DIGITAL DIVIDE AND BROADBAND ACCESS: THE CASE OF AN ITALIAN REGION

Abstract

Reducing digital divide in order build an information society for all is one of the top priorities for European policy makers. A better understanding of the determinants of broadband access at the individual level represent a key starting point for any e-inclusion policy. Based on a review of the literature on digital divide and broadband access, we document different approaches to understanding the digital divide and argue that these perspectives can also help to understand broadband access. Combining the digital divide and broadband literatures provides a systematic and theory-based approach to the selection and inclusion of variables in different models. This chapter presents as a case study conducted in an Italian region. We provide some implications of our findings and argue that policy makers should explore the relationship between IT skills acquisition, broadband access, and Internet use in order to develop more effective policies and programs.

INTRODUCTION

Over the last decade academic scholars, public officials, and private sector leaders have argued the positive social and economic impacts of broadband technologies as a key ingredient for the economic and social development of nations. Evidence of this considerable expectation is demonstrated by the prominent and consistent role the issues of broadband diffusion have played in the last several years in the various strategic development plans devised at the European-level (eEurope 2002, 2005, i2010).

In his recent best seller, "The World Is Flat," *The New York Times* columnist Thomas Friedman argued that in the year 2000 the world entered a third and new era of globalization. According to Friedman, the first two phases were spearheaded by countries signing international trade agreements and organizations turning into multinational corporations. Whereas the latest phase is, and will be, built around individuals "globalizing", a process that requires fast and convenient access to people and knowledge regardless of their location. Friedman's worldview stresses the importance of the key role individuals play as dynamic agents in an information-based economy. His perspective adds an interesting frame to the issues surrounding uneven distribution, access and usage of broadband technology. The public policy problems of the digital divide, or e-inclusion, when viewed from this perspective are shifted from a focus of pure social inequality to an issue of the strategic use of information and communication technologies in the economic and social development of countries competing in a global market. At present, the different globalization patterns individuals may pursue are still vague and surely require further investigation. Nevertheless, the new direction hypothesized by Friedman and others offers an interesting point of departure for exploring new ways of conceptualizing the policy issues surrounding the diffusion of broadband.

While little doubt remains about the role broadband plays in sustainable economic development (OECD 2004, Annis 2005), it is still unclear how to obtain a widespread and economically accessible diffusion of such networks (Cantamessa *et al* 2005). In this respect, the liberalization trend of telecommunication (TLC) markets that occurred in the nineties throughout most of the Western world represented an important turning point that led to a shift in logic. The logic moved away from strategies based on an acceptance of a natural monopoly toward a more market-driven approach (Hulsink, 1999).

The privatization of telecommunication markets was one of the ingredients that led to the Internet boom during which infrastructure expansion was mainly driven by an unconditional faith in the future profitability of Internet-related services. Since the burst of the speculative bubble, a strong emphasis on the efficiency of investment allocation policies for building network infrastructures has emerged. However, recent studies continue to demonstrate that the expansion of broadband networks was and to a large extent, still is, driven by technological push rather then demand pull dynamics (Ferro, 2006). In this respect, the considerable marketing efforts currently made by the main European TLC operators to raise the adoption rates among residential users somehow supports this thesis.

The lack of a demand pull driving the diffusion of broadband infrastructure poses a number of issues. First, it raises the minimum thresholds in terms of total inhabitants a municipality has to meet in order to attract investments in infrastructure (Howell, 2002), thus leaving un-reached a higher portion of smaller municipalities. Second, it extends companies' payback times for sunk cost investments and, finally, it hinders the birth of complementary services (Pentland et al., 2003). In simple terms, it fosters the formation of uneven access and usage opportunities (i.e., in rural and urban areas) and lowers the market profitability, thus hindering the viability of broadband technologies as an economic and social development tool.

Therefore, it is evident why it is extremely important for both the private and public sectors to understand how to enlarge the broadband customer base. In this respect, there are two main objectives to be considered. The first is an increase in the total number of Internet users and the second is the maturation of usage patterns of current Internet users (i.e., make them broadband dependent). Efforts aimed at understanding the gap between access and usage patterns present among different social groups and geographical areas will be beneficial. The objective of this chapter is to explore how the digital divide literature may help identify some important areas for investigation and could prove useful in understanding the needs of broadband-enabled populations and how to increase broadband use.

The rest of the chapter, starting with section two, highlights the current situation of broadband diffusion in Europe and briefly reviews the broadband literature. Section three reviews the digital divide literature and section four presents the methodology of the study. Section five and six provide an analysis of different models for expanding the discussion about broadband, and section seven concludes with some remarks on policy issues.

