From the Digital Divide to the Psycho-digital Divide: Elderly and Online Social Networks
De la brecha digital a la brecha psico-digital: Mayores y redes sociales

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Abstract
The present study analyzes the evolution of the concept of the digital gap with the elderly from the perspective of active ageing and in the context of the use of online social networks as a communication instrument. We consider that socio-demographic variables are not enough to explain the elderly's use or non-use of Information and Communication Technologies (ICT). Psychological variables, such as cognitive age, technology anxiety and the level of adventurousness complement the former and can even explain more the elderly person's behaviour regarding the use of online social networks. The results come from a sample of elderly people who are students of an Experience Classroom in a university. They allow us to confirm that our doubts about the stereotype of the elderly concerning the digital divide are correct and that the psychological variables serve to a greater extent to show the significant differences with respect to determining their profile. The elderly user of online social networks feels younger, experiences a lower level of technology anxiety and is more adventurous. In general, psychological characteristics therefore offer a more discriminant power than those that are socio-demographic. This is why we propose the concept of a psycho-digital divide.

Resumen
En el presente estudio analizamos la evolución del concepto de la brecha digital para los mayores desde la perspectiva del envejecimiento activo y en el contexto de la utilización de las redes sociales como instrumento de comunicación. Consideramos que las variables socio-demográficas no tienen suficiente poder para explicar la utilización o no de las tecnologías de la comunicación (TIC) por los mayores. Las variables de corte psicológico, como la edad cognitiva, la ansiedad tecnológica o el nivel de audacia complementan a las anteriores, e incluso, pueden ser más explicativas del comportamiento del mayor con relación a la utilización de redes sociales. Los resultados provenientes de una muestra de mayores, alumnos del Aula de Experiencia de una universidad, nos permiten confirmar que nuestras dudas acerca del estereotipo de los mayores respecto a la brecha digital son acertadas y que las variables psicológicas sirven, en mayor grado,

para mostrar las diferencias significativas existentes entre usuarios y no usuarios de redes sociales en cuanto a la determinación del perfil de los mismos. El usuario mayor de redes sociales se siente más joven, experimenta un menor nivel de ansiedad tecnológica y es más audaz. En general, las características psicológicas ofrecen, por tanto, mayor poder discriminante que las socio-demográficas, por ello proponemos el concepto de brecha psico-digital.

Keywords / Palabras clave

Elderly, digital divide, active ageing, cognitive age, technology anxiety, adventurousness, ICT, online social networks.
Mayores, brecha digital, envejecimiento activo, edad cognitiva, ansiedad tecnológica, audacia, TIC, redes sociales.

1. Introduction

The Organisation for Economic Co-operation and Development (OECD, 2001: 5) defined the digital divide as «the gap or division between people, homes and geographic and economic areas with different socio-economic levels regarding both their opportunities of accessing Information and Communication Technologies and the use of Internet for a wide variety of activities». According to this organization, the digital divide in families basically depends on two variables, income and education level, as well as other socio-demographic variables such as race, gender, family type, linguistic limitations and age.

With respect to the elderly, the World Health Organization (OMS, 2002) defines active ageing as «the process of optimizing health, participation and safety opportunities with the aim of improving people's quality of life as they grow old». The term «active» suggests «a continuous participation in social, economic, cultural, spiritual and civic questions, not only the capacity of being physically active» (OMS, 2002: 79). In the current technological and globalized environment, Information and Communication Technologies (ICT) have a fundamental role, as noted by the World Economic Forum (WEF, 2011: 109). With the aim of promoting active ageing and diagnosing the real situation of the elderly in Spain, the White Paper on Active Ageing (Imserso, 2011a) and a Work Program (Imserso, 2011b) were created. In them appear as challenges, on the one hand, the developing of models of co-existence based on the increase of personal contacts, social networks and the use of new technologies and the encouragement of inter-generational relationships and, on the other hand, an advance in the use of ICT by the elderly (Imserso, 2011b).

The use of ICT by the elderly is a complex subject. There is the stereotype that the elderly are cut off from new technologies. Many studies (Chua, Chen & Wong, 1999; Dyck & Smither, 1994) state that the age of an individual is a variable which conditions their use of ICT. Nevertheless, there is other research (Mathur, Sherman & Schiffman 1998; Ramón, Peral & Arenas, 2013) which reveals that this segment is very heterogeneous. Not only age, but sex, the education level and the socio-economic class influence explain the elderly's digital behaviour. This is what we may call the socio-digital divide.

