

A Hierarchical Analysis of Internet Adoption and Usage by the Seniors



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Abstract The seniors are a large socially vulnerable population group in Greece, and the Internet can help them improve their quality of life. However, they do not take advantage of the technology and prefer to stay offline. Our study examined Internet adoption, usage and the digital skills of seniors in Greece. We analysed the micro-data of the annual national survey on the use of ICT by Greek households for the year 2015. We conducted hierarchical regressions to assess in three stages the influence of the socioeconomic factors to: (a) the decision of the seniors to access and use the Internet, (b) the extent and frequency of Internet use and (c) seniors' digital skills. According to the results, social inequalities are important determinants of seniors' decision to access and use the Internet. The seniors' educational level and gender are very important factors leading to an accumulated advantage, since older men and well-educated seniors use more extensively the Internet and are more digitally skilled. This work emphasizes the need not to treat the elderly as a single group. The Greek state should implement smart policies to address the seniors' digital divide, highlighting the benefits and promoting the technology with training seminars.

Keywords Digital divide · Internet use · Digital skills · Seniors

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1 Introduction

The seniors (aged 65 + years old) or elderly, are a big population group and are considered being socially vulnerable, since most of them are low-educated and do not work, while many of them may face social isolation and health problems.

Using new technologies and the Internet may be very useful for seniors and ensure independent living. It may reduce social isolation (Sum et al. 2008) and provide new opportunities, services and valuable information about health issues (Chaffin and Maddux 2007). The importance of the use of the Information and Communication Technologies (ICTs) from the seniors is substantiated by the emergence of a new scientific discipline which is called gerotechnology. This new field combines gerontology and technology and refers to technology that may fulfil the most important needs of an aging society such as good health, full social participation and independent living based on scientific knowledge about the aging process (Harrington and Harrington 2000).

However, the elderly have a negative attitude toward the use of new technologies and the Internet (Reisdorf et al. 2012) and tend to use it less, compared to young people. They prefer not to use the Internet for many reasons, such as lack of interest or need, lack of skills (Reisdorf 2011) and lack of knowledge (Zickuhr 2013). This variation may represent seniors' several disadvantages at various levels (Helsper and Reisdorf 2013).

According to the Greek national statistics (Hellenic Statistics Authority 2012), the seniors are a very large population group (19.5%) in Greece. The research of Dyken and Kaklamani (2013) showed that despite the inflow of foreigners, this figure is expected to increase further in the next years both in rural and in urban areas. This conclusion is in accordance with other estimations (Global AgeWatch 2016), which predict that in 2030 almost one in three Greeks will be over 60 years old. Moreover, the seniors in Greece have a low quality of life, mainly because of the prolonged economic crisis. According to the Global AgeWatch Index which evaluates the quality of life for older people (Global AgeWatch 2016), Greece is ranked 79th out of 96 countries for the year 2016 and is the lowest-ranked country in Western Europe.

However, Greek seniors do not make use of technology to enhance their quality of life. Age is one of the most important predictors for staying offline in Greece (Gounopoulos et al. 2018). During the year 2014, only 12% of older people (65–74 years) used the Internet at least once a week, compared to 38% of the older people in other European countries (EU28) (Eurostat 2015). They used it less extensively compared to the Greek Internet users and older people in other European countries (Eurostat 2015).

The aim of this paper is to assess hierarchically on three levels the influence of the socioeconomic and geographic level factors to Internet adoption, usage and the digital skills of the seniors in Greece. We conducted hierarchical logistic and linear regressions to the micro-data of the nationwide survey (Use of the ICT's from the Greek households and individuals), which was held by the Hellenic Statistical

Authority for the year 2015. Research results may help the Greek State to design more effective and diversified policy actions in order to help the elderly access and use the Internet.

2 Seniors and New Technologies

By not exploiting effectively the technology, the elderly are not only digitally but also socially excluded. According to many scholars (Norris 2001), this digital exclusion or digital divide is a dynamic, complex and multidimensional phenomenon, which needs to be explored in terms of access and usage in a micro (individuals), meso (social environment) and macro (geographic areas) level (König et al. 2018).

