The Age-Divide in Private Internet Usage: A Quantitative Study of Technology Acceptance

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ABSTRACT

In today's information society internet usage and e-literacy become more and more important. However, inequalities in internet usage of different social groups become and stay observable. Here, especially elderly citizens, with an increasing share of population in western societies, are often included from benefits related to information technology and internet usage. One important aspect of local governments' policy is to bridge this so-called digital divide. However, up to now a thorough understanding of potential factors influencing private internet usage is not provided by the literature. Hence, this paper aims at identifying important influencing factors in order to explain senior citizens' private internet use. Thus, we develop a model based on the Unified Theory of Acceptance and Use of Technology and digital divide research which is tested against comprehensive survey data (n=192). The combined model is able to explain more than 70% of the variation of private internet use. Major implications for future research and e-Inclusion practice are discussed.

Keywords

Digital Divide, UTAUT, Quantitative Study

INTRODUCTION

Today's western societies face two common trends: The growing amount of senior citizens and the growing importance of information and communication technology (ICT). First, today's societies around the world tend to "age" or "grey" (Anderson and Hussey 2000, Fougère and Mérette 1999). The share of population older than 65 years is 15.9% and will rise up to 25.9% by 2050 (cf. Table 1). Second, the importance of information, information processing, and communication is constantly growing. This phenomenon has been condensed to the term information society (Machlup 1962, Duff et al. 1996).

Societal aging bears several risks for an information society. On the one hand, an increasing share of elderly citizens results in problems for local governments such as fiscal stress and increasing expenditure on health care, unemployment transfers, or pensions (European Commission 2006). On the other hand, large parts of the population are excluded from the information society. They neither have access nor skills to use modern media like the internet. A digital divide among on-liners and non-liners exists (Ferro et al. 2007). Especially senior citizens are often excluded from modern technology (Brandtweiner and Donat 2007, Becker et al. 2008).

However, governments want to make use of the growing importance of ICT. Especially local authorities can enhance the effectiveness and efficiency of their processes and organisational structure using ICT and, by this, lever their productivity to a new level. This process has been called transformational-government (t-government, cf. Irani et al. 2007). Moreover, government agencies can provide their services "online" and support them by means of ICT. However, in a digitally divided world the non-liners are excluded from the benefits of ICT supported governmental services. Hence, the digital divide has been addressed by governments all over the world: The European Union recognised that ICT is an important driver of growth and employment and that many Europeans do not use and do not benefit from ICT. Therefore, the ministers of the member states of the EU called for an inclusive information society and declared to focus on multiple goals to reach this aim (European Union 2006). This was also captured by the cabinet office of the United Kingdom which called for tackling "overall issues of digital inclusion" (Cabinet Office 2005) and works "towards achieving equitable access to new technology and remove the barriers to take-up" (Cabinet Office 2006). Both define electronic inclusion (e-inclusion) as an integral part of t-government. Here, especially local authorities are supposed to strive for bridging the digital divide.

Projects to bridge the digital divide have a long history. First generation projects included grants to provide more senior citizens with computers (Eastman & Iyer 2004), free internet access at local libraries or comparable centres, as well as internet courses specially designed for elderly people (Kiel 2005). However, technology acceptance research suggests several

other barriers that could be tackled by governmental e-inclusion projects. The Unified Theory of Acceptance and Use of Technology (UTAUT) suggests that next to Effort Expectancy, which is tackled by internet courses, and Facilitating Conditions, which are (among others) established through the provision of access, Performance Expectancy and the social milieu play an important role in explaining usage behaviour. Hence, it is doubtable whether the mere provision of computer courses or free internet access are sufficient to reach an inclusive information society. Moreover, there is the possibility that the group of non-liners is fragmented and that different measures should be established for different groups. Hence, this study aims at clarifying the following research questions:

RQ1 How can we explain the private internet usage and non-usage of senior citizens?

RQ2 What are important factors for senior citizens' usage and non-usage of the internet?

RQ3 Does an extension of UTAUT using more moderating variables from the digital divide literature provide a benefit in explaining private internet usage among the elderly?

RQ4 What can practitioners learn from a more comprehensive view on senior citizens' internet usage?

