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Mature Adults' Use of Digital Health Services The Role of Prior Computer Experience on eHealth Adoption

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Abstract

In the light of aging societies in developed economies, the use of digital health services by mature adults becomes an ever more important issue. Although multiple offerings exist, the widespread use of these solutions is still considerably low. To the current date, research has not yet a good understanding on the specific behavior of senior citizens when it comes to adoption and use of eHealth services. Our research addresses this issue by analyzing the effect previous work experience with Information Technology (IT) has on the eHealth use of retired citizens. Using a paper based questionnaire, 132 respondents provided information on their previous work exposure to IT, their computer self-efficacy, computer anxiety, and use of digital health services.
Our findings underline the strong impact previous work with IT has on eHealth use regardless how long the respondent is already retired. We also found that outcome expectations are a strong mediator on the relationship between self-efficacy and the use of digital health services. This implies that seniors feel that they have all capabilities to use digital health services but only if they see a need to do so.

Keywords
Digital Health Services; eHealth; Mature Adults; Adoption; Prior Experience.

1. Introduction
Today, literally all developed economies are confronted with unfavorable demographic developments (OECD, 2013). The population grows older resulting in fewer medical personnel available to take care of ever more older people needing medical support. eHealth, i.e. '*health services and information delivered or enhanced through the Internet or related technologies*' (Eysenbach, 2001, p.1) is being advocated to enable consumers' active control of their health and well-being by making health information and health management tools available (Agarwal, Gao, DesRoches, & Jha, 2010; Marziali, 2009; Paré, Jaana, & Sicotte, 2007; Rozenkranz, Eckhardt, Kühne, & Rosenkranz, 2013). To relief the tremendous pressure social healthcare systems face, eHealth is widely regarded to be ideally suited for seniors to improve their well-being while saving resources in the healthcare system.

In its most basic form, eHealth offers information portals about diseases, symptoms, and treatment options (Rozenkranz et al., 2013). Consequently, the Internet has become a major source for health information and medical decision support for individuals (Kummervold, Chronaki, Lausen, Prokosch, Rasmussen, Santana, Staniszewski, & Wangberg, 2008). For instance, in 2009, 61% of the adults in the United States used the Internet to access information about their illnesses and treatment options (Fox & Jones, 2009).

Fully exploiting the potential of eHealth, however, is contingent upon the extent to which mature adults make use of such electronic health resources. Active use of the Internet and access to broadband connections are key enablers for using eHealth services (Pew Research Center, 2014). Even in regions where the aforementioned infrastructure is widely available, the motivating factors of adoption and use of eHealth services by seniors are not well understood. Research often shows that elderly people tend to resist accepting new information technology (IT) (Agarwal & Prasad, 1999) and possess anxiety towards novel technologies (Tams, Grover, & Thatcher, 2014). Despite these observations, recent evidence shows that 'the elderly' are not a homogeneous group and show significantly different behavior in technology acceptance and use (Niehaves & Plattfaut, 2014). Previous research on mature adults underlined the importance of computer self-efficacy (CSE) and computer anxiety (CA) to predict this groups' use of the Internet (Niehaves et al., 2014; Tams et al., 2014).

For this research we hypothesize that CSE and CA are influenced by previous use of computers (e.g. at the workplace) thus constituting a salient antecedent. To contribute to the understanding of seniors' use of eHealth, we therefore investigate the research question:

> *Does mature adults' previous work experience with computers affect their intention to use digital health services?*

In the following, we review the available literature on self-efficacy, anxiety and previous work experience and develop the corresponding research model. We test the model using quantitative empirics on seniors in Germany. The results are presented, limitations explicated and further research opportunities identified. The paper closes with a discussion of our findings.

2. Literature Review

2.1 Conceptualization of '*Mature Adults'*

Although mature adults are the interest of policy making and research alike, the boundaries which segregate the '*young'* and the '*old'* differ significantly. A commonly accepted definition of either a specific age or contextualizable external factor (e.g. 'retired') is still missing.

