DIGITAL DIVIDE SURVEY ANALYSING THE ".IT" REGISTRAR MARKET

Maurizio Martinelli, Michela Serrecchia and Irma Serrecchia
Institute for Informatics and Telematics, Italian National Research Council, Via G. Moruzzi, 1, Pisa, Italy

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Abstract: In this paper the identification of factors contributing to the differences on Internet use (digital divide) in Italy, during recent years, was reported, focused on the analysis of the market of "Registrars" in the domain name registration field. In particular a comparison between the results of a similar study, done until December 2005, and the data of domain names registered by "Registrars" up to December 2010, was carried out. In Italy, the registration of a new Internet domain name is usually made through a service company (Registrar) accredited by the National Registry, where all data related to such registration are managed. In order to analyse the diffusion of the Internet in Italy, the number of Registrars and the number of registered domains were used as indicators. To define the factors that determine the digital divide the regression multiple model was utilized, based on the stepwise method. The dependent variable taken into consideration was the penetration rate at the regional level and the independent variables were regional economic, cultural, demographic and technological factors. Above all the regions with a low unemployment rate and with high economic values, such as added value per employee and high per capita income, are more inclined to use the network. Furthermore, the level of education resulted a decisive factor: as a matter of fact, regions with a high number of graduates, specialized in ICT fields, are more inclined to utilize the Internet technology than those that register a number of ICT graduates below the average. Finally, an interesting result was that, in Italy, a few Registrars register a higher percentage of domain names under the Country Top Level Domain ".it". The phenomenon of the registration of domain names is concentrated in the hands of a few Registrars. This aspect was significantly evidenced in 2010.

1 INTRODUCTION

Web has undeniably entered our everyday life forcefully, ceasing to be an instrument used by a limited circle of academics to become a new and versatile example of mass media. According Rogers (2005) there are five attributes which, on average, are considered as the most influential for speed of adoption of a technology across different types of users: relative advantage, compatibility, complexity, trialability and observability. Any increase in the relative advantage over the previous technology, the compatibility of the new technology with the needs of potential adopters, the ability of adopters to experiment with the new technology and the ability of the users to observe the new technology, are all attributes that will speed up the diffusion process. Although Internet has become a worldwide protagonist of our days, it is not geographically uniform among countries, as well as within a country. For example Greenstein and Price (2004) reported that people living in rural areas might find greater relative advantages from the use of the Internet than people living in urban areas. Furthermore, according to Strover (2001), low Internet adoption is caused not only by factors such as lower education and income levels, but also by socio-economic factors and by low levels of technological knowledge. Based on the above consideration, this work wanted to verify if in Italy it is possible to sub-divide Internet users on the basis of the categories proposed by Rogers (1995) for the generic diffusion theory of a technology: innovators, early adopters, early majority, late majority, and laggards. For this purpose, the Internet diffusion in Italy was analyzed by using as indicator the number of companies (Registrars) that offer, as a service, the registration of domain names under the country code Top Level Domain (ccTLD) ".it". Furthermore, in this paper the factors contributing to the differences in Internet use (digital divide) in Italy at a regional level were defined by verifying the effects on the

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adoption of some local socio-economic hypotheses.