To answer this question, we quantitatively study the citizens of age 50 or higher in a medium-sized city in Western Europe. We created a questionnaire based on the theoretical background of the UTAUT (Venkatesh et al. 2003) and the Digital Divide literature (e.g. Wagner & Hanna 1983, van Dijk 2006; Agerwal et al. 2009, Bélanger & Carter 2009). This questionnaire was handed out to more than 3,000 randomly chosen inhabitants. In sum, we received 192 questionnaires from respondents aged 50 or higher. For data analysis, we use the partial least squares (PLS) method (Marcoulides et al. 2009).The paper is structured as follows. In the next section, we will present some theoretical background. Afterwards, we will develop our research model based on the UTAUT and Digital Divide literature. In section four, we will present our research methodology in detail. The results derived using this methodology are presented in section five. We will discuss the results in terms of relevance for theory and practice in section six. The last section is concerned with limitations, conclusions, and future research.PAGE SIZE

THEORETICAL BACKGROUND

T-government has been established as a main concept in government change processes and integrates technical, social, and organisational themes (Irani et al. 2007, Smith 2006). Being ready to change and improve has become a necessity for public administrations in order to cope with increased demands in a complex change environment. Reduction of costs, more efficient processes, and increased client satisfaction are regularly demanded from public administrations. Themes like the use of modern ICT, organisational change, new forms of service delivery, or opening up innovation processes have become vitally important for improving administrations. These comprehensive change processes have recently been subsumed under the term of t-government. Here, a publication by the former UK Prime Minister Blair describes a strategy for radical transformation of UK's public sector, particularly based on the use of technology (Cabinet Office 2005). Exploitation of benefits realised by electronic government (e-government) is the essential part of this strategy. Academic literature discusses that t-gov is not a single specific topic, but defines a complex research field based on public improvement and e-government (Irani et al. 2007, Sourouni et al. 2008, Elliman et al. 2007). Being part of this agenda, in its transformation government implementation plan, the Cabinet Office (2006, page 4) acknowledges that the exploitation of the full potential of electronic service delivery includes making wider use of online provision in order to make services more accessible to the public (see for instance, online centres (Cabinet Office 2005, Milner 2009)). However, research discusses age-related factors and demographic trends that might counteract these efforts. Societal aging is a major demographic trend in industrialised societies. Hauser & Duncan (1959, p2) define demography as "the study of the size, territorial distribution, and composition of population, changes therein, and the components of such changes, which may be identified as natality, mortality, territorial movement (migration), and social mobility (change of status)." Three major factors constitute the development of demography: a) fertility, b) mortality, and c) migration. Accordingly, demographic transition can be understood as the progressive alteration of these variables. In this context, especially fertility and mortality have undergone significant changes in most industrialised countries over the last decades. On the one hand, fertility has been declining due to, for instance, changed life models or family planning and the potential for birth control and abortion. Morgan & Hagewen (2005, p231) state that fertility transitions "[…] are complete in many developed countries and are in progress in much of the rest of the world." Such fertility transition has three stages: 1) relatively high and stable fertility, followed by 2) a period of fertility decline, and then 3) relatively low and stable fertility. On the other hand, regarding mortality, life expectancy has increased substantially because medical care, sanitation and agricultural production have improved. For instance, between 1995 and 2003, life expectancy at birth in European countries, now being 78 years on average for men and 83 for women, went up by an average of 3 months each year for men and 2 months for women (EHEMU 2005). As a consequence of both decreasing fertility and increasing life expectancy in many industrialised societies, societal aging (synonym: population aging) has

established itself as a long-term trend that will continue for generations to come. Demographic projections indicate that the group of 65 years and older will continue to constitute a growing share of population. For instance, at present, 14 of the world's 15 "oldest" countries in terms of percentage of people aged 65 or older, are in Europe, while Japan heads this ranking (Population Reference Bureau 2006). In 2050, for the European Union (EU) the population share of those aged 65 and more is projected to increase to 29.9% and for Japan to 39.6%. Similarly, in the United States (USA) and Canada, the population share of those aged 65 and more, is estimated to increase to 21% and 23.7% respectively. While the demographic trend of societal aging is particularly distinct in more developed nations, less and least developed nations also share this general tendency (see Table 1).

Nation	1990	2010	2030	2050
Least developed nations	3.0[1]	3.2	4.2	6.4
Less developed nations	4.7[1]	5.8	9.8	14.3
More developed nations	13.5[1]	15.9	22.7	25.9
Canada[2]	12.2[1]	13.5	21.8	23.7
European Union (EU-25)	13.9	17.6	24.7	29.9
Japan	12.0	23.1	31.8	39.6
United States	12.5[1]	12.7	19.4	21.0

[1] Data for 1995
[2] Data for Canada 2010, 2030, 2050 not including Quebec

Sources: Regional data: United Nations 2002; Canada: Chief Actuary 2001; EU-25: European Commission 2006; Japan: MIC Statistics Bureau 2006; United States: OASDI Trustees 2003.

Table 1. Percentage of Population Aged 65 Years and Older.

