INTERNET: ACTUAL STATE AND DEVELOPING SCENARIOS

by

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Abstract

The phenomenon of internet diffusion reached an overall dimension of meaningful interest also for the traditional financial-economic environment. Stock exchanges in the whole world are highly influenced by the so-called "technological shares" and the attention paid to the Nasdaq index is overcoming that addressed to the more traditional Dow Jones in media headlines.

The evolution's speediness of the virtual environment can be observed also in the specific glossary, while words daily used since few months ago, as e-commerce or e-work, became quickly obsolete and substituted by the new emerging one: "e-business".

However, the internet environment seems to be absolutely unknown to the majority of people until today. As the matter of fact, the most simple elements and indicators of it are still unidentified, so it is impossible to know the real dimension of this phenomenon and it's potential growth until now. The consequence is that it is impossible any reliable forecast about the importance of the virtual environment even in short-medium term.

Some specific analysis about the primary indicators of internet diffusion seems extremely hard, due to the main characteristic of this phenomenon: the virtuality. The most simple operation, as enumerating the "population", is difficult while interacting with something that does not "physically" exist.

Nevertheless, some attempts to estimate the main indicators for this phenomenon supplied results that seems reliable, especially in describing the evolution from the origin until today. Viceversa, the attempt done about the future development seems to be too simple and obvious.

The main objective of this study is to systematise the data obtained from different sources and use those to develop short, medium and log term scenarios scenarios describing the future development of Internet.

Keywords

Internet
Scenarios
Services

Paper presented at

41th Congress of the European Regional Science Association

Zagreb, Croatia, August 29th – September 1st, 2001

1. Introduction

Internet and network linkages really seems to be the main protagonist during last years. Their presence continuously introduce in daily activities some changes with strong effects in the whole socio-economic environment. Economy, communication and people's habit are highly modified to deal the need of self adapting to the requests and opportunities offered by the new medium.

However, the general approach to the new medium is still at a superficial level, basically made by trivial perceptions linked to a lot of commonplaces and "metropolitan tales", in terms of the high pervasiveness of internet phenomenon.

The majority of actual users generally approached this new medium trying to integrally transfer methodologies and operating techniques successfully used for different media and ambits. Viceversa, the virtual environment was (and is) still connected to totally different operating praxis commonly known by earlier users.

These particular operating techniques, actually known as "netiquette", was wrongly perceived by the larger amount of users as "elitary components", instead of a set of behavioural rules developed to deal with such a different tool. The amount of differences is still too large to totally inherit experiences formerly acquired in different environments.

The high diffusion growth of this new medium is basically due to the slender means to access it, contrariwise to different innovative phenomena influencing the mankind history.

Thus, in few years, a communication medium developed to face some special requirements of military and scientific ambits, completely changed its function, so becoming a medium potentially devoted to anyone.

The great accessibility to internet made the phenomenon extremely appealing to the economic environment, enabling highly-effective and low-costs contacts with a huge number of potential clients. The terms "E-commerce" and "E-work" entered the daily lexicon so suddenly and was so intensely abused to become obsolete rapidly, even if their meaning is not totally plain.

As the matter of fact, the primary effects deriving from the innovative characteristic of internet medium can be recognised today, since ten years from it's embryonic appearance. Those dreams about simple, immediate and gigantic earns was quickly recognised as illusions. They released opportunities to those few enterprises that obtained unbelievable success, due to their correct foundation.

Actually, some new enterprises are entering the virtual environment. These organisations have a more concrete approach, preserving an everlasting linkage with the physical world. So it is allowed to talk about a real "second generation" of enterprises in Internet, for which a brand new term was created: e-business.

The existence of a more direct link to traditional economic realities supplied an idea of greater stability to those Internet enterprises that have to face the real world. This modified image granted the survival during the start-up phase, that is a requisite condition for the growth and the final success.

A similar approach, less ambitious with respect to that proposed by the earlier network operators, reproduce that used for computer market in the age of 80 also in terms of technical solutions adopted. As the matter of fact, during that decade the earlier examples of personalised solutions specifically developed for each requirement appeared, substituting that dream about trivial standardised general products immediately recognised as unuseful for anyone.

2.   Technical Referring Elements

The linkages between computers is based on a communication standard called TCP/IP that requires the identification of each device connected to the network. This identification, that necessarily have to be strictly univocal, is based on a labelling system realised with a sequence of four numbers sequentially written and separated by a dot (i.e. 140.164.17.11 is the registered label of the main server at I.Pi.Ge.T. C.N.R.).

Each one of the numbers that is a part of a device label is included in a range from 0 to 255, so there are exactly 2^{32} = 4.294.967.296 potential different labels available. The network identifier is managed as a normal address, so enabling to connect indissolubly each device with the network activity done. The potential availability of labels is 2/3 of the actual world population, so it is allowed to imagine that this identification schema could be useful for some more years.