BACKGROUND: BROADBAND AND THE DIGITAL DIVIDE

The European Broadband Outlook

The emphasis on the importance of broadband infrastructure posed by European policies in the last decade has culminated in 2005 with an average coverage rate, in terms of population reached by xDSL services, of 85 percent (European Commission, 2006). Despite the presence of a portion of individuals still excluded from easy broadband access, the current situation may be regarded as a positive result. In fact, the reduction in infrastructure-related costs due to the fast mutating scenario in wireless technologies such as Wifi, HIPERLAN, and WiMAX, allows us to be optimistic about the near future coverage of underserved areas.

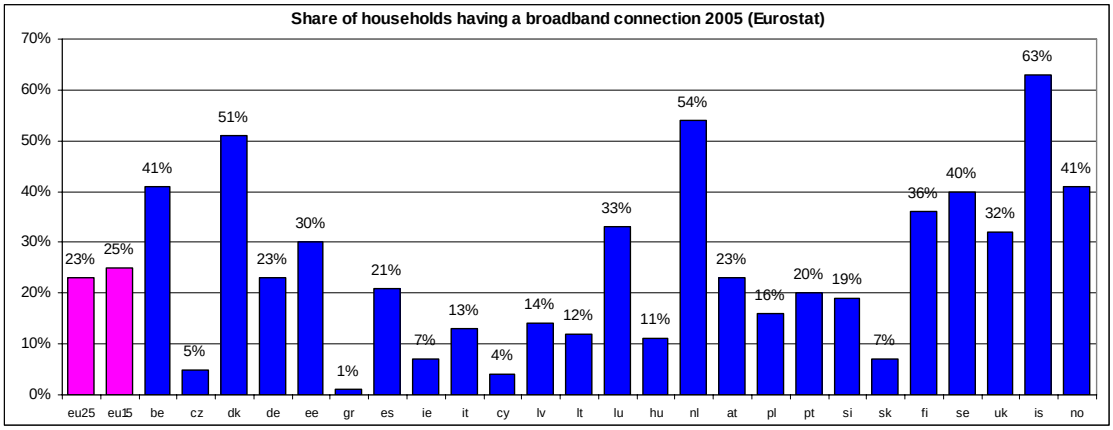

Figure 1. Broadband Penetration

The graph above reports specifically on the broadband penetration rates present in the different European countries. The average adoption rate for the European Union (EU25) in 2005 was 23 percent. Although there is some variance between Northern and Southern countries, the graph shows an overall picture in which demand is struggling to take off. This suggests the necessity for further investigation of broadband demand in order to understand how it may be stimulated. For this reason, we use an Italian region named Piedmont as a case study to explore some of the possible paths leading to the creation of broadband demand. Although the region in question may not be considered representative of each individual European country, its current situation is very close to that of Europe as a whole. As of 2005, the xDSL coverage and penetration in Piedmont were respectively 81 percent and 21 percent (Regional Observatory on ICT Report 2005).

Understanding Broadband: A Brief Literature Review

The diffusion of broadband connections represents a complex phenomenon. The relationship of broadband development to economic activities is also important (Ferro et al, 2007). However, three main streams of research are represented in the broadband literature and document the growing complexity of the phenomenon.

The first stream of research targets the role of socioeconomic variables (such as income, education, age, and gender, etc.) on adoption and usage of broadband connections. The end goal is to understand and control for the formation of potentially limiting information asymmetries among various population groups that could contribute to the rise in well-

documented inequalities in information access and usage (Flamm, 2004; Flamm et al., 2005; Grubesic, 2004; Varian 2001). Recent progress in this stream of research extends the conceptualization of individuals as just users to active consumers. In particular a few attempts have been made to develop various conceptual models aimed at investigating consumers' adoption, usage and impact of technology (Venkatesh and Brown, 2001; Oh et al, 2003; Dwivedi and Choudrie, 2004; Choudrie and Dwivedi, 2004a, b, c).

The second stream of research focuses on the role government and policy play in the diffusion process. In particular, since the liberalization of the telecommunications industry, research investigated the role that local governments have played as catalysts for attracting infrastructure investments by telecommunication couriers. Factors leading local communities to undertake broadband initiatives and the consequences of these initiatives on the local economy are particularly emphasized in this stream of research (Gillett et al. 2003; Lehr et al. 2005).