Societal aging poses challenges to the development of t-government and e-inclusion strategies. One of these challenges is the (here: age-related) digital divide (van Dijk 2006, Agerwal et al. 2009, Bélanger & Carter 2009, Al-Shafi & Weerakkody 2009), in this context understood as an emerging polarisation phenomenon in society, creating a gap between those who do have access to and use the potentialities of ICTs, and those who do not (European Commission 2004a). The demographic gap refers, amongst others, to the fact that senior people often do not use ICT on a regular basis (Brandweiner & Donat 2007, Niehaves & Becker 2008, Bélanger & Carter 2009). The reasons for this gap results from a multitude of challenges which senior people often face. These include for instance isolation, physical disabilities, or low retirement pension (Kraner 2004). Disabilities can debar people from actively using information technology. For the usage of online services the most important disabilities to consider are visual handicaps, cognitive defects and limitations of motor skills. Geographical differences refer to gaps in ICT usage between different regions. Socio-economic gaps include differences in occupation, income and education whereas ethnical and cultural gaps identify barriers in the ICT usage of migrants and ethnical minorities. Here, e-inclusion focuses on the elimination of these barriers for the use of ICT. The declaration of Riga gives the following definition of E-inclusion: "'eInclusion' means both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on participation of all individuals and communities in all aspects of the information society. E-inclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion." (European Union 2006, p. 1) The main focus of e-inclusion is on creating accessible services over ICT. This effort can be divided into accessibility and usability aspects (Kraner 2004). Accessibility means the possibility for handicapped people to access the relevant service. This includes, for instance, creating opportunities for Braille support on web-sites and general thoughts about compatibility with older technologies. Usability focuses on the user-friendliness of a web-service. According to EU's "Top of the web" report, the main criteria for this effort includes easy discovery and fast navigation within a website, easy use of the service, satisfying speed and a clear language that is easy to understand (European Commission 2004b).

RESEARCH MODEL

Against the background of our research objective, our research model is informed by two streams of research: acceptance and use of technology as well as digital divide research. As for research on acceptance and use of technology, Venkatesh et al. (2003) undertake a comprehensive comparison of theories in this field in order to develop their UTAUT. The authors provide evidence that, for the case of information technology acceptance, their model shows best explanatory power, comparing with, for instance, the theory of reasoned action (Fishbein 1967, Fishbein & Ajzen 1975), the technology acceptance model (Davis 1989), or the theory of planned behaviour (Ajzen 1985, Ajzen 1991, Taylor & Todd 1995). Therefore, we will apply UTAUT for explaining behavioural intention towards personal use of the internet (BI) as well as for explaining use behaviour regarding personal internal usage (USE). Here, Venkatesh et al. (2003) provide evidence for the influence of the following independent variables: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). Table 2 gives a detailed overview over these variables, including definitions and items for measurement.

Core Construct	Definition	Items[c]
Performance Expectancy (Venkatesh et al. 2003, Davis et al. 1989, Moore & Benbasat 1991, Compeau et al. 1999)	The degree to which an individual believes that using the internet will help him or her to attain gains in personal performance.	PE1: I find the internet useful.
		PE2: Using the internet enables me to accomplish tasks more quickly.
		PE3: Using the internet increases my productivity.
		PE4: If I use the internet, I will increase my chances of getting a raise.
Effort Expectancy (Venkatesh et al. 2003, Davis et al. 1989, Moore & Benbasat 1991)	The degree of ease associated with the use of the internet.	EE1: My interaction with the internet would be clear and understandable.
		EE2: It would be easy for me to become skilful at using the internet.
		EE3: I would find the internet easy to use.
		EE4: Learning to operate the internet is easy for me.
Social Influence (Venkatesh et al. 2003, Aijzen 1991, Davis et al. 1989, Thompson et al. 1991)	The degree to which an individual perceives that important others believe he or she should use the internet.	SI1: People who influence my behaviour think that I should use the internet.
		SI2: People who are important to me think that I should use the internet.
		SI3: I use the internet because of the proportion of peers who use the internet.[a]
		SI4: In general, my peers have supported the use of the internet.
Facilitating Conditions (Venkatesh et al. 2003, Moore & Benbasat 1991, Aijzen 1991, Taylor & Todd 1995)	The degree to which an individual believes that circumstantial and technical setting exists to support use of the internet.	FC1: I have the resources necessary to use the internet.
		FC2: I have the knowledge necessary to use the internet.
		FC3: Using the internet fits into my life style.[b]
		FC4: I know someone who is available for assistance with internet-related difficulties.
Behavioural Intention (Venkatesh et al. 2003, Davis et al. 1989, Taylor & Todd 1995)	The degree to which an individual will want to use the internet for personal activities.	BI1: I intend to use the system in the next 3 months.
		BI2: I predict I would use the system in the next 3 months.
		BI3: I plan to use the system in the next 3 months.
Use Behaviour (USE)	Actual usage of the internet for personal activities.	USE01INFO: I did use the internet in the last 3 months for finding information.
		USE02COMM: <see above> for communication (e.g., eMail).
		USE03BUSI: <see above> for buying or selling products or services.
		USE04BANK: <see above> for banking services.
		USE05HEAL: <see above> for obtaining health-related information or buying medication.
		USE06TOUR: <see above> for obtaining travel-related information of buying travel-related services.
		USE07GOVE: <see above> for government services.
		USE08EDUC: <see above> for obtaining education-related information of education travel-related services.
		USE09SOCI: <see above> for social networks, communities, blogs or related services.
		USE10GAME: <see above> for playing (online) games.
		USE_PRI_MINPERW = USE_PRI_MIN x USE_PRI_W USE_PRI_MIN: How many minutes do you use the internet in average per day for private purposes? USE_PRI_W: How many days do you use the internet in average per week for private purposes?