Therefore, we chose to include all respondents aged 55+ as seniors. This may sound odd for people still working (i.e. round 60 years of age), but it is actually the age when people tend to make proportionally more use of doctors and eHealth services. Also, it includes respondents who were in a more mature state when the Internet became widely spread for business purposes (i.e. around early 2000 and later). As laid out in the Research Methodology section, we tested for statistical significance of the influence of defined age clusters and detected no significant deviations in resonances.

2.2 Computer Self-Efficacy

The theoretical basis for our research draws on Social Cognitive Theory (SCT) (Bandura, 1982, 1986) which assumes that personal factors, behavior, and environmental factors reciprocally interact and influence each other (Bandura, 1986). SCT considers self-efficacy (SE) –defined as '*the belief in one's capability to organize and execute the courses of action required to manage prospective situations*' (Bandura, 1997, p. 2)– to be a key determinant of human behavior (Bandura, 1982, 1997). The individual's belief in her/his abilities to successfully execute a behavior strongly impacts her/his intention to perform a specific behavior (Barrick, Stewart, & Piotrowski, 2002; Devaraj, Easley, & Crant, 2008).

Bandura's concept of self-efficacy has also been tailored to the specific information technology context and defined as the *'judgment of one's capability to use a computer'* (Compeau & Higgins, 1995, p.192). In this respect we refer to computer self-efficacy (CSE).

SE and CSE were empirically validated in a diversity of IS research contexts, e.g. for investigating its effect on computer-related actions of individuals (e.g. Agarwal et al., 1999; Hsu & Chiu, 2004) and the actual decision whether to use computer technology, or not (Marakas, Yi, & Johnson, 1998; Thatcher & Perrewe, 2002; Thatcher, Zimmer, Gundlach, & McKnight, 2008). For mature adults, research showed that they have generally less CSE compared to younger individuals (e.g. Czaja, Charness, Fisk, Hertzog, Nair, Rogers, & Sharit, 2006; Mead, Sit, Rogers, Jamieson, & Rousseau, 2000). Research also shows that CSE (along with outcomes expectations) is the strongest predictor of seniors' intention to use the Internet (Lam & Lee, 2006; Niehaves et al., 2014).

2.3 Computer Anxiety

Previous research shows that elderly people often tend to resist using unfamiliar information technology (Agarwal et al., 1999) – a general anxiety towards novel technologies (Tams et al., 2014). This anxiety becomes amplified by the steady increase in complexity of contemporary technology and in conjunction with the continuous decrease of seniors' cognitive resources (Tams et al., 2014). Consequently, modern technology might not be in support of elderly's mental models of how effective interactions with technology actually work (Tams et al., 2014). This effect is reinforced through the characteristics of today's technologies, which are often designed without paying the necessary attention to the specific circumstances of elderly people (Tams et al., 2014). As system designers often tend to be younger individuals, a large age gap between (young) software engineers and (old) users exists (Hawthorn, 2007). In many cases, younger designers assume similarity with potential users leading to unconsciousness age-related differences (Hawthorn, 2007; Tams et al., 2014).

2.4 Previous Work Experience

Internet adoption and computer self-efficacy of mature adults increasingly gained academic attention in the last years (see for example the work of (Hill, Betts, & Gardner, 2015; Lee & Coughlin, 2015; Tsai, Shillair, Cotten, Winstead, & Yost, 2015; Vroman, Arthanat, & Lysack, 2015)). However, despite its importance, little is actually known about the specific determinants of mature adults' computer self-efficacy (Niehaves et al., 2014; Tams et al., 2014). Prior research reported computer experience (Marakas et al., 1998) in general, and training interventions in the context of older adults (Lam et al., 2006) as influential factors shaping one's computer self-efficacy. Regardless of these initial findings, research on the influence of previous work experience with computers and the Internet on the technology-related behavior of retired people is literally non-existent.

3. Research Model

Our research aims to explicate how prior working experience with IT influences computer self-efficacy and anxiety of mature adults which, in turn, influences the use of digital health services. In this section, we outline the arguments for our research model illustrated in Figure 1 below.