Finally, the third stream of research applies systemic approaches with the intent to identify macro factors contributing to broadband diffusion at the country or regional-level. Some of these studies (Ferro, 2006) analyze broadband demand and supply as complementary diffusion processes. Some others tackle the problem from the perspective of multiple stakeholders (Dwivedi et al 2003, Choudrie et al. 2003) or try to identify superior applications that could boost the diffusion of broadband-related services (Middleton 2002, Lee et al 2003), However, it is still debated whether broadband diffusion and demand are solely due to killer applications or due to users' mature use of the Internet.

At first, research efforts tackled issues regarding infrastructure diffusion, and subsequently expanded in scope to consider demand aspects such as adoption, usage, and purchase. Heretofore, most of the demand-related research analyzed socioeconomic differences between adopters and non-adopters and the impact that access to broadband connections had on Internet usage. In doing so, little attention was paid to the paths leading to the acquisition of necessary IT skills to become a broadband-enabled user. This chapter intends to contribute to the existing body of knowledge on broadband demand by using the literature on the digital divide to shed some light on the path leading to broadband adoption.

A Framework to Understand Digital Divide

The last fifteen years have yielded three main approaches to understanding the digital divide: an access divide, multi-dimensional digital divide, and a multi-perspective digital divide (see Helbig, Gil-Garcia & Ferro, 2005 for an extended review; Gil-Garcia, Helbig & Ferro, 2006). Broadband is one type of access to the Internet and the broadband literature evolved investigating diffusion rates, demand and usage issues, as well as calling into question the role of public policy. The purpose of presenting the broadband and digital divide literatures together is an attempt to identify some similarities and assess the usefulness of a digital divide framework (Helbig, Gil-Garcia & Ferro, 2005) in understanding broadband access and Internet use. The following sections outline the viewpoints and assumptions taken by different scholars about the digital divide.

Characterizing the Digital Divide

The digital divide is a complex social phenomenon. The term generally evokes a broad set of implications. Robinson et al. (2003) write, "The digital divide implies that significant minorities of the population are effectively denied access to a technology that, like other public facilities like libraries and super highways, is thought to be open to anyone" (p. 2). Therefore, the impact of the digital divide on certain segments of the poplulation implies differing life chances and opportunities for those who are not technologically savvy (DiMaggio & Hargittai, 2001; Nelson, 2002; Servon, 2002; p. 14). Debates continue as to the magnitude of these consequences. Some scholars argue there is no digital divide, while others argue that the construct 'digital divide' is not properly framed.

Access, Multi-dimensional, Multi-perspective Digital Divides

One of the first ways in which the digital divide was characterized was as an access divide – between those who have access to technology and those who do not. This perspective suggests the digital divide is a one-dimensional issue. The main issue is an 'access to technology problem' and the debate is framed as an inherent delay in the diffusion of technology among different groups of people (Adriani & Becchetti, 2003; Compaine, 2001). Another assumption is that "once online, there is no gap" (Walsh et al., 2003 p. 281) and that everyone can use the Internet for the same purposes. Therefore, this perspective evaluates access to the Internet as the only important determinant of the digital divide and sees no difference between having access *and* also being able to use the technologies (DiMaggio & Hargittai, 2001). Proponents emphasize market driven forces will close the gap over time and government intervention is not needed (Compaine, 2001).

A second stream of research focuses on multiple dimensions. This multi-dimensional viewpoint argues the basic building block of Internet use is access (Servon, 2002; Norris, 2001) but recognizes the importance of other dimensions which impact access and use such as race/ethnicity, income, skills, geography, cultural content, education and training (Bimber, 2000; Norris, 2001; Servon, 2002). DiMaggio and Hargittai (2001) state, "As the technology penetrates into every crevice of society, the pressing question will be not 'who can find a network connection at home, work, or in a library or community center from which to log on? but instead, What are people doing, and what are they able to do, when they go on-line?" as important factors in understanding the digital divide. More recently, Ferro *et al* (2005) added another dimension to this picture by highlighting the presence and the interrelation of demand and supply related divides. Proponents emphasize government intervention in access and use related issues and do not believe market forces will close the gap over time (Chin & Fairlie, 2004; Cole, 2004; Mossberger et al., 2003). This view has similarities to broadband research that focuses on socioeconomic variables on the adoption and usage of broadband.

