The Role of IT Literacy in Defining Digital Divide Policy Needs

Abstract

This article expands the understanding of the digital divide by examining differences in individuals' IT skills acquisition. In the last two decades scholars have gradually refined the conceptualization of the digital divide, moving from a dichotomous model mainly based on access, to a multidimensional model accounting for differences in usage levels and actors' perspectives. Digital divide views tend to focus on groups of users and user characteristics and focus less on different processes of use. As models of the digital divide became more complex, research focused on deepening the understanding of demographic and socioeconomic differences between adopters and non-adopters. While IT literacy is an important factor in digital divide research, and studies examine user characteristics with respect to IT literacy, few studies make the process of basic IT literacy acquisition their main focal point (Selwyn, 2005). This perspective furthers our thinking by expanding the notion of user characteristics beyond demographic and socioeconomic differences to differences in the processes leading to Internet use. Based on a dataset referring to an Italian region, this paper presents a metaphorical interpretation of the digital divide in general and explores the process of IT skills acquisition in particular. The analysis shows the key role of self learning and the presence of three distinct approaches in IT skills acquisition leading to different needs in terms of policy. We argue that these preliminary results are a useful starting point for the design of more effective and sophisticated digital inclusion policies.

1. Introduction

In his bestseller "The World Is Flat" *New York Times* columnist Thomas Friedman argued that in the year 2000 the world entered a new era of globalization spearheaded by "individuals globalizing". In stressing the key role played by individuals, whom he characterized as dynamic agents in information-based economies, Friedman's analysis adds an interesting perspective to the framing of digital divide debates. The digital

divide, as a ‘public policy problem’, shifts from a matter of pure social inequality to a matter of strategic importance in a global race for competitiveness (Drori & Jang, 2003). At present, the different patterns of globalization that individuals pursue are still vague and surely require further investigation. Nevertheless, it seems reasonable to suggest that worldwide access to people and information/knowledge are two potentially key ingredients within globalization processes. From a policy standpoint, the emphasis placed on the importance of a single information space for the creation of an inclusive information society in the *i2010 European Strategic Plan* seems to support this thesis. In the Plan, the use of information and communications technologies (ICT) underpins the social and economic progression of nation-states throughout the first stages of the twenty-first century (Selwyn, 2003). The ability to use ICTs and work with information may therefore be considered “the indispensable grammar of modern life” and a fundamental aspect of citizenship in the prevailing information age (Wills, 1999).

The aim of this paper is to look into the process of IT skills acquisition in order to provide policy makers with new and refined perspectives on the digital divide in an attempt to effectively shape and frame inclusion policies or e-Government services. The article is structured in seven sections including these introductory comments. The second section briefly reviews relevant literature on the digital divide. Section three presents the research design and methods used in this paper. Section four provides evidence on the importance of IT skills for Internet access and use and presents an illustrative classification of Internet users (including non-users). The fifth section lays out a digital divide metaphor and providing a simplified yet practical representation of reality to policy maker based on the empirical evidence presented in this paper. Section six

provides a socioeconomic description of user types, while the last section includes some concluding remarks and a discussion of important policy implications.

We are aware of the simplification effort behind the metaphor presented in this paper, but we think it has an important practical value for policy makers and other actors interested in understanding and designing policies related to this phenomenon. Implicitly, many digital divide policies conceptualize the phenomenon in a simplistic way and, therefore, many of these policies do not attempt to target specific citizen groups with policies that take into consideration some important differences among them. This paper is a first step towards recognizing some of these differences in terms of IT literacy and the acquisition process, as well as the role of IT literacy in the definition of better and more targeted digital divide policies.

2. Digital divide and IT literacy

The digital divide is the study of the relationship between information and communication technologies (ICTs) and groups of individuals, who are situated within a complex arrangement of social, environmental, political, and economic issues (Gil-Garcia, Ferro, & Helbig, 2006). Information Technology (IT) literacy is seen as both a determinant of the digital divide and as a divide itself.

The following section briefly outlines the viewpoints and assumptions taken by different authors. The last fifteen years yielded three main approaches to understanding the digital divide: access digital divide, multi-dimensional digital divide, and multi-perspective digital divide. During that time, IT skills and information literacy research evolved (Warschauer, 2002; Hargittai, 2002a; Bawden, 2008; Hargittai, 2009; Ferro,

Dwivedi, Gil-Garcia, & Williams, 2009); focusing on the development of the concept, ways to measurement it, and its impact on the digital divide.

2.1. The digital divide as a simple dichotomous phenomenon: The role of IT literacy

A dichotomous view of the digital divide assumes that it is a simple separation between 'haves' and 'have nots'; the 'haves' have access to computers and the Internet and the 'have nots' do not. The focus is on understanding an individual's access to technology, and not the complexity of individual use. Scholars have argued that a divide, if it exists at all, is solely because of an 'access to technology problem' and they subsequently frame the debate as an inherent delay in the diffusion of technology among different geographic areas and social groups (Adriani & Becchetti, 2003; Compaine, 2001). A dichotomous view of the digital divide tends to neglect the influence of IT literacy and its impact on access.

2.2. The digital divide as a multi-dimensional phenomenon: The role of IT literacy

A multi-dimensional conceptualization views the digital divide as emerging from a number of endogenous and exogenous factors. This view challenges the simple access dichotomy and assumes access to be 'almost a given' (Servon, 2002; Norris, 2001; Ferro, Gil-Garcia, & Helbig, 2008; Dewan & Riggins, 2005). The focus is on individuals and their use of information technology. IT literacy is an important, and frequently included, dimension in digital divide theoretical and statistical models (Bélanger & Carter, 2009; Van Deursen & Van Dijk, 2009).

IT literacy is also described as a multi-dimensional phenomenon. Some scholars focus on definitions (Bawden, 2008; Mossberger, Tolbert, & Stansbury, 2003) and measurement (Hargittai, 2009, 2002b; Van Deuresen & Van Dijk, 2009; Van Dijk, 2005), while others focus on understanding the IT literacy divide specifically (Hargittai, 2002a; Mossberger et al., 2003). Mossberger et al. (2003) described IT skills as the knowledge and skills needed to use IT effectively, highlighting the need for both technical competencies (e.g., skills needed to operate hardware and software) and information literacy (e.g., the ability to recognize when information use can solve a problem).