Thus, the registered devices are probably less than those really connected, while only in few organisations (generally in military or scientific environment and the very large ones) each single device in regularly registered. Moreover, the companies supplying private individual access to Internet enable their clients to use a "temporary label", useful to operate in the network. This temporary label is "recycled" at the end of each client session. This identification system was developed only for technical activities and is unuseful for human users, especially for those people who have no practice on technical core functions.

An identification system based on alphanumerical codes, written sequentially and separated by dots, was developed to reduce this problem. This identification system is more readable by humans, while the characters sequence usually shows a precise logical meaning (i.e. the name of a company), but have to be translated continuously in the equivalent numerical address. A procedure to register this alphanumerical names, known as "domains", is necessary to enable a direct translation in physical addresses that, again, necessarily have to be strictly univocal.

The need to manage in an absolutely univocal way the formal registrations was the reason for the foundation some specific Organisations, to Co-ordinate and Control[1] the procedure application. These organisations, getting some primary information, frequently supply some statistical resumes based on data collection (i.e. the number of devices operating on the net).

The data are primarily collected for management purposes, that is to optimise the net development, but supply also reliable information on the real activity trend, enabling the usage of adequate "normalising" factors on raw data. Nevertheless, the spontaneous origin of these organisations, due to a specific need, made their operating procedures totally different, so also the kind of data collected are not standardised.

The estimations available up to 1999 are of 205 millions of users and 56 millions of devices connected and registered (Tab 1), while computers continuously operating are the 20% of those registered (Tab. 2). These two tables are based on data collected with different origin and time scale.

Year	Hosts	Users
1999	56.218.000	205.000.000
1998	36.739.000	148.000.000
1997	19.540.000	98.000.000
1996	12.881.000	55.000.000
1995	6.642.000	26.000.000

Tab. 1: Computers registered in Internet at the end of every year
Source: Internet Software Consortium (http://www.isc.org/)

Data	Hosts	Continuously Operating
jan-99	43.230.000	8.400.000
jul-98	36.739.000	6.500.000
jan-98	29.670.000	5.300.000
jul-97	19.540.000	4.300.000
jan-97	16.146.000	3.400.000
jul-96	12.881.000	2.600.000

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[1] These Organizations started spontaneously, are not linked with any Governmental Structure and are recognized by all the network users because there is no alternative chance to operativity.

jan-96	9.472.000	1.700.000
jul-95	6.642.000	1.100.000
jan-95	4.852.000	1.000.000
oct-94	3.864.000	1.000.000
jul-94	3.212.000	700.000
jan-94	2.217.000	600.000
jul-93	1.776.000	500.000
apr-93	1.486.000	400.000

Tab. 2: Computers registered and continuously operating in Internet
Source: Internet Software Consortium (http://www.isc.org/)

3. The Market

3.1 *The "cruisers"*

An adequate analysis of Internet phenomenon have to be developed starting from the evaluation of people that actually uses this particular communication medium. Thus, this evaluation is really one of the most hard exercise due to a lot of reasons.

First of all, the "cruiser" can be both a user officially present in the network (so registered and known), or an occasional user of the service (so officially unknown). The difference between these two profiles is due to the usage of a permanent or a temporary technical element: the identification code.

Moreover, also the permanent users are frequently unregistered at the Official Organisations, with the exception of few very special cases. It follows that the presence of such users can be both calculated or not (depending from different circumstances), so generating another bias (and unreliability) source on data collected.

Another bias source is represented by the unavailability of data coming from the Providers of Internet access services, because this organisations have poor interest in distribute data on the real amount of their clients. This happens for two different reasons, both linked to the payment of a connection rate. The first one is for the enterprises requiring a connection rate, while the number of users can show their overall income. Viceversa, the organisations supplying a free of charges service prefer to show an optimistic evaluation of users, while their income is linked to advertising activity.

Nevertheless, some enough reliable estimations about the total number of users operating in the network environment are supplied by those Control and Management Organisations for each different country. The last overall data available estimate the "cruising" population at 205 millions of users in 1999 (Tab.1). Fig. 1 depicts the estimated values of last five years.

Many other information completing the general scenario are available. These include information about the characterisation of Internet users defined by nationality, age, gender, cultural level, main interests, reasons to access the network and so on.