A third stream of research looks at many perspectives and asks, 'is the digital divide problem framed properly?' Scholars argue there is a need to understand how marginalized groups interact with technology and how those differing relationships to social, political, and environmental factors (Mossberger, Tolbert, and Gilbert, 2006; Castells, 2001; Kennedy et al., 2003; Warf, 2001) impact their access and use of technology. In this view, the experiences with technology by marginalized populations should be the focal point for understanding the problem, and consequently, for providing solutions (Crensahw, 1999; Servon, 2002; Kennedy et al., 2003). Scholars criticize

solutions that mirror the needs of priviledged group members in society (in any dimension – age, gender, race, income, location, world) (Winner, 1988). Scholars reject that any one group of individuals inherently use technologies differently than the majority. Hines et al (2001) suggests " individuals and communities employ technologies for very specific goals, linked often to their histories and social locations…" and that "barriers to access [and use] operate on many levels and therefore solutions must take multiple approaches" (p. 5). Proponents of this perspective emphasize government intervention targeted to specific issues and problems and to reexamine the current discourse (Chin and Fairlie, 2004; Cole, 2004; Mossberger et al., 2003).

RESEARCH DESIGN AND METHOD

An important methodological question in the analysis of broadband diffusion is the definition of the object of study. As technology advances, the definition of broadband is considered as a moving target. Thus, finding a widely accepted and durable definition may result in an arduous task. In the literature, three main interpretations are found with respect to the definition of broadband. The first defines broadband through nominal bandwidth and is expressed in terms of kilobits or megabits per second (FCC, 2002). The second defines broadband by providing a detailed list of supported applications (Industry Canada, Broadband Office, 2000). Finally, the third approach defines broadband as 'the technological environment that enables the use of digital technologies at their highest level of interactivity' (Italian Broadband Task Force, 2002).

None of the definitions listed above may be considered, in principle, as optimal. Each carries both advantages and disadvantages. The first definition is an unambiguous definition, but becomes obsolete very fast. The last definition, in contrast, does not require to be continually updated, but leaves room for interpretation, and thus renders comparative analyses very inaccurate, if not impossible. For the purposes of this study, the first approach was preferred because it allowed a higher level of methodological homogeneity in the treatment of the data collected from different sources. In this paper broadband will be referred to as Internet connections with a downstream nominal speed equal to, or greater than, 2 Mbps.

The empirical analysis presented in this chapter is based on a survey to 2206 Italians who live in the region of Piedmont. The sample used for the purpose of this paper was created from a database provided by the Italian National Statistical Institute (ISTAT) whose data refer to the last periodical census carried out in 2001. The entire data set was collected via Computer Aided Telephone Interviews (CATI) by the ICT Observatory of the Piedmont's Regional Government. Thus, people without a fixed line are not represented in the sample. The stratified sample was 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 sample 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. 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.

BROADBAND ACCESS AND INTERNET USE

This section has two main purposes. First, it constructs models based on two of the three approaches presented in the digital divide literature review section and applies them to the phenomenon of broadband access: (1) access divide model and (2) multi-dimensional divide model (See Garcia, Ferro, Helbig 2006). This first effort provides evidence of the importance of some individual and household-level factors as determinants of broadband access, as well as evidence of the importance of broadband access as a determinant of the extent of Internet use. Second, this section proposes that Internet users can be classified into advanced, intermediate, and sporadic or non-users. Using this classification we argue that the divide (in general) is widening and policy makers should pay attention to the problem of lack of demand for broadband use, particularly to the issue of IT skills acquisition. Together these two subsections highlight the importance of broadband access and suggest some areas for future exploration.

Determinants of Broadband Access

Table 1 shows the results of the access divide and multi-dimensional divide logistic regression models, where broadband access was measured as a dichotomous variable (whether a person reported a connection of 2 Mbps or more). Income is positively associated with broadband access, but it is only significant in the access divide model. Age is negatively associated with broadband access in the access divide model and not statistically significant in the multi-dimensional divide model. Similarly, education is positively associated with broadband access in the access divide model, but not significant in the multi-dimensional divide model. Attitude towards computers was positively associated with broadband access, but it is significant only in the access divide model. Location (city versus village) was the only variable that was a significant determinant of broadband access in both specifications of the model. Being located in a village significantly decreases the probabilities of having broadband access to the Internet.

Some variables related to the multi-dimensional view were also significant. For instance, the ability to speak English was positively associated with broadband access. PC use was a significant determinant of broadband access and the sign was positive. Finally, household size is positively associated to broadband access and the relation is statistically significant. The Cox and Snell R-square improved from 0.112 to 0.168 and the Nagelkerke R-square went from 0.231 to 0.346 suggesting that the additional variables in the multi-dimensional model have an impact on the percentage of variance explained. However, given the low numbers in both R-squares, it seems that other important variables are missing. Ferro et al. (2005) suggest that individual level variables have limited explanatory power in relation to broadband and more household level variables should be included in future studies.