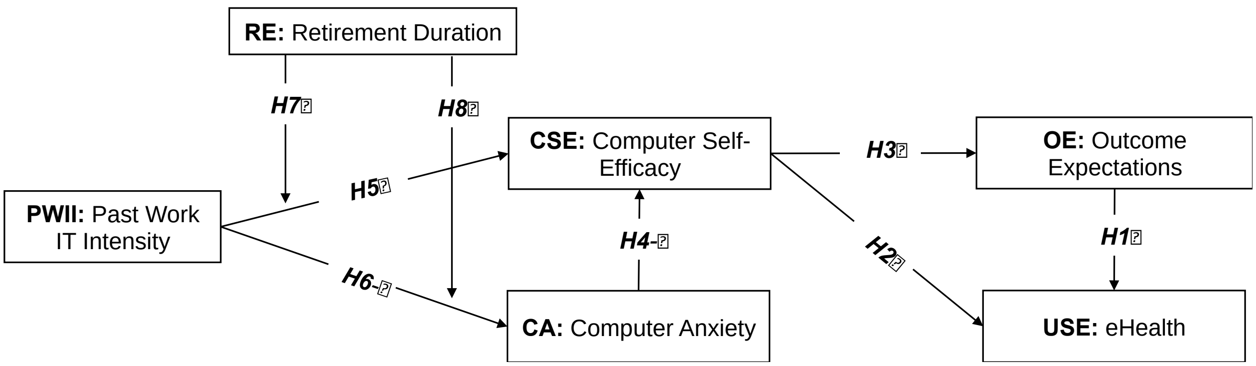


Figure 1: Research Model

3.1 Outcome Expectations (OE) and Use of eHealth Offerings (USE)

Use of eHealth offerings acts as dependent variable of our research model. In the context of our research, it is defined as the actual use of computer technologies to support one's health needs. It is conceptualized as a multifaceted construct and includes using computer technologies to look up general health information, to research healthcare providers to seek medical care, and to manage one's own healthcare regimen with computer technologies.

Following established causal relationships in the context of SCT and CSE, we propose that elderly's eHealth use is primarily shaped by outcome expectations and CSE (H1, H2). Outcome expectations are defined as an individual's anticipated consequences how using eHealth will positively impact her/his health status and well-being (adapted from Compeau et al., 1995).
According to SCT, individuals are more likely to engage in behavior, which is believed to result in favorable consequences (Compeau et al., 1995). The positive influence of OE on actual use of technology has been demonstrated by research on mature adults (Lam et al., 2006; Niehaves et al., 2014). Therefore, we pose the following hypothesis:

H1: *Outcome expectations positively affect the use of eHealth offerings*.

3.2 Computer Self-Efficacy (CSE) and Computer Anxiety (CA)

Computer Self-Efficacy reflects an individual's belief in her/his ability to use computer technology as discussed above. Computer Anxiety (CA) on the other hand reflects individuals' tendency to be uneasy or fearful when confronted with using computers. Reasons may result from fear data loss or other mistakes by the user (Heinssen, Glass, & Knight, 1987; Parasuraman

& Igbaria, 1990). SCT argues that one's outcome expectations are largely determined by one's judgments of how well one can execute the requisite behavior (i.e. self-efficacy) (Bandura, 1982, 1997). In the context of technology behavior, prior research demonstrated that CSE affects both, one's outcome expectations of using a given technology and one's actual technology use itself (Compeau, Higgins, & Huff, 1999) and these effects hold true for mature adults alike (Lam et al., 2006). Moreover, SCT argues that emotional arousal and self-efficacy are reciprocally determined (Bandura, 1982, 1997). Individuals with feelings of anxiety towards computers are found to be less likely to see themselves as capable to use a computer (Thatcher et al., 2002). Based on these insights, we hypothesize:

H2: *Computer Self-Efficacy positively affects the use of eHealth offerings*.
H3: *Computer Self-Efficacy positively affects Outcome Expectations*.
H4: *Computer Anxiety negatively affects Computer Self-Efficacy*.