The people present in the network was equal to the entire Italian population since 1996 (about 56 millions), with a meaningful typological difference. Internet users was and still are generally adults of an high social and cultural level with a good expense potentiality (while overcome the initial limitation of access due to the even minimal expense).
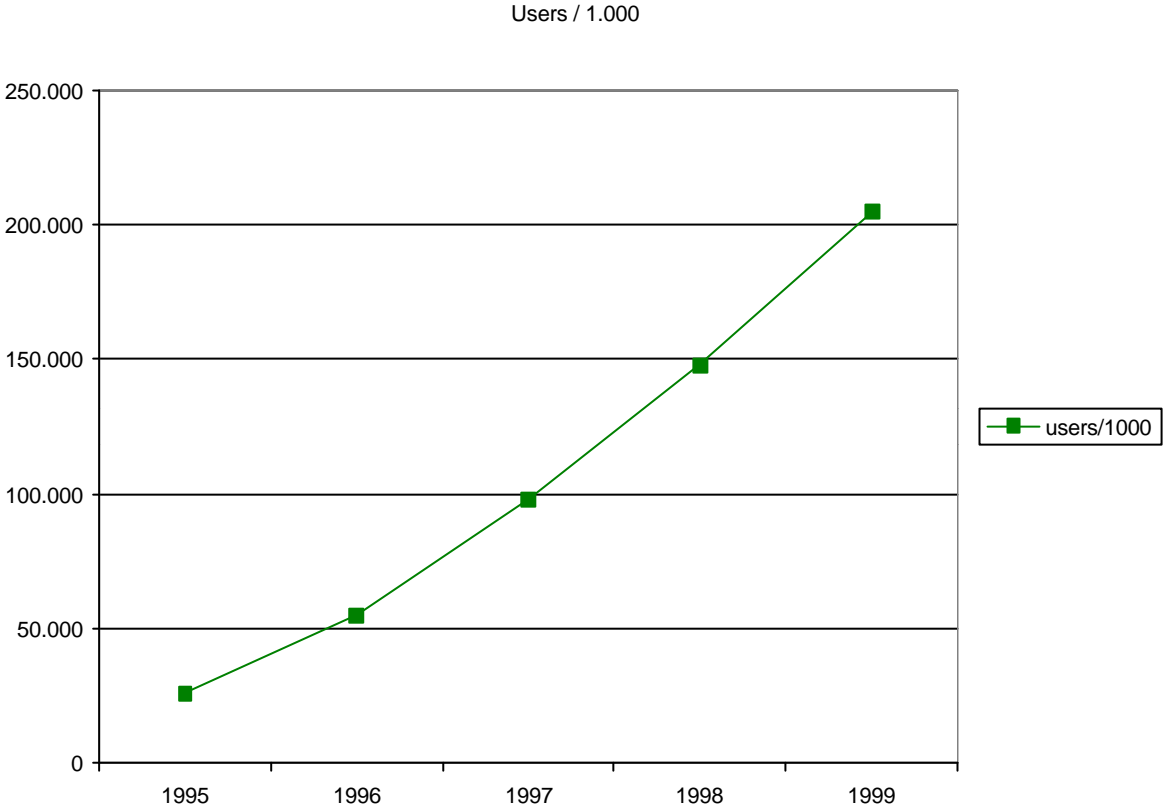
Users / 1.000

Fig. 1:   Estimation of Internet users by year
Source: Personal evaluation of Internet data by Software Consortium (http://www.isc.org/)

3.2 *The "potential market"*

The observation of actual existing dimension is useful to introduce another interesting element: the development of people using the virtual environment. A correct estimation of the potential market is absolutely necessary to be able to supply a mean-long term reliable forecasting. So it is necessary to estimate how many people are potentially allowed to access network services.

The first datum to be considered for this estimation is the actual earth population, that can be estimated in about six billions of people. Tab. 3 depicts the actual estimation of earth population by continent.

Europe	700.000.000
North Central America	450.000.000
South America	330.000.000
Oceania	30.000.000
Africa	720.000.000
Asia	3.800.000.000

Tab. 3: Earth population by continent

However, not all the earth population can really be considered as potential user of Internet, because a percentage of people will never access this medium for different reasons (i.e. child of pre-scholar age, adults that refuse "a priori" any technological innovation and those who cannot pay the initial costs).

So, in developed countries the percentage of potential users can be estimated as 70% of population, leading to the following values (Tab. 4):

Developed areas	
Europe	700.000.000
North Central America	450.000.000
Oceania	30.000.000
Japan	125.000.000
TOTALE	**1.305.000.000**

Potential Users Quota	**900.000.000**

Tab. 4: Estimate of Internet potential users in highly developed areas

Even after the intent declarations of G8 meetings, a reliable forecast for the short-mean term Internet diffusion in developing countries indicates the 5% as threshold for the potential market, while this

percentage indicates also the "richest" component of those populations that is also always available in technological innovation adoption. The resulting values are the following (Tab. 6):

Developing areas	
South America	330.000.000
Africa	720.000.000
Asia (- Japan)	3.675.000.000
TOTALE	**4.725.000.000**

Potential Users Quota	**237.500.000**

Tab. 5: Estimate of Internet potential users in developing areas

These estimates lead to an overall value of 1,137 billions of Internet potential users, with respect to the actual 205 millions of users estimated for year 1999.

