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Evolution of the Internet and the WWW in Europe

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Voorwoord

Sinds enkele jaren is het gebruik van INTERNET buiten de gespecialiseerde omgevingen van universiteiten en onderzoeksinstellingen snel groeiend. E-mail en WWW zijn voor veel mensen aantrekkelijk genoeg om ook thuis over te willen beschikken. Internet wordt gezien als de basis voor het ontwikkelen van "virtual communities" en "electronic commerce". En vrij algemeen wordt Internet gezien als model voor het toekomstige netwerk van "electronische snelwegen". Met andere woorden, de ontwikkeling van Internet is belangrijk. Belangrijk voor bedrijven om wereldwijd te kunnen concurreren, voor bedrijven en overheden om klanten en burgers beter te kunnen bereiken en bedienen. Belangrijk voor consumenten om beter, met meer keuze, sneller en goedkoper aan producten te komen. Belangrijk voor burgers om makkelijker met elkaar en met overheid en andere instellingen te kunnen communiceren.
Voor de Europese Commissie (DGXIII) was dit reden meer te willen weten over stand van zaken en ontwikkelingen van Internet in Europa. Databank Consulting (I), IDATE (F) en TNO-STB (NL) hebben in 1997 in opdracht van de Commissie onderzoek uitgevoerd gericht op beschrijving en analyse van de groeidynamiek van Internet en WWW. Daarbij is aandacht gegeven aan verschillende aspecten van aanbod van toegang, netwerkcapaciteit en diensten en aan de ontwikkeling van het gebruik.
In dit rapport wordt verslag gedaan van het uitgevoerde onderzoek. Het rapport bevat een schat aan informatie over de ontwikkeling van Internet en Internetgebruik. De rol en strategie van betrokken partijen als telecom-operators en "service providers" krijgt de nodige aandacht. De nadruk ligt op ontwikkelingen in Europa die echter als vanzelfsprekend in een globaal perspectief worden geplaatst. Met deze uitgave wil TNO-STB het belang onderstrepen van inzicht in de ontwikkeling van Internet en de resultaten van het onderzoek goed toegankelijk maken voor een Nederlands publiek.

Prof.dr. J. de Vuijst
Directeur TNO-STB

European Commission DGXIII
Telecommunication Infrastructures
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Evolution of the Internet and the WWW in Europe

by:
Databank Consulting, IDATE, TNO

Final Report

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do not necessarily reflect the views of the European Commission
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Executive summary

This study was carried out by Databank Consulting with the support of Idate and TNO in February-October 1997 for the European Commission DG XIII. Opinions expressed are those of the authors and do not necessarily reflect the views of the European Commission.

1. The evolution of Internet/WWW development in Europe

Both the Internet and the WWW are growing very fast in Europe, as shown by most reliable statistical sources. The study confirmed that WWW development in Europe, considered a very important condition for the exploitation of the more advanced applications and services offered by the Internet, is keeping up with the pace of growth in the US and may possibly be closing the present gap of diffusion. The WWW represents today the most popular and fast growing Internet service. The ISP survey results indicate that more than half of Internet traffic (52%) is WWW traffic.

By analysing the distribution of websites in Europe, the study demonstrated that WWW development follows in Europe different evolutionary trends vs Internet development. The most important conclusions are:

- The study found a polarisation between a Northern European Web development model (with relatively low ratios of webpages on hosts penetration, the extreme example being Finland) and a Southern European Web development model (with an unexpected high number of webpages and a high ratio of webpages on hosts, the extreme example being Italy).

- While Internet access and usage tariffs levels present a correlation with hosts diffusion by country (as remarked by several sources such as OECD, ITU, lower tariffs correspond to higher hosts penetration), this does not seem true for Web development.

- WWW usage and development seems instead to be influenced by the economic structure of the country and specific social approaches to the Internet and the WWW. The countries where the economic structure is characterised by a prevalence of Small and Medium Enterprises (SMEs) present a very high vitality in the multiplication of webpages.

- An important indicator of the WWW evolution is the language featured by websites. By analysing a sample of European company sites, the study found an overall trend towards the reduction of the percentage of English-only sites and the increase of bilingual or national language only sites (which are already the majority). This proves that WWW usage is driven by the need to serve local users and indicates a growing regionalisation and local characterisation of its content.

These results allow to draw some important conclusions on the trends of Internet/WWW development in Europe:

- First of all, the traditional view of the gap between Northern and Southern European Internet development dynamic based on hosts penetration is partially misleading. Clearly there is a strong actual and potential demand in Southern European countries for use of the Web services, but there is also a risk that weaker infrastructure development may constrain its development and lead to worse problems of traffic congestion. There seems to be a need for actions supporting the upgrading of infrastructures and removing barriers to hosts development in Southern European countries. Moreover, it seems confirmed that European SMEs are actively interested in the development of the WWW (even if the users survey pointed out several barriers and problems).

- Since electronic commerce development is strongly connected with WWW development, the vitality of Web growth across Europe and also in Southern European countries seems to confirm a positive potential of growth in the whole European Union. The lower relevance of tariffs levels in the Web development model, however, seems to indicate that Internet tariffs dynamics may also be a less important factor than expected in electronic commerce development, versus other factors such as the economic and cultural environment.

- in conclusion, the study results indicate that a strong regional/national characterisation of the WWW development is in process in Europe. The Internet growth is driven by global indicators strongly linked with telecommunication infrastructures, while the WWW, a complex combination of services providing content and interaction, is driven by other logics, more linked to local rather than to global needs.

2. The evolution of the Internet service provision market in Europe

The competitive scenery of the Internet service provision market in Europe is undergoing a rapid evolution, as confirmed by the results of a survey of Telecom and Internet Backbone operators (based on 17 face-to-face interviews in Finland, France, Germany, Italy, Netherlands and the UK) and a survey of European ISPs (80 interviews in 13 countries, 61 of which in the same countries defined above).

Internet backbone operators and Global operators are in direct competition for the transport and IP interconnection traffic at the international and world level, while PTOs, New Entrants and ISPs face each other at the local access level interfacing end users. Large multinational and national companies are the only end users directly targeted by Internet Backbone and Global Operators, but services at the local level are delivered by their local partners acting as ISPs. National Telecom Operators have entered in force the Internet market in the last two years, are usually already leaders in the access market, and pursue aggressive strategies of development of their customer base and their products and services portfolios.

The market is heading towards a shake-out of the large population of ISPs (especially local ISPs) whose early competitive advantages (early entrance in the market, low prices, closeness to local users) are rapidly vanishing. Key aspects in the market evolution are the pressure for change of peering agreements (commercial agreements for the exchange of Internet traffic among ISPs and backbone operators) and the increasing number of vertical and horizontal alliances between operators, ISPs, content and value added services/applications providers excluding weaker competitors.

All suppliers are trying to extend their positioning in the Internet value chain towards the provision of more value added services, in order to improve the very low profit margins due to the present flat-rate Internet pricing system. Suppliers already propose articulated pricing schemes to high-end business users. Suppliers foresee the need to move beyond the flat-rate pricing system towards pricing systems taking at least partially into account usage time and higher traffic volumes from multimedia and real-time applications. However it is not clear how this transition can be made, given strong resistance by the users.

3. Internet/WWW non-residential users trends

The study survey excluded residential users and was based on 317 telephone interviews to professionals, SMEs, educational and cultural organizations (schools, universities, libraries and museums), and public administrations with an active website and a home page, in order to analyse the more advanced European Internet users population. The survey was carried out in the same countries as the Operators and ISP surveys.

- The users give a very positive evaluation of the Internet/WWW as a channel for advertising and communication. The WWW explosion and the strong increase of the number of websites opened by users should be mostly interpreted at present as a wish **to be** on the Internet, but not **to act** over the Internet. A static approach seems still to prevail.

- Actual implementation of electronic commerce applications is mostly concentrated in the on-line order activity, with very few users carrying out on-line sales, purchase, payments and delivery. Electronic commerce results in a very early phase of its development.

- While most users plan to invest in the improvement and growth of their websites, only a minority plans to invest soon in e-commerce applications and many users define the Internet/WWW as unsuitable for economic transactions. Their diffidence, possibly resulting from scarce awareness of potential benefits or a general feeling of present inadequacy of networks and services in this area, may point to a slower than expected take-off of e-commerce in Europe.

- The survey results point to the conclusion that the simple implementation of safe electronic payments standards will not by itself generate an acceleration of electronic commerce diffusion, and that other barriers (such as increased awareness of potential benefits and solution of organisational innovation problems) must be overcome to stimulate its development.

- Users are in general satisfied of the services provided by their ISPs, including those carrying out e-commerce transactions. However, many of them do not seem prepared to pay higher tariffs in exchange for better quality services or performance guarantees. This may point to a difficulty in achieving users acceptance of the evolution of Internet pricing system.

Introduction

The goal of this study is to analyse the dynamic of growth and development of the Internet and the WWW in Europe, in the context of world-wide trends. This study has been commissioned by the European Commission DGXIII - Telecommunication Infrastructures - to Databank Consulting and was carried out in co-operation with Idate (France) and TNO (the Netherlands).

The study was led by Mario Martinoli (martinoli@dbcons.it), Databank Consulting (Italy), who is also the editor of this report. Part I has been conceived and written by Mario Martinoli, while all statistical data, the parts on the Internet Ratio, WWW search engines and the hypertextual maps have been realised by Eric Arnum (earnum@attmail.com), EMMS (USA). Part II has been led by Laurence Uzan (l.uzan@idate.fr), Idate (France) for the survey on telecom operators, Harry Bouwman (bouwman@stb.tno.nl), TNO (Netherlands) for the survey on ISPs and Mario Martinoli for the users' survey and the outlook on electronic commerce. Part II has been reviewed and consolidated by Gabriella Cattaneo, Databank Consulting (cattaneo@dbcons.it).

The objectives of the study were:

- to describe and analyse the dynamics of growth of the Internet and WWW use in the world and specifically in the EU 15 countries, based on the most relevant indicators and statistics available from January 1996 to the date of the final report;

- to analyse development and availability in Europe of the emerging Internet and WWW services (such as WWW search engines);

- to analyse the evolution of Internet and WWW supply and demand in Europe, based on supply and users surveys carried out in 6 countries (France, Finland, Germany, Italy, Netherlands, UK) and structured as follows:
  - 16 face-to-face interviews to Telecom Operators;
  - an on-line questionnaire diffused on the Web plus 50 telephone interviews in the 6 selected countries to Internet international service/content providers (ISPs);
  - 300 telephone interviews in the 6 identified countries, to four key users segments: professionals, SMEs, libraries/schools/universities/museums and local administrations.

- to consolidate results of the statistics, supply and demand research in order to define the main trends of development of Internet and the WWW in Europe and its impact on the evolution of trans-european connectivity and use of communication services.

The original target for interviews has been enlarged: an overall number of 17 telecom operators (instead of 16), 80 ISPs in 13 countries (instead of 50 in 6 countries) and 317 Internet users (instead of 300) have been interviewed.

The study is articulated in two parts:

- the evolutionary trends of the Internet and the WWW are presented in Part I. The principal analysis is based on known statistical sources and quantifies the Internet development through the use of consolidated indicators. New indicators assessing the WWW evolution and its development models are introduced and discussed. Two hypertextual maps (a comprehensive website map of Europe and a guided tour to the most diffused WWW search engines) are annexed on a diskette;

- Part II reports the results of the surveys to Telecom Operators, ISPs and Internet users. Among other topics, a comparative analysis on Internet market competition between telecom operators and ISPs is presented.

The annexed floppy disk, providing interactive on-line maps of European Internet backbones, European websites per country and a guided tour to the most popular WWW search engines, constitutes an integrating part of the present report.

The opinions expressed in this Study are those of the authors and do not necessarily reflect the views of the European Commission.

Part I.

Internet and the WWW in Europe: evolutionary trends

I.1. Evolution of the Internet

I.1.1 Methodology and scope

The overall purpose of this part of the study is:

- to track the evolutionary trends for the Internet as a whole and in Europe;
- to estimate traffic patterns for the principal Internet services, such as the WWW and e-mail.

To achieve these goals the adopted methodology considers direct quantitative Internet-related inputs as the starting point of the whole analysis, namely:

- Internet domains and hosts figures per country and Top Level Domains (TLDs, e.g. .de, .uk, .fr, .it, etc.), easily retrievable from well known databases, such as the Network Wizards;
- part of the results of the survey on ISPs led in the framework of this study (see Part II), aiming at tracking semi-quantitative estimates of the Internet traffic patterns in Europe.

Based on previous research and on statistical analysis, the evolutionary trends of the Internet development in Europe will be drawn, as well as estimates on the main Internet traffic patterns per country. A brief comparative analysis with the rest of the world will be provided.

I.1.2 The Internet growth in Europe

The number of Internet hosts and domains are the most easily measurable parameters providing quantitative evidence on the dimensions of the Internet, thanks to the existence of periodically updated on-line databases. In particular we considered:

- Network Wizards (www.nw.com), providing world-wide statistics on the Internet growth;
- RIPE (Réseaux IP Européens, www.ripe.net), providing quantitative figures on the Internet growth in Europe.

Network Wizards data have been chosen as the reference source for the statistical analysis, also due to their world-wide coverage. The Network Wizards data are collected according to the following definitions:

> *A **host** is a Domain Name that has an IP address record associated with it. This would be any computer system connected to the Internet (via full or part-time, direct or dial-up connections). Examples of Internet hosts are ibm.com, www.ibm.com, mail.ibm.com, etc.*
> *A **domain** is a Domain Name that has name server (NS) records associated with it. In other words, there may be subdomains or hosts under it. Examples of Internet domains are .com, etc.*
> *A Domain Name is any name representing any record that exists within the Domain Name Systems (DNS). Examples of Internet Domain Names are: com, ibm.com, www.ibm.com, etc. (Source: Network Wizards, www.nw.com).*

According to the above definitions and the survey procedure adopted by Network Wizards (a, the number of Internet hosts roughly corresponds to the *minimum* number of computer directly connected to the Internet. Exhibit 1 reports Internet hosts absolute data and relative annual growth rate on a 6-months basis for the period from January 1996 to July 1997, based on Network Wizards data.

Exhibit 1 Internet hosts growth in EU (January 1996-July 1997)

	January '96	July '96	January '97	July '97	Internet hosts annual growth rate (July '96-July '97)	Variation with respect to RIPE data (January '97)	Variation with respect to RIPE data (July '97)
UK	451,750	579,492	591,624	878,215	52%	-23%	-2%
Germany	452,997	548,168	721,847	875,631	60%	-3%	-6%
Netherlands	174,888	214,704	270,521	341,560	59%	-2%	-1%
Finland	208,502	277,207	283,526	335,956	21%	-13%	-15%
France	137,217	189,786	245,501	292,096	54%	-3%	-6%
Sweden	149,877	186,312	232,955	284,478	53%	-5%	-4%
Italy	73,364	113,776	149,595	211,966	86%	-22%	-15%
Denmark	51,827	76,955	106,476	137,008	78%	-4%	0%
Spain	53,707	62,447	110,041	121,823	95%	-7%	-29%
Austria	52,728	71,090	91,938	87,408**	23%**	-7%	-14%
Belgium	30,535	43,311	64,607	86,117	99%	-3%	-5%
Ireland	15,036	21,464	27,059	33,031	54%	-2%	-1%
Portugal	9,359	17,573	26,077	18,147**	3%**	10%	-50%
Greece	8,787	12,689	15,925	19,711	55%	-2%	-10%
Luxembourg	1,756	2,877	3,506	3,854	34%	0%	-1%
TOTAL EU	**1,872,330**	**2,417,851**	**2,941,198**	**3,727,001**	**53%**	**-10%**	**-8%**
Norway	88,356	120,780	171,686	209,034	21%	-3%	0%
Switzerland	85,844	102,691	129,114	148,028	15%	-4%	-5%
United States*	6,053,402	8,224,279	10,110,908	11,829,141	17%	N/A	N/A
Other countries	1,372,068	2,015,399	2,793,094	3,626,796	30%	N/A	N/A
TOTAL WORLD	**9,472,000**	**12,881,000**	**16,146,000**	**19,540,000**	**21%**	**N/A**	**N/A**

* considering the sum of .com, .org, .edu, .gov, .us, .mil and .net hosts.

** in Austria and Portugal the Network Wizards last survey reports a number of Internet hosts lower than in January 1997. While it is possible in theory that in this period the number of Internet hosts closed was higher than the number of new Internet hosts resulting in a net decrease, it seems unlikely. A similar problem has been encountered in UK data for January 1997. A message sent to Network Wizards asking for explanations was not answered.

Source: Databank Consulting elaboration on Network Wizards, 1997 (www.nw.com) and RIPE, 1997 (www.ripe.net).

RIPE adopts a different methodology:

> *The RIPE DNS host count is done by transferring every possible Domain Name System zones under the mentioned top level domains. Inside these zones, the number of A records is counted, but this is also checked against the machine name, so that machines with the same name, but multiple A records are only counted once. Also, machines with different names but the same A record are only counted once. The above checks are done per top level, not across top levels. (Source: RIPE, www.ripe.net).*

While the methodological approach is different, the gap in absolute values between Network Wizards and RIPE data is not very wide (8 to 10% for the EU, see Exhibit 1), with the exception of Italy (22%) and UK (23%) for January 1997 and Spain (29%) and Portugal (50%) for July 1997. In the framework of this study it has been decided to exclusively adopt the Network Wizards data by considering their world-wide

dimension, thus allowing the authors to perform some comparisons between Europe and the US.

