

E-PROCUREMENT, ADOPTION IN THE NON-PROFIT SECTOR USING ENDOGENOUS METRICS

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ABSTRACT

This paper analyzes Internet diffusion among various organizations, based on daily observation of second-level domain name registrations under the “.it” ccTLD. In particular, we analyzed domain names registered by organizations in the non profit sector. The penetration rate, calculated according to the number of organizations, was computed for various widely separated geographic levels (regions). Regression analysis was performed using demographic, social, economic and infrastructure indicators. Results show that a “social digital divide” exists, both in terms of geographical distribution (i.e., in macro-areas – Northern, Central, and Southern Italy - and at the regional level) and in terms of the legal status of the organizations.

KEYWORDS

Domain names, Digital Divide, Internet Diffusion, Non Profit Organizations.

INTRODUCTION

According to the economics literature, the Internet is expanding very rapidly (Coffman, Odlyzko, 2001). In this light, our study aimed to verify whether organizations that are not dedicated to making profits are also taking advantage of the new technology. Why the non profit sector? The non profit phenomenon is growing rapidly and can no longer be considered a marginal sector. This statement can be verified by comparing the number of institutions present in Italy in 1991 and in 1999; according to the ISTAT census of August 8, 2001, the number of non profit organizations active in Italy came to 221,412 compared to 54,000 in 1991 (Barbetta, 1996). The non profit sector has also been a focus of attention for public opinion as well as scientific study. Over the years, many Italian laws have been passed to protect various categories of non profit organizations, such as Benevolent Funds (Law 112/1980), volunteer organizations (Law 266/1991), social cooperatives (Law 381/1991), societies for social action (Law 383/2000), and bank foundations (Financial law of December 28, 2001). Several metrics are available to measure the diffusion of the Internet. The most suitable are the so-called endogenous metrics which can be “obtained in an automatic or semiautomatic way from the Internet itself” (Diez-Picazo, 1999). These metrics have the unquestionable advantage of accuracy; according to the literature the most frequently used are Internet hosts (based on hostcount procedures (see studies published by Internet Software Consortium or da Ripe¹) and second-level domain names (Naldi, 1997; Zook, 1999; Bauer, Carleen and Maitland, 2002). To measure the analysis of the internet diffusion in the non profit sector in Italy, we have used the endogenous measure of second-level domain names registered under the ccTLD “.it”, managed by the Institute of Informatics and Telematics of the Italian National Research Council, and located in Pisa. Aside from the advantages offered by endogenous measures, there are also a few disadvantages, since they tend in some cases to underestimate and in others to overestimate the phenomenon under study (Zook, 1999, 2000, 2001). Overestimation can occur when the number of hosts is used, often associated with IP addresses, while if we consider the number of domains registered more than one domain might be associated with the same registrant. Underestimation can occur because not all internet users register a domain name under their own ccTLD, and in many countries the regulations allow foreign citizens to register under their own ccTLD². In the case of hosts, underestimation may be due to the increasing presence of firewalls and private networks (Intranet) and the use of dynamic IP addresses, increasingly accompanied by new tools for access to the Net (for example, mobile phones). In spite of these disadvantages, the numbers of hosts and Internet domains are the principal means used for analyzing Internet diffusion.

¹ <http://www.ripe.net/statistics/hostcount.html>

² For example, Italy allows organizations and citizens of in the European Union countries to register under the “.it” ccTLD

METHODS

The Institute of Informatics and Telematics (IIT-CNR), which manages the “.it” ccTLD Registry, is conducting a study to analyze the diffusion of Internet use in Italy. Data were extracted from the databases³ of the registrations managed by the IIT-CNR, using automatic and semi-automatic procedures. Approximately 550,000 domain names have been analyzed and grouped into several categories (individuals, firms⁴, universities, associations, public groups and other registrants). Particular attention was focused on organizations such as associations, foundations, committees, and other corporations, in order to analyze the adoption and diffusion of Internet technology in the non profit sector. Our study showed that Internet diffusion in the non profit area is growing very quickly, and can no longer be considered a marginal phenomenon.