3.3 Prior Work IT Intensity (PWII) and Retirement (RE)

Experience of mastery is considered as major determinant of one's self-efficacy (Bandura, 1982). As to that, prior research has found positive effects of prior successful interactions with technology (e.g. training) on elderly peoples' self-efficacy perceptions (Lam et al., 2006). As over the last two decades workplaces increasingly rely on computer usage, we assume that elderly people, who already used computers at work, are more familiar with such technologies and are more likely to have a positive attitude towards those. Subsequently, we argue that the effect of prior occupational computer usage increases CSE and decreases CA:

H5: *Past Work Experience with IT positively affects Computer Self-Efficacy*.
H6: *Past Work Experience with IT negatively affects Computer Anxiety.*

It is not yet established in research how the length of the retirement phase (i.e. the time passed between entering retirement and the day of the interview) affects the CSE and CA of an individual. We assume that the length of being out-of-work has moderating influence on the relationship between Past Work Experience and CSE/CA. Thus, we hypothesize:

H7: *Retirement moderates the effect of Past Work Experience with IT on Computer Self-Efficacy*.
H8: *Retirement moderates the effect of Past Work Experience with IT on Computer Anxiety*

4. Research Method

To empirically test our research model, we deployed a quantitative survey research approach. A theory-guided questionnaire was developed, extensively pre-tested with experts and potential respondents and adjusted to fit to the research subjects (adults 55+ years of age). All together, the questionnaire underwent five revisions until no new issues arose.

As our research group comprises people of different computer skills, the questionnaire could not be distributed online (to avoid a bias towards IT-savvy people). Therefore, data needed to be collected in the field.

4.1 Questionnaire development

For data collection, a questionnaire was developed which includes measurement items drawn from established information systems research as discussed above. Wherever necessary, the wording was carefully adapted to the specific context of this research. The interviewees were asked to indicate their level of acknowledgement towards statements provided. All responses were measured on seven-point Likert-scales ranging from ‘strongly disagree’ to ‘strongly agree’. Apart from measuring the research model, demographic data on age, gender, marital status, household income and level of education was collected.

4.2 Data Collection and Sample Demographics

Data was collected in the second half of 2015 in the United States. Participants were recruited randomly in public places like pedestrian zones and in places where senior citizens are frequent guests (e.g. adult education centers or senior citizen centers). All interviewees have been ensured full confidentiality and that there are no ‘wrong’ or ‘right’ answers to the questions in the survey. The respondents filled in the questionnaire independently with the interviewers close by. If asked, the interviewer clarified questions but did not provide guidance. On average, it took around 15 to 30 minutes to fill in the questionnaire. We received 234 surveys in total, whereby 69 respondents were younger than 55+ years and/or not retired. These responses were removed from the data set. Of the remaining questionnaires, 33 responses were incomplete and consequently dropped from the dataset. The remaining 132 surveys constitute the basis of our analysis. Table 1 outlines the demographics of our data sample.

Age		***Gender***		***Marital status***		***Annual household income***	
55-59	2%	Male	38%	Single	7%	< 25 k USD	8%
60-64	7%	Female	62%	Married	63%	25–34 k USD	4%
65-70	27%			Divorced	12%	35–49 k USD	5%
70-74	26%	***Retired***		Widowed	18%	50–74 k USD	19%
75-79	20%	Yes	100%			75–99 k USD	17%
80-84	14%	No	0%			100-149 k USD	20%
85-89	4%					150-199 k USD	8%
> 90	2%					> 200 k USD	10%
						n.a.	10%

Table 1: Demographics of the data set (n = 132)

5. Results

Analysis of the data collected was performed with the Partial Least Squares (PLS) method using the software SmartPLS 3.0 (Ringle, Wende, & Becker, 2015). All constructs have been modeled with reflective indicators. A bootstrapping procedure with 5000 iterations and no sign changes was employed.

Following guidelines as per Chin (1998) and other IS researchers (Venkatesh, Brown, Maruping, & Bala, 2008), our analysis proceeded in two steps: we first analyzed the measurement model and subsequently the proposed structural model.

5.1 Measurement Model

The measurement model examines the relationship between the latent variables and their measures. Table 2 reports the results of the statistical assessments as discussed in the following.