The Internet hosts number gives a rough idea of the absolute dimensions of the Internet as a whole and constitutes an approximation of the minimum number of computer directly connected to the Internet per country. However, they are not exact figures, because of the following limitations:

- only national (two-digit) TLDs have been considered as valid entries for the statistical analysis. TLDs such as .com, even if known to have a increasing share in European countries, have not been taken into account because of the impossibility of performing a per-country discrimination. According to a Databank Consulting estimate, the .com share in European countries share shouldn't at present exceed 10-12%. The .com was in origin a US-only TLD. In the last years, however, mostly due to economic convenience with respect to European domain registrations, an increasing number of European organisations registered under the .com TLD. The upcoming opening of seven new TLDs will stop the rapid growth of the .com domains, but will also contribute to decrease the geographic representativeness of national TLDs;

- the count of the Internet hosts per TLD does not necessarily mean that the host is physically located in the related country. As outlined by the Network Wizards, it may for example happen that an Internet host with a .nl extension is located on a machine in the US;

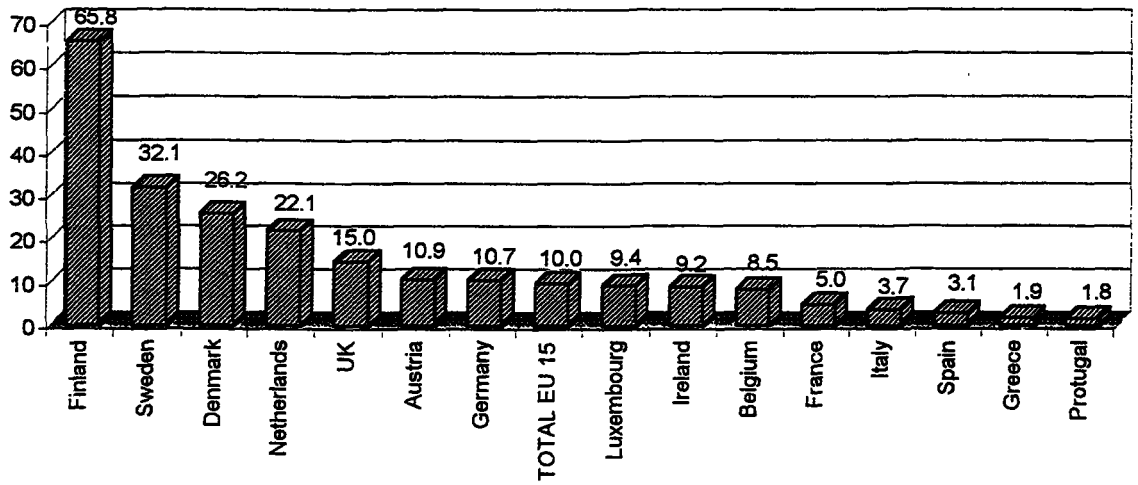
- according to the Network Wizards definitions, it is possible that different Internet hosts correspond to a unique physical computer. For example, the same machine may host a mail server, a WWW server, etc., each of them corresponding to a different Internet host. This is especially true for large organisations (who may have big centralised servers providing a large set of services) and for high-tech companies (such as ISPs). As explained in the Network Wizards, *"a host used to be a single machine on the net. However, the definitions of a host has changed in recent years due to virtual hosting, where a single machine acts like multiple systems (and has multiple domain names and IP addresses). Ideally, a virtual host will act and look exactly like a regular host, so we count them equally"*.

A more significant and popular measure of the Internet penetration per country is given by the *Internet host penetration rate*, which puts in direct relation the number of existing Internet hosts with the population. The Internet host penetration rate has not a direct relation with the diffusion of single Internet services, such as the WWW, but represents a useful indicator of the Internet development as a whole. More correctly, the Internet host penetration rate can be meant just as the development framework for single Internet services.

Exhibit 2 highlights the well-known differences in Internet hosts penetration rates between Nordic countries and Mediterranean countries in Europe. Nordic countries started the development of their Internet infrastructure much earlier than Central

European and Mediterranean countries and now are in a position of advantage. To this extent it must be however noticed how the gap between Nordic and Mediterranean countries in absolute terms decreased during the last years.

Exhibit 2 **Internet host penetration (number of Internet hosts per 1000 inhabitants) in EU (July 1997)**

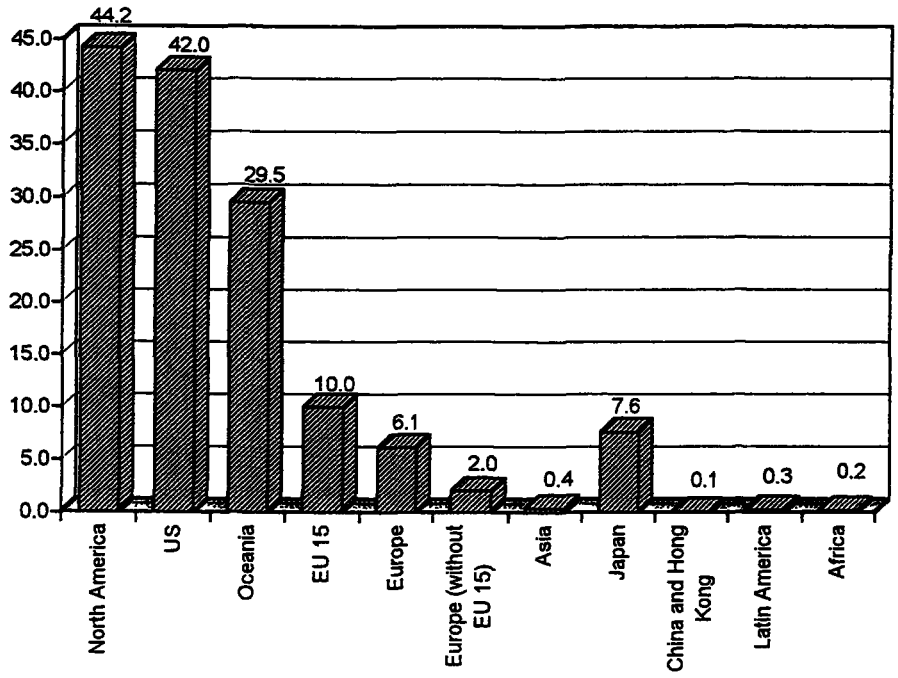


Source: Databank Consulting elaboration on Network Wizards, 1997 (www.nw.com).

When analysing the Internet host penetration data in a world-wide perspective (see Exhibit 3), EU countries as a whole position themselves in an intermediate stage between North America (44.2) and Oceania (29.5) on one side and the rest of the world on the other side, where, with some exceptions such as Japan and South Korea, the Internet presence is very poor. In Latin America and Africa the Internet phenomenon is at present negligible. Also in non-EU European countries the penetration of the Internet is very poor (2 hosts per 1000 inhabitants). Europe as a whole accounts for 6.1 hosts per 1000 inhabitants, which is in line with the Japan data (7.6). US has an Internet penetration rate of 42.0, which on a world basis is inferior just to the Finland data (65.8) which thus constitutes the country with the highest Internet host penetration rate in the world.

It is important to notice that the gap between EU and North America is however progressively reducing during the last years, both in terms of the absolute number of Internet hosts and of Internet hosts penetration rate.

Exhibit 3 **Number of Internet hosts per 1000 inhabitants (Internet host penetration) by world region (July 1997)**



Source: Databank Consulting elaboration on Network Wizards, 1997 (www.nw.com)

In conclusion, the Internet as a whole has mostly developed in the capitalistic and democratic countries, first in the US, then in Western Europe and in parts of Eastern Asia, regions where the diffusion of ideas and the freedom of contacting everyone anywhere (because this is what the Internet allows its user to do) are not subject to censorship[1]. The rest of the world, lacking also in terms of telecommunications infrastructures, is far behind the degree of development of the above countries and it is reasonable to suppose that it will take some years before a somehow relevant Internet presence can be detected in those world areas.

[1] Concerning this issue, Saudi Arabia shut down its whole Internet network in 1996.

I.1.3 Internet Traffic Shares

After the NSFnet (National Science Foundation net) shut down in April 1995, it has become difficult to trace quantitative measures of the Internet evolution in terms of traffic shares. Measures should be taken at interconnection points or inside international backbones, but these data are very often not made available by private Internet backbone operators. National academic networks can provide their data, but their traffic patterns are of peculiar nature with respect to the commercial traffic data (the usage of the WWW is expected to be higher than the other Internet services). In addition, as shown by the survey on European ISPs (see Part II), traffic patterns may even strongly vary between different countries (e.g. the UK has a smaller WWW traffic density than the other EU countries).

On the other hand, it is possible to draw qualitative conclusions on the Internet traffic patterns in Europe:

- the WWW has become the dominant traffic source over the Internet. The ISP survey indicates that the *WWW constitutes more than the half of the Internet traffic in Europe* (about 52%). The same figure in December 1994 (short before the NSFnet stop in operations) was of about 16%. In addition, as outlined in EITO '97, as electronic commerce develops and the Internet continues to grow, the WWW will become more and more important. Morgan Stanley foresees that *by year 2000 three-quarters of Internet users are expected to be WWW users.* Two experimental observations made by the National Laboratory for Applied Network Research (NLANR) in January 1997 over an Internet backbone trunk in California showed a WWW traffic share of about 68%.

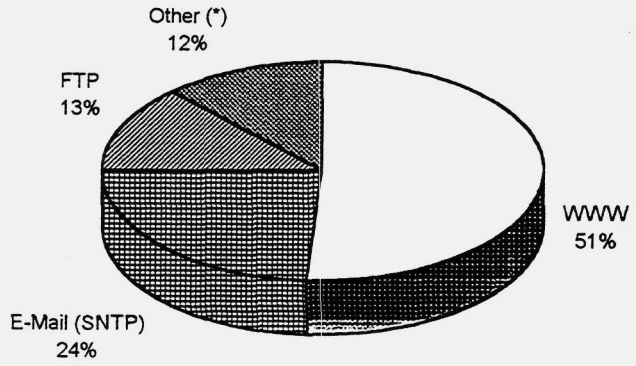
- Exhibit 4 reports traffic patterns per service according to the results of the survey on European ISPs led in the framework of this study (see Part II), which substantially confirm the above trend, with the exception of UK, where e-mail services look like having the biggest share in Internet traffic patterns;

Exhibit 4 **Internet traffic shares per protocol in 6 European countries. Data from a sample of 80 interviews to European ISPs**

	Finland	France	Germany	Italy	Netherlands	UK	Total
www	55%	45%	57%	63%	51%	27%	51%
e-mail	17%	31%	15%	28%	21%	55%	24%
FTP	12%	2%	19%	5%	15%	10%	13%
other	16%	22%	9%	4%	13%	8%	12%

Source: TNO, 1997

Exhibit 5 Internet traffic shares, 1997



(*) Telnet, Gopher, NNTP etc.
Source: ISPs interviews

- e-mail is the only other Internet service whose share of traffic has increased in the last years. The SMTP (the most used protocol for e-mail communication) accounts for about 24% of the European traffic according to the this study's survey while in December 1994 the share was just about 6% of the overall Internet traffic patterns;

- other services (such as FTP and Telnet) are declining in share, being still very popular in the academic world but with a smaller impact in commercial world.

I.1.4 The Internet backbones in Europe

This section aims at giving a short overview on the European Internet backbone structure in Europe, focusing on technical and geographical aspects, outlining in particular the existing interconnections between the principal hubs and the transoceanic links.

The major players in the Internet backbone market in Europe are:

- AT&T Unisource Internet backbone structure is constituted by some major 34 Mbit/s trunks (between Amsterdam and Geneva, Amsterdam and Madrid, Amsterdam and Frankfurt, Amsterdam and Stockholm, Stockholm and London) and by a series of lower capacity connections (2 to 6 Mbit/s). Transoceanic links are assured by a double 34 Mbit/s connection between Amsterdam and New York. AT&T Unisource activated strategic alliances with PTT Telecom, Swiss Telecom and Telia. More details on the AT&T Unisource offer can be found at the URL http://www.att-unisource.net/network/backbone.html;

- Ebone is a non-profit organisation providing IP connectivity to its members. Its high-speed connection hubs are located in London, Stockholm, Zurich, Frankfurt, Munich and Vienna. Direct transoceanic connections with the US (multiple 34 Mbit/s links) are active in Stockholm, Frankfurt, Paris and Vienna. More details on UUNet offer in Europe can be found at the URL www.ebone.net/structure/backbone.html;

- EUNet manages an own network in nearly all European countries, with a principal hub in Amsterdam and connections to the US from Helsinki, Amsterdam and Paris. More details on EUNet offer in Europe can be found at the URL www.eu.net/cinfo/map/display-map.html;

- NORDUnet is a Scandinavian Internet backbone connecting Stockholm, Oslo, Copenhagen and Helsinki through 34 Mbit/s links. NORDUnet is connected to the rest of Europe through the TEN-34 network. Several Eastern European countries are served by NORDUnet as well. USA are reachable through NORDUnet hubs in Stockholm and Reykjavik. More details on NORDUnet offer in Europe can be found at the URL www.nordu.net/info/con_map.htm.

- The UUNet European Internet hub for UUNet is located in London. Other principal UUNet Internet hubs in Europe are Stockholm, Amsterdam, Brussels, Frankfurt, Paris, Zurich, Milan and Monaco, most of them cross-connected through 45 Mbit/s links. Transoceanic connections (45 Mbit/s) to the US are guaranteed between London and Newark, London and Tysons Corner and Frankfurt and New York. An high-speed connection is active between Monaco and Singapore. More details on UUNet offer in Europe can be found at the URL www.uu.net/lang.en/network/oct1997/europe.shtml;

Among the major Internet hubs in Europe, the following ones are worth mentioning:

- Stockholm Global Internet Exchange (SGIX). According to Eurointernet, *"this is undoubtedly the major Internet Exchange within Europe offering the best connectivity and bandwidth to European backbone providers"*. In particular, its most attractive characteristics are:
  - more than 155 Mbit/s connection between Sweden and the USA;
  - multiple 34 Mbit/s connections to Scandinavia, Germany and other European countries;
  - all major European Internet backbone providers terminate with high bandwidth into SGIX;

- Cern Internet Exchange Point (CIXP) in Geneva, providing 34 Mbit/s connectivity in the framework of the TEN-34 network;

- German Internet Exchange Point (DIX) in Frankfurt. The DIX is considered a very important Exchange Point because of their privileged position for serving the German market, even if providing less bandwidth than the other two.

I.2. Evolution of the WWW

I.2.1 Methodology and scope

The main objectives of the forthcoming analysis are:

- to assess the WWW development models in Europe;
- to perform an exhaustive comparative analysis of American and European WWW search engines.

As for the Internet analysis (see Section I.1), the starting point is quantitative, namely the *webpages counts*, calculated on a per-country basis (considering national TLDs only).

It may be discussed whether a statistical analysis on the evolution of the WWW should start from the assessment of websites or of webpages. Webpages show some very attractive characteristics:

- they are the *WWW atoms*, i.e. a single webpage may be safely considered as the WWW information carrier unit. In other words, one webpage, one content. websites may even strongly vary in terms of number of contained webpages (from very few units to several thousands), and in this sense it appears unfeasible to use them for drawing conclusions on WWW activity;
- they are easier to count. While for websites reasonable Europe-wide estimates on their number are not available[2], webpages per TLD are relatively easy to count by using efficient WWW Search Engines (e.g. the AltaVista Search Engine). An hypertextual and easy-to-use map of European websites is included in the annexed floppy-disk.

The analysis will lead to the introduction of an original development model for the WWW. This model will be afterwards consolidated and validated by considering additional data such as European Internet pricing schemes and European economic productive structure. General findings will be provided to the reader.

Finally, a comprehensive hypertextual guided tour through well- and less well-known WWW search engines will be introduced, as well as an exhaustive map of European websites. The floppy disk in annex will interactively guide the reader through these subjects.

[2] At the European level, only for France and the Netherlands there exist reliable time-series on websites growth.

The concept requested by the Commission was to provide a easy-to-use mapping and accessing tool for each end user PC, targeted SMEs and individuals in the Information Society context, which should respond to the functions of:

- geographic map for Europe, with clickable navigation by country and with the summary display of key indicators;
- inherent directory of the European ISPs and sites with possibility to access (without typing the Internet address);
- a practical implementation to be offered to the ISPs' national Associations and their new European federation EUROISPA for a regular update.

I.2.2 The WWW development models in Europe

As a first step, WWW growth patterns have been retrieved through direct calculation of webpages' monthly evolution from December 1993 to May 1997, through the usage of the AltaVista search engine. More exactly these figures refer to the number of webpages appeared on the WWW rather than to the number of webpages created per month. The analysis should have been extended up to July 1997, but unfortunately in early June 1997 the AltaVista search engine has changed its search interface and it has become not possible any more to proceed in data collection. The data for July 1997 must be considered as an estimate made on the basis of the growth figures of webpages in the last 12 months.