2 METHODS

In order to analyze Internet diffusion in Italy, the number of Registrars registered up until 31 December 2010 were used as an indicator. The data were extracted from the databases managed by the National Registry, at the Institute of Informatics and Telematics of the National Research Council in Pisa (IIT-CNR). The database managed by IIT-CNR until the above date, counted 1,842 Italian Registrars. The choice of using Registrars as indicators instead of, for example, the number of domain names, which is one of the indicators most used in the literature (Zook, 2000; Bauer et al., 2002) together with the hostcount (see studies published by Internet Software Consortium or by RIPE-NCC (Réseaux IP Européens - Network Coordination Centre) derived from the fact that the number of Registrars is an indicator that appears to be more effective in order to identify the real extent of the Internet phenomenon in Italy. In fact, Registrars, in addition to registrating domain names, can supply other services related to Information and Communication Technology (ICT), such as Internet connectivity, selling of hardware and software products, electronic mail services, website design, and so on. This research intended to achieve two main goals. The first, was to analyse the extent of the Internet phenomenon in Italy, through which it is possible to compare the Italian situation with the international one and, therefore, to identify the situation of Italy within the international ranking of Internet use. The grouping of data at regional level allows comparison of the penetration rate of registrars in single geographical areas and measures the possible technological gap (the so-called digital divide). Moreover, it defines the factors that cause the digital divide in Italy. The second purpose of this research was to compare the market of Registrars in the domain name registration field until December 31, 2010, with that resulted at December 31, 2005. The comparison was made both to verify if, in the considered 5 years, the market situation of the Registrar was the same, and to see if there was an effect due to change in the system of registration of domain names. In September 2009, the synchronous system in the registration of domain names ".it" entered into force. Before September 2009, the domains were registered with an asynchronous system. It is necessary to highlight that in this research only data concerning the number of registered domain names ".it" were examined. Some Registrars, as matter of fact, focus their business on other types of services such as the xDSL access supply for retail customers, hardware and software sales, VoIP (Voice over IP) services or e-commerce and so on. The indicator used to identify in detail the existence of the digital divide in Italy at the regional level, was the penetration rate (PR). These entries allowed to analyze in detail the existence of digital divide in Italy at local level and also in macro-areas (North, Center, South). As penetration rate, the ratio between the number of Registrars and the number of companies existing in Italian national territory was used:

$$PR = (\text{number of registrars} / \text{number of companies}) \times 10'000 \quad (1)$$

3 RESULTS AND DISCUSSION

The analysis based on the proposed methods showed that in Italy, in the analysed period, only some regions registered the highest penetration rates. In particular northern and central regions registered penetration rates greater than one (see Table 1). Southern region, resulted all below the tenth position, demonstrating the presence in Italy of a digital divide.

Table 1: Internet distribution: the first ten Regions are ordered on the basis of the number of Registrars per 10'000 firms (PR).

Ranking PR	Region	Area	Registrars	PR
1	Trentino Alto Adige	North	60	5.87
2	Lombardy	North	459	5.57
3	Friuli Venezia Giulia	North	45	4.57
4	Tuscany	Centre	166	4.52
5	Umbria	Centre	34	4.06
6	Piedmont	North	170	4.03
7	Latium	Centre	178	3.85
8	Emilia-Romagna	North	154	3.59
9	Veneto	North	160	3.49
10	Liguria	North	49	3.43
	Italy		1,842	

In order to reach the second purpose of the study, the concentration of the number of domain names registered by Italian Registrars in the different regions, were identified by using two concentration indexes: the Herfindahl-Hirschman index (HHI)

(Hirschman, 1964) and the Gini concentration index (Gini, 1912). The HHI index, widely used in literature, measures the degree of competition in the market. Considering an industry with N firms it is possible to measure the market share of each firm, HHI is calculated by adding the square of the market shares of each firm as:

$$HHI = \sum_{i=1}^{N} S_i^2 \quad (2)$$

where S_i are the market share of each firm measured in percentage terms. For example, in the case of a market formed by four firms with shares respectively of 30%, 30%, 20%, 20%, HHI is equal to 2600 ($30^2 + 30^2 + 20^2 + 20^2$). The index is structured in a way that it increases both when the number of firms in the industry decreases and when the gap between firm size widens. An HHI index lower than 1000 indicates a market that is close to a competitive context. The markets in which HHI ranges from 1000 to 1800 are usually considered moderately concentrated. If HHI is greater than 1800, the degree of monopoly power becomes more significant.. The HHI index, calculated for Registrars at national level at the end of 2010, resulted in Italy 1,389.92. The index, compared with data of 2005, resulted increased, because both the number of Registrar decreased and the number of registered domains increased. Therefore it is not possible to talk about monopoly, and moreover the number of firms at national level proves to be high (1,842 Registrars). The Gini concentration index, unlike HHI, is a standard index, which ranges from 0 to 1. The Gini index is equal to 1 in case of maximum concentration (this happens when, for example, considering income distribution in a country, only one individual earns the entire amount of income), while it is 0 in a situation of even distribution (all individuals earn the same level of national income). Given its feature, that index is widely used in statistics literature because it renders better the concentration measurement in concrete situations and it is specially suitable for comparing the degree of concentration among heterogeneous situations. The Gini index at national level was calculated on the basis of the number of registered domain names, and it resulted 0.91, and so higher than in 2005, indicating that it is not possible to state that, in Italy, only one Registrar registers all the domain names under the ccTLD ".it". However, the value 0.91 is justified by the fact that only 10 registrars out of 1,842 register 63.83% of total domain names. In 2005, 10 registrars out of 2,552 registered 46.30% of domain names. Therefore both the indexes show that the concentration of domain names registered by Registrars, from 2005 to 2010, was increased. The analysis of concentration resulted more clear when, in particular, the three macro-areas North, Center and South were analyzed. In all three areas, both indexes are increased (Tables 2 and 3. However, especially in the Centre of Italy, the Gini index and the HHI in 2010 increased considerably**.** In particular, HHI increased almost twice, comparing data of 2010 with those of 2005. This depends on the fact that, in such period, the number of Registrars of the Center decreased while the number of registered domains increased, and also because the gap among Registrars in the registration of domain names increased. In fact, in 2010 the Range (the difference between the minimum and maximum of domains registered by Registrars) is higher than in 2005 (Tables 2 and 3). The Gini index of 0.96, in 2010, indicated that only few Registrars register the total amount of domain names under the ccTLD .it. As a matter of fact, analyzing the data at an individual level, in the Center, only two Registrars out of 427 register more than 70% of domain names, 74.17% out of the total amount of domain names. In 2005, two Registrars out of 561 registered more than half the domain names, 55.10% out of the total amount of domain names. The North, on the contrary, is the region in which there is more competition compared to the other macro-areas and, as resulted, the two concentration indexes are lower than in the Center and in the South: the Gini is 0.80 and HHI is 228.78,

Table 2: Analysis of concentration of domain names ".it" registered by Registrars 31-12-2005.

Macro Area	Gini Index	HHI Index	Registrar	Domain names	Range
North	0.78	103.51	1575	334350	14313
Centre	0.93	1838.44	561	544874	210255
South	0.83	940.84	416	155275	39747
Italy	0.87	542.75	2'552	1034499	210255

Table 3: Analysis of concentration of domain names ".it" registered by Registrars 31-12-2010.

Macro Area	Gini Index	HHI Index	Registrar	Domain names	Range
North	0.80	228.78	1101	486322	43183
Centre	0.96	3468.80	427	1118659	617753
South	0.86	1190.19	314	181109	42942
Italy	0.91	1389.92	1'842	1786090	617753

in 2010. Even if the HHI results to be higher than 2005, since the Registrars have registered more than

Table 4: Determinants of internet diffusion.

Models	Variables	Coeff	t statistic	Standard error	Sig.	R^2
Economic (Model 1)	Per capita income	0.001	4.452	0.000	0.000	0.703
	Total added value	1.954E-05	2.272	0.000	0.036	
Cultural (Model 2)	Number of ICT graduates	0.003	3.249	0.001	0.004	0.370
Demographical (Model 3)	Unemployment rate	-0.599	-5.969	0.100	0.000	0.733
	Population	7.119E-07	3.768	0.000	0.002	
Technological (Model 4)	Firms ICT every 1000 inhabitants	7.606	4.998	0.000	0.000	0.581

40% of domain names with respect to the situation in 2005, we cannot speak of a monopoly situation as in the Center. The data observed at an individual level, show that the first two registrars of the North register only 14.73% of domain names under the ccTLD .it, while in the Centre the two first registrars register more than 74.17% of domain names (see Table 3). In conclusion, in Italy a few Registrars register a higher percentage of domain names under the ".it". The phenomenon of the registration of domain names in Italy is concentrated in the hands of a few Registrars, and such aspect increased significantly in 2010.

