-related theories, such as from the domain gerontology, could be worth of further research to observe in the domain of adults' technology acceptance and use.

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TABLE IV. MEASUREMENT INSTRUMENT (TRANSLATED FROM GERMAN)

Items		Source
Computer Self-Efficacy (CSE)		
	I could use a heretofore unknown website…	Adapted from [12][21][46]
CSE.1	if I had previously used similar websites for the same purpose.	
CSE2	if someone showed me how to do it first.	
CSE.3	if I had just the built-in help facility for assistance.	
CSE.4	if I had never used a website like it before.	
CSE.5	if there was no one around to tell me what to do while using it.	
Computer Anxiety (CA)		
CA.1	I feel apprehensive about using the Internet.	Adapted from [12]
CA.2	It scares me to think that I could lose data by mistake by using the Internet.	
CA.3	It scares me to think that I could inadvertently reveal sensitive information on the Internet.	
CA.4	I hesitate to use the Internet for fear of making mistakes that I cannot correct.	
CA.5	The Internet is somewhat intimidating to me.	
Past Work Internet Use (PWIU)		
PWIU.FRQ	If you think (back) about your job, how often did you use the Internet on average in the last 6 months of your career in your job?	Adapted from [45][58]
PWIU.DUR	If you think (back) about that period, how many hours did you spend using the Internet on average in a typical week at your job?	
Private Internet Use		
PIU.FREQ	On average how often did you use the Internet in your private life in the last 6 months?	Adapted from [45][58]
PIU.DUR	If you think about the last 6 months, how many hours did you spend using the Internet on average in a typical week in your private life?	
PIU.INT	For what do you use the Internet in your private life? Check all that apply: (1) Information searching, (2) Reading news, (3) Online shopping, (4) Communication (e.g., e-mail, chat, telephony), (5) Entertainment (e.g., videos or games), (6) Online banking, (7) Browsing/Surfing	

Scale for Duration (DUR): (8) Several times a day, (7) Approx. once a day, (6) Several times a week, (5) Approx. once a week, (4) Several times a month, (3) Approx. once a month, (2) Less, (1) Not at all

Scale for Frequency (FRQ): (7) More than 30 hours, (6) 20-30 hours, (5) 10-20 hours, (4) 5-10 hours, (3) 1-5 hours, (2) Less than 1 hour, (1) Not at all

Scale for Computer Self-Efficacy (CSE): 10-point ranging from 'Not at all confident' to 'Totally confident'

Scale for Computer Anxiety (CA): 7-point ranging from 'Strongly disagree to 'Strongly agree'

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