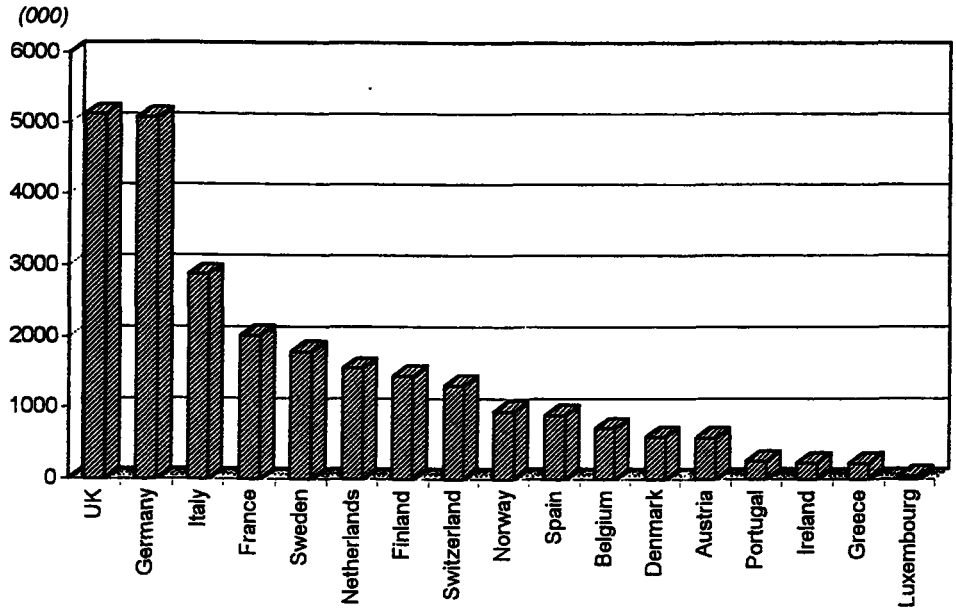
Exhibit 6 traces a 6-months basis evolution (referred to the national TLDs only) of all webpages visible on the WWW for each EU country. In addition, while the exposed method may be considered valid until today due to the very high reliability of the data, the increasing share of non-national TLDs (such as .com) and the imminent introduction of other new TLDs will make it much more difficult to retrieve realistic figures on the absolute number of webpages per country in the future.

Exhibit 6 Webpages growth in EU 15 (January 1996-July 1997)

	January '96	July '96	January '97	Webpages annual growth rate (Jan. '96-Jan. '97)	July 1997 (estimated)
Germany	781,696	1,592,522	3,819,896	389%	5,083,479
UK	820,034	1,604,797	3,815,330	365%	5,132,163
Italy	320,608	907,393	2,319,170	623%	2,875,077
France	295,154	637,453	1,516,092	414%	2,015,729
Sweden	198,349	493,545	1,299,317	555%	1,791,799
Netherlands	214,310	501,097	1,204,293	462%	1,563,346
Finland	262,944	536,818	1,164,855	343%	1,455,215
Spain	101,417	271,494	719,811	610%	903,140
Belgium	89,435	226,318	559,766	526%	720,108
Austria	113,185	225,702	459,100	306%	584,148
Denmark	97,243	195,773	451,922	365%	597,988
Greece	44,682	100,566	202,988	354%	226,136
Portugal	38,986	82,869	193,041	395%	254,355
Ireland	37,410	83,889	184,743	394%	232,968
Luxembourg	3,761	10,340	30,139	701%	48,987
TOTAL EU	**3,419,214**	**7,470,576**	**17,940,463**	**425%**	**23,484,638**
Norway	142,671	321,009	736,458	416%	955,570
Switzerland	224,462	451,857	1,040,907	364%	1,323,925

Source: Databank Consulting, 1997

Exhibit 7 Webpages in the EU 15 (July 1997)

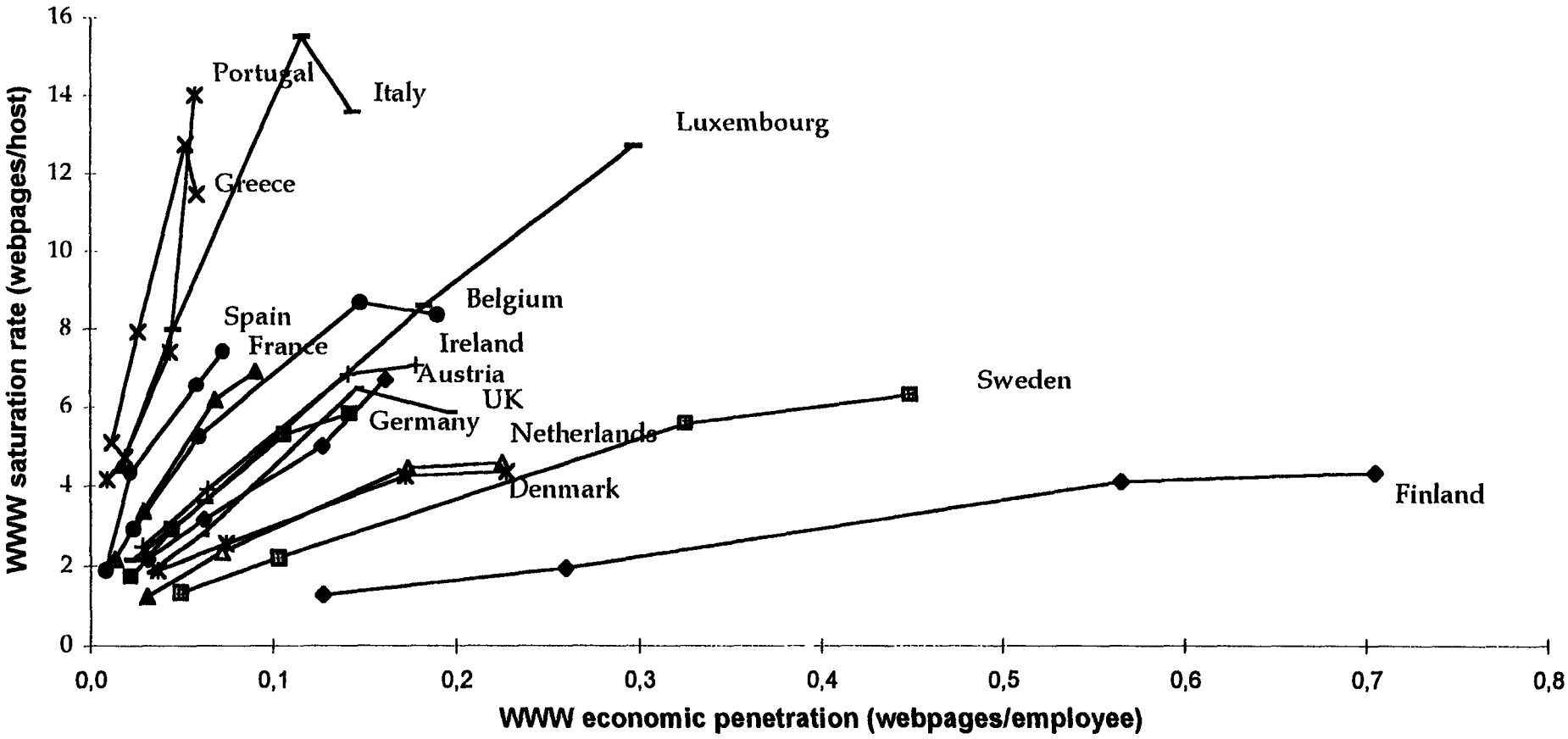


Source: Databank Consulting, 1997

Again, the number of webpages is not in a fixed proportion with the number of websites. While it is possible to calculate the average number of webpages per Internet host, it is not possible to calculate on a statistical basis the average number of webpages per website: this quantity may even strongly vary, due to the average dimension of the national ISPs, the typology of webpages' content (commercial or non-profit), etc. As an example, according to a Databank Consulting estimate, in February 1997 the average number of webpages per website was 306 in France and 390 in Italy.

As shown by several well-known indicators the Internet has very different diffusion and penetration rates when considering, for example, Nordic or Mediterranean countries. One very interesting investigation aspect is to try to understand if the WWW, within the Internet evolution, follows the same development model or not, and why. Exhibit 8 highlights the WWW development path in relation both with the overall Internet development and the economic structure per EU country. Exhibit 9 reports the same data in table format.

Exhibit 8 **WWW development chart for EU (period January 1996-July 1997)**



Source: Databank Consulting, 1997

Exhibit 9 Data for the WWW development chart in the EU.

Country	January 1996		July 1996		January 1997		July 1997	
	WWW economic penetration	WWW saturation rate	WWW economic penetration	WWW saturation rate	WWW economic penetration	WWW saturation rate	WWW economic penetration	WWW saturation rate
Finland	0.13	1.26	0.26	1.94	0.56	4.11	0.71	4.33
Denmark	0.04	1.88	0.07	2.54	0.17	4.24	0.23	4.36
Netherlands	0.03	1.23	0.07	2.33	0.17	4.45	0.23	4.58
Germany	0.02	1.73	0.04	2.91	0.11	5.29	0.14	5.81
UK	0.03	1.82	0.06	2.77	0.15	6.45	0.20	5.84
Sweden	0.05	1.32	0.10	2.21	0.33	5.58	0.45	6.30
Austria	0.03	2.15	0.06	3.17	0.13	4.99	0.16*	6.68
France	0.01	2.15	0.03	3.36	0.07	6.18	0.09	6.90
Ireland	0.03	2.49	0.06	3.91	0.14	6.83	0.18	7.05
Spain	0.01	1.89	0.02	4.35	0.06	6.54	0.07	7.41
Belgium	0.02	2.93	0.06	5.23	0.15	8.66	0.19	8.36
Greece	0.01	5.09	0.03	7.93	0.05	12.75	0.06	11.47
Luxembourg	0.02	2.14	0.06	3.59	0.18	8.60	0.30	12.71
Italy	0.02	4.37	0.05	7.98	0.12	15.50	0.14	13.56
Portugal	0.01	4.17	0.02	4.72	0.04	7.40	0.06*	14.02
EU AVERAGE	0.02	1.83	0.05	3.06	0.12	6.10	0.16	6.30

* in Austria and Portugal the Network Wizards survey reported for July 1997 a number of Internet hosts lower than in January 1997, thereby causing the WWW saturation rate (webpages/hosts ratio) to increase faster than in other countries.

Source: Databank Consulting, 1997

In particular Exhibit 8 considers:

- the *WWW saturation rate* (i.e. the *webpages/hosts ratio)*, which takes into account the growth of the WWW with respect to the overall Internet development ("inside the Internet" evolution);

- the *WWW economic penetration* (i.e. the *webpages/employees* ratio), which considers the penetration of the WWW in the economic structure for each country ("outside the Internet" evolution).

All ratios have been calculated on a 6-months basis (January 1996, July 1996, January 1997 and July 1997) for each EU country and plotted on the WWW development chart. Data on employees by sectors have been taken from Eurostat and refer to 1996. These data have been considered valid for all the years of observation (1996 and 1997), due to the very small expected variations in time of the number of employees (in the order of 2-4%) with respect to the increase of the number of webpages in the same years (in the order of 400-700%, as shown by Exhibit 6).

The webpages/employees ratio (WWW economic penetration in Exhibit 8) does not significantly differ from the webpages/population ratio, due to the substantially homogeneous unemployment rates in EU countries. As a consequence, the chart constitutes a useful instrument for the analysis both of the business and the residential WWW penetration.

The diagram must be read in the following way:

- the data are composed by three segments for each country, representing the combined growth of the above defined indicators registered in three consecutive 6-month periods: the first segment correspond to the period from January 1996 to July 1996, the second from July 1996 to January 1997 and the third and last one from January 1997 to July 1997;

- the length of each segment is proportional to the number of webpages created in the corresponding period. We will refer at this length as to an indicator of the *WWW activity* for the given time period;
- long segments correspond to a high degree of WWW activity;
- short segments correspond to a low degree of WWW activity.

The assessment of the WWW development model for each country is crucial. For example Finland and Italy, both very vital in WWW development, represent two extreme models in WWW evolution. According to Exhibit 8, Finland has a very high economic penetration and a very low saturation rate. We will refer at it as to the ***Northern European model.*** On the opposite, Italy has an extremely high saturation rate and a small economic penetration. We will refer at it as to the ***Southern European model***[3].

There is a clear correspondence between the two models and the Internet host penetration rates: countries with high Internet penetration rates approach the Northern European model, while countries with poor Internet host penetration follow the Southern European model.

However, the Internet host penetration says very little about the WWW activity per country. For example, Italy and Greece, having very poor Internet host penetration, demonstrate a surprising WWW activity. The reasons leading to follow one rather than the other WWW development model should therefore be searched not only within but also outside the Internet.

[3] This trend has already been foreseen in 1995 in a quantitative analysis contained in an EC-funded study by Eric Arnum introducing the definition of "IT quotient" as a discriminating factor for the ICT development in a given country or region, basing its analysis also on macro-economic indicators such as the GDP. A new updated definition of the IT quotient has been defined for this study and named "Internet Ratio", defined as the sum of Internet hosts, Internet domains and webpages divided by national GDPs. According to this indicator, the first EU ranking countries are: Finland, Iceland, Sweden, Norway, Switzerland, Denmark and the Netherlands, thus confirming a leader role of Nordic European countries in the Internet and WWW development. Details and discussion on this definition are included in Section I.1.4.

By analysing the WWW development chart, five important considerations come to evidence:

1. *Mediterranean countries denote a very high degree of WWW activity and growth, comparable to Northern countries. This is not detectable by utilising known growth indicators such as the Internet host penetration. New indicators, such as the WWW saturation rate and the WWW economic penetration indicator, could describe the WWW evolutionary trends better than the Internet host penetration does.*

2. *Countries following the Southern European model do not necessarily have higher Internet access tariffs than the countries following the Northern European model (see Exhibit 10). The opening of a website has its costs, which are mostly Internet access and website design costs. Access costs are not higher in countries approaching the Southern European model. While it is true that Finland and Sweden have the lowest Internet access tariffs in Europe, it is also true that Austria, in a nearby position, has the highest Internet access tariffs in Europe. On the opposite, Italy, which approaches the Southern European model, has very low Internet access tariffs. The strong development of the WWW in Mediterranean countries (such as Italy and Greece) appears to be independent of the present Internet access tariffs, as it can appear to a first glance. In other words, there doesn't seem to be a strong correlation between tariffs levels and the WWW development.*

Exhibit 10 **Peak, off-peak and average rate Internet access tariffs (in US$, 20 hours on-line per month), August 1996**

	Peak rate	Off-peak rate	Average rate
Austria	89.81	89.81	**89.81**
Portugal	86.90	66.41	**76.66**
Ireland	91.57	43.85	**67.71**
Germany	74.67	56.30	**65.49**
Denmark	72.54	50.57	**61.56**
Greece	58.28	58.28	**58.28**
Netherlands	65.59	47.58	**56.59**
UK	65.24	43.69	**54.47**
Luxembourg	62.36	46.18	**54.27**
Belgium	65.37	38.67	**52.02**
Spain	51.01	51.01	**51.01**
Italy	53.89	39.22	**46.56**
France	52.26	39.95	**46.11**
Sweden	46.33	41.58	**43.96**
Finland	37.96	26.13	**32.05**

Source: OECD, 1997

3. *it exists a **critical threshold** for opening a website, in term both of contents and enterprise dimension. All countries with prevalence of very small enterprises (i.e. with high numbers of individual enterprises, see Exhibit 11) approach the Southern European model. Individuals and very small enterprises do not open own websites. They prefer to produce a (limited) number of webpages and to host them at their ISP's site (or somewhere else) in order to vehicule their image and products over the Internet. Individuals and very small enterprises rarely reach such a content quality and quantity to justify the economic efforts to open an own website;*

This observation is confirmed by the results of the survey addressed to non-residential users led in the framework of this study. According to the results of this survey, the dimension of a website in terms of number of webpages is directly related to the dimension of the company (see Part III).

Exhibit 11 Size-class structure of the enterprise sector by country (1995)

	Number of enterprises (x 1000)	**Enterprise's average size** (number of employees)	**Size-class dominance***
Austria	145	13	SME
Belgium	410	7	Large
Denmark	150	9	SME
Finland	340	3	Large
France	1,965	7	Large
Germany	2,670	9	Large
Greece	690	3	Very small
Ireland	130	9	SME
Italy	3,365	4	Very small
Luxembourg	15	11	SME
Netherlands	390	11	SME
Portugal	580	5	SME
Spain	2,200	5	Very small
Sweden	415	5	SME
United Kingdom	2,565	8	Large
EU 15	**16,030**	**6**	**SME**

* A country is said to be very small, SME or LSE dominated if either very small enterprises, small and medium sized enterprises (taken together) or large scale enterprises have the largest share in total employment.

Source: The European Observatory for SMEs, 1996

4. *the Southern European model suggests a sort of "non-sustainable" WWW development model. The WWW explosion (started in early-mid 1995) led to a saturation of the existing Internet infrastructures (hosts) in Mediterranean countries. The main risk of the WWW saturation is to congestion the Internet traffic towards the websites, thus slowing down the access time and the overall speed of the connection, which, in case of commercial websites, may also negatively impact the business' development perspectives. In other words, in quantitative terms, in those countries the infrastructures appeared to be not ready for the content;*

The risk of congestion can be however easily detected by Internet operators (backbone operators, telecom operators and ISPs), which as a consequence may foresee bandwidth increases in high traffic density links.

