The MATH of Internet Adoption: Comparing Different Age-Groups

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ABSTRACT

Modern societies share two common trends: First, elderly people form a strongly growing group in the population (societal aging) and, second, the importance of information and communication technology is growing rapidly. However, the elderly are often excluded from benefiting from IT-enabled service delivery: An age-related digital divide exists. Current research lacks understanding what reasons prevent elderly to use the internet. Therefore, this paper examines the intention to use the internet in a private manner among the elderly. For higher explanatory power we also included two other age-groups (G1: <40; G2: 40-59; G3: >59). Here, we build a survey instrument based on the Model of Acceptance of Technology in Households (MATH) and test the model against comprehensive survey data (n=501). We find out that MATH is able to explain between 42% and 81% of the variance in private internet usage intention. Moreover, several differences in driver for usage intention exist, e.g. was the importance of applications for fun much higher in the first age group than among the other. Potentially fruitful avenues for future research are discussed.

Keywords

Model of Acceptance of Technology in Households, MATH, digital divide, demographic change, elderly

1. INTRODUCTION

Western Societies share two common trends. First, the share of elderly people is constantly rising [1,2]. Today, about 17% of Europe's population is older than 65 years. This share will rise up to 28% by 2050 [3]. Using this measure Germany has been among the oldest countries in the world and is the oldest country in the European Union with a share of 20.4% [4]. This trend is mainly due to better health care and food supply which results in a rising life expectancy. Moreover, the fertility rate defined as children per woman is only about 1.5 in the European Union [4].

Second, the importance of information, information processing, and communication is growing in industrialized countries. This phenomenon has been named "information society" [5-7]. In today's information societies electronic communication and commerce, the exchange of information, and the usage of information technology becomes more and more important. This development does not only occur in the workplace but also in private life.

However, even in high developed countries information and communication technologies as the internet are not used by everyone. A digital divide between those that use and those that do not use the internet exists. In the literature several reasons for the digital divide can be found, e.g. social status, ethnicity, education, income, or age [8-11].

Moreover, information and communication technologies are used as a measure to ease the life of elderly people. Here, concepts as ambient assisted living (AAL) aim at increasing the autonomy, self-confidence, and mobility of the elderly. However, AAL projects always require the ability to use modern technologies. Hence, an understanding of drivers for internet usage can help to close the digital divide and, thus, to prepare today's and tomorrow's elderly for AAL [12]. Subsuming, our research question is:

RQ: Which differences in the factors and their importance for private internet usage intention exist in different age groups?

This paper is structured as follows. First, we will present our theoretical background. We will shortly present our theoretical background consisting of digital divide and technology acceptance research. Afterwards, we will present the Model of Acceptance of Technology in Households (MATH) which will be used as our research model. In the next section we will show our research methodology including data collection and analysis. Then, we will present our results which will be discussed in the following section. The paper closes with conclusions, limitations, and future research.

2. THEORETICAL BACKGROUND

2.1 Digital Divide Research

Since more than a decade ago, digital divide has been established as a major research theme. The field was opened by first contributions around the year 2000 (A short introduction into digital divide and its history can be found in [13]). Generally, digital divide refers to the gap between, first, those who do have effective access to ICT ad use the potentials of these technologies and, second, those who do not have this access or those who do

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not use corresponding technologies. In digital divide research two different streams are observable with a difference in the unit of analysis. On the one hand, the unit of analysis can be the difference in technology adoption between different countries. Typically, developed countries have a high rate of (both early and late) adopters while developing countries have lower rates. Here research is about the influence of different variables, as culture, income, education, on the adoption [13,14]. On the other hand, the unit of analysis can be single users or groups of users in a specific region or country. Here, several groups of people are excluded from benefiting from the merits of ICT due to certain factors [15,16]. Examples for such groups are people with migration background, elderly people, or less educated citizens. In this specific study we understand digital divide as an emerging polarization phenomenon in a specific society (here: a German municipality, see below), which creates a gap between those people who do have access to and use the potentials of ICT (on-liners) and those who do not (off-liners) [17].