[a] Item SI3 from original UTAUT (=influence of senior management) did not fit the purpose of our study. Hence, we included an item with an evenly high loading (see Venkatesh et al. 2003, p. 459; Thompson et al. 1991).

[b] Item FC3 from original UTAUT (=system compatibility) did not fit the purpose of our study. Hence, we included an item with an evenly high loading (see Venkatesh et al. 2003, p. 459; Moore & Benbasat 1991).

[c] All items except USE_PRI_MIN and USE_PRI_W were measured using a 7-point Likert scale. USE_PRI_MIN and USE_PRI_W were measured on a metric scale.

Table 2. Acceptance and Use of Information Technology: Root Constructs, Definitions, and Scales

As for the representation of the digital divide perspective, four additional variables were included in our model: education (van Dijk 2006; Agerwal et al. 2009, Bélanger & Carter 2009), gender (Venkatesh et al. 2000; Gilly & Enis 1982, Brown & Venkatesh 2005, Agerwal et al. 2009, Bélanger & Carter 2009), income (Wagner & Hanna 1983, Brown & Venkatesh 2005,

Agerwal et al. 2009, Bélanger & Carter 2009), and migration background (Agerwal et al. 2009, Bélanger & Carter 2009). Here, we argue – in line with other studies (such as Venkatesh et al. 2003) – that these factors moderate the relationships described in the original UTAUT model (see Table 3 for an overview over digital divide variables and their measurement).

Core Construct	**Items**
Education (van Dijk 2006; Agerwal et al. 2009, Bélanger & Carter 2009)	EDU: I spent <x> number of years in school, college, university or comparable institution.
Gender (Venkatesh et al. 2000; Gilly & Enis 1982, Brown & Venkatesh 2005, Agerwal et al. 2009, Bélanger & Carter 2009)	GEN: I am a <woman [0] | man [1]>.
Income (Wagner & Hanna 1983, Brown & Venkatesh 2005, Agerwal et al. 2009, Bélanger & Carter 2009)	INC: The average monthly net income of the household I'm living in is <less than 1000€ [0] | between 1000€ and 2000€ [1] | between 2000€ and 3000€ [2] | more than 3000€ [3]>
Migration Background (also referred to as ethnicity; see Agerwal et al. 2009, Bélanger & Carter 2009)	MIG1: My citizenship is < that of the country studied [0] | other than that of the country studies [1]>
	MIG2: My mother tongue is < that of the country studied [0] | other than that of the country studies [1]>

Table 3. Digital Divide Research: Root Constructs, Definitions, and Scales

According to studies of information technology acceptance, specifically UTAUT (Venkatesh et al. 2003) and taking into account digital divide research, we are able to formulate the following hypotheses in order to explain behavioural intention towards personal use of the internet:

1) On the influence of Performance Expectancy:

H1a: Performance Expectancy will positively influence Behavioural Intention.

H1b: The influence of Performance Expectancy on Behavioural Intention will be moderated by education, gender, income, and migration background (digital divide variables).

2) On the influence of Effort Expectancy:

H2a: Effort Expectancy will positively influence Behavioural Intention.

H2b: The influence of Effort Expectancy on Behavioural Intention will be moderated by education, gender, income, and migration background (digital divide variables).

3) On the influence of Social Influence:

H3a: Social Influence will positively influence Behavioural Intention.

H3b: The influence of Social Influence on Behavioural Intention will be moderated by education, gender, income, and migration background (digital divide variables).

As for the explanation of internet personal use behaviour we formulate the following hypotheses based on Venkatesh et al. (2003) as well as digital divide research:

4) On the influence of Behavioural Intention:

H4: Behavioural Intention will positively influence Use Behaviour.

5) On the influence of Facilitating Conditions:

H5a: Facilitating Conditions will positively influence Use Behaviour.

H5b: The influence of Facilitating Conditions on Use Behavioural will be moderated by education, gender, income, and migration background (digital divide variables).