4. Services Offer

The evaluation of the offer, viceversa, is based on more reliable data sources, while a wide knowledge about presence and activity is one of the main objectives for any service supplier in Internet. We excluded from this sample all the trivial individual "home pages" developed by single users.

However, it's again difficult to recognise a service supplier through the network data available. As the matter of fact, information about the overall number of devices connected to the network and using a permanent identifier, joined with registered "domains" (the alphanumerical addresses starting with "www" and immediately translated in a network label) are available.

Unfortunately, not all services are supplied by registered domains and there are a lot of registered domains that don't match any supplied services. Even the service supplied by a scientific organisation, as the Italian Section of Regional Science Association, for example don't match any registered domain, while the hosting Institute cannot register this address due to internal rules.

Moreover, the quick development of business activities linked to network operations started a very special speculation on "property of domains". Many "famous" denominations was registered by private individual who "resold" rights on that registration with very high earns. Thus, this domains, even correctly registered, supplied no real services during that operation.

Nevertheless, the data about registered domains seems to be a good estimation for the number of information suppliers inside the network, even until last data collection. Data about registered computers and domains are presented in Tab. 6 e Figs. 2 and 3.

Date	Hosts	Domains
Jan-96	9.472.000	240.000
Jul-95	6.642.000	120.000
Jan-95	4.852.000	71.000
Oct-94	3.864.000	56.000
Jul-94	3.212.000	46.000
Jan-94	2.217.000	30.000
Oct-93	2.056.000	28.000
Jul-93	1.776.000	26.000
Apr-93	1.486.000	22.000
Jan-93	1.313.000	21.000

Tab. 6:   Registered domains until January 1996
Source: Internet Software Consortium (**http://www.isc.org/**)

hosts
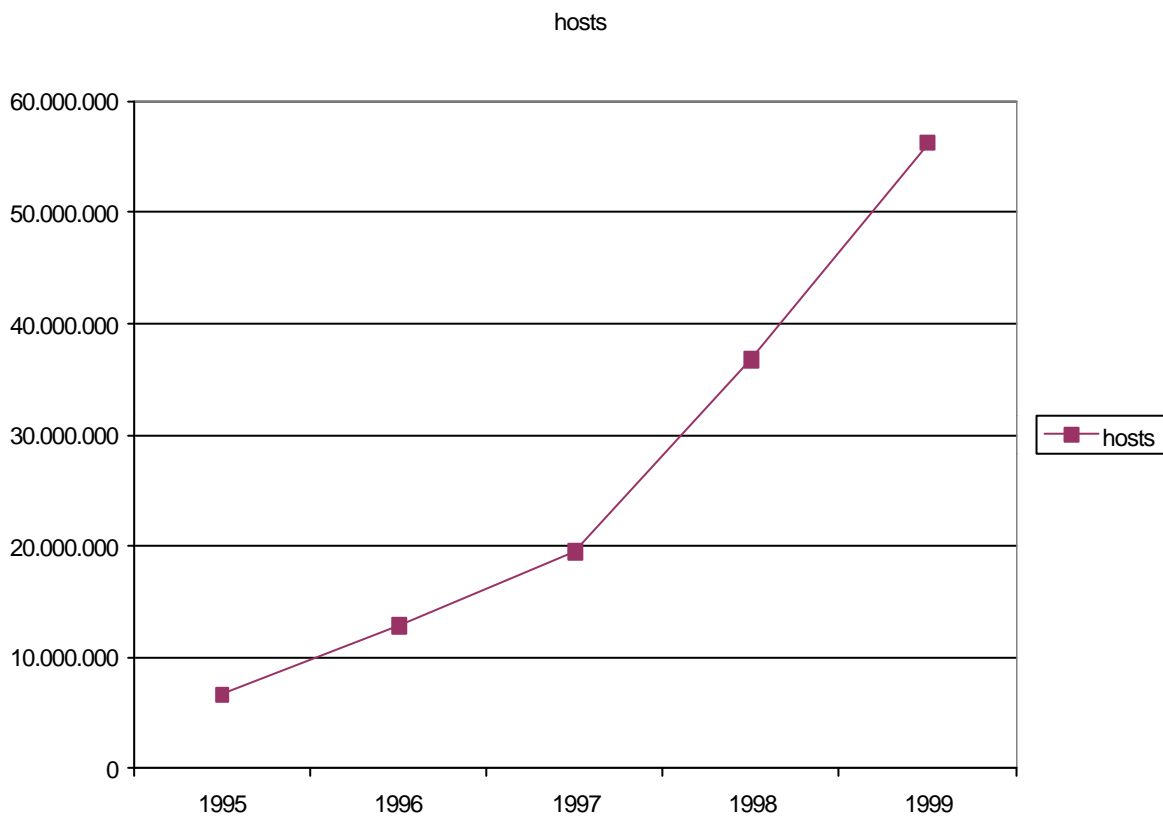
Fig. 2:   Internet registered and operating computers from 1995 to 1999
Source: Personal evaluation of Internet data by Software Consortium (http://www.isc.org/)
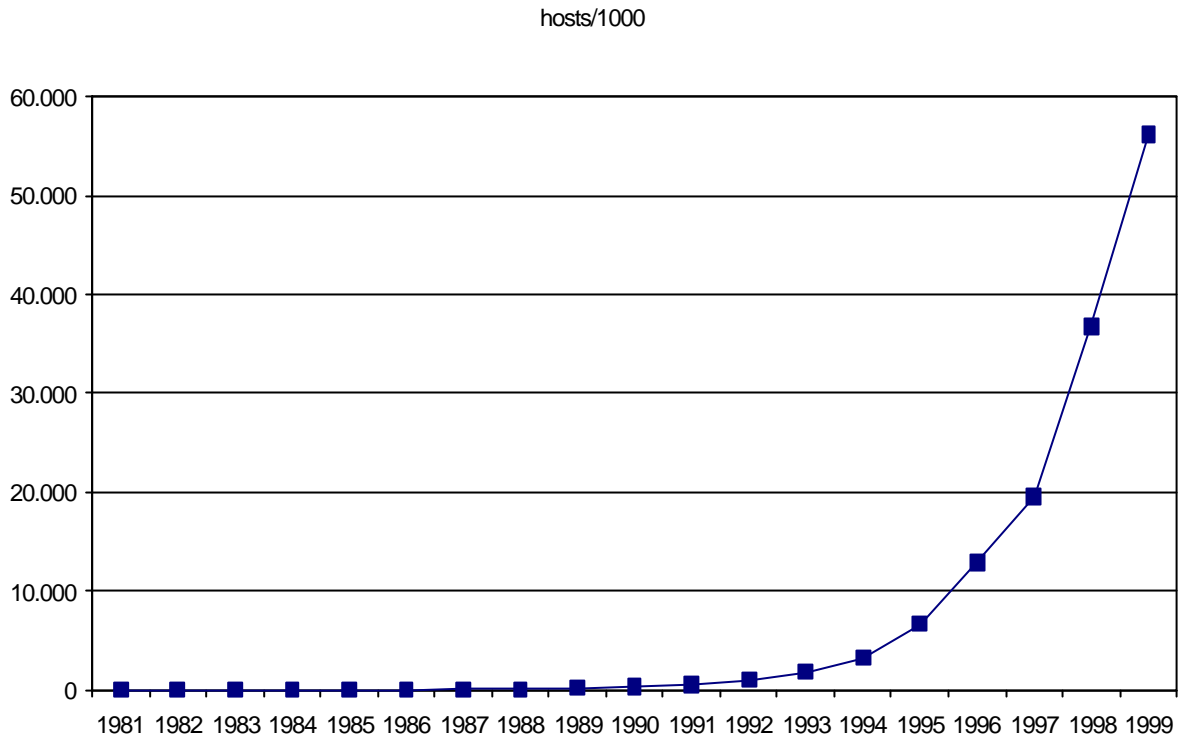
hosts/1000