2.3. The digital divide as a multi-perspective phenomenon: The role of IT literacy

Some scholars have begun re-theorizing technology's relationship with race, gender, and culture (Castells, 2001; Kennedy, Wellman, & Klement, 2003; Warf, 2001). A multi-perspective or emergent view rejects that any one group of individuals inherently uses technologies differently than the majority, but "recognize[s] that individuals and communities employ technologies for very specific goals, linked often to their histories and social locations" (Hines, Nelson, & Tu, 2001, p. 5). These scholars argue "barriers to access operate on many levels and therefore solutions must take multiple approaches" (Hines et al., 2001, p. 5). For example, Dholakia (2006) found that while gross differences between genders in Internet use have narrowed, the issues of "gendered patterns of computer and Internet use will emerge and diverge in different cultures and societies based on their particular construction of gender roles" (p. 239). Scholars call for redefining and reframing the concept of the digital divide in public discourse and argue

that policy solutions need to be developed based on this conceptual redirection (Helbig, Gil-Garcia, & Ferro, 2009).

Likewise, viewing IT literacy from a multi-perspective view opens up the possibility to examine more closely the acquisition patterns of IT literacy. IT literacy researchers suggest that the idea of literacy is complex (Bawden, 2008; Selwyn, 2005; Warschauer, 2002) and cannot be reduced to a simple set of discrete behaviors or skills. Warschauer (2002) argues for understanding literacy "as a set of social practices rather than a narrow cognitive skill." Understanding IT literacy as embedded within the social, political, and environmental contexts fits a multi-perspective approach.

Some scholars have studied the importance of IT literacy for Internet access and Internet use, but few examine the process of basic IT skills acquisition and policy development. We argue that understanding the process, including both informal and formal learning (Selwyn, 2005), is essential for the design of effective inclusion policies. That is why this analysis will be aimed not only at testing the importance of IT literacy for Internet access and use, but also at casting some light on the different patterns of IT skills acquisition.

3. Research design and methods

The empirical analysis presented in this paper is based on a longitudinal data set made available by the ICT Observatory of the Piedmont Region in Italy that annually conducts CATI surveys on the diffusion, use and impact of ICT among the citizenry on samples of over 2000 individuals. The total population of the region is 4.3 million inhabitants. The samples used in this paper were taken from a database provided by the Italian National

Statistical Institute (ISTAT) whose data refer to the last periodical census carried out in 2001. Thus, people without a fixed phone line are not represented in the samples. The stratified samples were created using a differentiated probability approach in order to over-represent segments with a higher variance in terms of technology adoption and usage (i.e., young *versus* older people). The variables adopted for the stratification of the samples were: age, gender, and size of town of residence. Following the guidelines provided by the European Statistical Institute, people less than 16 years old were excluded from the sample.

Respondents were asked questions about computer ownership, Internet access, and Internet use. In particular, the concept of basic IT literacy (Mossberger et al., 2003) has been operationalized in the surveys as the 'ability to use a computer and Internet for information search and email exchange'. Relevant individual demographics and household characteristics were also collected. The main analytical tools used for the analysis and interpretation of data are multiple linear regression models, hierarchical cluster analysis, and cross tabulations. The inclusion of multivariate techniques contributed to increase the robustness of the results and to reduce the risk of exposure to misinterpretations deriving from the use of simple bivariate analyses, as highlighted by Vehovar et al. (2006) in their methodological study on digital divide.

4. Analysis and discussion

The next sub-sections have two main purposes. The first set of analyses applies two of the three approaches presented in the digital divide literature review section to the

phenomenon of Internet access and Internet use: (1) the access divide model and (2) the multi-dimensional divide model. It provides evidence of the importance of some factors as determinants of Internet access, as well as evidence regarding the importance of Internet access as one of the determinants of the extent of Internet use. The second section uses cluster analysis to uncover how individuals are learning IT literacy skills and associated experience (Hargittai, 2010). This clustering is exploratory, but provides a jumping off point to illustrate the potential range of processes which result when viewing IT literacy through a multiple perspective lens. A multiple perspective lens does not privilege any one user characteristic, this leaves room for determining how individuals acquire IT literacy from their own primary vantage point. Viewing IT literacy as a process, rather than as a static skills set, the analysis illustrates how policy makers can create policies aimed at promoting IT skills acquisition. Together these two subsections highlight the importance of Internet access and Internet use and suggest some areas for future exploration.

4.1. Internet access, Internet use, and IT literacy

Using multiple regression analysis, this section provides empirical evidence regarding the importance of IT skills on Internet access and Internet use. The statistical analysis follows the most important ideas of the access model and the multi-dimensional model characterized in the literature review section of this paper. Table 1 presents the results of our application of both models and uses the number of devices for Internet access as a dependent variable.[1] Income is positively associated with Internet access, which is not

[1] The overarching study operationalized Internet access in several ways, from a dichotomous variable representing whether a respondent indicated he or she had access to the Internet, to the number of locations

surprising, since people need money to buy the necessary devices to access the Internet. Age is significantly associated with Internet access, but in the access divide model the relationship is negative and in the multi-dimensional model it is positive. That is, as a general trend, older people tend to have a smaller number of devices to access the Internet. However, once controlling for PC use, IT literacy, household size, and occupation, older people seem to have a greater number of devices. This seems to suggest that once older people accept technology and have the necessary skills, they tend to have more devices to access and use the Internet. This might be because they have the time and money necessary to buy these new devices. In addition, education and attitude towards computers are positively associated with Internet access. Therefore, people with more formal education and with a positive attitude towards computers and related technologies tend to have more devices to access the Internet. Finally, being female is negatively associated with Internet access (measured as the number of devices to access the Internet). That is, in general terms and as a trend, females have a smaller number of devices to access the Internet than males.

Several variables related to the multi-dimensional divide model were found to be important determinants. Speaking English is positively associated with Internet access. This may be because many of the Internet websites have content in English only; individuals who do not speak English have fewer incentives for accessing the Internet than individuals who do speak English. Having a PC at home and individual use of a PC are positively associated with Internet access. This is generally expected. The logic is that

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in which she or he had access, to the number of devices she or he used to access the Internet. We think that this later measure is interesting, because it shows different alternatives that a single person could have for accessing the Internet as a continuum, instead of a dichotomy. We think that this representation has some important advantages, especially the fact that access could be seen as more than having or not having Internet access and it is, at least in part, a matter of individual choice.

individuals that have a PC at home and use it for other activities will use it at some point to access the Internet. Employment status is a significant determinant of Internet access. Employed individuals have significantly less access to the Internet than students, which was our referent variable for this set of dummy variables.