Figure 1 visualises these hypotheses. We assume that the original UTAUT has significant power to explain variations in behavioural intention towards personal internet use and in use behaviour. Moreover, we assume that taking into account insights from digital divide research, specifically variables such as education, gender, income, and migration background, will further increase the explanatory power of the model (cf. Donat et al. 2009). We thus seek to apply UTAUT for studying personal internet usage and to extend the model by integrating insights from digital divide research.

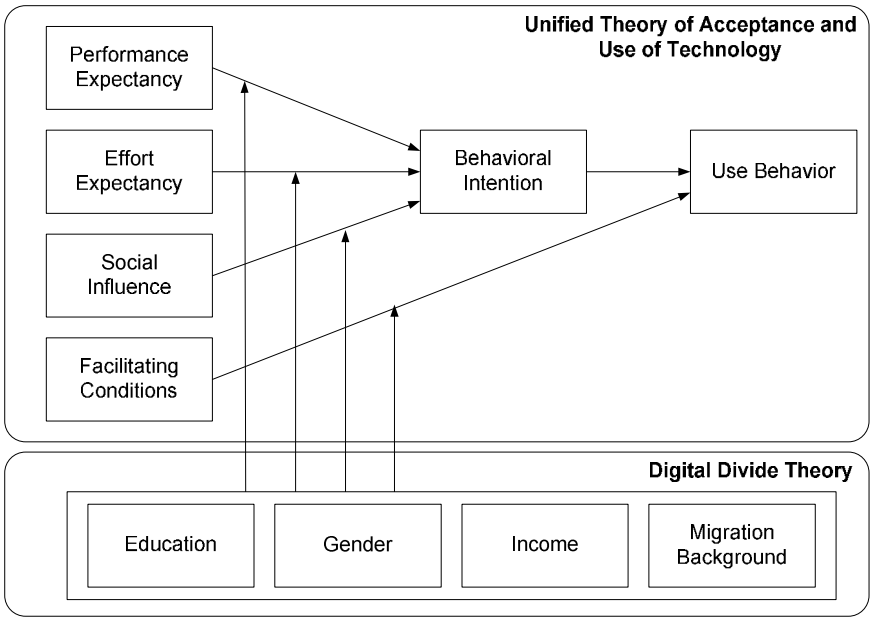

Figure 1. Research Model.

RESEARCH METHODOLOGY

Data collection phase. Before the data collection phase, we constructed a questionnaire according to the research model presented above (see Tables 2 and 3, column 'items', for details on the questions asked, including measurements). Here, we applied well established constructs and items for measurement (see again Tables 2 and 3, column 'core constructs', for detailed references to prior studies). Also, we conducted a pilot study with 7 respondents for the purpose of questionnaire validation. It led to positive feedback and did not result in any changes in the set of questions, items, or constructs. The questionnaire was used to gather data within a medium-sized city located in << excluded for anonymity>> between September and October 2009. We employed a multi-channel strategy to reach the respondents: a) We sent out the questionnaire via mail to 1,500 randomly chosen citizens, b) we called more than 100 randomly chosen people and interviewed them via phone, and c) we placed additional 1,500 questionnaires at the cities' town-hall and local libraries. Potential respondents were assured of the confidentiality of their responses. People addressed via channel a) not only received the questionnaire but also a personal letter from the mayor and a stamped return envelope to lever the response rate. Furthermore, we raffled three material prizes among all respondents. At the very beginning of the data collection phase, the mayor held a press conference announcing the start of the survey. In the middle of the collection period another press release was issued. Both events found good coverage in the local media. Thus, we received 518 questionnaires (192 from respondents of age 50 or higher). An additional non-response analysis did not reveal any biases.

Data analysis phase. We started our data analysis with entering the data into an online tool. The structured data was then first analysed using SPSS 17.0.0. Here, we selected only data records from respondents of age 50 or higher (senior citizens) which led to 192 cases. To further analyse our dataset, we employed the partial least squares (PLS) path modelling algorithm (Chin & Dibbern 2009, Marcoulides et al. 2009, Henseler & Fassott 2009). The software package to support this was SmartPLS (Ringle et al. 2005). Except internet usage (formative measurement), all constructs were modelled using reflective indicators (cf. Venkatesh et al. 2003; for a detailed discussion on formative versus reflective indicators, cf. Diamantopoulos & Siguaw 2006). The data used incorporates some missing values. On average, there are two missing answers per case with a standard

deviation of 3.38. These missing values were treated using the mean replacement algorithm (Afifi & Elashoff 1966). In the analysis phase we compared two different models, one without moderating effects and one with moderation through variables from the digital divide knowledge base. This data analysis procedure allows us to evaluate the above stated hypotheses.