Fig. 3: Network registered and operating computer from 1981 to 1999
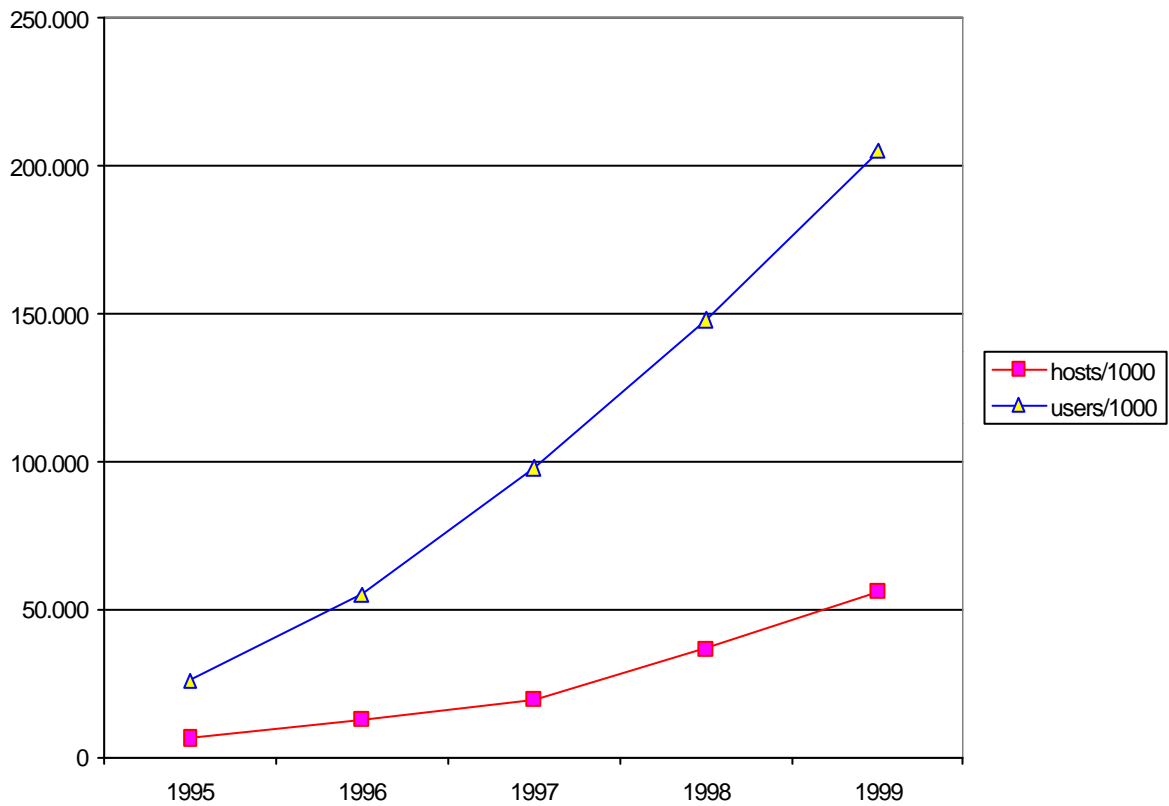Source: Personal evaluation of Internet data by Software Consortium (http://www.isc.org/)