Finally, basic IT literacy is positively associated with Internet access. This is important because in order to access the Internet an individual needs to have basic IT literacy. Having IT literacy is a necessary, but not a sufficient, condition for Internet access and use. Individuals should also have an incentive to access and use the Internet. Overall, there was an improvement in adjusted R-square from 0.403 to 0.575.

Table 1.

Determinants of Internet access (number of devices)

Independent Variables	**Access Divide Model**	**Multi-Dimensional Divide Model**
Constant	-0.343** (-2.232)	-0.217 (-1.537)
Income	<0.001*** (7.675)	<0.001*** (3.813)
Age	-0.009*** (-10.483)	0.002* (1.776)
Education	0.174*** (8.139)	0.033* (1.700)
Attitude towards Computers	0.093*** (9.705)	0.038*** (4.450)
Nationality (Italian = 1)	0.164 (1.603)	0.028 (0.319)
Location (Town = 1)	0.079 (1.290)	0.031 (0.593)
Location (Village = 1)	0.049 (0.803)	0.013 (0.240)
Gender (Female = 1)	-0.109*** (-3.860)	-0.047* (-1.916)
Other Language (English)		0.120***

		(3.966)
PC at Home		0.105*** (3.191)
PC Use		0.630*** (16.756)
IT Skills		0.083*** (2.685)
Household Size		0.003 (0.235)
Occupation (Employee = 1)		-0.258*** (-4.744)
Occupation (Self Employed = 1)		-0.264*** (-4.070)
Occupation (Unemployed = 1)		-0.231*** (-3.101)
Occupation (Other = 1)		-0.338*** (-5.132)
R-square	0.407	0.580
Adjusted R-square	0.403	0.575
F-statistic	115.712***	108.750***

Note: T-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10 percent level, those followed by ** are significant at the 5 percent level, and those followed by *** are significant at the 1 percent level.

Table 2 presents the results of three models using the extent of Internet use as the dependent variable. The extent of use is operationalized as the number of activities an individual performs using the Internet. The first regression model is based purely on the access divide view; it considers Internet access as the only relevant factor affecting Internet use directly. The second model includes the factors mentioned in the access divide view, but tests direct relationships from all of them to Internet use. Finally, the third model incorporates additional variables related to the multi-dimensional divide view, including IT literacy.

Table 2.

Determinants of Internet use (extent of use)

Independent Variables	**Access Divide Model**	**Access Divide Model (Extended)**	**Multi-Dimensional Divide Model**
Constant	0.376*** (6.545)	-0.824* (-1.650)	-0..229 (-0.434)
Internet Access	2.929*** (35.882)	1.842*** (16.408)	1.347*** (7.183)
Income		<0.001*** (2.881)	<0.001 (1.555)
Age		-0.023*** (-7.644)	-0.013*** (-3.194)
Education		0.550*** (7.801)	0.369*** (5.035)
Attitude towards Computers		0.253*** (7.906)	0.221*** (6.999)
Nationality (Italian = 1)		0.276 (0.831)	0.175 (0.543)
Location (Town = 1)		0.050 (0.249)	0.057 (0.294)
Location (Village = 1)		-0.012 (-0.060)	0.031 (0.162)
Gender (Female = 1)		-0.554*** (-5.980)	-0.449*** (-4.926)
Other Language (English)			0.539*** (4.785)
PC at Home			-0.271* (-1.659)
IT Skills			0.238** (2.059)
Household Size			-0.060 (-1.354)
Occupation (Employee = 1)			-0.256 (-1.254)
Occupation (Self Employed = 1)			-0.391 (-1.603)
Occupation (Unemployed = 1)			-0.440 (-1.579)
Occupation (Other = 1)			-0.667*** (-2.702)
R-square	0.371	0.532	0.566
Adjusted R-square	0.371	0.528	0.560

F-statistic	1287.531***	168.124***	113.923***

Note: T-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10 percent level, those followed by ** are significant at the 5 percent level, and those followed by *** are significant at the 1 percent level.

Overall, there is an improvement in adjusted R-square, which went from 0.371 in the access divide model to 0.560 in the multi-dimensional divide model. As expected, Internet access is positively associated with Internet use and the most important factor in all specifications. Income is positively associated with Internet use in the extended access divide model, but becomes statistically insignificant once controlling for other variables. It seems that the impact of income on Internet use is indirect and once we incorporate the variables that are the authentic direct influences to the model income becomes statistically insignificant. Variables such as access to a PC at home, level of IT literacy, and occupation appear to have income as their underlying influence. Age is negatively associated with Internet use. The younger an individual is the more he or she uses the Internet. Education and attitude towards computers are positively associated with Internet use. The effect of formal education on Internet use is greater and more statistically significant than its effect on Internet access. Using the Internet for several activities seems to involve not only IT literacy, but also a level of formal education that allows the individuals to understand the possibilities of the Internet and to use it meaningfully. Finally, being a female is negatively associated with Internet use.

Similar to Internet access, there were several variables related to the multi-dimensional divide that were significantly associated to Internet use. For example, speaking English was positively associated with Internet use. As with Internet access, the explanation of this result could be related to the fact that most content available in

websites is still in English and, therefore, there are some activities that are only available to individuals if they know how to speak English. Having a PC at home was negatively associated with Internet use. This result could seem surprising, but it may be just an indication that, in contrast to Internet access, for Internet use having a PC at home is not an important factor, because people can have access in other locations. Finally, basic IT skills were positively associated with the extent of Internet use. For Internet use, it seems clear that, similar to Internet access, IT literacy is even more important than other factors. In order to perform more activities using the Internet, individuals need to know more about how to use a computer and how to use Internet in terms of IT literacy (specifically technical skills) (Mossberger et al., 2003).