Domain names were divided into various categories. A preliminary classification was based on registrations by individuals, companies, public administrations, universities, associations, and so on. To determine the legal category of organizations in the non profit sector, a check was performed for each corporation in order to obtain its corresponding status, by using the registered domain addresses, and then accessing the related Internet sites. The search for non profit corporations was anything but simple⁵ (Salomon e N.K. Anheier, 1994, 1996, 1997) since in Italy there is neither a unique definition nor a law explaining clearly and concisely the necessary requirements for a person or group to be considered “non profit”, as in the USA (Barbetta, 2000, Cima, Zamano, Barbetta, 2003). Not all organizations publish their statutes on their Internet site, so they were contacted directly by e-mail and their legal category was requested. Some organizations kindly provided a prompt response to the request, while others never replied at all.

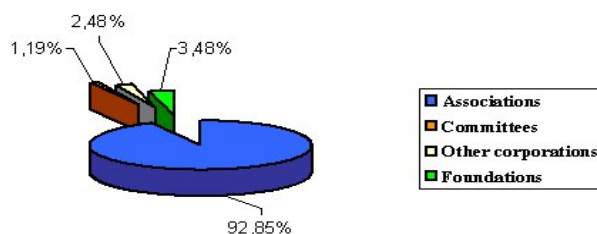
Based on this research, and in accordance with the juridical literature (Bacchiega, 1996, Fazzi, 2000, Propersi, 2001), organizations in the non profit sector were divided into four categories: associations, including recognized associations (for example, assistance associations, recreational organizations, sports associations, associations offering health services) and unrecognised associations (i.e., trade unions, political parties); committees (i.e., committees to organize the feasts of patron saints); foundations (foundations managing theatres and museums, bank foundations, private universities); other corporations (for instance, institutions supporting the clergy, state-recognized ecclesiastical institutions, private schools, and moral corporations).

Moreover, to reduce the aforementioned disadvantages regarding the overestimation of Internet diffusion when using domain names as a yardstick (in other words, if an organization has registered multiple domain names) only the first one registered in the order of data has been taken into account.

RESULTS AND DISCUSSION

According to our research, the number of domains registered by non profit corporations as of September 7, 2001 was 14,749; 13,682 of these were registered by associations, 175 by committees, 366 by “other corporations”, and 512 by foundations. Fourteen domains were not classified, either because it was impossible to determine the area to which the corporation belonged, or because they were registered by corporations whose legal headquarters were abroad. As shown in Figure 1, the 92.85% of the domains registered by non profit corporations was represented by associations (13,682 of 14,735); foundations attained a percentage of 3.48%, the category “Other Corporations” a percentage of 2.48%, and finally, committees showed a percentage of 1.19% (175 domain names registered, of the total number 14,735).

Figure 1: Percentage of Domains Registered by Non profit Corporations



³ Database Whois, Database of the state of the registrations, Database of the Letter of Assumption of Responsibility

⁴ The database of Italian firms managed by Infocamere was used for classification.

⁵ For the search for institutions belonging to the non profit sector, we utilized the structural-operative definition introduced by several scholars participating in the research project of the Johns Hopkins University of Baltimore to compare experts and operators of different countries. The definition is based on three criteria: an organization can be considered non profit that are formally founded; private: and are not subject to any restrictions on distribution of funds

The greater diffusion of associations on the Net may be due to the fact that in Italy associations are more common than other categories. One of the reasons for this diffusion may be linked to the fact that associations, unlike other juridical forms, can support any purpose of a non-economical nature, as long as it is not forbidden by penal law (art.18 Cost. Italiana). In Italy unrecognized associations are especially widespread; in fact, all the most important examples of the association phenomenon and of these, the political parties (72.4%, according to the ISTAT survey) and the trade unions (75.8%, according to the ISTAT survey) prefer the form of an unrecognized association (Galgano, 2000, De Giorgi 2000). In fact, the lack of any public control permits them considerable expression of the freedom to associate (art. 18 Cost. Italiana). According to the ISTAT survey held on August 8, 2001, which is compared to 1999, associations represent 91.3% (27.7% recognized associations and 63.6% unrecognized associations) of the entire non profit sector, 1.4% belonging to foundations, 5.7% to "Other Corporations", and 1.7% to committees.