Table 1. Determinants of Broadband Access – 2 Mbps and above (Dummy Variable)

Independent Variables	Access Divide Model	Multi-Dimensional Divide Model
Constant	-21.987 (<0.001)	-39.895 (<0.001)
Income	<0.001*** (12.656)	<0.001 (1.736)
Age	-0.032*** (23.769)	-0.010 (0.939)
Education	0.303** (4.717)	0.077 (0.243)
Attitude towards Computers	0.275*** (11.584)	0.128 (2.135)
Nationality (Italian = 1)	18.476 (<0.001)	17.949 (<0.001)
Location (Town = 1)	0.042 (0.013)	-0.270 (0.451)
Location (Village = 1)	-1.093*** (7.784)	-1.381*** (10.746)
Gender (Female = 1)	-0.402** (4.142)	-0.336 (2.593)
Other Language (English)		0.444* (3.266)
PC at Home		18.153 (<0.001)
PC Use		1.167*** (6.989)
IT Skills		-0.021 (0.010)
Household Size		0.231** (5.670)
Occupation (Employee = 1)		-0.070 (0.043)
Occupation (Self Employed = 1)		-0.122 (0.082)
Occupation (Unemployed = 1)		-0.155 (0.069)
Occupation (Other = 1)		0.020 (0.002)
-2 Log likelihood	740.095	651.262
Cox & Snell R-square	0.112	0.168
Nagelkerke R-square	0.231	0.346
Chi-square	161.144***	249.541***

Note: Wald-statistics are in parentheses under coefficient values. Those coefficients followed by * are significant at the10 percent level, those followed by ** are significant at the 5 percent level, and those followed by *** are significant at the 1 percent level.

Broadband and Internet Use

Following the three approaches proposed in the literature review, this section presents the results from several specifications of Internet use models and assesses the impact of broadband as one of the determinants. Overall, the multi-dimensional divide model has greater explanatory power and untangles the complex relationships in a more specific manner. Table 2 presents the results of three models using the extent of Internet use as the dependent variable. The extent of use is represented as the number of activities an individual performs using the Internet. The first regression model is based purely on the access divide view and therefore considers Internet access (including broadband 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, instead of assuming that they are determinants of access only. Finally, the third model incorporates additional variables related to the multi-dimensional divide view.

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*** (6.674)	-0.826* (-1.669)	-0.120 (-0.274)
Internet Access	2.660*** (31.250)	1.702*** (14.876)	1.417*** (8.914)
Broadband Access (2Mbps and above)	1.315*** (9.343)	0.832*** (5.185)	0.411*** (3.125)
Income		<0.001*** (2.656)	<0.001 (0.830)
Age		-0.022*** (-7.451)	-0.007* (-1.942)
Education		0.543*** (7.780)	0.138** (2.236)
Attitude towards Computers		0.249*** (7.851)	0.099*** (3.712)
Nationality (Italian = 1)		0.230 (0.700)	-0.057 (-0.212)
Location (Town = 1)		0.060 (0.299)	0.059 (0.361)
Location (Village = 1)		0.073 (0.366)	0.066 (0.406)
Gender (Female = 1)		-0.533*** (-5.805)	-0.279*** (-3.668)
Other Language (English)			0.189** (1.999)
PC at Home			-0.470*** (-3.373)
PC Use			1.158*** (9.291)
IT Skills			-0.099 (-1.026)
Household Size			-0.030 (-0.817)
Occupation (Employee = 1)			-0.060 (-0.357)
Occupation (Self Employed = 1)			-0.211 (-1.042)
Occupation (Unemployed = 1)			0.152 (0.654)
Occupation (Other = 1)			-0.171 (-0.834)
Individual Internet Experience			0.362*** (18.094)
Household Internet Experience			-0.088*** (-3.496)
R-square	0.395	0.541	0.703
Adjusted R-square	0.395	0.537	0.699
F-statistic	712.875***	156.939***	146.727***

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 important improvement in adjusted R-square, which went from 0.395 in the access divide model to 0.537 in the extended access divide model, and then to 0.699 in the multi-dimensional divide model. Internet access is positively associated with Internet use in all specifications. Broadband access is also significant and positively associated with extent of Internet use, even when controlling for access. Income is positively associated with Internet use in the extended access divide model, but becomes not statistically significant once controlling for other variables. Age is negatively associated with Internet use. Education and attitude towards computers are positively associated with Internet use. Being female is negatively associated with Internet use.