	Construct	*# Items*	*Loadings*	*1*	*2*	*3*	*4*	*5*
1	Past Work IT Intensity	3	0.951 - 0.969 ***	**0.961**				
2	Computer Self-Efficacy	10	0.832 - 0.921 ***	0.490	**0.875**			
3	Computer Anxiety	4	0.803 - 0.940 ***	-0.246	-0.557	**0.903**		
4	Outcome Expectations	3	0.952 - 0.966 ***	0.314	0.534	-0.225	**0.962**	
6	eHealth Use	4	0.654 - 0.837 ***	0.203	0.447	-0.223	0.642	**0.774**
Average Variance Extracted (AVE)				0.923	0.765	0.815	0.925	0.599
Composite Reliability (CR)				0.973	0.970	0.946	0.974	0.855
Cronbach's Alpha (CA)				0.959	0.966	0.924	0.960	0.775
Mean				4.21	5.34	3.23	4.24	2.76
Standard Deviation (SD)				2.26	2.45	1.86	1.71	1.67

Table 2: Measurement model validation and descriptive statistics
*** p < 0.001; ** p < 0.01: * p < 0.05

All item loadings are above .50 and each item loaded on its construct significantly (p < .001) (Urbach & Ahlemann, 2010); items with poorer loading have been dropped. To ensure further construct quality, we ensured that values for composite reliability (CR) are above .70, values for average variance extracted (AVE) are at least .50 (Fornell & Larcker, 1981), and values for Cronbach's alpha (CA) exceed the threshold of .70 (Nunnally, 1978). Lastly, sufficient discriminant validity is given since construct correlations are smaller than the square root of AVE (Fornell et al., 1981; Hulland, 1999). In sum, the results demonstrate adequate psychometric properties of the measurement model allowing us to test the structural model.

5.2 Structural Model

The structural model reflects the relationship between the constructs of the research model. The results of the structural model assessment are depicted in Figure 2 below:

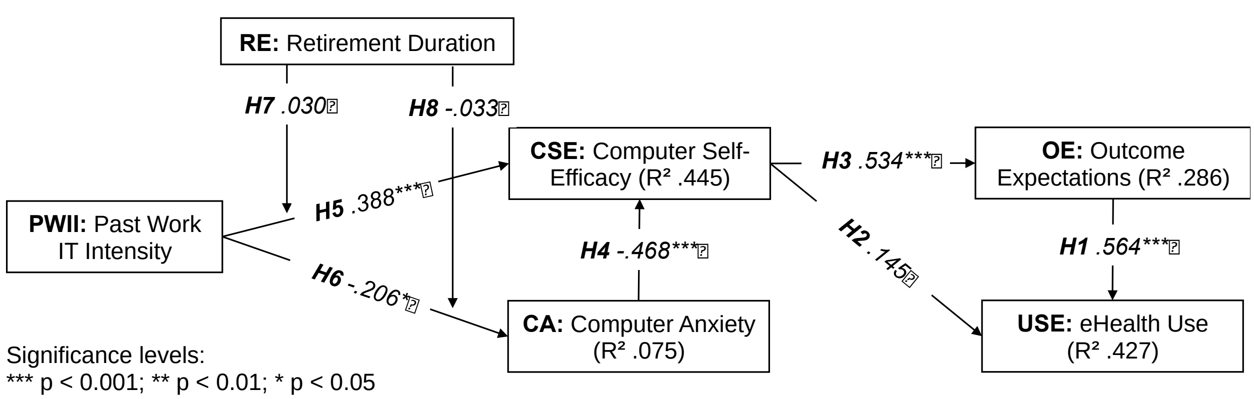
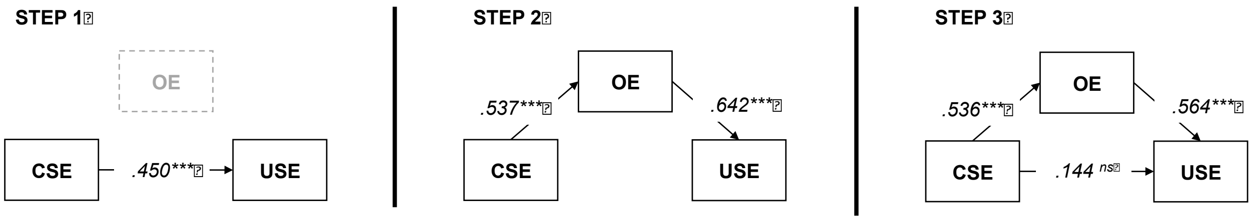