Digital divide research often focuses on the access to and usage of the internet. Several theoretical contributions and models provide explanation for internet usage behavior (often with concentration on the usage in a private manner; here: private internet usage). Early research on this theme (first generation digital divide research) has focused on issues of physical access. Here, researchers and practitioners focused on the provision of computers and internet connection to off-liners. Projects to bridge the digital divide were established and encompassed free internet access at local libraries or comparable centers or the free provision of computers to elderly people [18]. This research was somehow limited in terms of explanatory power. Hence, second generation digital divide research extended this narrow focus on physical access and included factors as motivational or skill access [9,19,20].

2.2 Technology Acceptance Research

The field of technology acceptance research originates in psychology. Here, several theories exist to explain reasoned action [21,22] or planned behavior [23,24]. The idea of individual technology acceptance was prominently introduced into IS by Davis with his Technology Acceptance Model (TAM) [25,26]. TAM consists of two independent and two dependent (lateral) variables. Perceived usefulness and perceived ease of use of a certain technology both influence the behavioral intention to use this technology. The behavioral intention then translates into actual system usage. TAM has been criticized for its lack of falsifiability, its limited explanatory and predictive power, and even its triviality [27,28]. Other models as extend TAM – a prominent example is the Unified Theory of Acceptance and Use of Technology [29]. While UTAUT and TAM are theories to explain technology adoption in workplaces and in private environments, the Model of Adoption of Technology in Households (MATH) focuses on personal technology (in early studies: personal computer) adoption [30-32].

3. RESEARCH MODEL

MATH was created to explain the adoption of technology in households. Its key constructs were derived in a qualitative longitudinal study of personal computer usage in households (Venkatesh and Brown 2001). Later, Brown and Venkatesh (2005) used these constructs and created a comprehensive multi-item measurement model. This model was tested in a quantitative study to predict the adoption of personal computers in households. One of its construct is Utility for work-related use. It is defined as the extent to which using a PC enhances the effectiveness of work-related activities (Venkatesh and Brown 2001, Venkatesh et al. 2003, Aijzen 1991, Davis et al. 1989). As our study focuses only on private internet usage this latent variable was not considered in our study. Moreover, we changed items to measure the workplace referents' influence to also measure the influence of the extended social network (e.g. acquaintances from political or sport activities). According to MATH attitudinal, normative, and control believes influence behavioural intention. We argue that the influences of the independent variables on behavioural intention are moderated by the age of the respondents (see Figure 1).

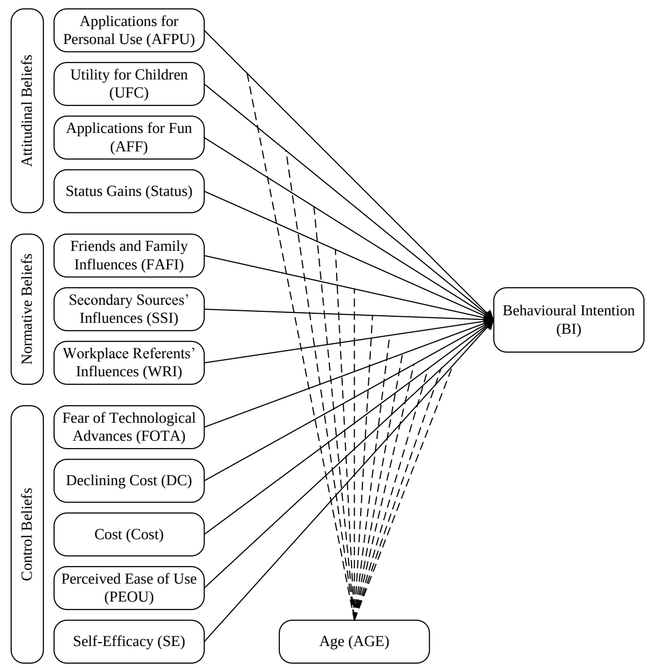

Figure 1: Model of Acceptance of Technology in Households

These moderating effects were modeled using three different groups for analysis (see below). Moreover, it led to the following hypothesis:

1. AFPU: Internet adoption for personal use requires a serious intent in internet usage. We assume that this seriousness is higher in older age groups. Hence, we hypothesize that the influence of AFPU is higher for people aged 40 or higher.
2. AFF: Young people tend to use technology for its own sake. Gaming is usually associated with the younger generation. Hence, we assume that age will moderate the influence of applications for fun so that the influence is higher for young people.
3. FAFI: Young and medium-aged people have bigger social networks. Hence, we hypothesize that the influence of friends and family is more important for them.
4. SSI: The influence of traditional media is suspected to be of greater importance for old people.

5. PEOU: Elderly people are more likely to need the right skills for internet usage. Here, the perceived ease of use plays an important role. Hence, the influence of PEOU will be greater for people age 60 or older.
6. Self-efficacy: In the same way, the influence of self-efficacy will be higher for old people.

For UFC, Status, WRI, FOTA, DC, and Cost we do not hypothesize any influence of Age as these variables seem to be relevant for all age groups.

4. RESEARCH METHODOLOY

4.1 Data Collection

We constructed a questionnaire following our presented research model. The constructs and items are well established in the literature.[1] In a pilot study (n=7, random selection) the respondents gave positive feedback to our questionnaire. Hence, the study did not result in any changes. We used the validated questionnaire to gather data within a medium-sized city located in Western Europe between September and October 2009. We used three unique data-gathering strategies simultaneously: First, we extracted contact data of 1,500 randomly chosen citizens out of the cities resident registration. Each addressee received a personal letter from the mayor announcing the aim of the questionnaire, the questionnaire itself, and a stamped return envelope. Second, we placed additional 1,500 questionnaires at the cities' town-hall and local libraries. Third, we called slightly more than 100 randomly chosen people and interviewed them via phone. Hence, we avoided problems as mentioned by [33]. To lever the response rate we raffled three material prizes among all respondents. Additionally, we held a press conference with the mayor to announce the start of the survey and issued another press release in the middle of the data collection phase. This led to good coverage of our survey in the local media. All in all, we received 501 questionnaires (see section 4.3 for sample demographics). An additional non-response analysis did not reveal any biases.

4.2 Data Analysis

As stated above we employed a paper-based questionnaire to gather our data. Hence, for analysis we entered our data into an online tool. Here we used SPSS 17.0.0 for first analysis. To be able to answer our research question we split the data in three disjoint sets with respect to the respondents' age. G1 (younger) includes the respondents aged 39 or younger, G2 (middle-aged) includes the respondents between age 40 and 59, and G3 (older) covers the older adults (60 years or older). We chose this grouping following [34] as it results in adequate and comparably high numbers in all groups. To further analyze our datasets with regards to the presented research model we employed the partial least squares (PLS) path modeling algorithm [35-37]. To run the corresponding algorithm we used the SmartPLS 2.0 (M3) Software Package [38]. In correspondence to other MATH studies, all constructs were modeled using reflective indicators [32]. While running the PLS algorithm we employed the centroid weighting scheme. The centroid weighting scheme does not tend to slightly overestimate effects as the factor weighting scheme [39]. Our datasets include some missing values (for more details see sample demographics). These missing values were treated using the mean replacement algorithm [40].

4.3 Sample Demographics

Our sample consists of data of 501 respondents. As described above we split the data in three datasets. G1 consists of all respondents aged 39 or younger (n=186, approx. 37% of all subjects). In this group about 2% of all items were missing. The mean age was around 28 years with a standard deviation of 8. The youngest respondent was 13. About 37% of all respondents were male. G2 consists of 199 middle-aged respondents (age between 40 and 59, approx. 40% of all subjects). Here, about 3% of all items were missing. In this age group every possible year of birth occurred. About 36% of all respondents were male. In G3 we subsume 116 respondents aged 60 or older (approx. 23% of all). The oldest respondent was 83. Here, 53% of all respondents were male (see Table 1).