5. *the two development models may also represent two different cultural approaches. Simple lack of infrastructures in Mediterranean countries or alternative development models?*

By deepening the analysis of the WWW development chart per country some remarks come to evidence:

- a strong slow-down in WWW activity has been registered in the last period of observation (from January 1997 to July 1997). In the same period, the change of the slope of the curves for most countries denotes a shift towards the Nothern European model, particularly evident for Mediterranean countries (Italy and Greece). On the other side, an extremely high degree of WWW activity was registered for all countries in the second half of 1996;

- some countries (e.g. Germany, France and UK) show a rather surprisingly low relative WWW activity. In strict terms the data are true. In these countries it must however be taken into account the effect of Intranets. Intranets, vehiculing a very high quantity of WWW information between different sites of the same organisation, are not visible from outside, and it is likely that the outlined WWW development models are somewhat influenced by this fact. Intranets applications are spreading within corporations and smaller companies at least as fast as the use of the Internet. For example, an Intranet survey carried out in the UK on 1567 user companies in 1996 (the Black Box Survey) showed that by October 1996 a quarter of them had Intranets and another quarter expected to install one within a year. In larger companies Intranet penetration was already over 40%. A 1996 survey of large European companies by Netscape Communications Corp. and IDC showed that 82% of British and Swedish companies will have Intranets operating within one year, as will two-thirds of German companies and half of those in France. In conclusion, the WWW evolution data in countries where the dominant size-class of enterprises is Large (i.e. UK, France, Germany, Belgium and Finland, see Exhibit 10) should take into account the Intranet impact on the WWW evolution figures. By increasing the overall number of webpages, it should be expected that both ratios increase, with a global and perhaps considerable increase in the relative WWW activity for those countries (represented by an increase of the absolute lengths of the segments as defined in Exhibit 8);

- Luxembourg and Belgium have a relatively high WWW saturation rate probably due to the presence of several public large-sized public interest European websites;

- data for Portugal, Spain and Austria are possibly less reliable for the last period of observation (from January 1997 to July 1997) due to some contradiction of the Network Wizards data, as outlined in Section I.1.2;

The emerging relevant key messages are:

- *the development of the WWW doesn't follow the same development model of the Internet as a whole. The Internet as an infrastructure (i.e. in terms of host penetration) has precise development trends, based on consolidated indicators. The WWW, which is the most popular Internet service, follows a different development model per country, as shown above in the quantitative analysis;*
- *Mediterranean countries have a degree of WWW activity comparable to Northen countries. This is not detectable by utilising known growth indicators such as the Internet host penetration. New indicators, such as the WWW saturation rate and the WWW economic penetration indicator, could describe the WWW evolutionary trends better than the Internet host penetration does;*
- *Internet access and usage tariffs seem not to be the determinant factors affecting the WWW usage and development, as it could be expected. Driving factors appear to be the economic structure of the country and specific social approaches to the Internet and the WWW. This fact implies that electronic commerce development, closely linked to the WWW, is apparently not directly influenced by Internet access and usage tariffs yet;*
- *the WWW development in Southern European countries suffers from lacks of Internet infrastructures, risking to cause traffic congestion in national Internet networks. An upgrade of the existing ones could help to avoid this problem.*

I.2.3 The language on the WWW

Another crucial aspect, closely linked to e-commerce development perspectives, is represented by the answer to the question:

"Which language is spoken on the WWW?"

or, alternatively:

"Is English the first language on the WWW?"

The answer is no, English is definitely not the first language on the WWW at least for company sites, but the second. The first language on the WWW in Europe are the national languages.

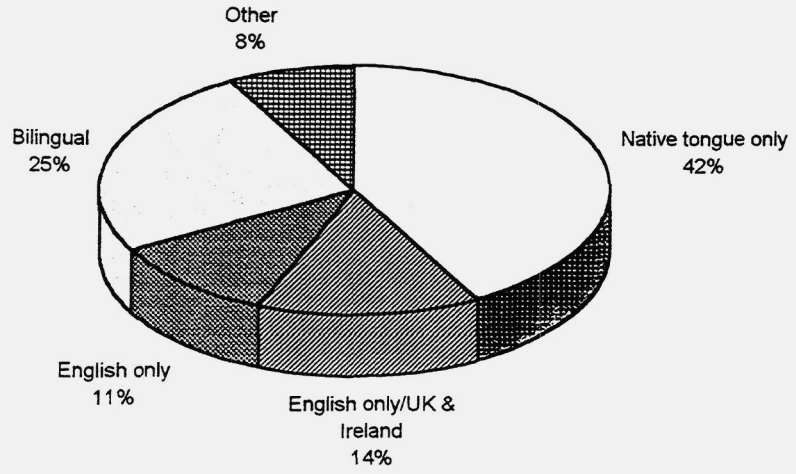
Exhibit 12 shows the estimated overall distribution of the languages on the WWW in Europe, based on a random sample of about 1% of the European websites (825 overall, 615 in the EU countries). The sample has been chosen by selecting from each European country about 1% of the websites. Only commercial sites, that is sites opened by companies (not by sites within the .com domain) have been selected, no academic or non-profit websites have been visited.

Exhibit 12 Distribution of languages on the WWW in Europe, based on a sample of 1% of visited company websites

	Number of EU websites	%	Number of non-EU websites	%	Total number of websites	%
Native Tongue (non English-speaking countries)	**261**	**42%**	**72**	**33%**	**333**	**40%**
English only (UK and Ireland)	84	14%	0	0%	84	11%
English only (outside UK and Ireland)	71	11%	27	12%	98	12%
Total English only	**155**	**25%**	**27**	**12%**	**182**	**23%**
Bilingual (Native Tongue and English)	**150**	**25%**	**90**	**43%**	**240**	**29%**
Multilingual	**49**	**8%**	**21**	**10%**	**70**	**8%**
TOTAL	**615**	**100%**	**210**	**100%**	**825**	**100%**

Source: Databank Consulting, 1997

Exhibit 13 Distribution of languages on the WWW in the EU, based on a sample of 1% of visited commercial websites



Source: Databank Consulting, 1997

This trend is confirmed in all EU countries. Even Nordic countries, which are known to be the most English-speaking European countries show a high number of websites in national language only (60% in Sweden, 50% in Denmark, 47% in Finland and 42% in the Netherlands). Outside English speaking countries, only Flemish-speaking Belgium (47%), Greece (35%) and Luxembourg (30%) revealed a high share of English-only websites. No English-only websites have been detected in France and in French-speaking Belgium, and only 3% in Spain. The highest share of multilingual commercial sites (more than two different languages) has been detected in Luxembourg (60%).

The share of English-only websites strongly decreases when analysing the data for nine non-EU countries: Norway, Switzerland, Poland, Russia (.ru), Czech Republic, Hungary, ex Soviet Union (.su), Slovenia and Iceland.

The share of bilingual and multilingual sites is higher in countries with relatively small internal markets, in general countries with no more than few millions of inhabitants, such as Luxembourg (90%), Iceland (80%), Greece (75%) and Norway (63%). Poor Internet penetration doesn't facilitate the creation of webpages in native languages as well, as in the case of most part of the Eastern countries under exam (more than 55% of the visited websites are bilingual or multilingual), with the only exception of Slovenia (45%).

Two preliminary conclusions can be drawn:

- *the WWW is quickly going towards a strong regionalisation. Companies approach the WWW in a non-global commercial perspective;*
- *the WWW is quickly transforming the Internet in a real mass-market which will probably soon start to develop peculiar national or regional characteristics in terms of structure, offer, content and information deployment.*

I.2.4 The Internet Ratio: old and new superhighways

In a study of 70 countries that collectively represented 99.91% of the hosts on the Internet in January 1997, it was revealed that in general, the nations with the highest diffusion rates for transportation, energy and telecommunications also are among the leaders in Internet usage.

Countries in this category include Switzerland, Bermuda, Norway, Canada, Australia, Denmark, Netherlands, and USA. They are leaders in the diffusion of the old superhighways and leaders in the diffusion of the new superhighways.

In general, countries that deployed high amounts of roads, railways, electrical power, phones, and TV broadcasting in earlier generations are also leaders in the current generation's deployment of Internet hosts and webpages. One can be said to be the result of the other: extensive transportation and communications infrastructures enabled commerce and created wealth, and these indicators in turn produced a demand for the Internet.

Conversely, the nations of South America and the Asia/Pacific Region (with notable exceptions such as Japan, Australia, Singapore, Hong Kong, Taiwan, and New Zealand) are behind the curve in terms of deployment of paved roads, wired infrastructure, and, no surprise, Internet usage.

Countries were compared on measures such as size, population, and Gross Domestic Product, as well as on their kilometre totals for roads and railroads. Statistics also were collected for their electrical output, and number of phones and televisions in use.

For the top 40 of the 70 countries, statistics also were compiled for the number of webpages, number of Internet domains, and number of Internet hosts in existence in January 1997. For countries 41 through 70, only the number of Internet hosts was used in the calculation.

These statistics were compiled to create five ratios, for Density, Wealth, Paved, Wired, and Internet. In general, the ratios rank the 70 countries from highest to lowest diffusion rates within the category, for example the Paved Ratio is the addition of kilometres of paved road and railways, divided by the square kilometres of area within the country's borders.

$$\text{Internet Ratio} = \frac{\text{Internet Hosts} + \text{Internet Domains} + \text{webpages}}{\text{GDP}}$$

$$\text{Wired Ratio} = \frac{\text{Electric (kWh)} + \text{Phone Lines} + \text{TVs}}{\text{Population}}$$

$$\text{Paved Ratio} = \frac{\text{Railway (km)} + \text{Road (km)}}{\text{Area (sq km)}}$$

$$\text{Wealth Ratio} = \frac{\text{GDP}}{\text{Population}}$$

$$\text{Density Ratio} = \frac{\text{Population}}{\text{Area (sq km)}}$$

In all, there were nine to eleven data points per country, for a total of more than 700 different statistics. They were collected from public sources including CompuServe's Groliers Encyclopedia, the CIA World Factbook, and the Network Wizards and Alta Vista websites that provided the statistics used elsewhere in this report.

Exhibit 14 summarises the overall statistics for all countries under observation. The Internet Ratio confirms and validates the trends observed in the Internet and WWW analysis, placing Northern European countries at top of the list.

Exhibit 14 Internet Ratio, Wired Ratio, Paved Ratio, Wealth Ratio and Density Ratio

	Internet Ratio	Wired Ratio	Paved Ratio	Wealth Ratio	Density Ratio
Finland	**15.66**	12.31	6.31	18,085	39
Iceland	11.39	18.12	1.11	18,345	3
Sweden	8.64	16.98	2.09	19,918	20
Norway	8.61	**27.67**	2.92	24,112	14
USA	8.59	13.05	6.61	**27,048**	27
Switzerland	7.43	9.12	18.44	21,865	176
Australia	6.57	9.38	1.14	21,986	2
Canada	5.37	18.47	0.94	23,830	3
Denmark	4.97	7.22	16.87	21,409	122
Netherlands	4.89	5.63	25.93	19,287	374
Ireland	3.90	4.73	13.52	15,356	51
Britain	3.87	6.01	17.38	19,423	240
Austria	3.63	6.96	13.91	18,872	96
Belgium	3.17	7.35	**46.29**	19,307	334
Luxembourg	3.10	4.00	20.74	23,670	163
Germany	3.07	6.92	7.48	17,272	236
New Zealand	2.72	9.40	3.65	17,367	13
Russia	2.49	13.85	14.45	11,527	102
Japan	2.47	8.58	30.47	21,311	333
Italy	2.27	4.50	10.72	18,921	191
Greece	2.16	4.13	10.04	9,610	80
Portugal	1.88	3.52	7.98	11,776	107
Slovenia	1.81	5.08	7.78	11,614	96
France	1.50	8.74	15.52	20,061	107
Hungary	1.48	3.71	4.05	7,297	107
Spain	1.47	4.49	6.67	14,397	78
Czech Republic	0.89	N/A	8.24	10,292	131
South Africa	0.83	4.06	1.72	5,079	35
Hong Kong	0.73	6.06	16.31	23,765	**6,166**
Poland	0.59	3.83	12.44	5,858	124
Chile	0.40	1.82	0.24	7,803	19
South Korea	0.33	4.15	6.73	12,856	467
Brazil	0.30	1.74	1.74	5,938	19
Mexico	0.20	1.51	1.39	7,394	50
Argentina	0.15	1.81	0.90	7,780	13
Russia	0.15	6.46	0.57	5,379	9
China	0.01	0.69	1.13	2,865	128

Source: Databank Consulting, 1997

I.2.5 Comparative analysis of American and European WWW search engines

WWW search engines constitute at present the main navigation instrument on the WWW and one of the most used Internet generic services. This section aims at providing an overview on the most popular European and American WWW search engines, together with evaluation criteria and results.

The "Tour for the European Commission DGXIII of WWW search engines" may be found in the annexed floppy disk and allows the reader to navigate through the most diffused world search engines. Evaluation procedures and complete relevant findings are contained in the floppy disk as well.

In order to give a quantitative angle to this admittedly subjective tour of the Web's search engines, we chose to execute a keyword search for a word that would be commonly found on many thousands of websites, in multiple languages. But it couldn't be too common, because many search engines screen out searches for terms such as "the" or "com".

We chose the term "java", which is the name of a popular Web programming language, the name of an island in the South Pacific, a type of chicken, and a slang term for coffee. It is safe to say that the number of matches for a common search term such as "java" is an indicator of the depth of a search engine's database.

American search engines are still the most powerful ones. In particular:

- AltaVista, by Digital Equipment Corp. is without doubt the most comprehensive Web search engine. Our search on the example "java" as a search term, for instance, found more than three million pages that mentioned the term. This is at once its major strength and its major weakness. Getting too much information is sometimes as bad as getting too little. Digital Equipment Corporation developed AltaVista in 1995 at its Palo Alto research labs, with a goal to index the entire Web and Usenet news groups. The company claims that its vast index takes up more than 60 Gigabytes of disk space at present. In July 1997, AltaVista improved the look and feel of its user interface, adding options for searching by language, and continuing other advanced options such as searching by date. The search on the term "java" as well as additional experience researching the rate of creation of webpages and the language of websites in Europe convinced us that AltaVista is the most comprehensive Web search engine. HotBot, Infoseek and Excite also are worth a look, but AltaVista also returns the most organised search results. In addition to the original AltaVista site, five additional mirror sites operate around the world. There are now AltaVista sites in Australia, Malaysia, Spain, and Sweden, as well as an assortment of other search engines listed on AltaVista main site;

- other top-scoring American WWW search engines are:

  - The *HotBot Web Index* by Wired Digital Inc., publishers of Wired magazine, was the second most thorough search engine, after AltaVista. For the search term

"java", HotBot found over 675,000 matches. They are, however, presented only ten at a time, with no easy way to skip to the end or middle of the listings. HotBot also allows advanced searches by domain, by host, by date, and by page type, using the advanced search options available on the home page;

- The *Infoseek Guide* also has a vast collection of webpages at its disposal. Our search for information on "java" produced over 289,000 matches. There also is a list of websites organised by topic. If the user prefers, this list of websites by topic can be suppressed by choosing the Ultraseek option to get to the streamlined search page;

- *Excite Inc.* operates a Web search engine that claims to have indexed about 50 million webpages. The Excite search engine doesn't give a count of how many matches it makes for a term such as "java". At first, it lists only the Top Ten, with no advice as to how many more matches are to follow. We found it to be rather cumbersome to use. The home page is cluttered with film reviews, advertising, links to games, weather, and news headlines. The home page also contains links to various Global Excite mirror sites that operate user interfaces in local languages, including in French, German, Japanese, and Swedish. The French, Japanese, and Swedish interfaces, however, are merely options off the main excite.com host. The only true mirror site among them is the German search engine. There also is an Excite mirror site in the UK that operates from Excite's offices in London's Soho district. This English-language search engine allows users to search the entire Web, or look just for matches on UK websites, or search only European websites. This search engine found about 127,800 matches on European sites for "java" information, and about 23,650 matches on UK sites for "java" information;

- The *WebCrawler* search engine is somewhat limited in comparison to the others. Our search for information on "java" produced 41,000 matches, initially displaying the first 25, and providing an option to see the next 25, and so on. There also is a directory of websites organised by topic;

- most part of native European search engines, even if claiming to have indexed million of pages, perform in general unfortunately rather poor. Among the best European WWW search engine they are worth to be mentioned:

  - *Rambler Search* (Russia), by Stack Ltd., in an English-language search engine that claims to have indexed some 800,000 documents from 6,500 websites. A search on the term "java" produced 14,339 matches in Russia, Ukraine, and other domains in the former Soviet Union. The first 15 matches were displayed immediately, with options to jump to any of the next 20 pages using the navigation buttons at the bottom;

  - *ILSE* (Netherlands), the Internet index for the Netherlands, is a comprehensive Web search engine of Dutch websites. A search on the term "java" produced 3,930 matches within the Netherlands alone, organised ten to the page, with navigation buttons at the bottom for the multiple pages;

- *Swiss Search* (Switzerland) is a comprehensive search engine that will display up to 50 matches for a given search term. A search on the term "java" resulted in 2,399 matches within the .ch domain, the first 50 of which were displayed in one long scroll. Descriptions (in English) also were provided. Navigation buttons at the bottom of the page pointed to additional matches;

- The Italian Spider, *Il Ragno Italiano* (Italy), is a multi-function search engine that provides access to its own listings as well as to other major Web search engines such as AltaVista, Lycos, Infoseek, Excite, WebCrawler and Open Text. A search of its database found 1,629 matches for the search term "java" on Italian Web servers. There also is an Italian user interface available.

Part II.

The Internet Market: actors and users

II.1. The European telecom and Internet backbone operators

II.1.0 Methodology and scope of Telecom and Internet backbone Operators Survey

This section is based on 17 face-to-face interviews with operators managing an Internet backbone, at national, European or world-wide level. The interviews were of qualitative nature, based on open questionnaires, focused on market and technical development strategies.

The interviews were carried out with operators based in 6 EU countries, selected in order to represent the main characteristics of the European Internet market, on the basis of the following criteria:

- *Germany and UK,* as the two countries with the highest absolute number of Internet hosts in Europe;
- *France and Italy,* as the other two large countries with remarkable growth rate in Internet usage;
- *Netherlands and Finland,* as representative of the Northern European countries.

The interviews included the four main typologies of Internet backbone operators, that is Global Operators, National Telecom Operators, New Entrants and Internet backbone operators (see following par. for definition).

The interviews focused on three main aspects:

- operator position in the Internet market and in the Internet Value Added Chain;
- future plans for operators' Internet backbones, both under market and technical point of view;
- relationships with ISPs and other operators (peering, market position).

On some aspects, such as financial issues, the operators requested confidentiality and therefore only summarised general conclusions are reported.