In the micro-level, the perception and the attitude of the elderly about Internet use may be related to their socioeconomic status (Dutton et al. 2013). Various socioeconomic factors such as age, educational level, gender (Helsper and Reisdorf 2013), income and occupation (Lelkes 2013) are related to their decision to use the Internet. The elderly face difficulties in the adoption of new technologies because of: (a) age and education-related factors such as cognitive ability, memory, health and (b) physical barriers (Carpenter and Buday 2007), such as the hand–eye coordination. According to Smith (2014), memory is a predictor of digital skills in video and mobile phone interfaces. In addition, older seniors show low levels of interest, low control and confidence and higher technology anxiety (Jung et al. 2010). The educational level is considered a valid predictor of Internet adoption and use (Reisdorf 2011; Gounopoulos et al. 2018). In particular, the elderly's negative attitude may be because of their inadequate education and information. Based on a national survey in Switzerland ($n = 1105$), Friemel (2016) found that the elderly consider as the most important obstacles the complexity of Internet use and the great effort at the beginning. As a result, the elderly saw no clear benefit from using the Internet. Language may also be an important barrier for them, since most seniors speak only Greek and may face more difficulties getting online (Troulos et al. 2012). The gender is also considered an important factor, since there are distinct differences on the use of the Internet between men and women. Older women are more likely to have Internet access in their homes without using it (Van Deursen and Helsper 2015). This differentiation may be because of their previous work experience, since women are less preferred in technology-related professions. Although there may be no significant differences between women and men, women tend to underestimate their Internet skills (Van Deursen and Van Dijk 2010). The income is associated with the ability to afford telecommunication costs and equipment, although some researchers (Eastman and Lyer 2004) argue that the cost is not an important factor. However, the elderly's occupation which is closely associated with their income, is also related to their experience using the Internet at work.

On the meso level, the composition of the household and the social environment may act as a motivational factor to use the Internet (Schreuers et al. 2017). If their social network comprises technology literate adults, it may be a good support system

providing them with help and affecting their attitude and self-efficacy (Gatto and Tak 2008). The elderly can get help from their wider social environment in many ways such as encouragement, motivation to use support from other sources, make the Internet more attractive to learn, and provide them with second-hand access (Friemel 2016). The elderly may have a strong incentive to use the Internet and get help from other people, if their social network comprises young people, grandchildren and friends (Gatto and Tak 2008). According to interviews with older adults which was held in Canada (Schreuers et al. 2017), the seniors prefer to turn to their children, grandchildren, spouse and friends to help them learn how to use technology. However, sometimes the social environment may prevent seniors from using the Internet. This happens when their tech-savvy relatives or friends act as proxy users and use it on behalf of them (Dutton et al. 2013).

On the macro level, rural areas of residence have a poor ICT infrastructure and are thinly populated. This may even be observed in developed countries with a high Internet rate, such as Germany (Doh et al. 2015).

We have formed five research questions to assess hierarchically the influence of the micro (individuals), meso (social environment) and macro (geographic areas) level factors to Internet access, Internet use and the seniors' digital skills.

The first research question (RQ1) examined the most important factors related to Internet home access, which is important but not a necessary condition for using the Internet. The second research question (RQ2) examined the main factors related to Internet use. The third research question (RQ3) examined the most important factors which may influence the decision of older people who have access to the Internet from their home not to use it. In order to assess Internet use by the elderly, we have examined the most important factors related to the frequency and the extent of use (RQ4). The extent of use refers to the diversity of Internet use. The greater the extent of use, the more opportunities and benefits may emerge for Internet users (Wei 2012). Finally, we have examined the most important factors associated with the digital skills of the elderly (RQ5).

The five research questions are as follows:

RQ1. Which are the most important micro, meso and macro factors which may affect the decision of the older people to have access to the Internet from their home?

RQ2. Which are the most important micro, meso and macro factors affecting the decision of the elderly to use the Internet?

RQ3. Which are the micro, meso and macro factors related to the decision of the elderly not to use the Internet, although they have access from their home?