Sample Demographics. Our sample consists of data of 192 senior citizens. The mean age of the respondents was slightly above 62. They spent on average 11.6 years in school or university which proves a decent education. Concerning gender, our sample is almost equally distributed. The income variable shows the most missing values (52). However, we can observe quite high incomes for the sample population. Moreover, sample demographics show that the number of people with migration background is rather low. 98% of the respondents have the citizenship of the country studied and 97% are native speakers of the corresponding language. Hence, it is quite difficult to analyse any results related to migration background (Table 4).

Question	N	Min	Max	Mean	Std. Dev.
AGE: I am <x> years old.	192	50,00	83,00	62,3385	8,41371
EDU: I spent <x> number of years in school, college, university or comparable institution.	180	0	20	11.63	3.853
GEN: I am a <woman [0] | man [1]>.	192	,00	1,00	,4844	,50106
INC: The average monthly net income of the household I'm living in is <less than 1000€ [0] | between 1000€ and 2000€ [1] | between 2000€ and 3000€ [2] | more than 3000€ [3]>	140	0	3	1,83	,952
MIG1: My citizenship is < that of the country studied [0] | other than that of the country studies [1]>	189	0	1	0,02	,144
MIG2: My mother tongue is < that of the country studied [0] | other than that of the country studies [1]>	190	0	1	0,03	,175

Table 4. Demographics of the analysed sample

RESULTS

We will present our results derived using the above mentioned methodology in a three-stepped approach. First, we will study the validity of our constructs (outer model) using standardised measures as used by, for instance, Venkatesh et al. (2008), Brown & Venkatesh (2005), or Venkatesh et al. (2003). Second, we will present the inner model: the paths and their coefficients in both models (with and without moderating digital divide variables). Third, we will present and compare the coefficient of determination of both models.

	ICR	Mean	S Dev	PE	EE	SI	FC	BI	GEN	INC	EDU	MIG
PE	.71	4.59	1.21	.74								
EE	.81	4.85	1.28	.61	.80							
SI	.59	4.63	1.02	.41	.31	.66						
FC	.75	5.23	1.49	.67	.68	.42	.78					
BI	.88	5.53	1.86	.67	.56	.45	.76	.90				
GEN	1.00	.48	.50	.24	.16	-.11	.14	.19	1.00			
INC	1.00	1.83	.81	.22	.10	.24	.22	.18	.11	1.00		
ECU	1.00	11.63	3.73	.11	.12	.09	.12	.15	.07	.22	1.00	
MIG	.90	0.03	.15	-.05	-.01	-.10	-.15	-.17	.01	-.16	.05	.95

a) ICR: Internal consistency reliability (Cronbach's Alpha)
b) Diagonal elements are the square root of the shared variance between the constructs and their measures
c) Off-diagonal elements are correlations between constructs

Table 5. Measurement Model Estimation

Outer Model. The results derived using the above mentioned methodology are listed below. We measured the internal consistency reliability (ICR) of all latent variables using Cronbach's Alpha. Generally, an ICR above .9 is considered as excellent, one between .7 and .9 as high, one between .5 and .7 as moderately high, and one between .5 as low (Hinton et al. 2004). The reliabilities in the presented study are comparably high, only social influence is in the high moderate area (Table 5). The high ICRs show that the items measure the corresponding construct. All correlations between the constructs were lower than the square roots of the shared variance between the constructs and their measures in every case. According to Fornell and Larker (1981) this supports convergent and discriminant validity (Table 5). We employed a bootstrapping method (500 iterations) using randomly selected sub-samples to the significance of our PLS model. Analysing the item loadings, we could generally observe that our latent variables are measured by the corresponding items. All items except PE4 and FC4 have comparably high item loadings (Table 6). However, analysing the average variance extracted in all cases shows that our constructs can be considered valid (Hinton et al. 2004).

LV	Item	Loading		LV	Item	Loading
PE	PE1	.8910***		BI	BI1	.9301***
	PE2	.8190***			BI2	.8323***
	PE3	.7681***			BI3	.9235***
	PE4	.3629***		USE	USE01INFO	.5894
EE	EE1	.8473***			USE02COMM	.2515
	EE2	.8244***			USE03BUSI	.1113
	EE3	.8142***			USE04BANK	.1475
	EE4	.7042***			USE05HEAL	.0582
SI	SI1	.6820***			USE06TOUR	.0829
	SI2	.5839***			USE07GOVE	.0556
	SI3	.5977***			USE08EDUC	.0217
	SI4	.7666***			USE09SOCI	.0147
FC	FC1	.8779***			USE10GAME	-.0678
	FC2	.8835***			USE_PRI_MINPERW	.0744
	FC3	.8887***		MIG	LANGUAGE	.9507***
	FC4	.2518*			NATIONALITY	.9530***

a) USE was measured in a formative way, therefore we present the corresponding weights.
b) Education, Income, and Gender were measured with one variable.