In summary, it seems clear that basic IT literacy is an important determinant of Internet access and Internet use and that it is positively associated with both. That is, basic IT literacy significantly increases the likelihood of greater Internet access and greater extent of Internet use. Since, not everybody has the same level of skills, for research and practical purposes, it is important to understand the differences and similarities among Internet users. Using hierarchical cluster analysis and cross-tabulations, the following section provides the empirical foundation for a preliminary classification of Internet users (including non-users). User typologies are one way to examine which people conduct what types of activities online (Hargittai & Hinnant, 2008; Horrigan, 2002)

4.2. IT literacy acquisition and Internet use

The aim of this section is to develop a user typology that examines differences between users based on Internet use and preferences for acquiring IT skills. Hierarchical cluster analysis and cross tabulations were used to examine Internet usage levels, purpose of use, and acquisition of basic IT skills and their evolution over time. The analyses presented in the first three subsections were conducted on the 2004 dataset, while the last subsection shows the dynamics of the phenomenon in the five years following (2004 – 2009).

4.2.1 Internet usage levels

The first cluster analysis takes into account different levels and types of Internet usage (or experience). Interviewees were asked if they used the Internet and what applications they used (motivation).

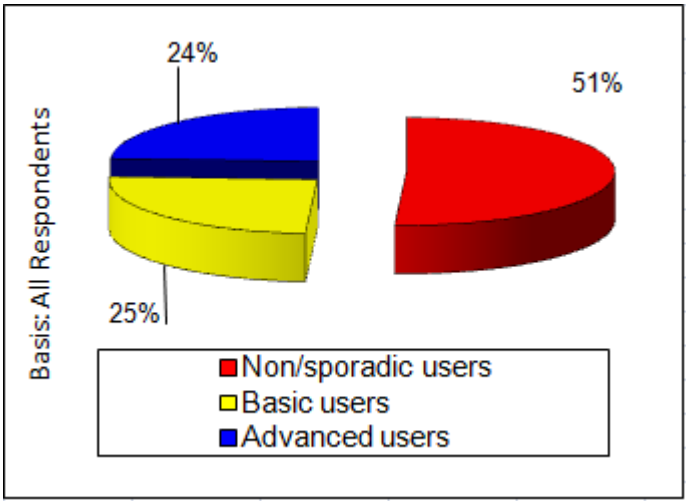

Fig. 1. Internet Usage Levels

The analysis highlighted the presence of three clusters (see Figure 1). The first cluster was labeled non/sporadic users (51%) since respondents exhibited ‘a lack of’ or ‘very

limited use' of the Internet. The second cluster was labeled as periodic users (25%) since respondents showed more regular usage, mainly information searches and email exchange. Finally, the last cluster was defined as regular users (24%) since respondents made use of a much wider range of Internet applications (i.e. videoconferencing, VoIP, e-shopping, blogging and auctions).

These results provide an indication of the diversity of users and the range of usage levels, regardless of demographic or socioeconomic factors.. Nevertheless, they do not provide insights as to what the determinants of these differences are. For this reason, a second cluster analysis was conducted to subsequently cross the results of both analyses.

4.2.2 Purpose of Internet use

The second cluster analysis focused on the purposes, or motivations, driving Internet use. Respondents were asked to list the main purposes for which they used the Internet. In the population considered, two clusters were identified. Cluster 1 (about 80% of the population) and Cluster 2 (about 20% of the population). Interestingly enough, the discriminating variable determining whether a respondent belonged to one or the other group was the use of Internet for leisure.

Figure 2 shows a breakdown of the four main purposes of use by cluster. Although the data presented focuses on the purpose of use and not on the level of enjoyment generated by the use of technology, it seems reasonable to assert that a portion of the population (cluster 2) does not appear to perceive Internet technologies as a potential source of leisure or entertainment. In other words, they do not seem to derive as much pleasure from using these technologies.

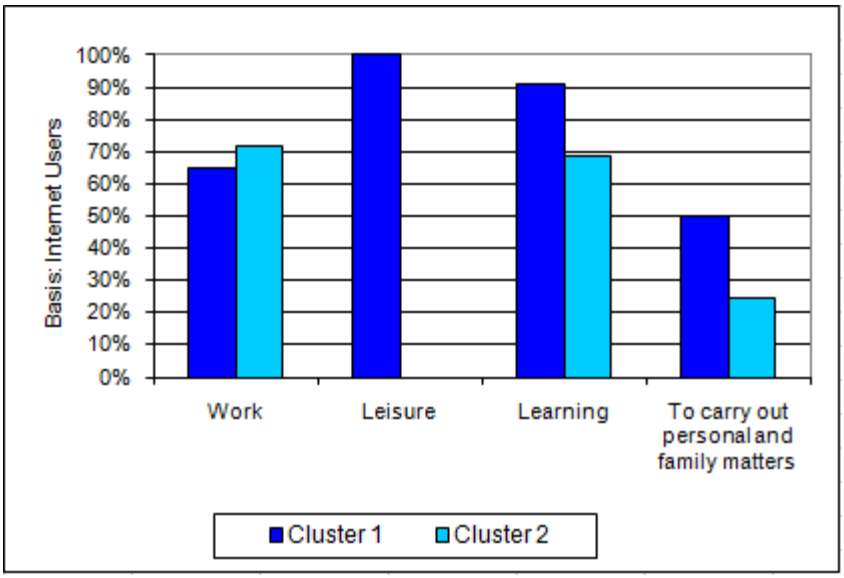

Fig. 2. Purpose of Internet Use by Cluster

By crossing the results obtained from the two cluster analyses conducted so far, some interesting results emerge. Figure 3 shows a clear trend may be identified between sporadic Internet use and lack of pleasure derived from using technology for leisure purposes. This constitutes initial evidence that the presence of different attitudes/approaches to technology may lead to different usage levels. From a policy standpoint, it goes without saying that being able to understand and account for the presence of different attitudes/approaches to technology represents a key ingredient for the creation of more effective inclusion measures.