RQ4. Which are the micro, meso and macro factors related to the frequency and extent of Internet use by the elderly?

RQ5. Which are the micro, meso and macro factors related to the digital skills of the elderly?

3 Methodology

3.1 Data

We conducted hierarchical multiple regressions using the micro-data of the nationwide survey for the year 2015, which aims to investigate the use of ICTs by Greek households.

Our research examined the most important micro, meso and macro factors affecting the adoption and usage of the Internet by the seniors in Greece (Table 1).

The primary sampling unit of the Hellenic Statistical Authority Survey was one or more building blocks, the secondary unit was the household, and the final unit was a randomly selected individual aged 16–74 years. In total, 4667 persons participated in the survey, of which 973 were 65–74 years old (Hellenic Statistics Authority 2016). The majority of older people (844 people) did not use the Internet during the last three months.

3.2 Variables

The binary-dependent variable examining the access to the Internet from home (RQ1) was based on the question: Do you or anyone in your household have access to the Internet at home? (1: yes, 0: no). The binary variable examining Internet use (RQ2) was based on the question: When did you last use the Internet? (1: during the last three months, 0: more than three months or never used it). The binary-dependent variable examining Internet nonuse from people living in households with Internet access (RQ3) was based on the answers of the two previous questions. The binary-dependent variable examining the frequency of Internet use (RQ4) was based on the question: How often on average did you use the Internet in the last 3 months? (1: every day or almost every day, 0: at least once a week (but not every day) or less than a week).

The extent of Internet use (RQ4) was estimated out of a list of 12 activities, by the number of Internet activities carried out by individuals who have used the Internet in the last three months. It is based on the diversification index estimated by Eurostat (European Commission 2016). In order to evaluate the Internet skills of the elderly (RQ5), we used a binary-dependent variable (1: individuals with above basic or basic skills, 0: individuals with low skills level or no skills). The estimation of the elderly's digital skills was based on the European Commission's DigComp framework (2013), which evaluates digital skills in different areas (information, communication, content creation, security and problem solving).

The independent variables of our analysis are continuous (age), dichotomous (gender, the number of household members, household composition), nominal (employment status, the region of residence (Code NUTS 1)) and ordinal (household income, educational level, degree of urbanisation).

Table 1 Demographic characteristics of people aged 65–74

Factors	<i>N</i>	Percentage
<i>Micro factors</i>		
Age (65–74 years old)	973	100
<i>Gender</i>		
Man	388	39.9
Woman	585	60.1
<i>Household income</i>		
Lowest quartile	275	28.2
Second lowest quartile	504	51.8
Second highest quartile	167	17.2
Highest quartile	27	2.8
<i>Educational level</i>		
Primary education (ISCEDD 0, 1 or 2)	713	73.3
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	155	15.9
Tertiary education (ISCEDD 5, 6, 7 or 8)	105	10.8
<i>Employment status</i>		
Employee or self-employed	21	2.2
Domestic tasks	153	15.7
In retirement or early retirement or given up business	782	80.4
Other inactive person	17	1.7
<i>Meso Factors</i>		
<i>Number of household members</i>		
One member	204	21.0
At least two members	769	79.0
<i>Household composition</i>		
Household without any children	950	97.6
Household with at least one child	23	2.4
<i>Macro factors</i>		
<i>Region of residence (code NUTS 1)</i>		
Attiki (Attica)	346	35.6
Nisoi Aigaiou, Kriti (Aegean Islands and Crete)	88	9.0
Voreia Hellas (Northern Greece)	278	28.6
Kentriki Hellas (Central Greece)	261	26.8
<i>Degree of urbanization</i>		
Urban area	267	
Semi-urban area	573	58.9
Rural area	133	13.7

Data Source Authors calculations based on the Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: Individuals aged 65–74 years old, ($n = 973$)

3.3 Data Analysis

We carried out hierarchical logistic and linear regressions to the micro-data of the Hellenic Statistical Authority Survey, on the use of Information and Communication Technologies by households and individuals, for the year 2015.