II.1.1 The structure of the Internet market in Europe

Since the Internet is a network of networks, the structure of delivery of its services is fairly complex and includes multiple levels of interconnection among suppliers. The Internet value chain is also becoming more articulated as activities such as content provision and aggregation, system integration, electronic commerce develop and increase in relevance. For the supply-side analysis of this study we focused on the generic value chain of Internet delivery and provision, excluding actors engaged in content provision and other value added services development and implementation. From this point of view, the main categories of actors present in Europe can be described as follows:

- *Global operators,* operating global world-wide Internet backbones: Global One, Concert, Cable&Wireless, Worldcom-UUNET, AT&T-Unisource. These 5 global operators are positioned on the global telecommunications market, based on their own global network;

- *National Telecom Operators*: Dominant national operators entering the Internet market in the last 2-3 years, usually through ad-hoc subsidiaries or departments;

- *New Entrants*: emerging telecom operators entering the market thanks to liberalisation, starting very recently to include Internet services provision in their portfolio because of its success;

- *Internet backbone operators*: operators whose roots are in the early Internet academic and research communities networks structure, grown together with the development of the market in the last ten years. They are not real telecommunications operators as they do not operate their own infrastructures, but manage what can be considered as national/international private backbones, developing Points of Presence at local or European level.

- *Internet Service Providers* operating at national or local level: usually local Internet providers give mainly access services and act as Points of Presence for larger providers, while Service Providers at the national or international level have more extended products and services portfolios.

Exhibit 15 The structure of the Internet Services Provision Market in the European Union

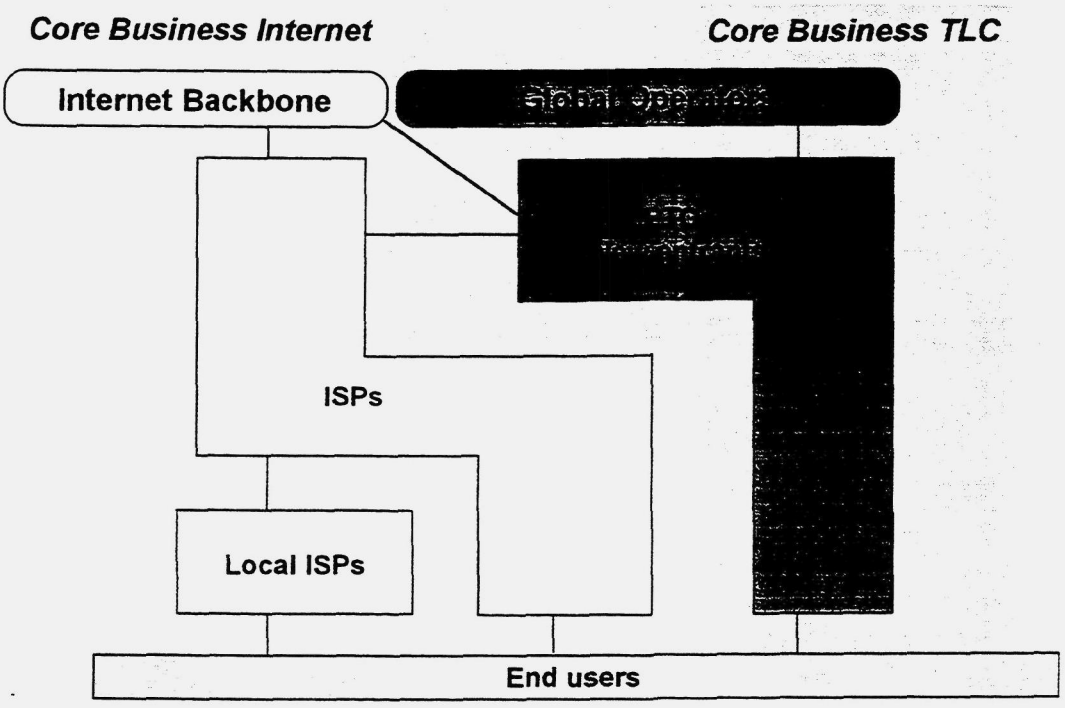
Actors	Present In Europe	Core business	Average time of presence in the Internet market	Geographical extension of market addressed
European PTOs	20	Telecom services	2-3 years	Mainly national markets through subsidiaries
Global Operators	5	International Telecom services	2 years	World - large multinational companies
New entrants	c.a 20	Telecom services	1 year - planned	Mainly national markets
Internet backbone operators	c.a 5-10	Internet	10-20 years	World / Europe
ISPs	c.a 1000	Internet	3-5 years	A minority of large ISPs international /national markets - majority address regional/local markets

Source: Databank Consulting, 1997

The interaction among these categories of actors is shown in the following chart which illustrates network interconnection dependencies. The chart makes clear that Internet backbone operators and Global operators are in direct competition for the transport and IP interconnection traffic at the international and world level, while PTOs, New Entrants and ISPs face each other at the local access level interfacing end users. Large multinational companies are the only end users directly targeted by Internet Backbone and Global Operators, but services at the local level are delivered by their local partners acting as ISPs.

The following analysis of actors positioning and development strategies will show that the market is in fast evolution, heading towards a shake-out of the large population of ISPs (especially local ISPs) whose early competitive advantages (early entrance in the market, low prices, closeness to local users) are rapidly vanishing. Key aspects in the market evolution are the pressure for change of peering agreements (commercial agreements for the exchange of Internet traffic among ISPs and backbone operators) and the increasing number of vertical and horizontal alliances between operators, ISPs, content and value added services/applications providers excluding weaker competitors.

Exhibit 16 Internet Delivery Chain



Source: Databank Consulting, 1997

II.1.2 Telecom operators and Backbone operators profile and positioning in the Internet market

Historic Telecommunications Operators

National European Telecom Operators entered in force the Internet market in direct competition with ISPs mainly in the last two years (even if obviously they've always been carrying Internet traffic for national and local ISPs). They did so by establishing dedicated subsidiaries or concentrating in ad-hoc departments. Internet service provision to business and residential end users. In some cases national regulatory authorities have required separate accounting to avoid cross-subsidisation and guarantee fair competition, as the national Antitrust Agency imposed to Telecom Italia Networks, Telecom Italia business unit acting as ISP. The provision of IP connectivity services to ISPs/OSPs is usually separated from services provision to end users in different company organisational units.

National TO consider Internet as a strategic market and are pursuing aggressive strategies aiming at providing a full range of services for all target markets at the national backbone and access level: IP connectivity to ISPs, Internet access to business, residential and SOHO (small office - home offices) end users. They match traditional ISPs offering in access services (basic Internet/WWW access services, email, customer helpdesk, server capacity for hosting/housing) and value-added applications (usually at least technical consultancy and editorial support for websites design, creation and management, database access). They are also investing in the development of new services, mainly Intranet/Extranet for the business market, Webcasting and push technologies services, electronic commerce applications at varying levels of functionality.

By leveraging their networks capacity and capillarity, their deep pockets and their name recognition, TOs have managed to gain the lion's share in their national access markets and clearly aim at increasing their leadership. For example, Transpac in France carries about 50% of the Internet traffic and provides Internet connectivity, through France Telecom Internet service, Wanadoo, and through other Internet access providers, to 40% of the final dial-up French market. Telecom Finland has a 43% market share for Internet business connections, and a 50% market share for residential connections, followed by Finnet which controls about 25% of the access market. Deutsche Telekom, through its service T-On-line, dominates the final access market (1,7 million subscribers in September 1997, from which 1.3 million access the Internet) and is positioned at the backbone level through its data network, Datex. In France and Germany national operators have also been able to leverage their previous large users base in teletext type services which are being migrated to the Internet.

In France, Transpac has a special position offering national coverage to on-line services: by limiting the need for the on-line services to develop their national network, the operator limits the risk to see these new competitors likely to take advantage of their own infrastructure to develop new value-added services.

Main European operators are also taking advantage of their multinational alliances in Global Operators to channel national traffic at the international backbone level.

Global Operators

Since 1996, operators of global telecom services have been investing heavily in the development of international IP backbones of very high capacity. The initial results recorded by operators of global services for multinationals indicate that this corporate market is not sufficient in itself for amortising the hundreds of millions of dollars required for developing seamless infrastructures. Although it has not yet reached maturity, it has become fiercely competitive, generating small margins that are not made up for by the volume of traffic.

To cope with this situation, it is necessary for global operators to increase the traffic circulating on their infrastructures. This not only involves enlarging the geographical coverage of their services and adopting an increasingly aggressive sales strategy but, above all, it also calls for diversification of the nature of the traffic conveyed. Insofar as increasing profit margins is concerned, operators have to establish themselves in the market for high value-added services.

It is in this context that global service operators have recently taken up positions in the IP backbone market. This market offers the dual advantage of generating high-volume traffic (because of its increasing multimedia content) and of requiring the implementation of high value-added services (particularly following the increasing diffusion of corporate Intranets: consultancy, designing and developing applications, systems integration, accommodation of servers, firewall implementation). On the other hand, the potential threat of Internet telephony (if still immature) is particularly relevant for the international corporate voice and fax traffic, where Internet tariffs present the highest advantages, and Global Operators must be ready to face it.

The IP market provides global service operators with an opportunity to extend their clientele towards ISPs by offering IP transit services via access to their global high-speed backbone from local nodes.

Internet is a global communication service, so for global operators it represents a "natural" market. They tend to control the global backbone market thanks to their world-wide fiber optic infrastructure. As the network is becoming more and more commercial, their role will increase because they are used to provide quality of service on a global basis. At the same time, they are able to support the financial investments to propose capacity, availability, security and technical support to their ISP and business customers.

WorldCom via UUNet is the only full-American operator (long-distance) positioned on the Global Internet backbone in Europe. But American operators are present via alliances: Sprint via Global One, MCI via Concert, AT&T via AT&T-Unisource Communications. These alliances allow European operators to build the trans-

European Internet backbones and interconnect it with the American ones, building the Global Internet Backbone.

Worldcom/MFS/UUnet is also the only global operator who has made the Internet the cornerstone of its international development strategy, most recently announcing a commercial offensive to carry international fax traffic on the IP backbone at very convenient prices. This is likely to accelerate the pace of competition for international Internet services. The recent bid by the group to acquire MCI is disrupting the American operator's planned merger with BT, even if its outcome (due to the recent stockmarket crisis) is still uncertain. This recent move underlines how competitive strategies in the Internet market are directly affecting overall competitive strategies in the world telecom market.

Exhibit 17 Internet backbone market organisation. Main local partnerships of global players

	Global players				
	Concert	**Global One**	**ATT-Unisource**	**Cable&Wireless**	**UUNET**
USA	MCI	Sprint	ATT	C&W Inc	UUNET
Europe	BT	Global One Europe (Atlas)	Unisource	Cable&Wireless Europe	UUNET International
France	Cegetel	France Telecom (Transpac)	Siris		Oleane
UK	BT		ATT-UK	Cable&Wireless Communications	Pipex-UUNET
Germany	VIAG Interkom	Deutsche Telekom	CNI		EUNet
Netherlands	Telford		PTT Telecom		
Italy	Albacom				
Spain	Telefonica				
Sweden	Telenordia		Telia	Tele2	
Finland			HTC (Finnet)		

Source: Idate, 1997

The main competitors in the global Internet market are the five operators interviewed. SITA (the international network serving airlines), and IBM Global Network are also quoted as competitors at the international level. But the Internet is also a multi-domestic market. The global operators enter in competition with the national operators, offering local POPs. Thus, Concert consider Pipex in UK, EUNet in Germany, or Transpac in France as direct competitors. Global operators also enter the foreign domestic markets, with, for example, BT-MCI, AT&T Unisource, MFS-UUNet and Cable&Wireless developing offers for Internet connectivity directly in France via local partnerships.

Global operators are present in Europe, at various levels: UUNet backbone covers 7 European countries, Global One 14 countries, Concert 10 countries, Unisource 13

countries. Sweden, and the Netherlands are considered as major markets for Global One (along with the United Kingdom) and Concert (along with Spain and Belgium). The Netherlands are also the first market for AT&T Unisource Communication (30% market share), along with Belgium (30% market share), Italy (15%) and France (15%).

Internet backbone operators

Internet backbone operators have profited from the Internet unexpected success but are now facing a choice to define their future: whether to maintain their role of servicing the academic and research network market or to pursue growth in the competitive commercial market. Eunet (at the European level) and Oleane (in France, 20% owned by UUNet) have made this second choice, targeting the business market and building alliances with local partners to improve their range of value-added services. The residential market seems less attractive for this type of operators, lacking the financial strength and capillarity of network of telecom operators.

These operators have high expectations to profit from the impact of liberalisation, since they do not own their infrastructures and hope to gain from decreasing tariffs for transport services and leased lines. If the advent of duopoly markets will not allow these advantages to materialise, they are ready to exploit alternative networks such as satellite.

SURFnet (no profit operator serving the Netherlands academic market) instead has no intention to develop a commercial strategy, aiming at maintaining a high-quality technical service for its universities customers, partially funded by the Ministry of Education. Since PTT Netherlands is also its shareholder, it is likely that SURFnet role at the national level may not be challenged directly in the future.

The position of traditional academic Internet operators at the international level (such as Ebone) instead is weakening, as they lack the investment capabilities to invest in network development to keep up with increasing bandwidth demand.

New entrants

With the upcoming deregulated market in 1998, new players are likely to enter the IP trans-European backbone market, mainly alliances from the traditional telecommunications market. The market should become more and more competitive, the ISPs will have at least two backbone providers for performance and security reasons. At the national level, new operators are going to enter the backbone market, such as Cegetel in France or Albacom in Italy. Being able to operate their own infrastructures, these new entrants can modify the structure of the national markets. New entrants aiming to become full telecom suppliers will also have to enter the access market at the ISP level, as for example o.tel.o. is doing.

Cable operators entry on the Internet market is positioned at the local access level, and no competition is expected at national level. The higher bandwidth likely to be offered by the cable operators will contribute to the bandwidth needs at the backbone level.

Exhibit 18 Telecom operators interviewed

Operator	Country	Profile on the Internet market
Telecom operators		
Telecom Italia/ TIN (Telecom Italia Networks)	Italy	Dominant Telephone Operator business unit (separate accounting) providing Internet services to the consumer market since 1996.
France Télécom/ Transpac	France	Dominant Operator/controlled Transpac manages since 1994 national Internet network with cooperation from Global One for international connections.
Deutsche Telekom	Germany	Dominant Operator/offers Internet services via T-On line subsidiary launched in Aug. 1995.
Telecom Finland	Finland	Leading operator/offers TF-iNet service for Internet.
PTT Telecom	Netherlands	Dominant Operator/ integrated Internet services provision under business unit Net in January 1997.
Finnet/Telegroup	Finland	Consortium of 46 local telephone companies/ Internet access service Kolumbus launched in 1995.
New entrants		
O.tel. o	Germany	Telecom subsidiary of Veba AG and RWE AG, electricity companies, created in Feb. 1997 (previously Vebacom). Active in all liberalised telecom markets including Internet.
Albacom	Italy	Joint venture between Mediaset, ENI and Albacom holding (BT+ Banca Nazionale del Lavoro) created in 1995. It offers Concert Internet Plus services in Italy.
Internet backbone operators		
EUNet	Europe	Started in 1982 as UUCP network. Become commercial in 1992. International holding created in 1996 represents 12 European national subsidiaries. Both backbone and Internet access provider to final users.
Oleane	France	French company (created 1989) with 20% share owned by UUNet-Pipex: international connections through UUNet-Worldcom.
Ebone	Europe	Non-profit association operating since 1991. Provides international and intercontinental connectivity to regional ISPs. Most customers are also association members.
SURFnet BV	Netherlands	Owned by education institutions and PTT Telecom. Provides backbone facilities to universities.
Global operators		
Global One Europe	Europe/world	Joint venture between Deustche Telekom, Sprint, and France Telecom created in Jan. 1996. Internet/IP products minor activity but growing fast.
UUNet (Worldcom/MFS group)	Europe/world	UUNet funded in 1987, merger with Pipex in 1995, with MFS mid-1996, with WorldCom end 1996. IP connectivity and Internet services are core business.
Unisource	Europe/world	Alliance of PTT Telecom, Telia, Swiss Telecom, (Telefonica withdrew in 1997). Allied with AT&T for world services.
Concert	Europe/world	Strategic alliance between MCI and BT launched in 1994, end 1996 definitive merger agreement announced, 1997 rival bid for MCI launched by Worldcom/MFS. IP international backbone.
Cable&Wireless	Europe/world	Announced the creation of business unit Cable&Wireless Internet Exchange in December 1995, reinforced in Europe in 1997.