Fig. 4: Registered computers and estimated users in Internet from 1995 to 1999
Source: Personal evaluation of Internet data by Software Consortium (http://www.isc.org/)

A quantitative estimation of services offer in Internet based on the same criteria adopted for users and excluding the personal homepages will lead to a value about 12 millions of domains. This value should be observed considering that not all the economic activities operation in the virtual environment are linked to a registered domain and present a ratio near 1/100 of the estimated users.

Viceversa, the phenomenon of registering alphanumerical domains only for speculative objectives made the data collected less reliable during last years. Nevertheless, the special operating conditions of Co-ordination and Control Organisations of the network enable the introduction of correcting procedures that will normalise the activity in a very short time. This means that collected data about registered domains should become shortly totally reliable, because it will not allowed to get the property of a registered domain without supplying a specific service. This approach will reduce the speculative trend on domain registration.

5. The European And Italian Environment

The presence of Co-ordination and Control Organisations in those countries with an higher rate of network connections enable the collection of information both a continental and national level. Consequently, it is possible to collect data also about smaller geographical ambits.

This information is particularly interesting for those nations using a language different from English, because this character introduces meaningful boundaries to effectiveness of information supplied.

Unfortunately even considering the multiplicity of requests addressed to the Italian Organisation, it was impossible to obtain systematic data on smaller geographical ambits (regional or municipal scale) to enable different analytical studies.

Fig. 5 shows the presence of registered domains in 15 European countries, both included or not in European Union, collected by the French Organisation. Thus, the reported values seems to be inconsistent with other sources still presented here. The data about Germany, United Kingdom and Netherlands seems to be different with respect to others, while including various elements in domain definition. This occurrence demonstrates the absolute need of a standardised procedure in data collection.
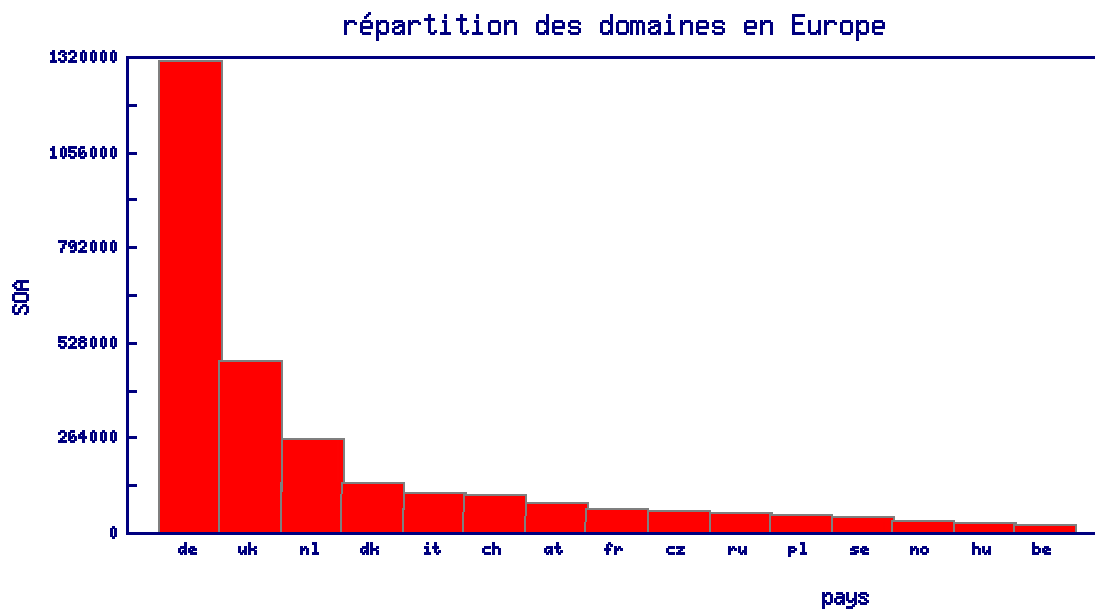
répartition des domaines en Europe