Hierarchical regression is a statistical method that explores in stages the relationships of a dependent and many grouped independent variables. This method helps us evaluate the contribution (i.e., total variation accounted or R^2) of a group of independent variables to the regression model. In order to separately assess the contribution of the three groups (micro, meso and macro level factors), the corresponding variables were entered into the hierarchical regression at three stages. We entered the micro factors at the first stage. The meso factors were entered at stage two and the macro factors at stage three.

We present the results with the use of odds' ratios, except the results of the extent of Internet use in RQ4, where we use linear regression to estimate the influence of the factors related to the extent of Internet use by the elderly. If an odds ratio is greater than 1.0, it represents an increased chance relative to the reference group (Montagnier and Wirthmann 2011).

We analysed the data using the SPSS statistical analysis software (version 21).

4 Results

According to the results of the first research question (RQ1) (Table 2), older people with a low income and low educational level who are living alone with no children in the household and those living in rural areas are more likely not to have Internet access at home. The micro factors are the most important, while the meso and macro factors have a rather minor influence.

Older people with a low educational level who are not working (i.e., those who are in retirement, inactive or do domestic tasks) (Table 3) are more likely not to use the Internet at home. The meso and macro factors have no effect on the decision of the elderly not to use the Internet (RQ2).

Most of the older people who live in households with Internet access do not use it ($n = 262$). These people are more likely to have a lower educational level, be professionally inactive or to deal with domestic tasks, and not to live alone (Table 4). The micro factors are important, while the meso factors have a rather small influence (RQ3).

Table 2 Odds’ ratios of logistic regressions for having Internet access at home

Factors	<i>b</i>	Exp (<i>B</i>)	
<i>Micro factors</i>			
Age (65–74 years old)	−0.108***	0.898	
<i>Gender (reference woman)</i>			
Man	0.326	1.385	
<i>Household income (reference lowest quartile)</i>			
Second lowest quartile	0.407	1.502	
Second highest quartile	0.815**	2.260	
Highest quartile	1.367*	3.924	
<i>Educational level (reference: primary education)</i>			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	0.852***	2.344	
Tertiary education (ISCEDD 5, 6, 7 or 8)	1.664***	5.279	
<i>Employment status (reference: employee or self-employed)</i>			
Domestic tasks	−1.028	0.358	
In retirement or early retirement or given up business	−0.596	0.551	
Other inactive person	0.421	1.524	
<i>Meso factors</i>			
<i>Number of household members—reference: one member</i>			
At least two members	0.556**	1.743	
<i>Household composition—reference: household without any children</i>			
Household with at least one child	2.146***	8.550	
<i>Macro factors</i>			
<i>Region of residence—reference: Kentriki Hellas (Central Greece)</i>			
Attiki (Attica)	0.338	1.403	
Nisoi Aigaiou. Kriti (Aegean Islands and Crete)	0.228	1.255	
Voreia Hellas (Northern Greece)	0.122	1.129	
<i>Degree of urbanization—reference: rural area</i>			
Urban area	0.491*	1.633	
Semi-urban area	0.170	1.186	
Constant	5.109**	165.45	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
<i>R</i> ²	0.241	0.269	0.283
ΔR^2	–	0.028	0.014

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people (*n* = 973)
 Significance levels: * *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001