Source: Databank Consulting elaborations on Idate data, 1997

Exhibit 19 Operators positioning in the Internet market

	Main strategy in Internet market	Target markets				
		IP connectivity to ISPs/OSPs	Internet access to Business users*	Internet access to residential users/ SoHo*	Intranet services	Value added services on Internet
Telecom Operators						
Telecom Italia	Aggressive - full range of services for all target markets in Italy	Offered at national level by Interbusiness (business unit of Business Clients Division)	Offered by Interbusiness / market leader	Offered by Private Clients Division TIN (Telecom Italia Networks) / market leader	Offered by business unit Application services (launched 1997) and by TIN to SoHo	By Application services business unit for business market, by TIN for residential
France Telecom	Aggressive - full range of services for all target markets national and international Exploits large Teletel kiosk system base	Offered at national level by Transpac, international by Global One	To large business through Transpac / to others via controlled access provider Wanadoo / market leader	Offered by controlled access provider Wanadoo / market leader	Offered by Transpac	Offered by Transpac / Migration of Teletel value added services foreseen
Deutsche Telekom	Aggressive - full range of services for all target markets, national and international - Exploits large BTX (German teletext) users base	Offered at national level by Datex, international by Global One	by subsidiary T-Online / market leader	by subsidiary T-Online / market leader	developed by DT (alliance with Netscape) and offered by T-online	Strong telebanking services (legacy from BTX network) in migration to IP protocols.
Telecom Finland	Aggressive / mainly positioned as ISP but entering IP international backbone market	National backbone TFiNET not open to other ISPs.	market leader	market leader	Offered to business market	Standard range
PTT Telecom	Aggressive / ISPs and consumers major target markets / full range of services at national / international level via Unisource	by Net business unit at national level	by Net Business unit	by Net business unit	Offered to business market	Standard range
Finnet	Positioned mainly as ISP, expanding backbone, aims at being among market leaders	Via nation-wide IP network Lanlink managed by subsidiary Datatie	Kolumbus service owned by Finnet and Helsinki Telephone company	Kolumbus service owned by Finnet and Helsinki Telephone company	Standard offering	Standard offering

	Main strategy in Internet market	Target markets				
		IP connectivity to ISPs/OSPs	Internet access to Business users*	Internet access to residential users/ SoHo*	Intranet services	Value added services on Internet
New Entrants						
O.tel.O	Strong presence in Internet market relevant for overall goal of becoming major carrier in Germany	Several ISPs using network services	presently corporate market, expansion planned in SMEs market	via subsidiary Germanynet	offered to business market	Standard offering plus turn-key on-line services and LAN services
Albacom	Presence in Internet relevant for overall goal of t becoming major carrier in Italy	offers Concert Internet Plus in Italy + national transport services	Corporate service aimed at large companies to be launched soon	not at present	Being developed	Included in Concert Interenet Plus + others in development
Internet Backbone op.						
EUnet	Positioned as European global operator Main business focus provision of high quality Internet to business users at pan-european scale	No access to other Internet access providers / services national partners active as national access providers	Main business focus	No offer for cheap unlimited dial-up access	Through local partners	International level directly, national level through partners
Oleane	Claims to be second operator on the French market - Allied with UUnet	10% of clients are national IAP - building network of access partners specialised in value added services	Main target: professionals, large businesses, public administrations, emerging local alternative networks (i.e. Teleports)	No direct offer	Developing supply through a network of access partners	Developing supply through a network of access partners
Ebone	No-profit Provider of pan-European international and intercontinental Internet service to associated partners	Core business / ISPs customers are also associated partners	no	no	no	no
SURFnet	No-profit Netherlands Internet network serving Universities	not appropriate	not appropriate	not appropriate	Not on a commercial basis	Experimenting with videoconferencing, telephony, video and audiostreaming

	Main strategy in Internet market	Target markets				
		IP connectivity to ISPs/OSPs	Internet access to Business users*	Internet access to residential users/ SoHo*	Intranet services	Value added services on Internet
Global operators						
Global One Europe	World-wide IP backbone operator / Internet important in overall strategy as leading world TLC operator	international connectivity offered to parent companies, national data networks and ISPs	Main target: 500 world leading companies National offers through local POPs	not directly	Offering launched in 1997	Evolution foreseen in medium term in partnership with specialised companies
Worldcom/ MFS / UUnet	Aggressive strategy as global telecom operator leveraging Internet network	Positioned as global backbone and global Internet access provider for ISPs/OSPs market	Main target	Not targeted as being too low-margin	n.a.	Involved in electronic commerce in UK and US with partners
AT&T-Unisource	Global telecom operator focused on business market/ international IP network relevant in overall strategy	Provides international connectivity to several hundred ISPs	Large national and international companies main target	not targeted	Included in IP/VPN service to national and international business clients	E commerce transaction services and advanced communication services under development
Concert	Provider of global communication services to multinationals - positioned in international IP backbone market (InternetPlus)	international and world-wide connectivity offered	Directly to large multinational companies	not directly targeted	Provided with partnership agreements to corporate customers	Through Internet Plus Services
Cable & Wireless Internet Exchange	To provide an international infrastructure to ISPs and major corporations / Internet relevant in overall strategy	Provides Transit, Peering and Hosting services to ISPs	Directly to large multinational companies	not directly targeted	Packages supporting ISPs offering of Intranet services	not applicable

* Standard offering usually includes basic Internet/WWW access services, e-mail, customer helpdesk, server capacity (hosting / housing);

** Present offering usually includes at least technical consultancy and editorial support for websites/pages design, creation and management; database access; electronic commerce applications at varying levels of functionality.

Source: Databank Consulting elaborations on Idate data, 1997

II.1.3 Internet revenues status and trends

Internet revenues streams

Internet revenues streams have a different weight when considering telecom and backbone operators or simple ISPs. Internet revenues still account for a very small part of the income of the largest telecom operators (historic operators and global operators), at national and global level, but they are quickly growing with respect to other more traditional incomes such as PSTN telephony. In particular the following different general market trends emerged from the interviews:

- for *global operators* the Internet is not a profitable activity yet. In the opinion of all interviewed global operators the Internet still represents a very small share in terms of revenues (ranging from 5 to 7% of the global revenues per operator). In addition, global operators made of alliances of European operators with American operators (such as Unisource, Global One and Concert) still register losses. On national networks it may be detected a big difference between Internet traffic shares and Internet share of income, being always the incomes much lower than the traffic;

- revenues for *Internet backbone operators* are growing very fast: between 1992 and 1996, for example, UUNet revenues increased by more than 200%. UUNet, which has about 50,000 customers world-wide, reported an increase of about 600 high-speed customers connections every month;

- for *national telecom operators positioned as ISPs*, as it is today the majority of them, dial-up connections, although accounting for the larger number of customers represent still a very small part of the income. These operators are the traditional interface with small- and medium-sized national ISPs.

Exhibit 20 Revenues shares, traffic shares and profitability of the Internet market operations by operator typology

	Revenue shares	Traffic shares	Internet profitability
Global operators	small	medium (at national level)	no
Internet backbone operators	core business	very high	yes
Telecom operators and new entrants (positioned in the ISP market)	very small	very small	no

Source: Databank Consulting/elaboration on Idate data, 1997

Internet backbone operators still have a large share of the traffic (because of their longer presence in the market) and therefore are profitable. Revenue and traffic increase margins for other operators are however very high, in consideration of the fact that they have been in the Internet market for a relatively short time and the potential of their telecommunication infrastructures is enormous. As outlined in EITO '97, *"if the Internet does become a mass market service, there is a great opportunity for PNOs because of the large number of lines already installed (estimated to be five times the forecast number of Internet users in 2000)"*.

Internet revenues include payments for traffic (based on peering agreements among operators and ISPs) and revenues from access services to end users. The mix of revenues is different depending on the operators positioning and is evolving rapidly as follows:

- for Global Operators (excluding UUNet) upstream carrier services (connecting the national ISPs with international networks) represent the larger share of present revenues (90% for example for Unisource). It is expected that direct access and one-stop-shopping international services to large business users will shortly increase in relevance (up to 60% of revenues in two years for example for Unisource). For UUNet which is already a large ISP in many European national markets, Internet access accounts for 70% of the income, and backbone operations for 20% of the income;

- Internet backbone operators are also planning to increase their revenues from access services from their target markets (EU net for example is improving its offer of value added services to the business market proposing European one-stop-shopping);

- National Telecom Operators and New Entrants already receive a large share of their Internet revenues from access services both to business and residential users and target the provision of value-added services and higher quality services (including guarantees for security, higher bandwidth exc.) as a strategy to increase it.

International policies

Global operators propose full packages of services including: backbone interconnections, router configuration, management services, helpdesk facilities, customer services, IP address registration, back-up mail exchange, back-up DNS (Domain Name Server).

Various policies apply for pricing at international level:

- EUNet international offers different pricing schemes in each country, and wants to evolve toward one-stop-shopping at the European level, with one tariff scheme;

- Global One, which now applies one tariff level per geographic zone (i.e. Europe), wants to differentiate its policy according to the reality of each local market;

- Concert policy should remain the same, and is based on the situation of the local market, the idea being to remain cheaper that the national backbone leader for connecting premises up to 15 km from a Concert Internet Plus node. To specifically tailor pricing and services for large customers, and to go with degressive pricing according to consumption is also foreseen as a general trend.

Some operators, such as AT&T Unisource Communication already consider services as tailor made for large business, and cannot give insight about their tariffs.

Issues connected to peering policies (interconnection agreements between ISPs and telecom operators) will be treated in Section II.3.

II.1.4 Technical development strategies

The transition from traditional text or data-only narrowband applications (such as electronic mail) towards real-time, multimedia broadband applications (such as the World Wide Web, now accounting for the largest share of traffic) is putting pressure on the network capacity of the Internet, both at the backbone and local access levels. All operators interviewed are investing heavily in the development of the network. Main trends are:

- at the backbone level, Global Operators are investing in ATM based international and intercontinental very high bandwidth backbone infrastructures. Also native IP technology operators such as UUNet are planning the migration to ATM for backbone links, because of its scalability and its capability to handle multimedia traffic. National operators too are planning this migration at the national level, for example Transpac core network runs already on France Telecom ATM network upgrading from 34Mbps to 155 Mbps by the end of 1997;

- at the access level, all operators already offer a choice for dial-up access between the traditional modem to the PSTN and ISDN, or via leased lines. Upgrading to high speed modem of 56Kbps is already enabled or planned soon. However these technologies are not considered satisfying for the near future, and besides further development of ISDN connections, telecom operators are focusing their research on xDSL technologies and cable modems (in the countries where the TV cable network is already diffused). National operators especially believe that xDSL may become a viable alternative to ISDN for providing high-speed local Internet access to residential customers in the next three to five years. According to EITO 1997, however, up until the year 2000 dial-up access via modem to PSTN will still remain the dominant access mode to the Internet, with the balance shifting in the first years of the new century;

- Satellite technologies for local high-speed Internet access and to complement infrastructures development are being considered in Europe especially by private Internet Operators and New Entrants as a way to reduce dependency on Telecom operators leased lines, in the case that liberalisation does not drive down prices to acceptable level. Global Operators consider them as a complementary technology to offer services to large multinational companies (but especially in areas with low infrastructure development, such as Eastern Europe). Telecom operators are studying satellite access mainly as a defensive move against potential loss of traffic from Internet telephony, or from success of digital television diffusion.

Present IP protocols are not optimised for multimedia traffic. The main evolution foreseen is towards the implementation of real time protocols such as IPv6, RSVP or RTP which however are not presently implemented as the standardisation process is not concluded.

Global Operators and Internet backbone operators share the view that, together with higher bandwitdth, better security and quality levels are needed to promote the development of the Internet especially for the business market. The development of

electronic commerce and Intranet/Extranet services is directly connected with security guarantees at all levels of the network.

The general view is that Internet is evolving from an unstructured, unmanaged assembling of networks to a set of well managed networks with defined service levels, suited to different targeted market needs, telecom operators grade quality levels and sophisticated interconnection agreements. Again, this transformation will be leveraged by operators in order to go beyond the present low flat rate tariffs, which do not guarantee the margins needed to recover the substantial investments in networks development. Already, Global Operators offer to corporate customers different pricing schemes tied with different service levels guarantees (for example the Premium and Standard Global One offers, the standard vs Internet Plus Concert offers).

Evolution towards flexible bandwidth

Operators see the cost of bandwidth as decreasing rapidly, especially after the deregulation of 1998. Nevertheless, this should have a limited impact on the final customers, as most operators will first aim at improving their current low margins. Moreover, this cheaper available bandwidth will allow the operators to develop new Internet multimedia applications, and to rise their prices to the final customers for such value-added services.

The main trend among operators is to exploit their increasing capacity by offering flexible bandwidth management with different pricing to ISPs and business customers. These offers are based on level of pricing for a minimum-maximum bandwidth usage. For example Oleane makes a difference between the nominal speed of the support (i.e. Transfix 256 Kbps), the basic speed of the service (i.e. 64 Kbps), and the maximum speed of the service (i.e. 256 Kbps). This allows a flexible evolution of the bandwidth needs, with no immediate change of the local loop, and the possibility to pass the bought bandwidth with no extra charge. Cable&Wireless, offers a flexible usage plan, which does not constrain the customers to fixed levels or large monthly payment commitments. This constitutes a benefit for large businesses, whose usage rates vary very rapidly: the flexible 100 Mbps Fast Ethernet service charge only for actual sustained usage rather than a committed level, and there are no upgrade fees.

II.1.5 Main Internet development strategies

All operators interviewed consider the Internet market a fundamental aspect of their development strategies. Among the operators interviewed, there is a main difference between the Global and Internet backbone Operators development strategies and the National Telecom Operators ones: while the first target mainly the IP interconnection and the international/national business markets, the second ones consider the residential market also as a prime target, therefore representing the most important threat to traditional ISPs role.

New Entrants position is somehow in between: as far as they aim at becoming full-range telecom carriers in their national markets, they are also planning to expand into the residential and small business end-users market. But given their very recent starting date and their being still in the process of building their networks, their Internet offer for the mass market is still immature and likely to develop more strongly in the medium term. At present their strategy focuses mainly on the business market, with Intranet/Extranet services seen as the main driver of growth. O.tel.O. for example sees the small and medium companies market as a major opportunity, to be pursued with the offer of turn-key services. Since New Entrants are not constrained by the risk to cannibalise present telecom revenues, they are also more likely to exploit in the near future alternative Internet access or backbone network solutions, such as satellite or wireless local loop solutions, either in alliance with existing operators or by exploiting their own mobile networks (Albacom for example will bid for the third mobile operator license in Italy).

Concerning the evolution of the Internet market, all operators share the view that margins on traffic handling and IP interconnection will remain low, even if tariffs evolve from the present flat rate towards taking into account some compensation for usage time or traffic volumes. Therefore all the operators are planning to expand in the Internet value chain, moving towards the offer of higher value-added services and forging alliances with content providers and content aggregators. The most important growth opportunity however lies in the transition from traditional Internet store and forward applications (website browsing, e-mail, bulletin boards, on-line databases or text retrieval) to real time multimedia applications.

The main trends of development of products/services portfolios are the following:

- operators targeting the business market see their best chance in the already rapidly growing diffusion of Internet/Extranet services, driving a profound restructuring in the corporate network market (giving a chance to new and alternative competitors to infringe into the most profitable telecom operators market) and gaining new clients among SMEs moving into the networked age;

- operators targeting the residential market are investing in Webcasting and push technologies, starting to evaluate the possibilities of convergence with the media market: for example TIN has launched Webcasting services in the fall of 1997, and Telecom Finland is experimenting Internet access via TV sets; alliances and battles

are to be expected, as Internet access offer is also considered a crucial weapon for emerging digital TV suppliers;

- electronic commerce is at present at an embryonic stage in Europe, but all operators are investing in the development of the enabling applications and services, with Global and Internet backbone operators focusing on security and network-level transaction applications, and PTOs and new entrants on users-side applications developments.

- finally Internet telephony is also in a technical immature stage, but potentially affecting greatly the structure of the market. Here opinions among operators differ the most. Global and Telecom operators tend to be sceptical about its medium-term success, envisaging it as a niche market, possibly influencing the international voice and fax market the most. Internet native operators are more bullish about it, and at least MFS/Worldcom/UUNet is leading a commercial offensive to transfer international fax traffic on the IP network. Operators such as Deutsche Telekom, Telecom Finland and AT&T are carrying out different experimentations.

The potential diffusion of Internet telephony is also tied with the development of electronic commerce, since one of its most interesting potential applications is the integration of call-centres with web sites for promotion and sales. The booming call centres - business covers a variety of applications including customer support, telephone mail order, telephone sex or telemarketing. Internet telephony would offer a chance to reduce telephone charges (a major component of cost) and to offer an automatic connection to call centres to customers browsing web sites.

A key motivation in operators drive to move towards higher value added applications is of course the possibility to articulate prices, moving beyond the present flat rate tariff constraining profitability. Pricing strategies are particularly sensitive, so operators were not willing to provide much information on their plans. Operators targeting the high-end business market are already proposing articulated prices linked with higher performance guarantees for security, quality and bandwidth. At the European level, operators are also moving towards one-stop-shopping offers for multinational clients. But this strategy is not likely to work as well in the smaller business and residential markets, where low costs are a major driver of Internet success. However the introduction of new generation IP protocols optimised for multimedia applications will require pricing strategies taking into account the greater volume of traffic generated and the need for service quality guarantees. It is not clear yet how operators will deal with this evolution. An easier way in which operators may improve their margins instead is the revision of present international and national traffic settlements, the so-called peering agreements. As explained in the following paragraphs, major operators are starting to move in this direction.

II.2. The European Internet Service Providers

II.2.0 Methodology and scope of ISP survey

This section analysis the present positioning and main development trends of European ISPs, based on 80 closed questionnaires compiled by ISPs in 13 EU countries.

The questionnaire was distributed on line to 240 ISPs and answers were solicited via telephone and e-mail messaging, and sometimes if requested face to face interviews. Nevertheless, many ISPs refused to answer either because of lack of time or because of confidentiality reasons. The survey goal was to achieve a sample of at least 50 interviews distributed in the 6 European countries selected also in the Operators survey to represent the main characteristics of the European Internet market (UK, France, Germany, Italy, Finland, the Netherlands). Interviews in these countries were 61.

The Generic Services Teleforum (GST) in 1996 identified about 420 ISPs in the 6 target countries. The GST ISP directory however is not exhaustive (given the high number of small ISPs). In the Netherlands for example reliable estimates point to a total number of 130 ISPs, twice as many as the 73 present in GST list. Another source, EITO '97, estimates a number of about 4000 ISPs world-wide. Overall, we estimate that the interviews represent a sample of 8-10% of the total number of ISPs in the 6 targeted countries.

The questionnaire addressed ISPs market positioning, technical and market development strategies and opinions on a number of sensitive issues such as content regulation. On some issues (such as financial issues) some ISPs did not answer because of confidentiality reasons.