Fig. 5:   Registered domains in Europe until year 2000
Source: France NIC (http://www.nic.fr/)

The information about Italian case seems to be more reliable and consistent with international data. Figs. 6, 7 and 8 show, respectively, the monthly evolution of registered domains for years 1999 e 2000, and the overall annual trend starting from 1994.
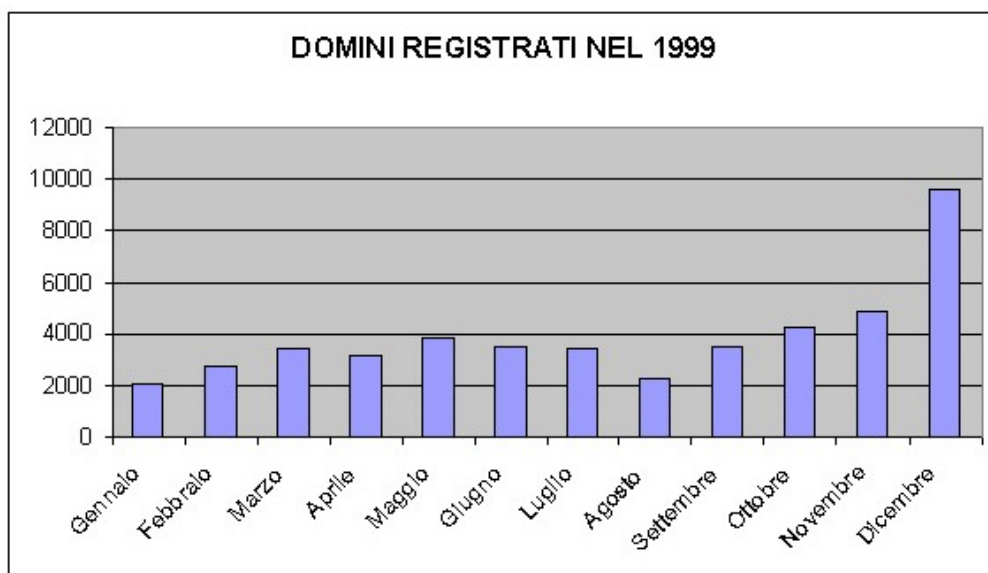