Figure 2: Structural Model Results

The structural model reveals interesting results regarding the relationship between CSE, OE and USE. The findings partially contradict our theoretical understanding of the cognitive mechanisms of use of technology: It seems that OE has a strong mediating role on the relationship between CSE and USE. To investigate this issue, we conducted formal meditation analysis (Baron & Kenny, 1986; Preacher & Hayes, 2004) by following the PLS-oriented procedure of Hair, Hult, Ringle, and Sarstedt (2013). Figure 3 depicts the (1) direct, significant effect of CSE on USE without the mediating variable OE; (2) the indirect, significant effects of CSE on OE and OE on USE without the direct effect of CSE on USE, and (3) the mediator model in which the former direct effect of CSE on USE strongly decreases due to the mediator. As a next step, the Variance-Accounted-For (VAF) was calculated to determine the size of the mediating effect. The resulting VAF score of 0.677 and the insignificant direct effect of CSE on USE indicates a good mediating effect (Hair et al., 2013).



Significance levels: *** p < 0.001; ** p < 0.01; * p < 0.05; ns = not significant

Figure 3: Formal Testing for Mediation

Additionally, we controlled for effects of gender and age on USE. Our results indicate, that neither gender (p=0.236), nor age (p=0.478) significantly affected the dependent variable.

In conclusion, the results demonstrate solid support for our research model. Although H2 is not significant and shows a low loading, strong evidence is provided for the important role of mature adults' CSE as a determinant of eHealth use (H2). This is because of the strong mediating effect of OE on the relationship CSE to USE. Therefore, contrary to our hypotheses, OE proves to have a mediating effect on the aforementioned relationship. Accordingly, H1 and H3 are strong and significantly supported.

In addition to that, our results underline the strong impact of prior work with IT on the respondents' CSE and computer anxiety (H4, H5, H6). It is important to note, that these effects persist, regardless of how long a person is already in retirement: H7 and H8 had no significant effect.

6. Findings

Our findings demonstrate that previously working on a job with exposure to IT has a long-term impact on people's CSE and CA, and therefore affects mature adult's use of digital health services significantly.

As expected, we see evidence that people who used IT on their job before they got retired have a high CSE and low CA. This finding is interesting especially if one takes into account that ~20%

of the respondents are 80 years or older. This means that (assuming retirement by the age of 65) these respondents have gained their computer expertise well before the widespread use of the Internet. In other words, it could be suggested that there is a sort of ‘universal technology skill’, which makes people comfortable working with IT in general, regardless of the rapid developments the technology takes. Maybe it is a general competency like riding a bike – ‘once learned, is never forgotten’. However, this research only provides a starting hypothesis in this respect and more research is needed to prove it.

The other major finding is the moderating role of OE on the relationship from CSE to USE. This outcome underlines the effect that people revoke their skills (in this research setting their CSE) only when they expect a certain outcome from it. In other words: mature adults believe that they can handle digital health services, however, they do only so when they have a need for it. This argument seems logical as people tend not to bother with health related topics unless they experience a health issue. Apart from the (assumingly) few men and women who proactively take serious care of their health (i.e. proactively live health etc.), the majority lives the lifestyle they are used to and only change things when a health problem forces them to do so. On the bright side: Mature adults indicate to be confident that they can handle digital health services should the need arise.

In summary, we see that previous work experience with IT is a tremendous help when it comes to the use of digital health services. However, these services will only be used when there is a perceived need for them.

7. Limitations and Further Research

Although the research model produces robust findings, two major limitations need to be kept in mind when interpreting the results.