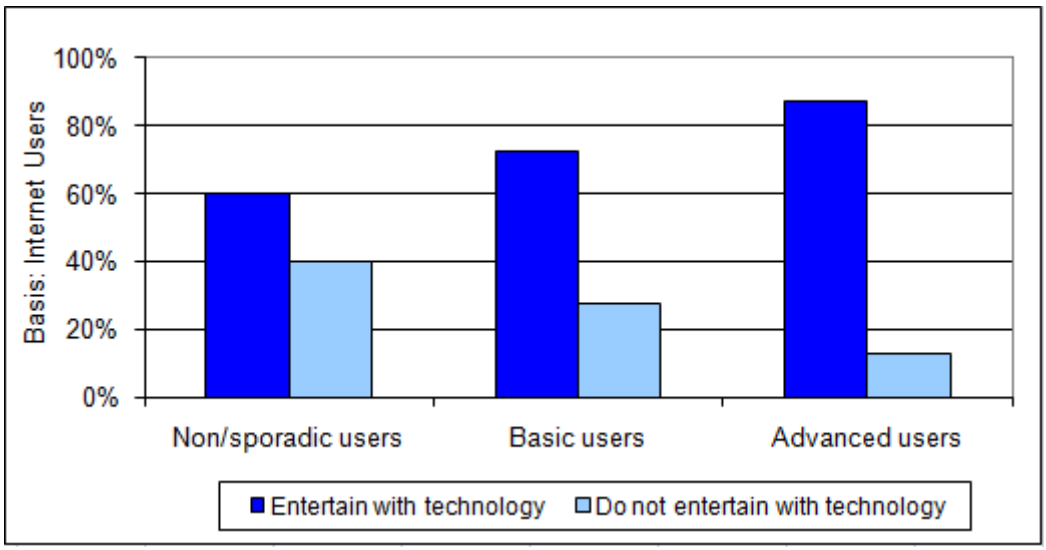

Fig. 3. Level of Entertainment Use by Cluster

4.2.3. Basic IT literacy acquisition

The final part of the analysis focused on basic IT literacy acquisition. In particular, interviewees were asked how they learned to use personal computers and the Internet. From the results presented in Figure 4, two main considerations are explored. First, a good portion of IT literacy acquisition appears to occur through an informal process of learning by doing. This result is suggested by the important role played by the self-learning process (present in nearly 60% of respondents) and is consistent with other similar research findings (Selwyn, 2005; Van Dijk, 2005) The prominence of self-learning is not specific to the geographical area considered but may be found across Europe as well (Van Deursen & Van Dijk, 2009). For example, the data published on Eurostat's website concerning e-skills shows that the percentage of individuals obtaining IT skills through formalized training in educational institutions is as low as 20% (Eurostat 2006). The second consideration regards the fact that basic IT literacy is mainly acquired at school or in the workplace.

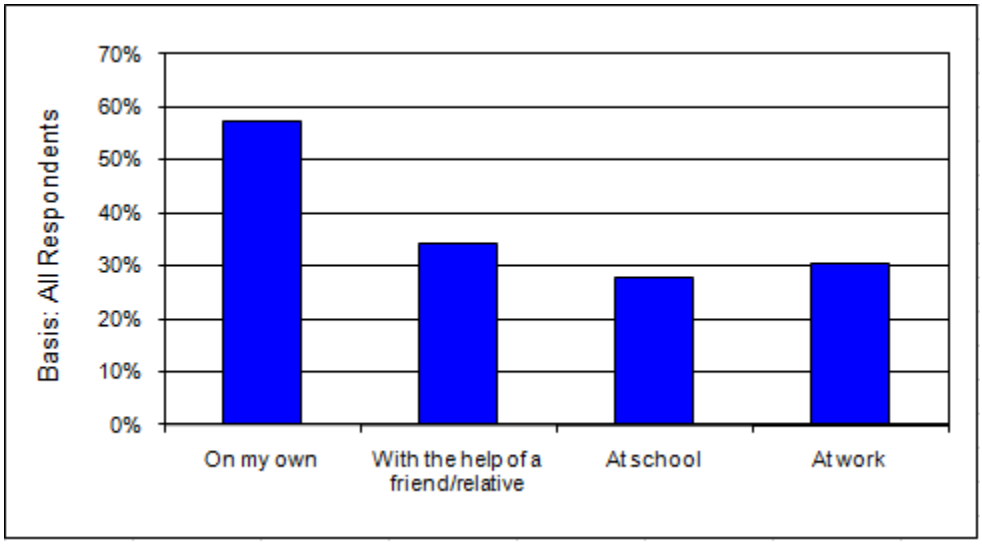

Fig. 4. Process of IT Skills Acquisition

Figure 5 cross-analyzes the answers about literacy acquisition with the results obtained from the first cluster analysis, and reveals that self-learning emerged as a common characteristic for both regular and periodic users. For sporadic users, the presence of self-learning persists, but with a significantly lower importance. This suggests that participation in formal training courses may be an appropriate way to overcome the initial inertia that prevents non-users from embarking on the learning process leading to the acquisition of IT skills. Such results offer useful insight into the design of more effective and better targeted policies aimed at reducing different types of digital divides.

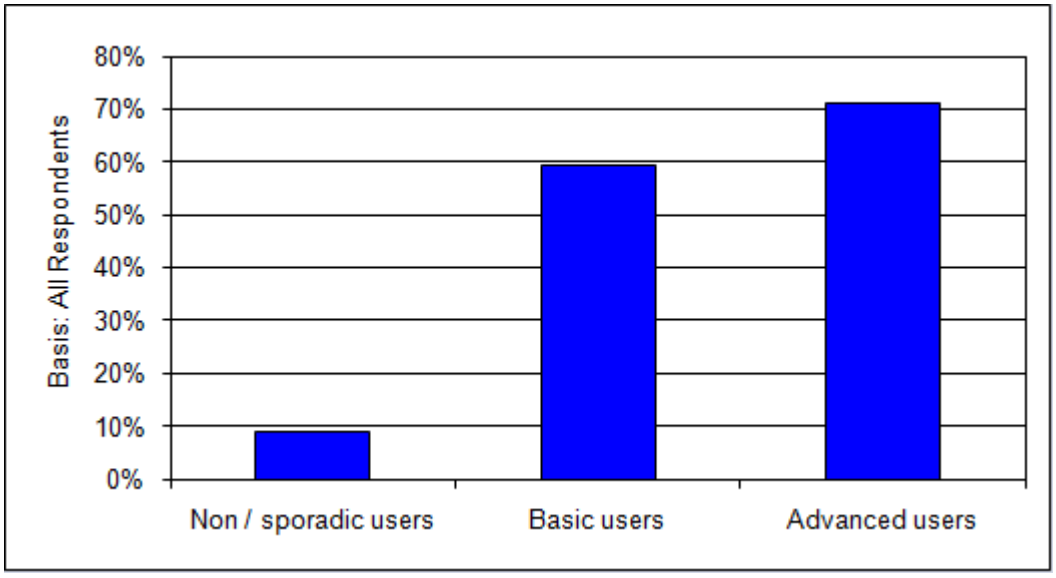

Fig. 5. Proportion of Self-learning Preferences by Type of User

4.2.4. The evolution over time

The final part of the analysis was aimed at providing some insights into how the situation in terms of users/non users distribution evolved over time. For this reason, the first cluster analysis on Internet usage was carried out on a set of data collected for the next four years (2005 – 2008).