3.1 Factors that Cause the Digital Divide

To define the factors that cause the digital divide, a multiple regression model was used, taking into consideration the penetration rate as a dependent variable (PR) at regional level, and economic, cultural, demographic and regional technological factors as independent variables. In this work, four models were defined, called Model 1, Model 2, Model 3 and Model 4, which take into consideration, as independent variables, economic factors, cultural factors, demographic factors and technological factors, respectively. The variables taken into account in this analysis were extracted from various sources (ISTAT - Italian Statistics Institute, G. Tagliacarne Institute and so on). The economic factors taken into consideration in Model 1 were: added value per employee; total added value; total income; per capita income; total amount of tourist businesses; firms with 250 employees or more; patents every 100 firms; entrepreneurial density every 100 inhabitants. In Table 4 are reported the only two economic variables that express the linear relation with the penetration rate: the total added value and per capita income. The remaining variables do not express in a significant way a linear relation with the penetration rate). This means that regions with a high per capita income are in the first positions in the Internet use ranking. Model 1 explained approximately 70% of total variability (R^2 = 0.703). The fit to the model proved to be good and significant. Model 2, based on the use of cultural factors as independent variables, took into consideration the number of ICT graduates; the number of graduates; the number of ICT graduates every 100 graduates; and the amount of employees involved in research and development. At the regional level, the only variable of Model 2 that expresses in a significant way the linear relation with the penetration rate resulted the number of ICT graduates (Table 4). However, the fit to the model is very weak and it explains approximately 37% of the variability of Internet diffusion at a regional level (R^2 = 0.370). Demographic factors taken into consideration in Model 3 were: population; percentage of men and women (to verify for example if regions with a higher percentage of men are more inclined to use the Internet than other regions that have a higher percentage of women); population density per Km^2; the total amount of foreign people at regional level; and unemployment rate. The statistical analysis showed that in Model 3, the significant independent variables are constituted by population and unemployment rate. The other variables analyzed in the model have been eliminated as scarcely significant. The results obtained are shown in Table 4. As expected, the correlation, β, between penetration rate and unemployment rate proves to be negative and rather different from zero (β = – 0.750), in accordance with the economic literature (Bimber, 2000). In order to define the technological factors that cause the digital divide in Italy, in Model 4 different indicators were taken into consideration: the degree of digitalization calculated as weighted average by the indexes of territory coverage of infrastructures and connectivity services, such as optical fibre and broadband (ADSL, HDSL, SHDL) (Assinform, Milano); the degree of ICT specialization measured through the ratio between the concentration of ICT employees and the concentration of employees of all productive

fields (Iuzzolino, 2001); the employees concentration index measured through the ratio between the number of ICT employees of the region and the number of national ICT employees (Iuzzolino, 2001); investments in information technology (IT) made by the regions, IT expenditure on the regional added value, IT expenditure per employed person. As shown in Table 4, in Model 4 the only significant variable resulted to be the "number of firms ICT every 1000 inhabitants". Such model expresses approximately 58% of Internet diffusion variability.

4 CONCLUSIONS

This research identifies a crucial issue: the continuity of a digital divide at local level. The penetration rate, calculated in relation with the number of Registrars, appear to confirm this trend. As in the previous period analyzed, few regions register the highest penetration rates. This is true, above all, for regions with a low unemployment rate and with high economic factors, such as high added value per employee and per capita income. Furthermore, regions that have a high number of firms specialized in ICT fields in relation to the number of inhabitants, are more inclined to use the Internet. Therefore, regions that are in the last positions in economic terms are also in the last position in technological terms. This is probably due to the fact that low economic development is also associated with a lower interest in new technologies and their adoption. Furthermore, our research shows that the concentration of domain names registered under the ccTLD ".it" is very high, in fact only few Registrars register the total amount of domains at national level, especially in 2010. Moreover a high rate of registrations results in those areas where competition is not present. The absence of competition was measured by the portion of domain names owned by Registrars in a given geographical area (North, Centre, South) and by the number of actors that supply ICT services (Registrars) in a given geographical area. Considering the macro-area level, the study shows that in the Centre, where the competition level is lower than the North and South (HHI index, the index that measures competitiveness in a territory, is greater in the Centre than in the North and South) the number of registered domain names is on average greater than the national average. These results appear not in line with Greenstein & Prince (2004) which affirm that is absence of competition, Internet Service Providers are less motivated to intensify their services. However, it is necessary to remember that, here, only the domain name registration service were taken into consideration. Registrars could be specialized in other types of services, like Internet connectivity, electronic mail services, website design, etc. Moreover, it must be underlined that areas that are more specialized in domain name registration are those presenting a competitive advantage, in terms of economics, culture and technology, over the others.

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