Table 1: Sample demographics

	G1	G2	G3
N	186	199	116
Missing Values	2.22%	2.91%	8.45%
Age - Mean	28.18	48.77	68.03
Age - Std. Dev.	8.09	5.3	5.5
Sex - Male	68	71	62
Sex - Female	118	127	54

5. RESULTS

The constructs used in our study are well known and have been proven to be valid. However, using standardized measures we can show that some minor problems exist with regards to construct validity. The measurement model estimations of the different age groups are presented in Tables 2 to 4. Here, ICR stands for the internal consistency reliability (Cronbach's Alpha). Generally, an ICR above .9 is considered as excellent, one between .7 and .9 as high, and one between .5 and .7 as moderately high [41]. A lower ICR is a signal for problematic construct validity. In our study, only the ICR of workplace referent's influences (WRI) is low for the young age group. This could be due to a different understanding of the studied social group. However, as the corresponding reliability is above .5 for all other age groups, we did not change the items at this stage of research. All other reliabilities are over .5, sometimes even higher than .9. Moreover, all correlations between the constructs (off-diagonal elements in the tables) are lower than the square roots of the shared variance between constructs and their respective measures. This is a good indicator for convergent and discriminant validity [42].

[1] An overview of the items used can be requested from the authors.

	ICR	Mean	S-Dev	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Applications for personal use	.778	4.856	1.363	.824												
2 Utility for children	.892	5.228	1.239	.325	.888											
3 Applications for fun	.802	5.123	1.202	.494	.530	.797										
4 Status gains	.746	4.005	1.272	.285	.178	.374	.785									
5 Friends and family influences	.895	4.595	1.480	.320	.134	.337	.403	.870								
6 Secondary sources' influences	.890	4.483	1.377	.301	.158	.356	.403	.443	.904							
7 Workplace referents' influences	.427	4.272	1.392	.286	.234	.269	.383	.582	.432	.795						
8 Fear of technology advances	.667	3.912	1.318	.216	.087	.049	.159	.197	.169	.167	.668					
9 Declining cost	.666	4.845	1.011	.293	.087	.079	-.081	.062	.202	.045	.227	.776				
10 Cost	.776	2.778	1.300	-.025	-.027	-.001	.081	.016	-.026	.045	-.002	-.238	.789			
11 Perceived ease of use	.652	5.709	.892	.566	.306	.499	.201	.329	.281	.317	.093	.202	-.083	.708		
12 Self-efficacy	.663	6.214	.868	.438	.161	.443	.193	.336	.239	.212	.043	.121	-.176	.695	.774	
13 Behavioral intention	.866	6.598	.948	.444	.160	.485	.196	.243	.230	.236	.171	.169	-.107	.551	.571	.889

Table 2: Measurement Model Estimation for Group 1 (G1)

	ICR	Mean	S-Dev	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Applications for personal use	.736	4.767	1.278	.789												
2 Utility for children	.907	5.327	1.127	.027	.906											
3 Applications for fun	.804	4.408	1.227	.317	.245	.791										
4 Status gains	.677	3.945	1.090	.194	.054	.216	.770									
5 Friends and family influences	.888	4.098	1.462	.197	.098	.255	.306	.864								
6 Secondary sources' influences	.839	4.556	1.208	.300	.061	.193	.332	.461	.869							
7 Workplace referents' influences	.503	4.021	1.469	.269	-.031	.187	.186	.540	.476	.817						
8 Fear of technology advances	.562	3.202	2.425	-.225	-.085	-.210	-.074	-.155	-.166	-.159	.688					
9 Declining cost	.652	4.950	1.021	.309	.042	.039	.132	.114	.035	.057	-.092	.759				
10 Cost	.838	2.937	1.437	.042	-.131	.125	.091	-.057	-.064	-.039	.176	-.213	.867			
11 Perceived ease of use	.712	5.235	.962	.357	.146	.483	.027	.115	.212	.156	-.383	.194	-.116	.733		
12 Self-efficacy	.667	5.926	.991	.417	-.028	.395	.099	.084	.252	.265	-.380	.166	-.005	.642	.781	
13 Behavioral intention	.809	6.358	1.208	.390	-.111	.180	.145	.205	.191	.239	-.320	.249	-.133	.339	.561	.850