The aim of this work is to question the stereotype of the elderly regarding the digital divide. Its justification is determined by the heterogeneity of the elderly in their behaviour with new technologies. On the other hand, the traditional definition of the digital divide differentiates between users based on socio-demographic characteristics. However, the use of these variables may be insufficient to understand more thoroughly the motivations which lead the elderly to use ICT (Dabholkar & Bagozzi, 2002). We believe that the digital divide continues to exist, but it is evolving toward other aspects which are inherent to the individual. This is why we propose psychological criteria which better reveal the differences which exist among the elderly, specifically their influence on the use of social networks.

In a hyper-connected world, active ageing can be seen to be favoured by the use of social networks (WEF, 2011). Research on this topic has not yet been developed. Fritsch, Steinke and Silbermann (2013) in their bibliographical review, find only eight articles focused on people over 50

and social networks. The majority of these works are centred on safety and privacy as the main obstacles to using them. Others, such as Pfeil, Arjan and Zaphiris (2009), analyze the relationships built in social networks based on age, observing that the elderly have a greater diversity of ages among their contacts (despite their number being fewer), among which are included family members as opinion leaders in social networks. The work of Ji, Choi, and Lee (2010) proposes the identification of the profiles of elderly users and non-users of social networks and the differences in their behaviour. This leads us to consider possible segments of users who will more easily access other forms of online communication which are more oriented toward e-commerce and its different forms of social commerce (Liébana, Villarejo & Sánchez-Franco, 2014). Finally, the work of Curran and Lennon (2013) considers the influence of sociological variables, such as social influence and social tension, on the intention to use social networks among the elderly.

Psychological factors explain the development of expertise and skills in the elderly. These will favour the use of social networks and will enable the optimizing and prolonging of their use as they grow old. This is because they are an instrument of communication which will allow the achievement of levels of well-being and benefits for health care and the improvement of self-sufficiency (Leist, 2013). The social interaction that the elderly attain when they take part in social networks keeps them in communication, active and constantly learning. They thus solve technological challenges individually or supported by the advice of family members and younger friends who have a greater experience in the digital context (Braun, 2013).

In the analysis of individual differences, we consider those related to demographic characteristics, such as sex and age, and psychological characteristics. In our study, within the last of these we have gone deeply into the cognitive age, setting out from the works of Barak (Barak, 2009; Barak & Gould, 1985; Barak, Guiot, Mathur, Zhang & Lee, 2011), given that this is a variable that is habitually used in studies about the elderly and which reveals the existence of differences between chronological age and cognitive age. On the other hand, the other psychological variables proposed, technology anxiety and adventurousness begin with the works of Meuter & al. (2003) and Niemelä (2007) which have been used in research on the acceptance and use of technology, such as Venkatesh et al. (2003).

The structure of the work begins with the bibliographical review of the defining psychological variables in the behaviour of the elderly in social networks: cognitive age, technology anxiety and adventurousness. As a result of the literature review we make a research proposition. In the second section we describe the material and methods used. We finish by analyzing the results obtained and summarizing the study's main conclusions.

1.1. Cognitive age

Each person perceives his/her maturity based on the social and cultural stereotypes, of the social reality in which they live and their own psychological and physical changes which they have developed while getting older (Peters, 1971). The over-50s currently feel younger than their chronological age (Sherman, Schiffman & Mathur, 2001), rejecting descriptions such as aged or old (Mathur & al. 1998), as well as the image that advertising at times projects about them (Moschis & Mathur, 2006).

The term cognitive age appears in this context. This is part of the self-concept which people have of themselves. The perception of cognitive age is influenced by the chronological age but also by the life experiences and changes in social roles (Mathur & Moschis, 2005). This cognitive age positively influences self-esteem and confidence in the capabilities that one believes one has (Barak & Rahtz, 1990).

In this sense, cognitive age is a better criterion to segment the market (Barak & al., 2011; Mathur & Moschis, 2005; Reisenwitz & Iyer, 2007), as it enables a better understanding of the decisions of elderly users (Sudbury & Simcock, 2009a) and their responses to the stimuli of communication (Moschis & Mathur, 2006), given that it expresses better identity, perceptions and, therefore, the behaviour of each individual in the challenge of coping with the use of ICT.

As Barak and Gould (1985) point out, the cognitively young elderly are more adventurous, have greater self-confidence and are selective innovators, as they accept new practices and products when they feel that they are going to benefit from them. This is why a lower cognitive age may mean for the elderly an antecedent about the use and acceptance of technologies (Wei, 2005).