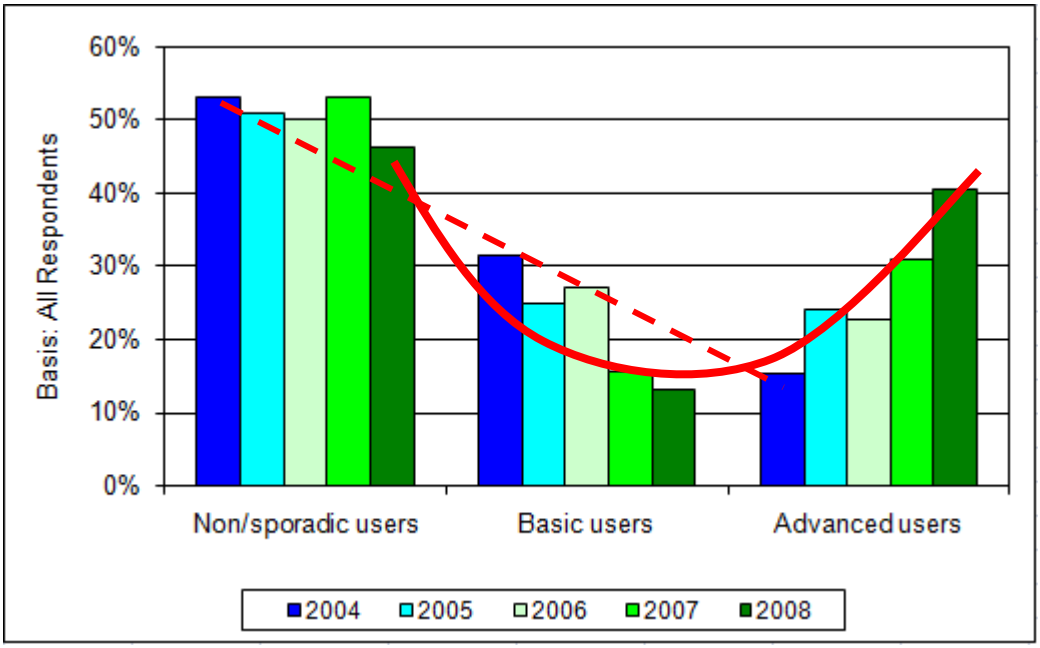

Fig. 6. Evolution of User Types Distribution

By looking at the evolution of the distribution of user types a few interesting results emerge (See Figure 6). While in 2004 such distribution showed a negative slope (dashed line), a difference in the migration rate from periodic users to regular users and from sporadic users to periodic users has gradually lead to a "U" shaped distribution in society. This indicates an initial polarization of society, particularly between non/sporadic users and regular users.

The identified trend may constitute a possible illustration of the impact of technology as trend amplifier (Van Dijk, 1999, pp. 153-154). The above considerations suggest the need for careful reflection if we are to understand the reasons behind such a polarization process and how it may be reduced. The use of the digital divide metaphor presented in the next section intends to be a first step in this direction.

5. A digital divide user typology: The athletes, the laid-back, and the needy

From the analysis carried out, the acquisition of basic IT skills emerged as mainly occurring through a process of "self-learning" (learning by doing). The process of skills acquisition is in fact usually triggered by either an interest in technology or by a constraint/requirement posed by school or at work. For this reason we compared the acquisition of basic IT skills to the act of climbing a set of stairs, in which the first step is in relative terms higher than the others. Going up and down the stairs is an action that has to be carried out alone and the people that do it may be divided in three groups: (1) athletes, (2) laidback, and (3) needy.

The Athletes. These are the people that climb stairs mainly because they enjoy exercising and being fit. These are technophiles; they are very keen on technology and usually have an innovator or early adopter behavior because of the pleasure and other benefits they extract from using technology. These benefits justify the learning costs that they have to bear to keep their skill set up to date. Athletes extensively use the Internet in both their professional as well as private daily life. To a certain extent, they should not be a concern for policy-makers since they enjoy keeping the pace with technological evolution and change and thus they do not need any kind of external incentive.

The Laidback. People in this category have the physical ability to climb the stairs; nevertheless, they are reluctant to do it. In other words, they have the necessary intellectual capacity to acquire IT skills on their own, but do not have sufficient incentives to do it. This may be attributed to a lack of clarity about the potential benefits or to the fact that learning costs far exceed the perceived benefits. They thus adopt a minimum effort approach that results in a very basic use of the Internet (mainly

information search and email exchange). These people in Rogers' diffusion theory (1962) could be classified as "early-late majority". Their adoption may be accelerated by policy makers through two levers. The first one is an incentive lever – policy makers could explain to these people (through sensitization activities such as communication campaigns, conferences, etc.) what benefits could be enjoyed by climbing the stairs (i.e.: there is a cake waiting for you at the end of the stairs). The other policy that could be used is a "coercive" measure, which can foster the wide diffusion of IT requirements in school and in the workplace (i.e., to ask teachers to require that students increase their use of PCs to complete work).

The Needy. These people, regardless of their willingness to climb the stairs, do not have the physical capacity to climb the first step (the highest) and need external help. That is, even when they may be willing to use the Internet in their daily life, they lack the basic IT skills and cultural background to win the initial inertia for starting using it in meaningful ways. What is important to stress is that the external help needed by this group of people will mainly serve to overcome the first step of the staircase. In fact, similar to the other categories, their learning process is characterized by significant self-learning.

We are aware of the fact that the profiles included in the above user typology do not constitute an exhaustive representation of the nuances of user profiles and policy needs present in society. Nevertheless we are convinced that it provides a reasonable heuristic. As a matter of fact, the design of public policies requires a process of problem simplification in order to identify few effective measures. The metaphor should be interpreted as a first attempt to represent an issue whose complexity often makes it

difficult to be communicated and manipulated. Despite the room for improvement and refinement, the metaphor offered may represent a valuable tool to be used for framing the problem and finding possible solutions. This is due to the fact that the definition of three different profiles in terms of policy needs provides a more adherent yet manageable representation of reality. Research needs to be done to determine the possible range of policy levers that can be used to address the issues associated with different patterns of IT skills acquisition. Further research and investigation will help flesh out the right mix and balance of policy solutions.