Table 3: Measurement Model Estimation for Group 2 (G2)

	ICR	Mean	S-Dev	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Applications for personal use	.791	4.505	1.375	.836												
2 Utility for children	.819	4.961	1.108	.122	.857											
3 Applications for fun	.851	4.330	1.351	.632	.348	.830										
4 Status gains	.742	3.975	1.234	.162	.169	.295	.809									
5 Friends and family influences	.863	4.141	1.445	.293	.129	.293	.284	.839								
6 Secondary sources' influences	.853	4.362	1.421	.182	.353	.376	.449	.324	.879							
7 Workplace referents' influences	.636	3.772	1.442	.269	.172	.338	.247	.371	.318	.853						
8 Fear of technology advances	.713	3.610	3.129	-.211	-.009	-.224	.034	.038	.065	-.016	.565					
9 Declining cost	.674	4.529	.946	.306	.330	.347	.206	.039	.213	.124	-.107	.781				
10 Cost	.763	3.385	1.189	-.018	-.129	-.105	.068	.114	.041	-.056	.052	-.146	.820			
11 Perceived ease of use	.844	4.743	1.329	.553	.271	.737	.276	.112	.276	.353	-.246	.431	-.122	.827		
12 Self-efficacy	.824	4.875	1.642	.524	.245	.648	.295	.235	.436	.439	-.220	.316	-.088	.766	.860	
13 Behavioral intention	.893	5.153	2.031	.487	.196	.550	.253	.326	.449	.514	-.195	.302	-.093	.650	.878	.908

Table 4: Measurement Model Estimation for Group 3 (G3)

We employed bootstrapping (with 500 iterations) using randomly selected sub-samples for testing the significance of the PLS model.[2] In general, the item loadings show that the latent variables are measured by the corresponding items, as almost all items have comparably high loadings (Table 5, please note that AGE is a single-item variable). However, the latent variable FOTA appears to be measured incorrect: In G1 there are low item loadings for FOTA1 and in G2 and G3 for FOTA2. Here, we also analyzed the average variance extracted. Here, we observe high values so that all variables can still be considered valid [41].

[2] Significance is depicted using the asterisk symbol (* means significant on a .95, ** on a .995, and *** on a .999 level).

		G1	G2	G3
AFPU	AFPU1	.875	.891	.901
	AFPU2	.741	.589	.674
	AFPU3	.850	.854	.912
UFC	UFC1	.965	.824	.832
	UFC2	.858	.930	.867
	UFC3	.837	.960	.871
AFF	AFF1	.828	.767	.889
	AFF2	.487	.604	.656
	AFF3	.900	.902	.865
	AFF4	.898	.860	.887
Status	SS1	.750	.713	.898
	SS2	.643	.799	.707
	SS3	.933	.794	.810
FAFI	FAFI1	.906	.884	.897
	FAFI2	.873	.876	.872
	FAFI3	.861	.877	.826
	FAFI4	.841	.816	.756
SSI	SSI1	.923	.813	.868
	SSI2	.910	.905	.902
	SSI3	.878	.888	.867

		G1	G2	G3
WRI	WRI1	.864	.847	.799
	WRI2	.718	.786	.904
FOTA	FOTA1	.303	.812	.642
	FOTA2	.918	-.327	-.444
	FOTA3	.635	.809	.590
DC	DC1	0.89	0.63	0.77
	DC2	0.9	0.84	0.88
	DC3	0.45	0.78	0.67
Cost	COST1	0.92	0.8	0.83
	COST2	0.67	0.9	0.89
	COST3	0.76	0.9	0.74
PEOU	EE1	.836	.849	.907
	EE2	.633	.657	.854
	EE3	.505	.559	.660
	EE4	.807	.827	.865
SE	SE1	.584	.572	.798
	SE2	.825	.822	.863
	SE3	.880	.908	.916
BI	BI1	.955	.921	.929
	BI2	.780	.710	.857
	BI3	.924	.904	.936

The paths of MATH have been proven to be significant to explain behavioral intention to adopt technology in households in previous studies [32]. However, in this application of the model bootstrapping suggests that many relationships are not significant among the different age groups (see Table 6).