There were several variables related to the multi-dimensional divide that were significantly associated to Internet use. For instance, speaking English was positively associated with Internet use. Having a PC at home was negatively associated with Internet use, but individual use of a PC was positively associated with Internet use. Similarly, individual Internet experience was positively associated with the extent of Internet use, but household Internet experience was negatively associated with the extent of individual Internet use.

The models presented in this section represent two of the three approaches to understanding the digital divide and how they can be applied to the study of broadband access. The next sections go further, using different analytic techniques to look at the complexities of acquiring IT skills. In doing so, the analysis is an attempt to explore a multi-perspective model (derived from the spirit of the digital divide literature), where an individuals' preferences, skills, and aptitudes are highlighted. The combination of the three models together, is an effort to add to the empirical literature, for both broadband access and the digital divide.

Internet Use and Basic IT skill Acquisition

The adoption of broadband services has been linked to more intense, advanced, and varied uses of Internet applications. While the presence of this relationship has been documented in a multitude of studies (Carriere et al 2000, Horrigan et al 2001,Anderson et al, 2002, Dwivedi and Choudrie 2003a, Lebo 2001, 2003), the causal associations still remain unclear. This is similar to the multi-dimensional digital divide view that says access and use are both equally important. From a policy maker point of view, being able to understand to what extent the adoption of broadband leads to advanced Internet behavior or whether broadband adoption occurs only as a consequence of mature Internet usage, is key for the creation of effective broadband access and use policies. Although the answer probably lies somewhere in the middle – since it would be reasonable to assume the presence of a recursive two-way relationship – it may be worthwhile to investigate the issue further in order to have a deeper understanding of its dynamics.

The presence of basic IT skills – acquired either through formal or informal processes – may be considered an essential prerequisite for both advanced usage of the Internet and the adoption of broadband connections. In addition, the motivation for use (based on a person's perspective) may also be an important factor. For this reason, this section will start by exploring the process of basic IT skills acquisition and motivation for use among different user types.

The analysis below reveals a user typology representing three main types. The first type is characterized by 'a lack of' or 'very limited use' of the Internet and is labeled as none/sporadic users (51 percent of the population). The second group represents more regular use mainly based on information search and email exchange and is labeled as basic users (25 percent of the population). Finally, the last cluster of users demonstrate a much wider range of use including Internet applications that require fast connections (i.e. videoconferencing, VoIP, e-shopping, video-blogging and auctions) and is defined as advanced users (24 percent of the population). The last cluster reveals the concurrence of mature Internet behavior and the use of broadband-enabled applications.

If we go further and investigate how the different types of users acquired their IT skills some interesting details are exposed. For example, as showed in Figure 2 a good portion of IT skills acquisition appears to occur through an informal process of learning by doing. This is evidenced by the important role self-learning plays among both basic and advanced users. Moreover, this result does not seem to stem from regional considerations. Eurostat's recently published data on e-skills, in fact, shows that the percentage of individuals who obtained IT skills through formalized training in educational institutions in 2005 was as low as 20 percent (Eurostat, 2006).

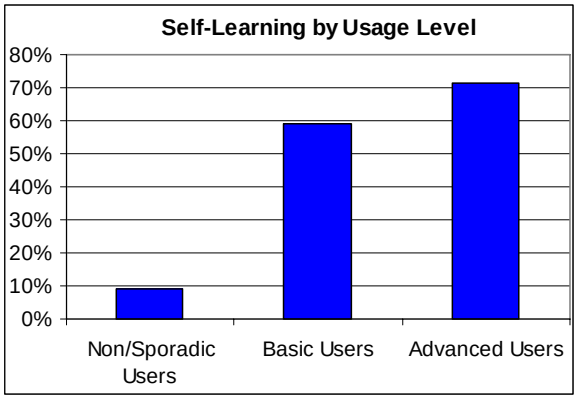

Figure 2. Basis: All Respondents

But the graph above does not simply show the importance of informal and self-learning. It also suggests the presence of different approaches to technology adoption and usage or user's motivations. Thus it suggests that a correct interpretation of the relationship between broadband adoption and mature Internet usage may require us to consider a number of different individual perspectives. This adds support for looking at the presence of a multi-perspective divide as documented in the literature and discussed in section 2.3. In other words, it seems plausible to assert that the presence of a significant level of self-learning in basic and advanced users renders the availability of broadband an enabler or represents the strategy of "engaging the engaged". For none or sporadic users, instead, the acquisition of IT skills through formal IT training seems to play a more important role in moving users toward more mature usage.