6. Viewing usage level and types through a traditional digital divide lens

Traditional digital divide literature privileges demographic and socioeconomic factors as the main determinants of the divide (e.g., gender divide, income divide, etc.). The aim of this section is to examine the socioeconomic characteristics of the three types of users identified above. In order to do so, some descriptive statistics have been inserted in order to cross different users' types with the main socio-economic variables.

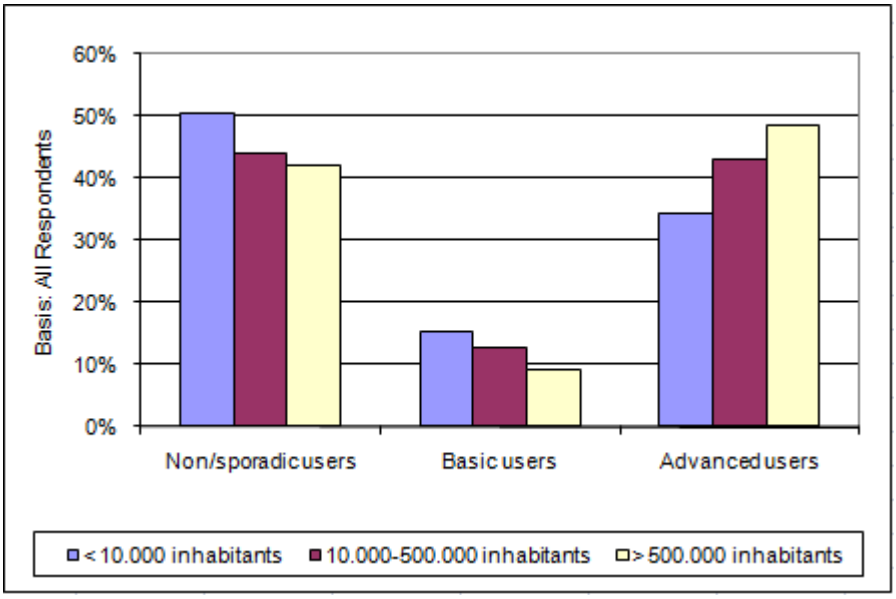

Fig. 7. Geographical Distribution of User Types

In terms of geographical dispersion, the data show a higher concentration of advanced users in urban areas. (See Figure 7). This represents an important piece of information for both policy makers aiming at stimulating demand for ICT related services and telecom carriers considering infrastructure investments in rural areas. Being aware of such heterogeneity in distribution may allow for the creation of more effective policies and more accurate estimates of the latent demand present in areas not yet reached by broadband infrastructure.

As far as education and income are concerned, the graphs in Figure 8 show a clear positive correlation. As a matter of fact, the percentage of wealthy, educated people increases with usage sophistication. It would interesting to determine what the causal relationship between the variables considered might be; whether the presence of IT skills leads to higher education levels and salaries or vice-versa.

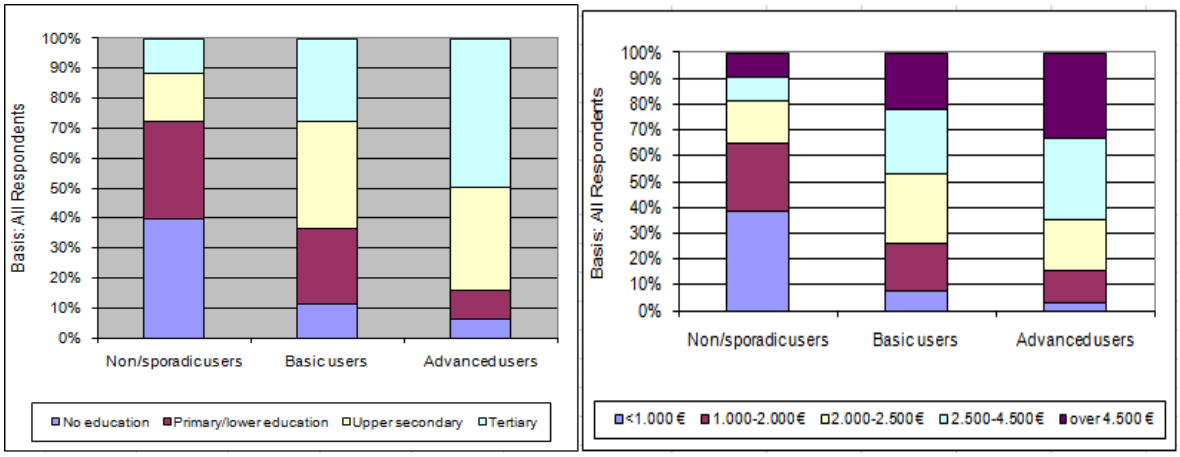

Fig. 8. Education and Income Characteristics by User Types

Although answering this question may prove to be difficult, some preliminary indications may be found in the graph below. The chart depicts the relationship between Internet users' types and employment status.

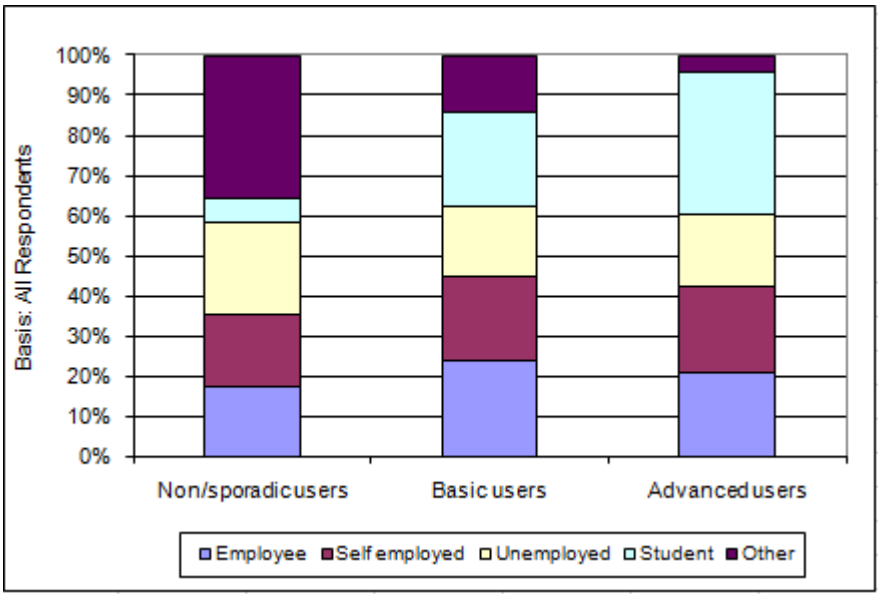

Fig. 9. Employment Characteristics by User Types

A high level of computer literacy does not seem to be a sufficient condition to produce a marked increase in the chances of finding a job. As it may be noticed from the graph, the percentage of unemployed people does not vary significantly among different user types. A reduction is present between non users and basic users, but the percentage of unemployed people increases among advanced users. This is an important indication for policy makers, since it confirms the role of IT literacy as a necessary but not sufficient condition for reducing unemployment levels. Such skills should thus be considered as a catalyzer that requires complementary knowledge and skills to ignite a professional as well as personal development process. To strengthen the robustness of the user type characterization, a further multivariate analysis has been conducted.