Table 5: Path Coefficients (Dependent Variable: BI)

	G1	G2	G3
R^2	.456	.418	.812
AFF	.318 **	-.052	-.091
AFPU	.086	.164 *	.037
Cost	-.035	-.121	-.032
DC	.030	.080	.053
FAFI	-.092	.149 *	.101
FOTA	.124	-.095	-.031
PEOU	.170	-.072	-.008
SE	.305 **	.505 ***	.807 ***
SSI	-.027	-.062	.091
Status	-.016	.052	-.064
UFC	-.154	-.119	-.052
WRI	.095	-.007	.132 **

The coefficient of determination (R^2) is here defined as the proportion of variance explained by the model (and not by random error or non-included constructs). Considering that applications of MATH in other contexts resulted in R^2-values between .50 and .74 [32] our study results shows one considerably high coefficients of determination. In G1 we can explain about 46%, in G2 about 42%, and in G3 about 81% of the corresponding variance in behavioral intention to use the internet. The value for G3 is astonishingly high although we did not model any product terms for moderating effects. Usually moderating effects modeled using product terms result in higher coefficients of determination.

Table 6: PLS-MGA-Results (Dependent Variable: BI)

	G1 vs. G2	G1 vs. G3	G2 vs. G3
AFF	> *	> **	>
AFPU	<	>	>
Cost	>	<	<
DC	<	<	>
FAFI	< *	< *	>
FOTA	> *	>	<
PEOU	>	>	<
SE	<	< ***	< *
SSI	>	<	< *
Status	<	>	>
UFC	<	<	<
WRI	>	<	<

To evaluate whether the path coefficients differ significantly we employed PLS-Multigroup-Analysis (PLS-MGA) as suggested by [43]. PLS-MGA does not require any distributional assumptions and is used with the help of bootstrapping results. Table 7 gives an overview whether path coefficients in a specific group are larger (>) or smaller (<) then the corresponding other. Moreover, significance of this comparison is given as calculated using PLS-MGA.

6. DISCUSSION

Our study includes several findings that are important for theory. First, all but one constructs of our measurement model seem to be reliable and consistent. Only the influence of workplace referents shows a low Cronbach's Alpha in the first age group. Reasons for this could lie in the different understanding of the underlying questions between age groups. Moreover, we changed the questions of this variable to better fit the extended social network.

Second, the further analysis of the measurement model highlights differences in the mean values of the latent variables between the age groups. Apparently, the young age group (G1) believes strongly that the internet offers applications for fun (AFF in G1 is 5.123). The other age groups are lower (AFF in G2 is 4.408 and in G3 4.330). Here, as suspected, younger people use the internet more for fun-related purposes. Moreover, the average perceived influence of friends and family declines with the age (FAFI in G1: 4.595; in G2: 4.098; in G3: 4.141). Apparently, as usage is generally declining with the age pressure from friends is declining as well. The same holds true for the perceived costs of internet usage. Here, the young generation thinks of the internet as cheap while older users see the costs more dominantly (Cost in G1: 2.778; in G2: 2.937; in G3: 3.384). This is in line with the different usage behavior. Studies as well as media coverage report an always-on mentality among young internet users while old users see the internet more as a tool you explicitly have to "turn on" [44]. Two other latent variables support this perception very well. Perceived ease of use (PEOU in G1: 5.709; in G2: 5.235; in G3: 4.743) as well as self-efficacy (SE in G1: 6.214; in G2: 5.926; in G3: 4.875) are both high among the young generation and lower in the older ones. Here, we argue that the big experience of the young generation and availability through multiple devices especially to them are factors for this phenomenon.