II.2.1 ISPs profile and positioning in the European Internet market

As previously illustrated, ISPs are positioned in the generic value chain of Internet service provision between backbone operators and end-users. They do not own the physical infrastructures, but provide Internet access services based on more or less extended leased lines networks, connected to the national and international backbones. ISPs connect to the backbones through an high-speed connection (typically 2Mbit/s). Large ISPs connect directly to the backbones, while the majority of smaller local ISPs are linked at lower speed to larger ones. A large ISP may have several tens of smaller ISPs connected, providing access to end users at the local level.

The value chain of the Internet service provision directly influences the pricing system. Backbone providers charge ISPs on the basis of the traffic volume they offer to the network (peering agreements), but soon, as outlined in EITO '97, *"ISPs may receive bills based on the measured volume of traffic in the same way as telecom operators bill data network users now. When the ISPs have to pay for volume, this is likely to be passed on to the users in the form of usage charges of some sort"*.

The position of ISPs in the value chain may therefore also radically change their evolution perspectives in terms of traffic, clients, services and revenues.

Exhibit 21 Breakdown of interviewed ISPs

Country	Number of interviewed ISPs
Germany	17 (DFN-Verein, Roses On-line Service GmbH, Cybernet Internet-Dienstleistungen AG, CU-Connection Universe GmbH, SpaceNet GmbH, W4, Easynet DV GmbH, IPF.NET GmbH, Circular Informationssysteme GmbH, Sontheimer Datentechnik GmbH, Münzer-Intercommunication, Birch Internet GmbH, Internet GmbH, NTG Netzwerk und Telmatic GmbH, LF.net GmbH, ECRC GmbH, Internet Vernetzung Mehrwertdienste GmbH)
Netherlands	11 (NInet, SURFnet, ZeelandNet B.V., bART Internet Services, Cistron Internet Services, NederNet On-line Services, NederNet On-line Services)
UK	10 (BT plc, UUNET UK, PSINet UK Ltd, UKERNA, I-way Ltd, Internet-UK, GreenNet, TweedNet, Zetnet Services Ltd, Poptel)
Finland	9 (EUNet Finland Oy, Megabaud Ltd, Scifi Communications International Oy, Center for Scientific Computing Ltd, Freenet Finland, Clinet, Kolumbus, Planet Media Oy, Jiop Oy)
France	9 (Wanadoo, InfoPointu, IBM Global Services, CGE OnLine, Infonie, AlexNet, Remcomop sarl, Quarternet)
Belgium	5 (EUNet Belgium, United Callers, PING NV, Euronet Internet)
Italy	5 (Cineca Nettuno, Inrete, Onion srl, Eclipse srl)
Sweden	4 (ABC-Klubben, Kajplats 305, NetGuide, Dataphone Communications Networks)
Austria	3 (At-net, Net4You, EUNet Austria)
Denmark	2 (Cybernet.dk, ALCO Company)
Portugal	2 (IP Global SA1, EUNet Portugal)
Spain	2 (IdecNet)
Ireland	1 (EUNet Ireland)
TOTAL	80

Source: TNO, 1997

The sample of 80 interviews was articulated as follows:

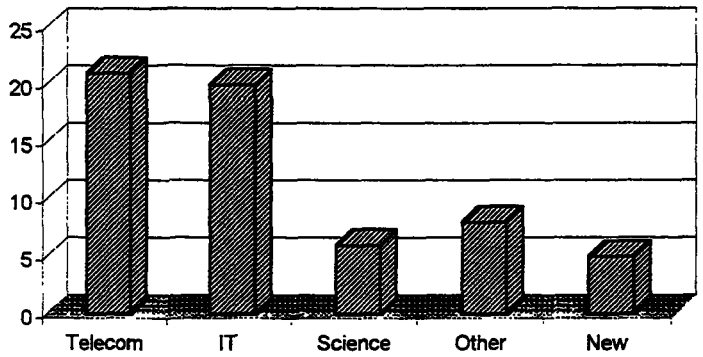
- the majority (62%) are top level ISPs, i.e. connecting directly to national or international backbones, including national educational providers;
- 38% are lower level ISPs, either subsidiaries or regional or local providers, accessing the Internet backbone through top level ISPs.

The background of the ISP sample is multiple:

- about 34% of the sample originateS from the telecommunications industry;
- about 33% of the sample comes from the IT industry;
- about 10% originate from a scientific institute or is related to the scientific community;
- about 8% are start-ups.

It is remarkable that only one ISP explicitly originates from the marketing sector and that none is related to the publishing industry. The oldest organisation in the sample was already active as an ISP in 1982. Moreover, 64% started to be active as an ISP in 1994 or 1995. The ISP sector can therefore be seen as a sector which was formed recently and which is developing very quickly. The majority is profit-oriented (84%), just 10 organisations in the sample are non-profit in nature.

Exhibit 22 Background of ISPs sample (actual numbers)

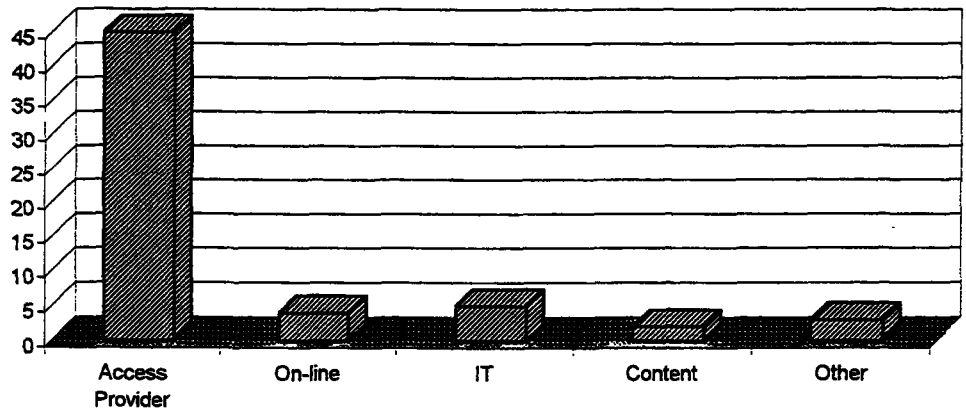


Source: TNO, 1997

The large majority of interviewed ISPs consider themselves Internet access providers. A minority of them are active as value-added services provider to businesses and consumers. The main private On-line Service Providers (OSPs) like America On-line,

CompuServe, IBM and Microsoft Network didn't participate in the survey. Nevertheless, four organisations introduced themselves as private OSPs. Only two organisations consider themselves as pure content providers.

Exhibit 23 Characterisation of ISPs sample



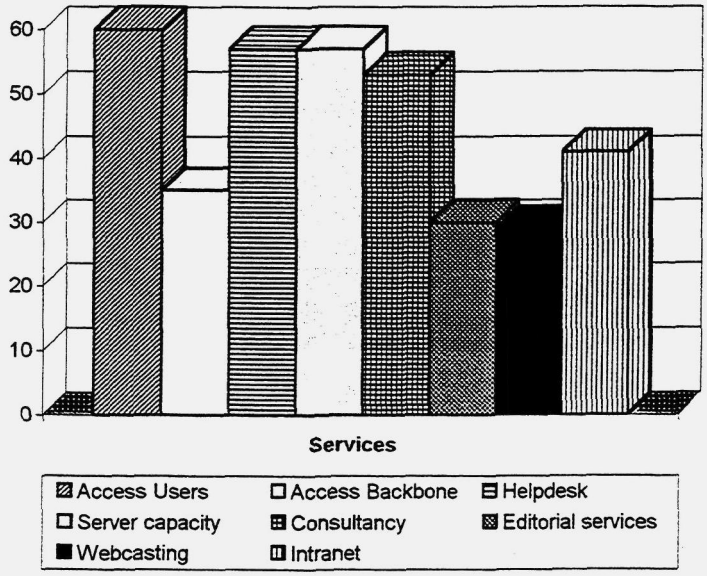
Source: TNO, 1997

The profile of services offered by the interviewed companies reflects their efforts to increase their services portfolio, adding value added applications, and to keep up with Internet technical innovations.

Beyond basic Internet access services, almost every ISP (93%) offers helpdesk facilities and server capacity (93%). Editorial services such as webpages creation are also offered by approximately 50% of ISPs. Usually this entails editorial support (50%) and consultancy (88%). Consultancy is mainly technical in nature.

It is remarkable that most ISPs are already present in the newer application areas, such as Intranet and Webcasting. Intranet services are offered by 76% of the ISP. Webcasting like Pointcast and Marimba applications are offered by 50% of ISPs. All top-level ISPs offer Internet backbone connection also to other ISPs.

Exhibit 24 Services offered by ISPs



Source: TNO, 1997

An interesting result of the survey is that the satisfaction expressed by ISPs on the Quality of Services provided by Telecom Operators is increasing rapidly, probably reflecting the greater attention given by Operators to the Internet market in the last year and their investments in capacity and bandwidth.

Exhibit 25 Average degree of European ISPs satisfaction in Quality of Services provided by Telecom Operators in 1996 and 1997

	1996	1997
Not satisfied	43%	19%
Satisfied	41%	58%
Very satisfied	16%	23%

Source: TNO, 1997

II.2.2 Financial data and perspectives of final markets development

This section reflects the opinions expressed by the interviewed ISPs about pricing schemes and final markets development. Informations about revenues and profitability were provided by just 44% of ISPs (27 answers) but do not appear to be of general value due to the differences in company size and position in the value chain.

Revenues

The Internet service provision is a high growth market with low access barriers. As outlined in EITO '97, the set-up costs for an ISP can be as low as 60,000 ECU. However, revenues may vary strongly according to a series of factors, such as the position in the value chain and the set of services offered.

The average size of ISPs is naturally much smaller than that of traditional telecom operators. In the analysed sample, we noticed that the larger number of ISPs had less than 10 employees (about 38%), and about 25% between 10 and 20 employees; another group had between 20 and 100 employees, and only a minority over 100 employees, confirming the non labour-intensive nature of this business.

The range of annual turnovers declared was also very wide, ranging from extremes of 16,000 ECU to 20 MECU per year in 1996. For the larger providers it is sometimes difficult to differentiate between revenues coming from Internet services, strictly defined, and the provision of value added applications and services. However the segmentation of revenues classes shows that even ISPs with few employees achieve rather substantial revenues. Very few ISPs declare revenues between 10-20 MECU or between 2-6 MECU. The majority can be placed in the two revenue classes between half a million - 1 MECU and between 150-500 KECU, with a small group under the 150 KECU line. The majority of ISPs declared a steep increase in revenues from 1996 to 1997 and foreseen for 1998. The weighted average turnover (calculated excluding 3 ISPs over the 10 MECU turnover level) climbs from about 750 KECU in 1996 to 1.3 million in 1997, with some ISPs more than doubling their revenues.

ISPs' income depends on the number of subscribers and the subscription fees for services. The subscription fees range from 10 to 50 ECU for individual subscribers, while fees for corporate subscribers range from 4000 to 11000 ECU. The average subscription fee is 18 ECU. Subscriptions based on ISDN range from 10 to 125 ECU. The average subscription fee for ISDN is 28 ECU. In general, these are flat fee rates.

As outlined above, the information provided by ISPs on financial issues is rather thin, due to the confidentiality of data. An overall number of 30 ISPs provided forecasts on their profitability. Only 10% of interviewed ISPs believe that they will be never profitable, while only 23% of ISPs declared an already profitable business.

Exhibit 26 ISPs profitability

	Profitability rate
already profitable	23%
profitable in 1 year	43%
profitable in 2 years	11%
profitable in 3 years	13%
never profitable	10%
TOTAL	100%

Source: TNO, 1997

Final markets addressed: status and trends

Concerning the type of markets addressed, almost half of interviewed ISPs (46%) claim that more then 50% of their operations are directed to the local market, 23% claim that more then 50% of their operation is directed to the regional market and 46% claim that more then 50% of their operations are directed to the national market. At the other hand, no ISP claims that more than 50% of their operations are directed to either the European or the World market. Of ISPs, 70% claim a maximum of 10% of their operations being oriented to the European or the World market. In general this leads to the conclusion that ISPs are rather regional and national oriented and they offer a limited number of international services.

The local market is most important for the majority of ISPs in Finland, France, Germany and the UK. In the Netherlands the regional market is assessed to be more important. The orientation towards an international market in the UK can be attributed to their position in international publishing and to the dominance of the English language. Only Finland has a strong international orientation, comparable to the UK.

ISPs were asked to define their expectations of their users number growth in the medium (2 years) and long-term (5 years), segmented as follows:

- *individual users*, including residential users, very small companies and professionals (SOHO: small office-home office market);
- *business users*, including SMEs, large companies, local and national authorities and educational organisations.

As it could be expected, most ISPs gave glowing predictions of users growth, with increase rates almost always over 100%. While these predictions cannot have an absolute value, some interesting differences emerge in ISPs perceptions by country and market addressed. More specifically:

- the general perception is that the residential market will develop faster that the business market in terms of numbers of users;

- UK forecasts are the most optimistic ones, with estimates up to ten times higher than those from other countries. By contrast, French ISPs seem to held a more cautious view;

- the gap between residential users and business users growth rates will become higher, with unanimous belief that residential users and SMEs will perform the highest relative growth.

In conclusion:

- *ISPs' expectations in terms of users and services growth are in line with global statistical trends on Internet and WWW development as developed in Part I of the study;*

- *there is uncertainty about profitability forecasts in the ISP market. This is a signal that the shake-out has already started;*

- *ISPs expect residential and SMEs users to strongly increase in number in the medium- (2 years) and long-term (5 years) perspective. Business users should also increase in number, but to a slower extent.*

- *Intranet provision is expected to boom in the long-term run (5 years).*

II.2.3 ISPs opinion on Content regulation issues

One of the most important issues regarding the Internet and the WWW are the content aspects and their regulation. There is increasing concern among regulatory authorities and the general public about the social impact of unrestricted and non-controlled circulation of pornography (especially children pornography) or information and communication connected with other sensitive topics such as racism. There is much discussion on how to deal with these problems, without recurring to censorship and restraining the free circulation of information on the net, firmly considered by the Internet users community as one of its core values and a factor of its success.

One of the major problems is that traditional regulation applied to the publishing and media world does not fit well the Internet, both because of the difficulty to trace back the origin of the information circulating on the network and of the different nature of actors. In traditional media, the publisher is by definition responsible of the content diffused: in the Internet world, ISPs and OSPs have a limited control of the content flowing through the networks, and are generally willing to take responsibility only to a limited extent, depending on their different strategies and perception of their roles.

The most recent attempt to regulate Internet control, the US Communication Decency Act, which included restrictions and sanctions for pornography and racist information diffused on the net, was striken down in June 1996 when the US Supreme Court declared it unconstitutional.

The survey asked ISPs whether Content regulation was needed, who should be in control of this regulation, and differentiated between general content, pornography and racism. A minority, but a not irrelevant number of ISPs declared that no content regulation is needed, especially in the case of general content. Among those expressing the need for regulation, the majority of ISPs is in favour however of self - regulation for general content. For pornography and racism however about two thirds of the sample expressed the need of either national or European level regulation, with a preference for European level intervention. It is not clear how self-regulation could be implemented and harmonised, since only 35% of the sample are members of national ISPs associations, which seem the natural fora for defining general rules of behaviour.

Exhibit 27 ISPs opinion on Content Regulation needed (average answers by six European countries ISPs (UK, France, Finland, Italy, Germany, Netherlands).

	General	Pornography	Racism
No regulation	30%	22%	18%
Self regulation	43%	29%	20%
National regulation	11%	16%	13%
European regulation	16%	33%	49%
TOTAL	100%	100%	100%

Source: Databank Consulting elaboration on TNO data, 1997.

ISPs position about content regulation may be summarised as follows:

- *Internet and WWW content should be in principle subject to ISPs self-regulation, but a 30% believes that there should be no regulation for general content;*

- *concerning racism and pornography issues, instead, about half of the sample sees the need for regulation at the national or European level, with another third still sustaining self-regulation.*

II.2.4 Barriers to Internet market development

ISPs were asked to give their opinion about the most important barriers for the Internet market development as a whole, without restricting their view to the ISP market only. Answers are summarised in the following Exhibit. The variety of answers and the number of barriers evaluated as "very important " or "important" confirm that the Internet market is at an early stage of development, and that ISPs perceive problems to be overcome in all areas, from regulation, to demand evolution, to technical issues, to financial issues.

The barriers perceived as more relevant by the majority of the sample concern regulation and users friendliness. The term regulation covers a variety of issues, including on one hand the wish to see deregulation and liberalisation of the telecom market implemented (in order to deal with network suppliers at more favourable conditions), and on the other hand the lack of regulation concerning issues such as the legal validity of electronic signatures which may constrain successful application diffusion. By lack of users friendliness the ISPs seem to refer to the still low knowledge of information technologies use in the European mass market, and more generally to the general public mixed attitude towards the more advanced and interactive applications bound to drive Internet development.

The financial barrier (costs for the users, probably referring to the likely higher costs of the new multimedia applications expected to drive further Internet development) is also considered as one of the most important barriers by two thirds of the interviewed ISPs.

Some other general comments:

- regulation is seen as a barrier in Germany, France and the UK. To a lesser degree ISPs from other countries perceive this as a problem;

- security of transactions is considered to be very important for the development of electronic commerce. In France, Germany and the Netherlands this is seen as a very important barrier, but not so much in Finland, Italy and the UK;

- funding Internet development is seen as a problem in Finland, France, Germany and the Netherlands. Although more than 50% of the ISPs view this as an important issue, it appears to be strongest felt in these countries;

- technology is not perceived to be an important barrier in most countries. However there is one exception, i.e. the Netherlands, where technology is seen as a very important issue. There is no simple explanation for this phenomenon;

- copyrights are often mentioned as an important issue to deal with while designing services. This attributed importance is not reflected in the response of ISPs. Only the UK-based ISPs see this as a very important issue;

- an important aspect of Internet is its open standards. 48% of ISPs perceive their insufficient development as an important barrier;

- language is no barrier for almost 50% of ISPs. Only in France a majority of ISPs see it as a relevant barrier;
- amazingly, of all the mentioned barriers, lack of relevant services is the item that has been judged to be the least significant.