Table 3 Odds' ratios of logistic regressions, for using the Internet at home

Factors	<i>b</i>	Exp (<i>B</i>)	
<i>Micro factors</i>			
Age (65–74 years old)	−0.092*	0.912	
<i>Gender (reference woman)</i>			
Man	0.196	1.216	
<i>Household income (reference: lowest quartile)</i>			
Second lowest quartile	0.307	1.360	
Second highest quartile	0.531	1.701	
Highest quartile	0.717	2.049	
<i>Educational level (reference: primary education)</i>			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	1.684***	5.384	
Tertiary education (ISCEDD 5, 6, 7 or 8)	2.319***	10.165	
<i>Employment status (reference: employee or self-employed)</i>			
Domestic tasks	−2.266**	0.104	
In retirement or early retirement or given up business	−1.544**	0.213	
Other inactive person	−2.523*	0.080	
<i>Meso factors</i>			
<i>Number of household members—reference: one member</i>			
At least two members	−0.055	0.946	
<i>Household composition—reference: household without any children</i>			
Household with at least one child	−0.041	0.960	
<i>Macro factors</i>			
<i>Region of residence—reference: Kentriki Hellas (Central Greece)</i>			
Attiki (Attica)	0.506	1.659	
Nisoi Aigaiou. Kriti (Aegean Islands and Crete)	0.559	1.748	
Voreia Hellas (Northern Greece)	−0.053	0.948	
<i>Degree of urbanization—reference: rural area</i>			
Urban area	0.152	1.164	
Semi-urban area	−0.042	0.958	
Constant	4.472	87.488	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
R^2	0.295	0.296	0.307
ΔR^2	–	0.01	0.011

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people ($n = 973$)

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 4 Odds' ratios of logistic regressions for having Internet access at home and using the Internet within the last three months

Factors	<i>b</i>	Exp (<i>B</i>)	
<i>Micro factors</i>			
Age (65–74 years old)	–0.006	0.994	
<i>Gender (reference woman)</i>			
Man	0.112	1.118	
<i>Household income (reference lowest quartile)</i>			
Second lowest quartile	0.504	1.655	
Second highest quartile	0.488	1.630	
Highest quartile	0.611	1.842	
<i>Educational level (reference: primary education)</i>			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	1.812***	6.121	
Tertiary education (ISCEDD 5, 6, 7 or 8)	1.866***	6.645	
<i>Employment status (reference: employee or self-employed)</i>			
Domestic tasks	–2.888*	0.056	
In retirement or early retirement or given up business	–2.107	8.227	
Other inactive person	–3.871*	0.021	
<i>Meso factors</i>			
<i>Number of household members—reference: at least two members</i>			
One member	1.360**	3.896	
<i>Household composition—reference: household without any children</i>			
Household with at least one child	1.160	3.191	
<i>Macro factors</i>			
<i>Region of residence—reference: Kentriki Hellas (Central Greece)</i>			
Attiki (Attica)	–0.504	0.604	
Nisoi Aigaiou. Kriti (Aegean Islands and Crete)	–0.808	0.446	
Voreia Hellas (Northern Greece)	–0.121	0.886	
<i>Degree of urbanization—reference: rural area</i>			
Urban area	0.141	1.152	
Semi-urban area	0.322	1.380	
Constant	–2.966	0.052	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
<i>R</i> ²	0.286	0.329	0.341
ΔR^2	–	0.043	0.013

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people with Internet access at home (*n* = 262)

Significance levels: **p* < 0.05; ***p* < 0.01; ****p* < 0.001

The elderly who use the Internet are a rather small group (13.2% of the total sample). Those who use it frequently (RQ4) (i.e., every day or almost every day) are more likely to be women, lower-educated and living in Central Greece (Table 5). The micro and macro factors are important, while the meso factors have no influence.

Men and higher-educated seniors use more extensively the Internet (Table 6). We found no statistically significant difference between people living in various geographical areas or areas with different urbanisation (RQ4).

According to the results of the fifth research question (RQ5), the seniors who are more digitally skilled are more likely to be men, have a high educational level and live at the Aegean Islands and Crete (Table 7). The micro factors are important while the macro factors have a sufficient influence.

5 Discussion

According to the results, socioeconomic inequalities may be an important reason for the decision of the elderly not to access and use the Internet.

Age is an important determinant, since older seniors do not access and use the Internet. Similar to other countries (Peacock and Künemund 2007), the senior's age may affect negatively their decision to use the Internet and their attitude toward new technologies (Czaja and Lee 2007). Greeks adopt a negative attitude toward the Internet, because they think the Internet is a medium that requires new skills and may bring changes to their lifestyle (Tsatsou 2011).

The educational level is a very important determinant not only for the Internet adoption and use by the elderly, but also for their digital skills level leading to a Matthew effect of increased advantage. The well-educated seniors are more skilled and use the Internet more extensively, while the lower-educated seniors do not use it even when they have access at their home. Moreover, the elderly in Greece as in other European countries have higher illiteracy and lower educational attainment, compared to younger age groups (Kinsella and Taeuber 1993).