Hong, Lui, Hahn, Moon and Kim (2013) divide the elderly into two groups –those with a cognitive age the same as their chronological age and those with a cognitive age lower than their chronological age– to compare the influence of factors of acceptance of mobile data services. However, Szmigin and Carrigan (2000) indicate that the elderly feel increasingly happier and confident concerning their capabilities and do not need to feel or appear younger than their real age. Indeed, Teuscher (2009) finds that the differences between cognitive age and chronological age are fewer than those revealed in previous studies (an average of 5.6 compared to fifteen years). Nonetheless, we understand that the cognitive age and its difference with respect to the chronological age can help us to understand the variations which are produced in the acceptance and use of social networks.

1.2. Technology anxiety

The first research about anxiety was centred on that produced by computers (Meuter & al., 2003). This was considered to be an example of the state of anxiety (Chua & al., 1999), that is to say, a transitory state or condition which varies in intensity and fluctuates over time. Nevertheless, anxiety as a feature of an individual's personality is a predisposition in their behaviour to perceive a set of objectively non-dangerous circumstances as a threat (Spielberger, 1966). In accordance with the classical theories about anxiety, it is considered that it induces negative impacts in the individual's cognitive responses (Guo, Sun, Wang, Peng & Yan, 2013) and can mainly be modified by training and experience with computers.

A less studied concept is that of technology anxiety (Niemelä, 2007) derived from the former (Guo & al., 2013). The effects of technology anxiety are especially strong in the first phases of the process of adopting a new technology (Venkatesh, 2000), when people use it for the first time, and even before doing so and especially in public (Gelbrich & Sattler, 2014). Technology anxiety is the main determiner of the use of a technology at an individual level (Meuter & al., 2003). Furthermore, another of its consequences is resistance to change, given that those people with high levels of technology anxiety tend to be more worried about the unexpected mistakes caused by the technology, which is why they will try to maintain the initial status quo (Guo & al., 2013).

Various studies (Dyck & Smither, 1994; Guo & al., 2013) have maintained the stereotype that the elderly have higher levels of technology anxiety and less self-confidence than younger people. Yet, Niemelä (2007) on the elderly belonging to the baby-boom generation does not agree with this idea. Given that nowadays the elderly have grown up with the birth of new technologies such as cell phones and Internet, they differ from previous generations in their experience with them. Their greater use and experience with technology enables the elderly of this generation (currently between 59 and 69 years old) to have lower levels of technology anxiety. Recent studies (Agudo, Pascual & Fombona, 2012) indicate that the elderly mainly use technologies with the aim of communicating, learning and facilitating their daily and leisure activities.

1.3. Adventurousness

Adventurous people exhibit more daring behaviour but are aware that there is a risk involved in their decisions. The desire to try out new and exciting things is associated with the individual's intrinsic motivations toward stimulation, knowledge and achievement (Clarke, 2004). Moreover, adventurousness can be related to the locus of internal control (Chantal & Vallerand, 1996). That is to say, the subjects perceive that the facts which occur in their life are the effects and consequences of their decisions, so they like to face challenging experiences. As Rogers (2003) points out, adventurousness is almost an obsession for innovators. Therefore, it is to be expected that the people who have this dimension of their personality will be involved in new and challenging activities, such as those related to technology.

There are few articles which relate adventurousness with the acceptance or use of ICT, and less among the elderly. Siu and Cheng (2001) study the adoption of e-commerce considering different characteristics, finding that adopters reflect a greater level of adventurousness than non-adopters, are more predisposed to taking risks, as well as being more interested in technological developments. Regarding the elderly, Sudbury and Simcock (2009b) carry out a segmentation of 650 British people between 50 and 79 years old, using behaviour variables to explain why elderly people show less innovative behaviour than younger people (Dean, 2008). The results indicate that an adventurous character enables differentiation among the elderly. Thus, the segment called positive pioneers has high levels of adventurousness, as due to curiosity they like to buy and try out new things, they like to be the first to do so, to comment about it with their friends and to share information.

1.4. Research proposition

To sum up, we establish as a research proposition that the psychological characteristics of people –in this case the elderly– provide a better explanation of the digital divide than the traditional socio-demographic variables. Based on the review of the previous literature, it is expected that the elderly who use social networks more are not differentiated by their socio-demographic profile but are characterized by a lower cognitive age, as they have less technology anxiety and are more adventurous.

2. Material and methods

The sample used come from students who had enrolled in the Experience Classroom of the University of Seville. Its aim is to give an opportunity to people over 50 who wish to access education and general culture, becoming a forum of socio-cultural coming together and encouragement. The data were gathered in November and December 2013 via a survey carried out during class hours. To eliminate possible ambiguities, the questionnaire was revised previously with seven voluntary students.