Table 3.

Characteristics of user typologies

Independent Variables	**Coefficient values (t-statistics)**
Constant	1,249*** (3,265)
Age	-0,008*** (-5,011)
Gender (male=1)	0,117*** (3,936)
Education	0,115*** (4,619)
Income	0,073*** (4,682)
Occupation (employed=1)	0,238 (1,395)
Occupation (unemployed=1)	0,212 (1,144)
Occupation (student=1)	0,321* (1,766)

Occupation (other=1)	0,081 (0,467)
Household size	-0,048*** (-3,027)
Foreign language	0,106*** (2,919)
Location (town=1)	0,015 (0,474)
Location (city=1)	0,076 (1,197)
R square	0,639
adjusted R square	0,635
F statistics	154,261

Note: T-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10 percent level; those followed by ** are significant at the 5 percent level; and those followed by *** are significant at the 1 percent level.

The exercise provided a number of confirmations and some new insights. Income and education have been verified to exert a direct influence on usage proficiency. The weakness of the relationship between ICT literacy and occupation was also still confirmed. In addition, the presence of a gender as well as generational usage divide emerged clearly. Finally, the ability to speak a foreign language and the size of the household seem to be correlated with advanced usage behavior. Further analysis still needs to be conducted to reach a deep understanding of the above phenomena. Nevertheless, a number of hypotheses may be put forward to stimulate the discussion. The presence of a generational usage divide may be explained by the presence of a relationship between the generation of the users and the generations of applications/technologies (email & browsing vs. social computing). Proficiency in a foreign language, instead, may help increase the perceived utility attached to the use of the Internet thanks to the opportunity to access a wider range of content.

7. Conclusion

The research presented in this article provides evidence for a conceptualization of the digital divide as a complex phenomenon transcending simple information access problems. The use of different interpretation models has shown the important role basic IT skills play on both Internet access and use. In particular, different approaches to basic IT skills acquisition emerged and lead to diverse usage levels. In fact, about one fourth of the population considered in 2004 presented advanced user behavior; another fourth was characterized as basic users; the remaining fifty percent made sporadic use of the Internet or did not use it at all. Moreover, the analysis carried out over the following five-year period depicted the presence of a polarization process of Internet use between none/sporadic users and advanced users. Taking into consideration that Internet use is fundamental for individual and community development, national and local policy makers could direct part of their efforts to offset this usage polarization. In order to do so, understanding how people approach technology and the different paths leading to the acquisition of the necessary IT skills represents a fundamental aspect.

In this respect, the digital divide user typologies proposed in this paper constitutes a useful interpretation tool. In fact, in addition to highlighting that informal and self-learning is at least as important as formal face-to-face training courses in the process of basic IT skills acquisition, it identifies three main user profiles having significantly different needs in terms of policy support. While policy makers may not need to be very concerned about athlete users, they should pay greater attention to the laidback and needy user categories. If the assumption is that Internet use is intrinsically beneficial, and that more mature use may be fostered among the laidback group through a “carrot and stick”

approach; the question becomes ‘what are the incentives?’ Therefore, possible policy levers could create either the right incentives for use or make technological use a necessary complementary asset to other activities (i.e., school/work). The complementary nature of computer use is supported by the fact that literacy is becoming more important than numeracy and digital skills in the explanation of Internet use (Van Dijk, 2003). A priority for the neediest group, instead, is participating in formal training courses that provide computer access and skills to overcome the first step present in the process of IT skill acquisition (depicted as a staircase in the proposed metaphor). Such first step could also be lowered by designing more friendly and easy-to-use information systems that minimize the need for anything but the most basic of IT skills in order to produce significant benefits. To a certain extent, the ease of use of most IT systems has been enhanced over the years, nevertheless the considerable portion of the population represented by non-users shows the presence of a significant room for further improvement in this respect.

In conclusion, a careful and close management of the evolution of digital gaps by policy-makers seems to be desirable and necessary. At the same time, attention should be paid toward avoiding technological deterministic approaches aimed at fostering technology adoption and use *per se*. Rather, the use of technology should be advocated as an important enabling tool that can support individuals in their everyday activities – production, social, political, consumption, savings activities (Selwyn, 2003). Hence, this should translate to public policies framing the problem from a multitude of perspectives and fostering the diffusion of IT as well as important complementary skills.

A potential limitation of the present study is the limited geographical area considered. However, we are convinced that it is a useful starting point. First, digital divide is best understood, managed, and tackled in context. More and more, the public debate is moving toward a European discourse where regions are considered the best unit of analysis (in terms of homogeneity) in the discussion of strategic issues having to do with the Information Society (EU Commission 2006). Second, it is our belief that even if wider geographical areas had been considered, the generalization of results could not have been taken for granted in exactly the same way. As a matter of fact, findings from studies conducted in China or Asia most likely may not be generalized to USA, Europe, or Latin America due to the high level of heterogeneity present among the different contexts considered. We thus propose to take the results of this study for what they are: food for thought that may spark interesting reflections and discussions, and that may be taken up by other researchers and adopted in different contexts in order to advance the current understanding of a complex and dynamic phenomenon.

There are important opportunities for research in this area. Future research may focus on testing the validity of the model proposed for advanced IT skills also (i.e. programming languages, statistical packages, etc.). In addition, multivariate analyses would be required to strengthen the reliability of the user types' profiles. Finally, agent-based and system dynamics simulation models could be used for testing alternative policy solutions as well as understanding the role of the interaction among the different groups of users.

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