The evolution of the users' distribution over time to a certain extent supports the thesis unfolding above by showing the presence of two different maturation speeds between clusters. Figure 3 shows the distribution of user types for the years 2004 and 2005.

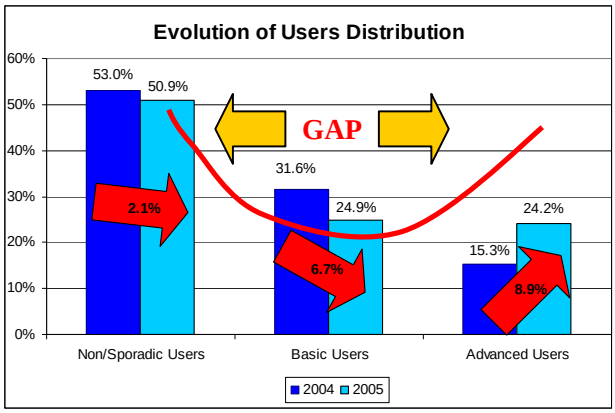

Figure 3. Basis: All Respondents

The presence of a U-shaped distribution is noticeable. The fourfold difference between the migration rates from basic users to advanced users and the one from sporadic users to basic users represents a clear signal. While part of the population is gradually progressing along the information society path, another significant portion is struggling (or is not motivated) to join this development process. The increase in the digital valley between different users represents a serious hurdle in the process of e-inclusion envisioned by recent strategic plans issued at the European level. A possible explanation of this phenomenon is the presence of positive and negative feedbacks in what has been defined as a "networked society" (Shapiro & Varian 1998) These concepts, mainly presented in the literature in relation to companies' performance, may be applicable to Internet users' behaviors as well.

From a policy standpoint, a counterbalance to the polarization created by positive and negative feedbacks may be necessary. This could happen through policies that produce flattening effects on the user type distributions. Such policies would require actions aimed at fostering the enlargement of the total Internet population, thus contributing to increase the migration rate from non users to basic users. In order to do this, policy-makers need to gain a better understanding of the different motivations and socioeconomic and demographic characteristics of the different user types in order to devise ad hoc actions tailored to the specific user types where they want change to occur.

FUTURE TRENDS

The analysis conducted above highlights three different types or levels of inconsistencies: (1) inconsistency in coverage, (2) inconsistency in adoption, and (3) inconsistency in usage. This categorization is not exhaustive and provides only a partial view of the whole phenomenon. Other authors have proposed to describe the phenomenon from different (and not necessarily opposing) points of views (i.e., Van Dijk 2005). Nevertheless, it is a useful starting point to discuss the evolution of the issues that national and local policy makers will have to deal with as time continues (and most likely, in the near future).

The coverage inconsistency has to do with the necessity to find new and more cost effective ways to deliver broadband services to rural areas or, more generally, to less

densely populated areas. Although currently this type of divide clearly represents a pending issue for policy makers, it is bound to decrease in importance as penetration increases. As a matter of fact, technological progress, which is led by companies racing for a competitive advantage, is significantly driving down infrastructure-related costs, but this trend is not uniform for all locations. Specific policies and programs may be needed in order to solve this important element. Coverage is a necessary, but not sufficient condition for adoption of broadband access and meaningful use of the Internet.

The second type of inconsistency has to do with the low demand levels in served areas. This may be attributable to a multiplicity of factors; however, not all factors can be addressed by local or national policy makers. Nevertheless, government action should be aimed at breaking the feedback loop between the lack of demand and the existence of broadband-related services that currently hinders the creation of more broadband-related activities. For instance, the fact that the ability to speak English has a significant positive impact on broadband access suggests that the content for meaningful uses is limited in other languages. Some policies and programs could promote the creation of meaningful content in specific languages.

In the medium/long term, inconsistency that should concern policy makers the most is usage. As a matter of fact, the analysis presented above shows a polarization trend, leading to a "U" shaped distribution with a clear separation between none/sporadic users and advanced users. The situation calls for measures that will produce a flattening effect on the distribution. A good starting point may be accounting for the importance self-learning plays in the acquisition of necessary IT skills, in addition to recognizing the presence of complementary skills. Digital divide policies should take into consideration the differences and similarities among social groups and have target programs for different types of users. Some people need training, others need motivation (meaningful content and transactions) and opportunities to experience the potential of using the Internet for a broader range of activities.