The refined questionnaire brought together the socio-demographic and descriptive variables of the use of technology and the measurement scales of the psychological variables used. The cognitive age and the desired age were measured with the scales of Barak and al. (2011). This is a scale expressed in decades that gathers four dimensions in which people indicate the age which they feel that they have, the age which they feel that they show, that which their actions reveal and that which their interests show. On the other hand, the desired age reflects what people aspire to be, their ideal self-conception that their dimensions are the same as the cognitive age, beginning with the conditional «I would like…». The average of each four values is what determines the cognitive age and the desired age.

On the other hand, the scale of Meuter & al. (2003) was used to identify adventurousness. For technology anxiety we follow the scale proposed by Niemelä (2007), which identified two factors within this construct: the first categorised fear of technology and a second which gathers self-confidence in the use of technology. These three variables were measured via a seven-point Likert scale.

To analyze if the variables linked to social networks are related with the individuals' characteristics we carried out the appropriate statistical tests. Thus, we used a one-way ANOVA in the cases in which the variables to be analyzed were categorical (e.g., having or not having an account in social networks) and another in a scale (e.g., chronological age); Pearson's correlation if the two variables were of a scale; and Cramer's phi correlation in the case of two dichotomous variables.

3. Analysis and results

A total of 474 questionnaires were first obtained. These were refined by eliminating those which were not correctly filled out and 415 valid surveys were obtained. A study of the sample's socio-demographic variables indicated that 62.5% were women, the average age was 63.6 and 57% of the respondents were married. The majority level of studies was secondary school (54.2%), fol-

lowed by university (36.1%). The social class was mainly middle class (80.2%) and 78.4% of the sample were retired.

Regarding social networks, 51.2% of the sample's elderly people had used one social network and 77.6% had created an account. 44.1% had an account in a single network, 14.2% in two and 5.1% in three. This explains that when adding up the use of social networks, the result is greater than 100: 93.1% used Facebook, 26.7% Twitter, 6.7% Tuenti and 22.7% used other social networks. The most frequent activities carried out in the networks were: making comments (64.6%); posting photographs (42.9%) and chatting (35.5%). These activities took place at least once a month.

The results (Table 1) comply with the pattern found by Barak (2009) in 18 countries, none of them Spanish-speaking, (desired age <cognitive age<chronological age), with a greater variation in the answers of the desired age. The average of the cognitive age and the desired age is less for women (48.66 and 39.04 years old for women and 53.57 and 42.38 for men, respectively), in a statistically significant manner (significance less than 0.05 of the t-test for differences in means for independent samples), as was found by Eastman and Iyer (2005) and Wei (2005).

Table 1: Description of the sample's ages		
	Average	Variance
Chronological age	63.32 years	35.84
Cognitive age	50.63 years	60,17
Desired age	40.35 years	101.18

The results (Table 2) do not support a relationship between the socio-demographic characteristics such as sex, social class, the education level or being retired or not and the use of social networks. The chronological age is, however, related to the use of social networks online and having an account, so that the younger elderly are the ones who use them more.

With respect to the cognitive age, only the number of social networks used is significant, showing that those who feel younger use a greater number of them. Nevertheless, we consider that the value of the cognitive age attains a greater significance when it is compared to the age that the person really has. This is why, following Hong & al. (2013), we divide the elderly into two groups: those with a cognitive age the same as the chronological age (people who feel they are their age) and those with a cognitive age lower than their chronological age (people who feel that they are younger). There were no people who felt that they were older than their chronological age. Having an account in a social network and using a greater number of social networks has a statistically significant relation with the fact of feeling younger.

Table 2: Summary of relations between the variables										
	Sex	Social class	Education level	Retired	Chronological age	Cognitive age	Feel young	Adventurousness	Technology fear	Technology self-confidence
SNS use	n.s.	n.s.	n.s.	n.s.	Sig. (1)	n.s.	n.s.	Sig. (1)	Sig. (1)	Sig. (1)
SNS account	n.s.	n.s.	n.s.	n.s.	Sig. (1)	n.s.	Sig. (3)	Sig. (1)	Sig. (1)	Sig. (1)
How many SNS	n.s.	n.s.	n.s.	n.s.	n.s.	Sig. (2)	Sig. (1)	Sig. (2)	n.s.	Sig.(2)
n.s.: not statistically significant										
Sig.: statistically significant at 95%. (1) one-way ANOVA (2) Correlations (3) Cramer's phi										

To study the other three psychological characteristics, we analyzed the Cronbach alphas. In the three cases, we obtained values much higher than the required minimum of 0.7: 0.907, 0.95 and

0.97 for being adventurous, having self-confidence and technology fear, respectively. This confirms the reliability of the scales used.