In order to analyze Internet distribution in the non profit sector at the geographic level and in terms of the legal status of the organizations we used as metrics the penetration rates (N of registered domains /Number of non profit organizations). Italy was subdivided into 20 regions. Of these 20, Lombardy and Lazio registered greater penetration rates than the other regions. At a macro-area level, the related penetration rates of each legal category presented higher values in Central Italy than in the North and South. In Central Italy, the average penetration rate recorded by associations for the entire observation period was 935.09, which is greater than both the rate in the North (699.41) and that recorded in the South (440.70). In the "Foundation" category, the average penetration rate recorded is much greater than that in the other categories. In fact, this was 2,246.07 in Central Italy, 1,698.33 in the North, and 1048.95 in the South. On the contrary, the average penetration rate recorded for committees in the North was 456.56 every 10,000 committees, whereas it was equal to 797.02 in Central Italy and 359.20 in the South. Finally, the "Other Corporation" category reached an average penetration rate recorded as 697 in Central Italy, whereas it reached values of 431.27 in the North and 337.57 in the South.

These data confirm that in the various legal categories as well as at a regional and macro-area level (North, Center, South), a digital divide does indeed exist.

FACTORS THAT CAUSE THE DIGITAL DIVIDE

The study has attempted to discover the factors (as illustrated in the following tables) that can determine the presence of the digital divide in Italy at a regional level.

With that intention the stepwise regression was utilized, using as a dependent variable the penetration rate (Table 1).

In the stepwise regression the independent variables are inserted in the equation if the F probability is of ≤ 0.050 while they are removed from the equation if the F probability is of ≥ 0.100 .

Independent variables have not been normalized.

The aim of regression was to identify the variables that most clarify variability at a regional level. Table 1 shows 6 some models where stepwise regressions are analyzed by taking into consideration economic values, values related to education, social values, demographic values, technological values and values related to the availability of public infrastructures.

Table 1. Stepwise regression taking the registered penetration rate as a dependent variable (Standard error in parentheses)

*P-value < 0.05 **P-value < 0.01

<u>Variables</u>	<u>M1: Economic</u>	<u>M2: Education</u>	<u>M3: Social</u>	<u>M4: Demographic</u>	<u>M5: Technological indicator</u>	<u>M6: Public spending</u>
Big firms percentage	423,470 * (154,051)					
Added value per employee	0.000* (0.000)					
Number of providers/maintainers every 100 firms		27,987** (9,537)				
Spending for theatrical and music performances			4,273E-05** (,000)			
Population				8,615E-07** (,000)		
Number of family unit components				-5,775** (1,647)		
Spending for IT investments related to the number of firms					1,015** (,281)	
Spending for public housing construction						2,115E-06** (0,001)
R ²	,665	,336	,519	0,634	,420	,773

In determining the factors contributing to the existence of the digital divide at a regional level in the non-profit world, we not only analyzed the variables referred to in table above. The table shows the variables that significantly express variability at a regional level. The rest of the variables analyzed proved to be scanty significant and have been removed from the models observed.

For example in Model 1 that takes into consideration economical indicators as dependent variables, the only two significant economic variables that better explain Internet diffusion in the non-profit world, are the percentage of big firms within Italian territory and the added value per employee. The rest of the examined variables, for example in Model 1, such as total income, the number of patents in proportion with the number of firms and per capita income have been removed from the equation of the stepwise regression line as scanty significant.

What have been stated previously can be demonstrated through the analysis of tables 2 and 3. The Anova table (table 2) shows that on the whole model 1, taking into consideration only the two economic variables, proves to be significant as we can see from the significance value that corresponds to the F statistics.

Table 2. ANOVA(c)

Model		Sum of the squares	df	Mean of the squares	F	Sig.
1	Regression and	82,298	2	41,149	16,860	,000(b)
	Reminder	41,490	17	2,441		
	Total	123,788	19			

b Coefficients: (Constant), Percentage_big_firms, Added_value_per_employee

c Dependent variable: Penetration

Table 3. Coefficients (a)

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Error std.	Beta			Tolerance	VIF
1	(Constant)	-6,766	4,551		-1,487	,155		
	Big_firms_percentage	423,470	154,051	,487	2,749	,014	,627	1,594
	Added_value_per_employee	,000	,000	,421	2,373	,030	,627	1,594

a Dependent variable: Penetration

Furthermore, from the standardized coefficients column we can observe the fact that the percentage of big firms in a region has more influence on the variation of the penetration rate than the variable added value per employee (beta is equal to 0.487 compared to 0.421). Finally, we can observe that the VIF values expressing the multicollinearity index are inferior to 2, this points out the existence of a moderate multicollinearity. The existence of a possible high multicollinearity would involve a change of the values of the calculations of regression coefficients as a consequence of slight modifications of the observed values, of a cancellation or addition of some explicative variable, of addition of new observations.