Table 6. Item Loadings (with moderator effect – significance of items is stable)

Inner Model. In the first model without moderator effects (UTAUT), all paths have to be proven significant using the bootstrapping method (Table 7). We observed a high influence of Performance Expectancy on Behavioural Intention and of

Behavioural Intention on USE. The other path coefficients are comparably low. However, as the analysis suggests that every considered path is correct, we did not drop any for the second model with moderator effects.

In the second model (UTAUT and digital divide variables), several relationships were moderated by education, gender, income, and migration background. By this, 16 interaction terms were added to the analysis. The moderator variable migration background was added; however, as the sample population shows almost no migration background the related results are not interpretable. Bootstrapping suggests that only a minority of all paths used is significant. This is due to the high amount of moderating constructs in the model and can be ignored (cf. Venkatesh et al. 2003). However, some path coefficients are high and will be further analysed in the discussion section (Table 7).

Dependent Variable: BI			**Dependent Variable: USE**		
	without moderator effects	with moderator effect		without moderator effects	with moderator effect
R^2	.5181	.6378	R^2	.7120	.7440
PE	.4651***	.0867	BI	.7065***	.6469***
EE	.2106**	.3892	FC	.1770**	.1274
SI	.1947***	.2223	EDU		-.0243
EDU		-.2678*	GEN		-.2206
GEN		.1682	INC		.0320
INC		-.0519	MIG		-.0679
MIG		-.0741	FC*EDU		.1265
PE*EDU		.6236*	FC*GEN		.3307*
PE*GEN		-.0502	FC*INC		.0471
PE*INC		.0394	FC*MIG		-.1191
PE*MIG		.0989			
EE*EDU		-.2068			
EE*GEN		.1472			
EE*INC		.0536			
EE*MIG		-.1460			
SI*EDU		.1354			
SI*GEN		-.1956			
SI*INC		-.0600			
SI*MIG		-.0736			

Table 7. Path Coefficients

Coefficient of Determination. The coefficient of determination (R^2) is defined as the proportion of variability in the data explained by the statistical model (and not by random error terms or not included constructs). The original UTAUT achieved an R^2 for BI between .51 and .77 and for USE between .41 and .52 (Venkatesh et al. 2003). Our analysis already shows a high coefficient of determination of .5181 for BI and .7120 for USE in the first model without moderating effects. In the second case with moderating effects we can even observe higher R^2-Values for both BI (.6378) and USE (.7440). Thus, the model combining UTAUT and Digital Divide is able to explain more of the variance in usage behaviour of senior citizens (Table 7).

DISCUSSION

Outer Model. As shown above, all constructs are valid which is in line with the theoretical foundation. However, the UTAUT-originating construct Social Influence has an ICR of .59. This is only considered moderately high by Hinton et al. (2004). Further theory development could try to find better fitting items, for instance by including items from the Model of Adoption of Technology in Households (Brown et al. 2006).

Inner Model and Hypotheses. The results for the paths' coefficients of the inner model can be mapped with the hypotheses mentioned in section 3. Especially the path coefficient of the moderating digital divide variables are of high interest.

(1) The expected performance of internet usage is the main driver for elderly citizens. With the highest path coefficient of all, performance expectancy has high influence on the internet usage. Therefore, governments aiming at an inclusive information society should evaluate their e-inclusion t-governmental strategies with special regards to raising the positive expectations of senior citizens. Thus, our analysis confirms hypothesis H1a. The influence of Performance Expectancy on Behavioural Intention is highly positive moderated by education. Especially for higher educated seniors the expected performance is a good predictor for the intention to use the internet. Other moderator variables provide only marginal powers of explanation. Hence, our analysis partially confirms hypothesis H1b.

(2) The influence of Effort Expectancy is overestimated. Although Effort Expectancy does significantly influence Behavioural Intention in a high positive way, it is not among the main drivers for internet usage. Apparently, Effort Expectancy is overestimated as its influence is not as high as expected. However, the analysis partially approved our hypothesis H2a. The relationship between Effort Expectancy and Behavioural Intention is moderated by education and gender. On the one hand, especially for less educated people, the expected effort is of high importance for their Behavioural Intention. On the other hand, the same fact holds true for men. The influence of other moderator variables is low. Therefore, our analysis partially validates the hypotheses H2b.

(3) Social factors influence Behavioural Intention. The impact of Social Influences on Behavioural Intention is comparable to the one of Effort Expectancy. Thus, hypothesis H3a can be regarded as partially confirmed. Moreover, our analysis shows that especially women are influenced by their social milieu with the path coefficient for the corresponding moderator variable at -.1956. The second moderator variable influencing the importance of social factors is education. Highly educated senior citizens are more influenced by their social setting than less educated ones. Thus, hypothesis H3b can be regarded as partially confirmed.

(4) The influence of Behavioural Intention on actual internet usage is high. In both models tested, the influence of the intention to use on the actual use is both high and significant. Thus, we can regard the hypothesis H4 as proven.