(1) The study was done with a comparatively small number of interviewees in a limited geographical range. Thus, the insights may not be applicable to the broader population and not in all international settings. Especially national healthcare systems and differing national approaches to broadband coverage and adult education may lead to bias.

(2) The informants were recruited in the open public and at special meeting places. Although this provides the advantage –compared to online surveys- that we were actually able to confirm that it were really senior citizens who provided the information, our response base is skewed. This results from the fact that a large proportion of the elderly generation may not be outgoing anymore, i.e. spends more time at home or in a retirement center. These people form a very interesting group as they could be the main users of digital health services, however, it is very difficult to access them for surveys like this.

These limitations actually link in directly into further research. It would be most interesting to initiate a research project, which closes the gaps discussed in the limitations (i.e. includes also seniors who do not leave their homes often or live in retirement centers). Also a cross-national study would be very interesting to investigate national differences in the adoption and use of digital health services. Finally, the aforementioned possibility that a perceived ‘general IT skill’ may exist should be investigated further.

8. Implications and Conclusion

Our findings have important implications for theory and practice. Amongst them is the need to provide different eHealth offerings for different clusters of people over age 55. Mature adults who worked on jobs with IT exposure are much more likely to use digital health services, than the group who had no occupational IT exposure. In order to provide digital health solutions to a broad community of mature adults, specific offerings for those who had no occupational IT exposure need to be developed. Our findings deliver theoretical and empirical foundation to the findings of PEW (2014) who emphasize the ‘new digital divide’ amongst seniors. To decrease this gap, society needs to put emphasis on seniors without previous IT experience and provide the necessary knowledge to a broad audience.

Additionally, we were able to show that it is of utmost importance to put emphasis on the communication of the advantages of using eHealth offerings. Although seniors with previous IT experience feel comfortable using digital health services, they will only do so when they see a need for it.

References

Agarwal, R., Gao, G., DesRoches, C., & Jha, A. K. (2010). Research commentary-The digital transformation of healthcare: current status and the road ahead. Information Systems Research, 21(4), 796-809.

Agarwal, R., & Prasad, J. (1999). Are individual differences germane to the acceptance of new information technologies? Decision sciences, 30(2), 361-391.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American psychologist, 37(2), 122-147.

Bandura, A. (1986). Social foundations of thought and action (Vol. 1986). Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). Self-Efficacy: The Exercise of Control. New York: Freeman.

Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. Journal of personality and social psychology, 51(6), 1173.

Barrick, M. R., Stewart, G. L., & Piotrowski, M. (2002). Personality and job performance: test of the mediating effects of motivation among sales representatives. Journal of Applied Psychology, 87(1), 43.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. Modern methods for business research, 295(2), 295-336.