Third, analyzing the path models we can see that only a minority of all paths are significant. However, this is in line with previous MATH studies [31,32]. Interestingly, the influence of SE is very high among all age-groups. Apparently, the perceived amount of existing knowledge is a good predictor of the intention to use the internet. Analyzing the differences in the path coefficients using our hypotheses yields the following results: First, AFPU is a significant path in the medium age group. However, the relationship is not significant in all other groups. Moreover, there are no significant differences in importance among the groups. Hence, hypothesis 1 is falsified. Second, AFF has a high and significant influence in the young generation and an even negative influence in both other groups. This difference could be shown to be significant. Hence, our second hypothesis is supported by this study. Third, we hypothesized that the influence of FAFI is higher for young and medium-aged people. However, the path coefficient is only positive in G2 and G3 (significant only for G2). The influence in G1 is significantly smaller than in both other groups. Hence, our third hypothesis is falsified. The influence is highest in the medium age group. Fourth, traditional media (SSI) has only a positive influence on G3. Although this influence is not significant, it is significantly higher than the influence in G2. Hence, hypothesis 4 is partially verified. Fifth, the influence of PEOU is not significant in all age groups. As there are no differences between the groups, H5 is falsified. Sixth, SE has a high and significant impact on BI in all age groups. However, as hypothesized this influence is significantly highest in G3. Hence, H6 is supported by this study. For the impact of UFC, Status, WRI, FOTA, DC, and Cost on BI we did not hypothesize any influence of age. Here, it has to be mentioned that WRI has a significant influence on BI in G3. Moreover, the influence of FOTA is significantly higher for the young group.

Fourth, the coefficient of determination (R^2) is generally in range of prior studies using MATH [31,32]. Although several relations have been shown to be of limited significance the model is able to predict a good share of the variance in usage intention. This holds especially true for the age group of the elderly.

Moreover, our results have several implications for practice. Many public and private organizations start projects and initiatives to bridge the age-related digital divide. These projects follow different ideas and have varying successes. However, especially with regards to future requirements (e.g. for AAL), successful e-Inclusion strategies are needed. Here, organizations should construct their initiatives recognizing the presented results. Decision makers should, for example, think about addressing the social environment of citizens through strong disseminators enrooted in the corresponding milieus.

7. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

This paper analyzes influencing factors for the intention to use the internet in a private manner. Here, we presented a research model based on MATH and established six hypotheses. To elaborate on the moderating effects of age on the internet adoption we use three different age groups. With data collected using an extensive survey in 2009 we could analyze the responses of more than 500 different subjects. Here, we used the PLS path modeling method (SmartPLS was the software package used). Our results suggest that MATH is of great use in predicting usage intention among all age groups, especially among the elderly (60 years and older). Our study highlights the importance of self-efficacy for the intention to use the internet: Among all age groups SE had one of the highest influences. Moreover, we showed that this influence is highest in the old age-group. Furthermore, we could show that in the young generation the influence of applications for fun was significantly higher than in all other groups. Hence, we contribute the following findings: First, in the young generation fun is the single most important driver for internet usage. Second, in the old generation self-efficacy plays the most important role. Third, in the medium age-group self-efficacy, friends and families opinion, and applications for personal use form a mixture of influence on behavioural intention.

However, our study is limited to a certain extent due to several issues. First, the representativeness of samples is always open to discussion. Here, it could be questioned whether a sample of 501 respondents is big enough. We argue that our sample was randomly chosen and that a non-response analysis yielded no bias. Second, we gathered our results in one city. While we have a good chance that our sample represents the inhabitants of this municipality, the generalizability to the region or bigger geographical units has yet to be proven. However, we believe that our results will, to a great extent, hold true in other settings in Western European countries as well.

Our paper shows several potentially fruitful avenues for future research. Future studies could aim at testing the generalizability by replication in other social or cultural settings. Up to now it is questionable whether results out of data gathered in one city can be generalized. Here, comparative studies could be valuable as well. Furthermore, new moderating variables could be introduced. These could either be more classical, as gender, ethnicity, or education or be completely different as psychological variables. Moreover, our study had a slight problem in the reliability of the WRI construct. Here, future studies should reassess the usage of the construct and aim at improving it with the help of other items. In the end, this could help to increase explanatory power.

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