DOMINI REGISTRATI NEL 1999

Fig. 6:   Monthly trend of registered domains in Italy in 1999
Source: Italian NIC (http://www.nic.it/)
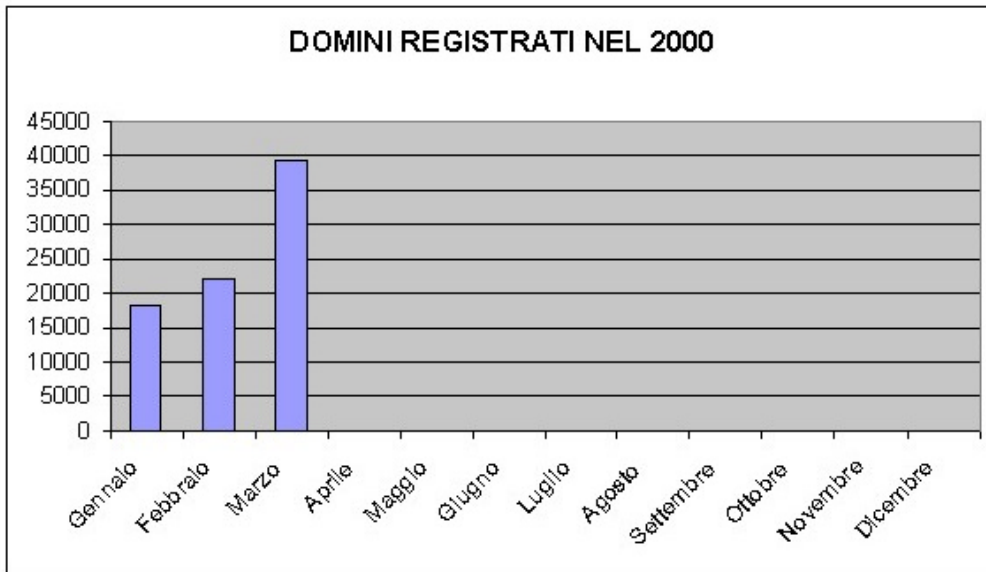
Fig. 7:   Monthly trend of registered domains in Italy in first three months of 2000
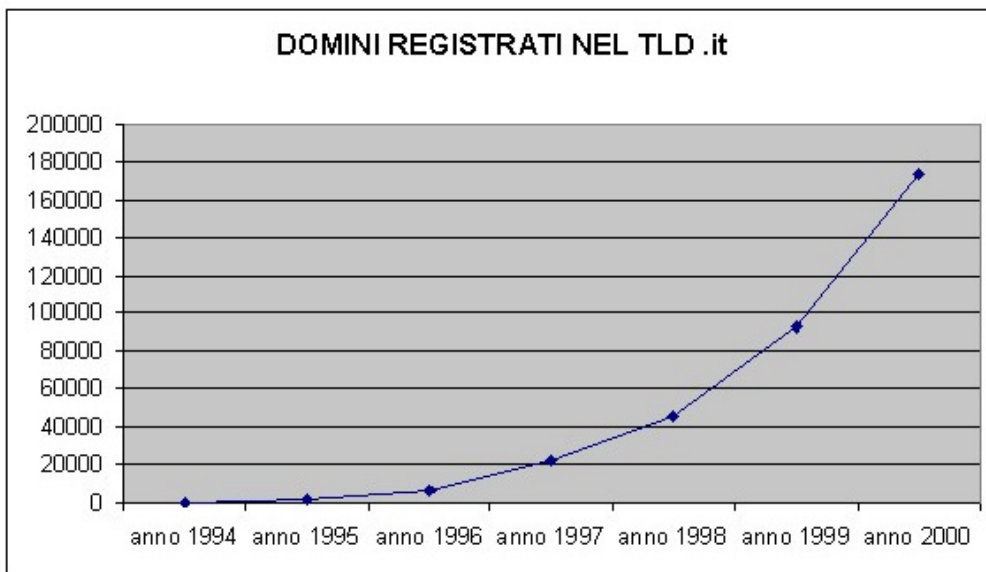Source: Italian NIC (http://www.nic.it/)

Fig. 8:   Registered domains in Italy from 1994 to 2000
Source: Italian NIC (http://www.nic.it/)

Data about registered domains in Italy show an high growth rate during last three years, so indicating the Italian case as one of the most productive in proposing new activities in the virtual environment. This happens in spite of the strong limitation due to language constraints that reduce the interaction potentiality with an international environment.

The majority of Italian enterprises present in Internet uses pages written only in Italian language, so reducing the proposal effectiveness to a very reduced ambit in terms of potential clients.

6. Conclusions

The data set actually available about Internet phenomenon seems initially to be huge and interesting. However, paying more attention to the components of the data set it's easy to understand that sources aren't homogeneous, so a hard work is necessary to ensure a reliable compatibility before using those data for analytical purposes. This effort is well known to analysers of innovative phenomena who developed forecasting exercises, because many scientifically and methodologically correct approaches was still developed to solve these problems and supply reliable results. Nevertheless, a more precise standardisation of collected data could ensure more reliable results.

Moreover, a greater standardisation could be easily obtained, because the Control Organisations have a mutual strong linkage with large and continuous information exchange involving many different levels.

In spite of any consideration, the data set actually available enable the usage of analytical and forecasting models formerly used with high reliability studying different innovative technologies. A future objective, than, is represented by the production of developing scenarios for the virtual environment, considering also some forthcoming innovations still announced. These scenarios can enable a more reliable approach to this new medium, supplying more concrete perspectives to future enterprises.

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INTERNET SOURCES

Main Denomination Organs in Internet:

Austria (.at)	http://www.nic.at/
Belgium (.be)	http://www.DNS.BE
Denmark (.dk)	http://www.nic.dk/
Finland (.fi)	http://www.ficix.fi/
France (.fr)	http://www.nic.fr/
Germany (.de)	http://www.nic.de/
Greece (.gr)	http://www.hostmaster.gr/
Ireland (.ie)	http://www.ucd.ie/hostmaster/
Italy (.it)	http://www.nic.it/
Luxembourg (.lu)	http://www.dns.lu
Netherlands (.nl)	http://www.domain-registry.nl/
Portugal (.pt)	http://www.dns.pt
Spain (.es)	http://www.nic.es/
Sweden (.se)	http://www.nic-se.se/
United Kingdom (.uk)	http://www.nic.uk/
USA Defence (.mil)	http://nic.mil/
USA Governmental (.gov)	http://www.nic.gov/
Commercial (.com)	http://www.iana.org/generic.html
Educational (.edu)	http://www.networksolutions.com/help/registration/index.html
Internat. Organiz. (.int)	http://www.iana.org/int.html
Networks (.net)	http://www.iana.org/generic.html
Organisations (.org)	http://www.iana.org/generic.html