The models discussed in this paper are cumulative. First, the findings and literature suggest that access to technology (i.e., computers) is important, as is, access to the Internet (broadband or not). Then, the second model and literature finds that broadband access is an important element, but another important factor is use. This builds on the idea that it is not just about access, but also about how individuals use the Internet. Access to broadband is a category of access to the Internet and it is suggested that a better connection allows for more extensive and sophisticated use. The third model, a multi-perspective model says, once you have access and use, meaningful use depends on the context of the user and their level of skill, overall motivation for using the medium, and the expected benefits perceived. Therefore, any meaningful development of comprehensive policies needs to address concerns highlighted by all three models.

FINAL COMMENTS

In general terms, the research presented in this article recognizes that the digital divide is a complex phenomenon transcending simple information access problems. Broadband access is an important determinant of the extent of Internet use and, therefore, its

diffusion could potentially have a significant impact on social and economic development. However, broadband access is only one of the important factors to take into consideration. Age, education, gender, attitudes toward computers, the availability of the necessary equipment, and previous experience are also important aspects contributing to the complexity of this phenomenon. If the main goal is to increase Internet use and the value for individuals and jurisdictions, policy-makers should consider integrative strategies that include not only broadband diffusion mechanisms, but also some policies targeted at some of the other dimensions of the problem.

Even when thinking about broadband access as the goal itself, there are still many factors that need to be taken into account. In fact, this study provides evidence of the importance of multiple determinants of broadband access such as location, ability to speak English, household size and familiarity with PCs. Consistent with previous research, this study found that location is important and individuals living in villages are less likely to have broadband access. In addition, individuals who can speak English, which is the language of a great number of Web sites, are more likely to have broadband access. In addition, the language difference may indicate, to certain extent, the value that the Internet has for individuals; the more Web sites an individual is able to use in meaningful ways, the more this individual is willing to invest in better ways to use the Internet, including broadband access and IT training.

In addition, different approaches to basic IT skills acquisition emerged and uncovered factors that influence diverse usage levels. In fact, about one-fourth of our respondents are advanced users (many of them also broadband users), about twenty percent are characterized as basic users, while the remaining fifty percent make sporadic use of the Internet or do not use it at all. Moreover, the analysis carried out over a two-year period depicted the presence of a widening gap in terms of Internet use between none/sporadic users and advanced users. Taking into consideration that Internet use is fundamental for individual and jurisdictional development, national and local policy makers should direct part of their efforts to offset this usage polarization, which in fact may be related to broadband access among other factors. In order to do so, understanding how people approach and use technology and the different paths leading to the acquisition of the necessary IT skills represents one fundamental aspect.

A careful and close management of the evolution of digital gaps by policy makers seem to be desirable and necessary. At the same time, attention should be put toward avoiding technological deterministic approaches aimed at fostering technology adoption and use *per se*. Rather, the use of technology should be positioned as an important enabling tool supporting individuals in their main everyday activities (production, social, political, consumption, savings activities) (Selwyn, 2003). Hence, this should translate into opportunities to re-frame public policy debates and direct attention to the problems from a multitude of perspectives. Broadband access may significantly impact some aspects of the problem described throughout this paper, but it is only one element in a much more complex web of social, economic, and political issues.

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KEY TERMS AND DEFINITIONS

Access Divide: a common viewpoint which assumes that the digital divide is a symptom of an 'access to technology problem' and as an inherent delay in the diffusion of technology among different geographic areas and social groups.

Digital Divide: often characterized as set of relationships between information and communication technologies (ICTs) and groups of individuals, who are situated within a complex arrangement of social, environmental, political, and economic issues. Popularly, the term itself, digital divide, carries the connotation of those who have access to technology and those who do not have access to technology.

Hiperlan: (HIgh PErformance Radio LAN) is a Wireless LAN standard. It is a European alternative for the IEEE 802.11 standards (the IEEE is an American organization). It is defined by the European Telecommunications Standards Institute (ETSI). In ETSI the standards are defined by the BRAN project (Broadband Radio Access Networks)

IT Skills: IT skills is a varied concept, ranging from skills describing information-retrieval and searching activities to skills regarding the synthesis of information and productive use of information in daily activities.

Multi-Dimensional Divide: a competing viewpoint which assumes that the digital divide is a mirror of other types of socioeconomic inequalities and suggests access and use are important determinants of the digital divide. In addition, other dimensions such as income, age, education, location, and IT skills impact access and use.

Multi-Perspective Divide: a competing viewpoint which rejects that any one group of individuals inherently use technologies differently than the majority and suggests any questions about access and use should be evaluated based on the needs and problems of the most disadvantaged groups, in addition to how the intersections of race, gender, class, worldview etc. come together.

Systemic Approach: accounting for the interactions and interdependencies present among a number of items forming a unifying whole (broadband diffusion).