(5) Facilitating Conditions is not the main driver for internet usage. Our analysis provides evidence that the impact of Facilitating Conditions on actual usage is not as high as expected. Material access as part of facilitating conditions is neither the only nor the main driver for internet usage as the corresponding path coefficient is the lowest of all construct related path coefficients in the whole model (ad H5a). However, the impact of Facilitating Conditions is highly moderated by education and gender. Apparently, especially for well educated men, facilitating conditions are crucial for internet usage.

Model Comparison. Both presented models explain the variance of private internet use significantly. Our quantitative analysis shows that the fusion of UTAUT and Digital Divide constructs provides great value in predicting both the intention to use and the use of the internet in a private manner. We can show that a model that integrates both approaches is better than a model building on the original UTAUT-constructs only. However, the UTAUT has to be proven as valuable for predicting private internet usage.

Our results bear several implications for practice. Today's local government use ICT to lever their organisation and processes to a more effective and efficient level in terms of e-government or t-government. However, to make their ICT supported governmental services accessed by everyone they need to bridge the digital divide.

(1) As Performance Expectancy is the main driver for behavioural intention to use the internet local authorities should think about the communication and marketing of benefits of internet usage in general and the usage of ICT supported governmental services (t-government) in special to elderly citizens. Here, especially more educated citizens can be reached.

(2) So far, a lot of courses to provide the right skill set to elderly citizens have been initiated or supported by local governments. However, the study shows that the influence of Effort Expectancy is comparably low. Authorities should evaluate their undertakings in terms of computer courses and especially focus on less educated persons.

(3) Decision makers should also think about working on the social environment of their inhabitants and, e.g. address strong disseminators enrooted in the corresponding milieu. One idea would be to train local opinion leaders to use the internet and give them the opportunity to talk about their path to becoming "experts" on the local radio.

(4) The silver bullet of local governments to bridge the digital divide has been to provide internet access to excluded groups. However, our study suggests that this approach is outdated: Material access as part of facilitating conditions

is neither the only nor the main driver for internet usage. The corresponding path coefficient is the lowest of all construct related path coefficients in the whole model. Apparently, pure material access is not the crucial factor any more. Local authorities should therefore rethink their engagements in this direction in order to make their ICT supported services used by everyone.

CONCLUSION

This paper examines influencing factors for senior citizens' use of the internet for private purposes. We present a research model and develop a corresponding questionnaire based on technology acceptance and digital divide research. Our 2009 survey yields 192 responses from senior citizens (age 50 yrs and above). The resulting dataset was analysed using PLS path modelling (Ringle et al. 2005). Our results suggest that UTAUT is particularly useful for analysing private internet usage achieving an R^2 as high as .7120. We also found that the main driver for senior citizens internet usage is performance expectancy: The higher the expected performance or utility, the higher the intention to use the internet. Drawing from digital divide research, we extended the UTAUT-model by four additional variables that are hypothesised to mediate original UTAUT-relationships. Including interaction terms, we observed that e.g. especially for women the social influence through their corresponding milieu is extremely important and that men are more influenced by the facilitating conditions. All in all, our extended model is able to explain as much as 74% of the variation in internet usage and, therefore, is better than the original UTAUT model for this specific purpose. We thus provide evidence that the inclusion of digital divide constructs yields greater explanatory power than UTAUT constructs only.

However, our study is beset with certain limitations. First, the total population studied did not include many people with migration background (only 3% of the respondents). Therefore, we could not well interpret the results on the influence of this specific variable. Moreover, our study was carried out in a specific region in Western Europe. We believe that our results will, to a great extent, hold true in other settings as well. Future research could aim at testing this assumption by carrying out a comparable study in other national/social/cultural settings. In addition, longitudinal studies could show the development of private internet usage and its influencing factors among senior citizens over time and could thus be regarded another potentially fruitful avenue for future research. Other future research could cover the matching of existing local government e-inclusion projects with the given explaining variables: Which projects contribute to performance or effort expectancy, how is social influence stimulated and how can facilitating conditions be improved? Which projects address the needs of specific groups (see digital divide variables) best? Such overview, we believe, could be very valuable but does not yet exist to our knowledge. As for future theory development, we were able to explain the largest share of variance in private internet usage among senior citizens by employing nine variables, taken from technology acceptance and digital divide research. Here, we believe, further testing of influencing factors, for instance psychological variables (e.g., the Big Five, cf. Costa & McCrae 1992) could still increase explanatory power.

ACKNOWLEDGEMENTS

First, we would like to thank the anonymous reviewers and the (mini-) track chairs for their remarks. Second, we gratefully acknowledge the financial support of the Volkswagen Foundation (Schumpeter Fellowship of first author).

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