The household income is a factor which affects only their decision to access the Internet, but it is not an important factor since there is no influence in their decision to use the Internet. We therefore assume that the elderly who have Internet access at home may afford the necessary equipment and telecommunication costs.

There is no difference between elderly men and women in their decision to access and use the Internet. However, there are differences in the way they use it. Women use it more frequently, while men use it more extensively and are more digitally skilled. We assume that most of the older women are engaged in housework and have no experience with ICTs, while most of the men were working and are more acquainted with the Internet. Seniors who are still working are more experienced and confident with computers and may easily integrate the use of the Internet into their daily lives.

According to the results, the immediate social environment of the seniors (living with other people and children) may have a small positive influence on their decision to access the Internet from their household. However in the survey, almost one in

Table 5 Odds' ratios of logistic regressions for the frequent use of the Internet

Factors	<i>b</i>	Exp (<i>B</i>)	
<i>Micro factors</i>			
Age (65–74 years old)	–0.001	0.999	
Gender (reference man)			
Woman	1.533*	4.663	
Household income (reference lowest quartile)			
Second lowest quartile	0.395	1.485	
Second highest quartile	0.371	1.450	
Highest quartile	2.106	8.218	
Educational level (reference: primary education)			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	0.202	1.224	
Tertiary education (ISCEDD 5, 6, 7 or 8)	–2.020*	0.133	
Employment status (reference: employee or self-employed)			
Domestic tasks	–0.031	0.969	
In retirement or early retirement or given up business	–0.273	0.761	
Other inactive person	–22.135	0.000	
<i>Meso factors</i>			
Number of household members—reference: at least two members			
One member	0.160	1.173	
Household composition—reference: household without any children			
Household with at least one child	–2.157	0.116	
<i>Macro factors</i>			
Region of residence—reference: Kentriki Hellas (Central Greece)			
Attiki (Attica)	–1.385	0.250	
Nisoi Aigaiou. Kriti (Aegean Islands and Crete)	–2.157*	0.116	
Voreia Hellas (Northern Greece)	–1.353	0.258	
Degree of urbanization—reference: rural area			
Urban area	–0.999	0.368	
Semi-urban area	0.914	2.495	
Constant	–1.533	0.216	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
R^2	0.240	0.248	0.363
ΔR^2	–	0.08	0.115

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people who are using the Internet during the last three months ($n = 129$)

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 6 Linear regression standardized coefficients for the extent of Internet use

Factors	β	t	
<i>Micro factors</i>			
Age (65–74 years old)	–0.010	–0.115	
Gender (reference man)			
Woman	–0.219*	–2.279	
Household income (reference lowest quartile)			
Second lowest quartile	0.046	0.346	
Second highest quartile	0.137	0.951	
Highest quartile	0.121	1.002	
Educational level (reference: primary education)			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	0.163	1.454	
Tertiary education (ISCEDD 5, 6, 7 or 8)	0.322*	2.553	
Employment status (reference: employee or self-employed)			
Domestic tasks	0.310	0.262	
In retirement or early retirement or given up business	–0.110	–0.096	
Other inactive person	–0.840	–0.908	
<i>Meso factors</i>			
Number of household members—reference: at least two members			
One member	0.125	1.373	
Household composition—reference: household without any children			
Household with at least one child	0.111	1.295	
<i>Macro factors</i>			
Region of residence—reference: Kentriki Hellas (Central Greece)			
Attiki (Attica)	0.376	–2.663	
Nisoi Aigaiou. Kriti (Aegean Islands and Crete)	0.156	1.549	
Voreia Hellas (Northern Greece)	0.239	2.008	
Degree of urbanization—reference: rural area			
Urban area	–0.386	–2.881	
Semi-urban area	–0.083	–0.728	
Constant	17.672	0.914	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
R^2	0.154	0.184	0.269
ΔR^2	–	0.030	0.085

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people who are using the Internet during the last three months ($n = 129$)