Compeau, D., & Higgins, C. (1995). Computer self-efficacy: Development of a measure and initial test. Mis Quarterly, 19(2), 189-211.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. Mis Quarterly, 23(2), 145-158.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). Psychology and aging, 21(2), 333-352.
Devaraj, S., Easley, R. F., & Crant, J. M. (2008). Research note-how does personality matter? Relating the five-factor model to technology acceptance and use. Information Systems Research, 19(1), 93-105.
Eysenbach, G. (2001). What is e-health? Journal of medical Internet research, 3(2), 1-2.
Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research, 39-50.
Fox, S., & Jones, S. (2009). The Social Life of Health Information. Retrieved from http://www.pewinternet.org/files/old-media//Files/Reports/2009/PIP_Health_2009.pdf
Hair, J. F. J., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2013). A primer on partial least squares structural equation modeling (PLS-SEM): Sage Publications.
Hawthorn, D. (2007). Interface design and engagement with older people. Behaviour & Information Technology, 26(4), 333-341.
Heinssen, R. K., Glass, C. R., & Knight, L. A. (1987). Assessing Computer Anxiety: Development and Validation of the Computer Anxiety Rating Scale. Computers in human behavior, 3, 49-59.
Hill, R., Betts, L. R., & Gardner, S. E. (2015). Older adults' experiences and perceptions of digital technology: (Dis)empowerment, wellbeing, and inclusion. Computers in human behavior, 48, 415-423. doi:http://dx.doi.org/10.1016/j.chb.2015.01.062
Hsu, M.-H., & Chiu, C.-M. (2004). Internet self-efficacy and electronic service acceptance. Decision support systems, 38(3), 369-381.
Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. Strategic management journal, 20(2), 195-204.
Kummervold, P. E., Chronaki, C. E., Lausen, B., Prokosch, H.-U., Rasmussen, J., Santana, S., . . . Wangberg, S. C. (2008). eHealth trends in Europe 2005-2007: a population-based survey. Journal of medical Internet research, 10(4).
Lam, J. C. Y., & Lee, M. K. O. (2006). Digital Inclusiveness-Longitudinal Study of Internet Adoption by Older Adults. Journal of management Information Systems, 23(4), 177-206.
Lee, C., & Coughlin, J. F. (2015). Older Adults' Adoption of Technology: An Integrated Approach to Identifying Determinants and Barriers. Journal of Product Innovation Management, 32(5), 747-759. doi:10.1111/jpim.12176
Marakas, G. M., Yi, M. Y., & Johnson, R. D. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. Information Systems Research, 9(2), 126-163.
Marziali, E. (2009). E-health program for patients with chronic disease. Telemedicine and e-Health, 15(2), 176-181.
Mead, S. E., Sit, R. A., Rogers, W. A., Jamieson, B. A., & Rousseau, G. K. (2000). Influences of general computer experience and age on library database search performance. Behaviour & Information Technology, 19(2), 107-123.
Niehaves, B., & Plattfaut, R. (2014). Internet adoption by the elderly: employing IS technology acceptance theories for understanding the age-related digital divide. European Journal of Information Systems, 23(6), 708-726.
Nunnally, J. C. (1978). Psychometric Theory (2 ed. Vol. 2). New York: McGraw-Hill.

OECD. (2013). OECD Employment Outlook 2013. Retrieved from http://dx.doi.org/10.1787/empl_outlook-2013-en

Parasuraman, S., & Igbaria, M. (1990). An examination of gender differences in the determinants of computer anxiety and attitudes toward microcomputers among managers. International Journal of Man-Machine Studies, 32(3), 327-340.

Paré, G., Jaana, M., & Sicotte, C. (2007). Systematic review of home telemonitoring for chronic diseases: the evidence base. Journal of the American Medical Informatics Association, 14(3), 269-277.

Pew Research Center. (2014). Older Adults and Technology Use. Retrieved from http://www.pewinternet.org/2014/04/03/older-adults-and-technology-use/

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behavior research methods, instruments, & computers, 36(4), 717-731.

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. Boenningstedt: SmartPLS GmbH.

Rozenkranz, N., Eckhardt, A., Kühne, M., & Rosenkranz, C. (2013). Health Information on the Internet. Business & Information Systems Engineering, 5(4), 259-274. doi:10.1007/s12599-013-0274-4

Tams, S., Grover, V., & Thatcher, J. (2014). Modern information technology in an old workforce: Toward a strategic research agenda. The Journal of Strategic Information Systems, 23(4), 284-304.

Thatcher, J. B., & Perrewe, P. L. (2002). An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy. Mis Quarterly, 26(4), 381-396.

Thatcher, J. B., Zimmer, J. C., Gundlach, M. J., & McKnight, D. H. (2008). Internal and external dimensions of computer self-efficacy: An empirical examination. IEEE Transactions on Engineering Management, 55(4), 628-644.

Tsai, H. Y. S., Shillair, R., Cotten, S. R., Winstead, V., & Yost, E. (2015). Getting Grandma Online: Are Tablets the Answer for Increasing Digital Inclusion for Older Adults in the US? Educational Gerontology, 41(10), 695-709. doi:10.1080/03601277.2015.1048165

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. Journal of Information Technology Theory and Application, 11(2), 5-40.

Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. Mis Quarterly, 32(3), 483-502.

Vroman, K. G., Arthanat, S., & Lysack, C. (2015). “Who over 65 is online?” Older adults’ dispositions toward information communication technology. Computers in human behavior, 43, 156-166.