As shown in table 1 a good adjustment of the studied models does not come only from the analysis of the economic variables but also the demographic variables and public expenditure acquire an important role (R^2 is equal to 0.665, 0.634, 0.773 respectively).

In model 4 the single accurate evaluations of regression coefficients (population and number of family unit members) prove to be all significantly different from zero for $\alpha = 0.01$ (see table 1). The variable "population" shows a direct relation with the penetration rate as can be inferred from the positive sign (beta = + 0.649) by observing the standardized coefficients column while the variable "number of family unit members" shows an inverse relation with the penetration rate (beta = - 0.516) (see table 4).

Table 4. Coefficients (a)

Model		Unstandardized coefficients		Unstandardized coefficients	t	Sig.	Collinearity statistics	
		B	Error std.	Beta			Tolerance	VIF
4	(Constant)	18,952	4,311		4,396	,000		
	Population	8,615E-07	,000	,649	4,412	,000	,994	1,006
	Number_family_unit_members	-5,775	1,647	-,516	-3,506	,003	,994	1,006

a Dependent variable: Penetration

Even model 4 variables show a VIF value not superior to 2, this means that there is no multicollinearity, as we can see from the values shown in table 4.

By observing the studied models we can infer that a significant variable that better expresses the penetration rate variation is represented by public expenditure for housing investments ($R^2 = 0.773$). The correlation between this variable and the registered penetration rate proves to be high and significantly different from zero (beta is equal to 0.879) this means that non-profit organizations that have their registered office in regions with higher public investments in housing are more inclined to exploit the advantages deriving from Internet technology.

Although model 5, that takes into consideration IT investments made by regions, proves to be significant, the adjustment degree of the model is not very high (it explains the 42% of the total variability). The relation between the penetration rate and the technological indicator even if it is positive and significantly different from zero at a 0.001 level proves to be inferior than the variable "public expenditure for housing investments" (beta is equal to 0.648 against 0.879). These results are not in line with economic literature (Guillén and Suárez, 2001; Kiiski and Pohjola, 2002; Chinn and Fairlie, 2004), which declares that technological indicators are important factors in determining the existence of digital divide.

Another fact that, according to us deserves attention is the variable spending for theatrical and musical performances. Model 3 that shows this factor proves to be significant and better illustrates the penetration rate variation than the above described model 5, ($R^2 = 0.519$ against $R^2 = 0.420$). According to economic literature (Florida 2002) there's a strong correlation between technological indicators and indicators that point to cultural activities. In fact, according to Florida, U.S. cities that have experienced the highest rate of growth in the '90s are those that combine strong technological activity, exciting social environment, and tolerance to deviance. These factors are attractive for the so-called creative class, i.e. the growing sector of the economy working to creative tasks, from research to design, from consultancy to advertising.

Our study seems to confirm this trend in fact the correlation between the registered penetration rate and the cultural indicator proves to be positive and significantly different from zero and equal to 0.720 (beta = + 0.720).

CONCLUSION

In conclusion the presence of the Internet in various social activities and economic and political areas indicates a serious problem: the existence of a digital divide both in terms of geographical distribution (i.e., in macro-areas – Northern, Central, and Southern Italy - and at a regional level) and in terms of the legal status of the organizations. As our research shows, in Italy this divide is determined by various factors: regions with an efficient and service-oriented production system, a lively cultural scene and with higher investments in public works are more inclined to use the new technology.

Also, in line with several authors in economic literature (Freeman e Perez 1986, Abramovitz e David 1996, Barro 1997) who have emphasized that international growth differentials depend on organizational and institutional factors, rather than on the direct and immediate effects of technology, the study has also shown that the internal differentials of a country (in this case, Italy) depend more on cultural and social factors rather than the number of infrastructures.

FURTHER DEVELOPMENTS OF THE RESEARCH

In the future we would like to broaden our research by updating the data to the year 2005, this study is already in progress. Furthermore we would like to verify, by making a comparison with the results illustrated above, if those who are more inclined to use the new technology today, in the future will reach a first level of saturation and the network will also spread among those who are disadvantaged in terms of accessibility and costs.

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