The more adventurous elderly and those with a greater technology-related self-confidence are, in a statistically significant manner, those who use social networks, create accounts and are also in more than one social network. On the other hand, those elderly people who are more afraid when they use technology are those who use social networks less.

4. Discussion and conclusions

The results enable us to confirm that, as we proposed in the main aim of this work, our doubts about the stereotype of the elderly regarding the digital divide are correct. Though it is true that we have found differences among the elderly regarding the chronological age, doubtlessly due to the implications which it may have in other physical and cognitive aspects, we find empirical arguments to propose that the new digital divide is linked to psychological factors– what we have called the psycho-digital divide –especially if we analyze specific segments of the population, such as the elderly (Chua & al., 1999). If we were to analyze all the ages of the Spanish population, the contributions of socio-demographic variables could have more meaning.

Firstly, concerning the stereotype of the elderly, our results confirm in the Spanish society the findings of Mathur and al. (1998) and Schiffman and Sherman (1991) in the United States; Sudbury and Simcock (2009b) in the United Kingdom; and Hong and al. (2013) in Hong Kong. They found a high heterogeneity among the elderly. The image of the elderly is based on an obsolete prototype (Teuscher, 2009) which comes from that of previous generations concerning their forebears. The elderly are more to be found among the late adopters of a technology than in the segment of pioneers (Chen & Chan, 2014). Notwithstanding, the heterogeneity among the current elderly provides different archetypes, many of which of very far from the initial stereotype.

Secondly, concerning the definition of the digital divide, our results show that socio-demographic variables do not serve to differentiate among the elderly regarding their use of social networks. As we proposed, other characteristics, which are inherent to the individual, enable the identifying of differences in the use of social networks. We have identified that the profile of elderly users are those who feel younger, experience less fear, feel more confident and have a greater level of adventurousness. Our results consolidate, and are in line with, those reached partially by other researchers in the last two decades. For instance, as a result of the use of the cognitive age in the case of the elderly, Mathur and al. (1998) find a group which they call «new age» elderly, characterized by their perception of being younger – at least ten years younger than their chronological age – and whose behaviour is in many ways similar to that of younger people. Indeed, they are convinced that age is a mental state which has little to do with the chronological age (Schiffman & Sherman, 1991). According to Barak and Gould (1985), these elderly people are more self-confident and are more adventurous. Furthermore, they exhibit behaviour which is oriented toward knowledge, as they reveal that they have recently acquired knowledge (Teuscher, 2009). Sudbury and Simcock (2009b) identify positive pioneers as being those who have a lower chronological and cognitive age, are those who perform more activities and have more social relationships, are more present on the Internet and, especially, are less concerned what others think about them. In the light of the results of other studies, we believe that this segment –adventurous, innovative, technology pioneers and inclined to share with friends, and whose difference between their chronological age and their cognitive age is greater– seems to be the segment given to using social networks. In our case, we have identified that 15.6% of our sample have used social networks, feel younger, are adventurous, are self-confident when they use technology and are not afraid to use it. 11.3% of the elderly fulfill these requirements and have accounts in social networks.

We indicate various implications from the practical point of view. Firstly, given that one of the main barriers continues being technology anxiety, and that this is a state, it can be overcome with the training and experience of the elderly. One way of tackling it is to do what some companies do, which is to allow their potential customers to experiment with new products (Gelbrich & Sattler, 2014), or, like McAfee, which offers its programme «Online Safety for Silver Surfers», an initiative

with which their employees teach the elderly how to browse the Internet safely, protecting their data. Secondly, it is necessary to encourage self-confidence with technology and for the elderly to see themselves as capable of its daily use. Self-confidence is a decisive factor in the motivations and behaviours of people and reduces the anxiety related to using new technology (Zhao, Matilla & Tao, 2008). Thus, the Fundación Vodafone (Vodafone Foundation) points out that some elderly people state that they are strongly motivated to learn to function in social networks. Thirdly, it is necessary to promote the advantages of social networks for the elderly as a means of communication and social participation. In this way, the Ministry of Health, Social Services and Equality, and Imserso are reinforcing their presence in social networks via the implementation of Web 2.0 technologies which facilitate the participation of the elderly through these tools.

To finish off, we wish to highlight that the sample used in this work comes from an Experience Classroom, which may influence the bias of this sample. Nevertheless, we have found differences in the behaviour of the elderly regarding social networks. The choice of this population of university elderly people can be justified by its use in previous research related to the use of ICT (Martínez, Cabecinhas & Loscertales, 2011). To broaden the sample to other contexts would increase the heterogeneity of the people, which would strengthen the conclusions proposed.

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