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 7 Odds' ratios of logistic regressions for the digital skills of people 65–74 years old

Factors	<i>b</i>	Exp (<i>B</i>)	
<i>Micro factors</i>			
Age (65–74 years old)	0.061	1.063	
Gender (reference woman)			
Man	1.968**	7.153	
Household income (reference lowest quartile)			
Second lowest quartile	0.211	1.235	
Second highest quartile	0.460	1.584	
Highest quartile	1.732	5.652	
Educational level (reference: primary education)			
Upper secondary and post-secondary non-tertiary education (ISCEDD 3 or 4)	3.895*	49.163	
Tertiary education (ISCEDD 5, 6, 7 or 8)	4.856**	128.530	
Employment status (reference: employee or self-employed)			
Domestic tasks	1.684	5.388	
In retirement or early retirement or given up business	0.104	1.110	
Other inactive person	−21.069	0.000	
<i>Meso factors</i>			
Number of household members—reference: at least two members			
One member	−0.405	0.667	
Household composition—reference: household without any children			
Household with at least one child	1.908	6.738	
<i>Macro factors</i>			
Region of residence—reference: Kentriki Hellas (Central Greece)			
Attiki (Attica)	1.068	2.908	
Nisoi Aigaiou, Kriti (Aegean Islands and Crete)	2.430*	11.359	
Voreia Hellas (Northern Greece)	−0.983	0.374	
Degree of urbanization—reference: rural area			
Urban area	1.955	7.066	
Semi-urban area	0.528	1.696	
Constant	−9.943	0.000	
	Stage 1: micro factors	Stage 2: meso factors	Stage 3: macro factors
R^2	0.367	0.387	0.494
ΔR^2	–	0.020	0.107

Data Source Authors calculations based on Hellenic Statistical Authority Survey on the use of ICTs from the Greek households, 2015. Base: 65–74 years old people who are using the Internet during the last three months ($n = 129$)

Significance level: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

two seniors who had access to the Internet at home did not use it. These people were not socially isolated, since most of them (92.6%) were not living alone. We assume that this contradiction is because the elderly may prefer not to use it, because another person may act as a proxy user and help them whenever they wish to. This choice may be more convenient for them (Reisdorf et al. 2012).

However, there is no influence of the immediate social environment (meso factors) on the way seniors use the Internet and on their digital skills.

There is no significant difference in Internet use by seniors who live in various geographic areas of residence and areas with a different degree of urbanisation. However, there is a difference in Internet access. Seniors living in urban areas are more likely to access the Internet compared to seniors living in rural areas. We presume that there are other reasons for this difference such as attitude, since the vast majority of the Greek households (99.7%) have access to a digital subscriber line (DSL) (European Commission 2016).

According to the results of our study, seniors should not be considered as a homogeneous group. The political interventions should not only address the socioeconomic inequalities, but also the different skills and motivations of the older people (Reisdorf and Groselj 2014) and the geographic discrepancies. Nonuse of the Internet should not be stigmatised, but on the contrary, we should highlight the benefits for the elderly.

The Greek government should adopt a policy framework that will emphasise the perceived benefits, such as that proposed by Wang et al. (2011). They suggested policy measures aimed at increasing technology acceptance by the elderly, focusing on improving their daily lives. According to their framework (Wang et al. 2011), the government should promote the technology with the following actions: (i) training seminars and educational material, (ii) advertise the benefits of using technology, (iii) create a business model and collaborations and (iv) provide support for the users.

5.1 Future Research

According to the results, the adoption of the technology by the seniors may be examined as a multilevel and dynamic phenomenon which requires analysis in terms of access, usage and digital skills.

In the present study, the R^2 coefficients that estimate the percentage of total variability interpreted by the six models (Tables 1, 2, 3, 4, 5 and 6) are between 26.9% and 49.4%. This means that in a future study, we should examine more factors including attitudes and personal factors, such as health problems and experience with ICT.

A qualitative research will also help us understand more efficiently the attitudes and needs of the elderly about the Internet and the real impact of the social environment to their decision to use effectively the Internet.

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