Exhibit 28 Barriers to Internet development

	Very important	Important	No barrier
User friendliness	43%	48%	9%
Regulation	48%	37%	15%
Security of transactions	32%	55%	13%
Financial barrier	26%	54%	20%
Technology	20%	47%	33%
Copyrights	7%	67%	26%
Lack of standards	11%	48%	41%
Language	11%	40%	49%
Lack of relevant services	9%	37%	54%

Source: TNO, 1997

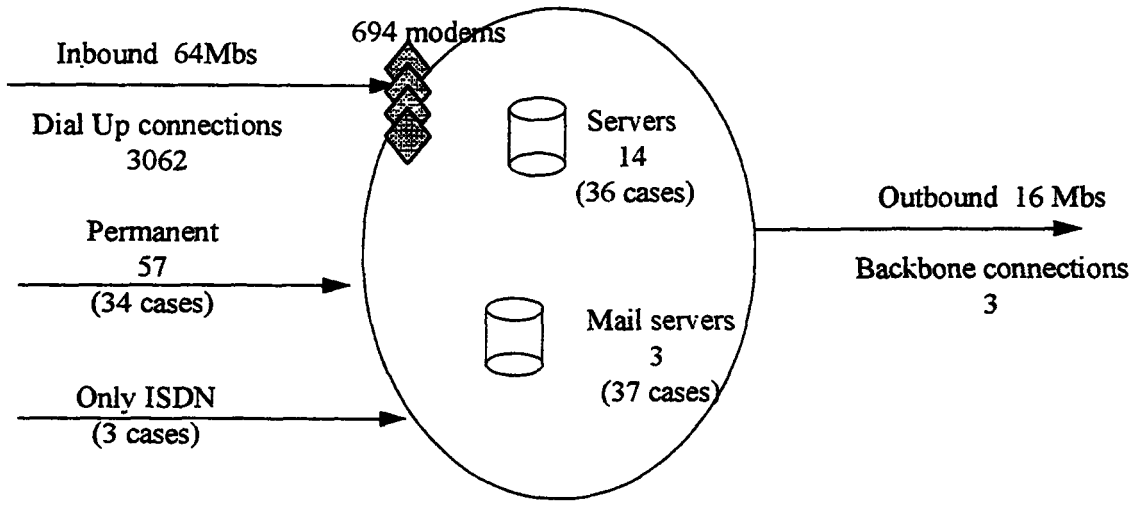
II.2.5 ISPs technologies status and trends

Configuration

Based on average scores of several indicators coming from the survey, it is possible to sketch a typical configuration of an ISP (see following Exhibit). Inbound traffic requires an average capacity of 64 Mbs. The available connection is mostly 128 kbps (25%), followed by 2 Mbps (21%) and 16 Mbps (21%). 32 Mbps connections are used by 10 % of ISPs.

The average number of dial-up connections is 3062 (ranging from 2 to 40000) which have access to servers via 694 modems (average, ranging from 7 to 6000). This indicates a ratio of 1 modem for 5 dial up connections, what is comparable with the average ratio as reported by ISPs, i.e. 0.19. Most commonly a ratio of 0.10 is reported.

Exhibit 29 Configuration of an ISP based on average scores.



Source: TNO, 1997

Furthermore an average number of 57 permanent connections are reported. The range of permanent connections reported, varies from 0 to 850. Most common are two incoming permanent connections.

74% of ISPs offers ISDN connections. Internet access shows a shift to ISDN. ISDN demand is increasing in a number of countries. Three ISP in the sample are only offering ISDN services.

The connection to the backbone is on average a 16 Mbs connection. Most ISP are only connected to one (43%) or two (32%) backbones. Three ISPs, probably the academic networks, indicate that their services have connections to 15 backbones.

Technology availability and future developments

Modem RTC is offered by 40 of the 61 ISPs. Modem RTC is quite common and within 2 years time all ISPs will have these facilities. ISDN is offered by 45 of the 61 ISPs (74%). As for modem RTC, ISDN will be available from every ISPs within two years.

Cable is less common as an access network. Only one ISP in the sample is a cable operator. Some experiments by cable operators are going on in the Netherlands, France and the UK. It is expected that the number of cable operators offering Internet Access themselves or access via an ISP will grow in the near future. 86% of ISPs expect to be connected to cable within 2 years.

ISPs are developing their capability to offer more advanced technological solutions for access connections, with a specific attention to xDSL technologies. Over 90% of ISPs expect to make ADSL-based connections available within two years and 61% expect to offer HDSL in the same time-frame. Of course this prediction does not say anything on how many users will actually use these access technologies, or how their diffusion on the territory will be: it only states that practically all ISPs believe they must have the technical capability to offer these solutions.

ISPs declare also a strong interest in the use of wireless and satellite technologies for the access networks. 28% ISPs report that they already have satellite connections. Within two years 75% expect to have satellite connections. Wireless connections are supposed to be available for 45% of the sample at the moment and available for 79% within two year. These connections are based on GSM.

ATM-switching is already used by 41% of ISPs. ATM will be used by 78% in two years time. As far as frame relay is concerned, this is installed in 69% of the networks at this moment and will be in 94% of ISPs networks within two years.

II.3 Telecom operators Vs ISPs: synergy or competition?

The hottest topic in today's debate on the future and the evolution of the Internet market structure is the entrance of Telecom and backbone Operators into the Internet market. This entrance opens wide Internet market development perspectives to the operators, due to their position of clear advantage in terms of existing infrastructures. But on the other hand, the operators risk to reduce their margins in traditional services by pushing the Internet development and its services (e.g. the development of Internet telephony and of e-mail messaging systems may represent a real threat for PSTN telephony).

All national telecom operators are backbone operators, but all are also entering the final access market, with a specific distinct offer, targeting business and residential customers with dial-up access: Wanadoo for France Telecom, Kolumbus for Finnet, T-On-line for Deutsche Telekom, the Net for PTT Telecom, TIN for Telecom Italia, etc. In that case, the national operator appears as both a competitor and a backbone provider for the ISPs.

ISPs look at this entrance as a threat for their business, and a shake out of the ISP market is expected in the near future. It is indubitable that a global redefinition of the Internet market and a redistribution of forces will lead in the short time to a reassessment of the existing balance between the players, with high risks for ambitious but small ISPs wishing to expand their operation areas at national or international level, fighting for their independence. On the other hand, ISPs may choose to forge market or strategic alliances with TOs, reinforcing their positioning.

The space for global competition is becoming narrow for most ISPs, because of their weak position in the market with respect to telecom and backbone operators. Synergy and alliances or redefinition of the target business appear to be the only real open opportunities for ISPs today.

Telecom and backbone operators adopt different strategic approaches towards ISPs:

- *competition and closure,* such as the case of Finland, where Finnet and Telecom Finland refuse to open their backbone to the ISPs, and finally are positioned on the market as large ISPs, operating their own national backbone. Another significant case is represented by EUNet France, who refuses to connect competitive ISPs to its backbone;

- *synergy and alliances,* such as the case of Oleane (France) which is trying to develop a network of "access partners" with about 70 ISPs, becoming their exclusive backbone supplier and distributing back, in exchange, a share of the income collected from the final customers;

- *open market,* such as the case of the other interviewed telecom operators: the backbone offer address the ISPs as well as the large business customers with Intranet development. This trend is also registered for the global backbone operators, targeting large businesses - at least the top 500 world-wide companies -

as well as the ISPs as final customers. Nevertheless, they do not address the final consumer market. UUNet, who consider itself as "the best positioned telephone company in the world"[4] adopts a special strategy, positioning itself not only as a global backbone provider but also as a global ISP, through its local subsidiaries.

It should be emphasised that ISPs as well as On-line Service Providers (OSPs) are a special type of customers for backbone operators, with a very high usage rate, such as loading links at 95% in busy hours, and over 30% on average, against average load below 10% for the business customers. Nevertheless, there is no difference registered or planned between prices paid by ISPs and business customers. Consequently, business customers somehow pay for ISPs, but national operators such as Transpac in France consider impossible to move the pricing scheme for ISPs, as it would disrupt too much the national market.

Peering

"Peering" is a word commonly used to refer to commercial arrangements between ISPs. This kind of arrangements were of very simple nature until the Internet was a mostly academic and a non-commercial networks. As outlined in ITU '97, peering agreements were mostly based on cross-subsidy (e.g. between a research funding organisation and its researchers) or on mutual benefit (e.g. "I'll carry your traffic if you'll carry mine"). But with the transformation of the Internet in a mostly commercial network, things changed. The need for more formal agreements grew and today the commercial relationships between ISPs, which involve backbone operators and their pricing structure as well, is one of the open issues in the Internet world.

ISPs have various possible settlement models (ITU '97):

- *peer-to-peer bilateral.* The two interconnecting networks may be considered equivalent in terms of size, experience, technology and customer-base. In other words, the two interconnecting networks roughly generate a comparable amount of traffic;

- *hierarchical bilateral.* The two interconnecting networks are not equivalent in terms of size, experience, technology and customer-base. This is for example the case of a regional ISP and an Internet backbone operator:

  1. the customer connects to the ISP;
  2. the ISP connect to the Internet backbone provider;
  3. the Internet backbone provider connect to other backbone providers.

  This kind of agreement is the most diffused one.

- *third-party administrator.* Two or more networks exchange data at a certain interconnection point which is administered by a third party. The conditions of peering of UUNet are interesting to quote, as they are already defined.

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[4] quotes by Alan Taffel, vice-president of marketing from UUNet, in Global Telephony, June 1997.

"UUNET PIPEX will consider peering with all ISP organisations in Europe at the SE-GIX, the SFINX, the Ams-IIX, or directly, under the following conditions: the ISP must be a European regional ISP, offering service to its customers in at least one European country outside the country hosting the proposed peering point; the ISP must have at least 2Mbps bandwidth to the interconnect point, or to the UUNET PIPEX backbone in the case of a direct connection; the ISP must aggregate route announcements to UUNET PIPEX. Even if these conditions are met, there is no guarantee that UUNET/PIPEX agrees to peer with the ISP or continue to peer at some stage after agreement has been reached. All decisions taken in respect of peering are at the sole discretion of UUNET PIPEX."

- *co-operative agreement.* As for the third-party administrator, but the administration is run by a committee constituted by representatives of the two interconnected networks.

These agreements are however not based on real traffic patterns, but on the theoretical amount of traffic which could be sent. In this fact resides the main difference between Internet operators and the public telecommunication industry, where the relations between operators are based almost entirely on the actual volume of traffic flowing between the two parties. The Internet does not apply these kind of settlements, but is based on the SKA model (Sender Keeps All).

The evolution of largest telecom and backbone operators peering policies tend to limit peering with small ISPs. The UUNet peering draft reported above poses such conditions that only large ISPs can satisfy. This fact, while placing large ISPs in good position for signing peering agreements with telecom and backbone operators, will create difficulties to smaller ISPs to stay in the Internet service provision market. This might contribute to the shake out within the Internet service provision market, which will force ISPs to buy their connections from costly upstream network providers.

Shake-out

Telecom and backbone operators are already on the market, as a matter of fact. This may accelerate the shake-out, which, according to the results of the ISP survey, is already going on in the opinion of more than 60% of the European ISPs. A minority of them (31%) believes that this shake out will take place during the next two years, while only 5% of the interviewed ISPs believes that the shake-out will not happen before 5 years.

Exhibit 30 Expected shake-out by country

	Finland	France	Germany	Italy	Netherlands	UK	Total
Already going on	67%	80%	77%	0%	37%	80%	*64%*
Within 2 years	33%	20%	23%	100%	37%	20%	*31%*
Within 5 years	0%	0%	0%	0%	26%	0%	*5%*

Source: Databank Consulting elaboration on TNO, 1997

To survive the shake-out, ISPs will have to reply on one or more of the following strategies:

1. to operate its own infrastructure, and to be positioned on the global market, on a regional or international basis. This is true for some big independent ISPs and for all telecom-dependent ISPs, but doesn't apply to the majority of small ISPs;

2. to activate strong alliances with telecom and/or backbone operators. This may represent the only chance for independent and non-backbone operator ISPs to stay in the Internet service provision market;

3. to propose value-added services, and to enter the growing server hosting and content development market. This is considered as a promising market, as it is assessed that two-third of the companies on the WWW sub-contract the creation and management of their web site. EUNet strategy illustrate this trend: creation of an international entity and development of new value-added services. Non-carrier ISPs will probably not be able to stay in the market.

The on-going shake-out will lead many ISPs to redefine their business, possibly in the direction of electronic publishing and advertising. Telecom operators, cable operators and on-line providers are still perceived as the most dangerous threat for European ISPs. The following exhibits (based on the ISPs survey) reports ISPs' perception of the potential market competition in other business areas.

ISPs are aware of the on-going shake-out, which will push some of them out or at the margin of the Internet service provision market, but on the other hand they do not feel areas such as publishing and advertising as possible competitive areas for their business. So it seems that the large majority of ISPs still believe to have competitive chances in the Internet service provision market.

Exhibit 31 ISPs potential market competition.

	Telecom operators	Cable Operators	On-line providers	Publishers	Advertising Agencies
Very strong	58%	16%	23%	0%	2%
Strong	33%	42%	43%	23%	16%
Moderate	2%	26%	30%	45%	41%
No competition	7%	16%	4%	32%	41%

Source: TNO, 1997

On-line Service Providers (OSPs) are organisations providing content (such as news and entertainment) and on-line discussion fora. A world-wide known OSP is CompuServe. As outlined in EITO '97, the dramatic explosion of the WWW led to an outpositioning of OSPs in the Internet market. These organisations quickly converted their operation to Internet Service Provision, occupying in this way the ISPs' business

sector. In other words, OSPs became ISPs, retaining however some advantages on them, as they are already well positioned in Internet commercial content provision business and in customised products delivery. As a logical reaction, ISPs look at them as a real threat for their business, even if to a lesser extent than the telecom operators.

Cable companies, representing together with PNOs the main providers of infrastructure, are trying to differentiate their business, because of the incipient threat represented by satellite TV development and diffusion perspectives. The Internet market represents for them a potential business sector, due also the fact that cable TV infrastructures may allow very high transmission rates, up to 10Mbit/s. Cable TV has not developed at the same speed in the European countries: according to EITO forecasts for 1997, cable TV subscribers in Germany are more than 18 millions, while in Italy they are only 38.000. It is evident that German ISPs may have a very different perception of the potential threat coming from cable TV operators that Italian ISPs have.

Advertising Agencies and Publisher Companies are not perceived as a threat by ISPs. This is due to the fact that most ISPs, due to their technology-oriented background, are not content oriented. ISPs do not really offer editorial services and concentrate their business on the Internet access and the on technology and customer services.

In conclusion, the emerging trends are :

- *telecom and backbone operators are becoming major players in the Internet market; large ISPs will become part, or closely allied, with telecom operators; non-carrier ISPs will have major difficulties in order to survive in the Internet service provision business;*
- *small ISPs focused only on access services will not be able to survive, unless they move towards the supply of value-added services such as electronic publishing and technical consultancy for the establishment and management of websites. It will be difficult for them, however, to get into the more profitable content aggregation and specialised applications business since at present they seem to lack the core competences. Therefore their number is likely to decrease.*

II.4. Internet users: non residential users analysis

II.4.0 Methodology and scope of users survey

The aim of the survey on Internet and WWW users was threefold:

- to assess the users' progress in the use of the Internet and the WWW;
- to estimate the Quality of Service provided by the Internet and the WWW, as perceived by the users;
- to identify existing and potential users' trends in the use of the Internet as a tool for electronic commerce.

Given these goals, the survey excluded residential users and focused on professionals, SMEs, and public organisations with an active website and a home page, in order to analyse the more advanced European Internet users population. The selection of users was carried out directly on the Web. 317 phone interviews were carried out, based on a closed questionnaire, in the 6 European Union countries also targeted by the Operators and ISPs surveys (Finland, France, Germany, Italy, the Netherlands and the UK).

The survey's sample is too small to provide statistical representativeness of the analysed market. However the segmentation of the sample by categories provides interesting results on the main trends in users motivations, expectations and needs regarding Internet/WWW use. Given the fast evolution of the Internet market and the very early stage of development of electronic commerce, these information provide useful insight about advanced users behaviours and plans.

Exhibit 32 Breakdown of interviews by category and country

Users' categories	F	I	UK	NL	D	SF	Total	Percentage
SMEs	35	25	24	17	18	15	134	42.3%
Professionals	6	9	11	15	15	13	69	21.8%
Public Administrations	14	7	8	14	8	9	60	18.9%
Universities, Libraries, Schools, Museums	8	9	8	10	9	10	54	17.0%
TOTAL	63	50	51	56	50	47	317	100.0%

Source: Databank Consulting, 1997

More specifically, the users categories were defined as follows:

- *Small and Medium Enterprises (SMEs)*, i.e. private businesses under 250 employees, with a specific attention to very small companies under 50 employees;
- *professionals*, i.e. individuals working as freelancers or as part-time consultants for larger organisations;
- *universities, schools, museums and libraries*, i.e. public educational, research and cultural organisations;
- *public administrations*, including both central government entities and local government agencies and organisations.

It must be remembered again that all interviewed users had an active home page on the Web, including professionals.

II.4.1 Internet/WWW usage patterns

The aim of this section is to analyse and compare by user category the motivations leading to the opening of a website and its usage patterns. The users categories were selected on the basis of their relevance for the foreseen development of the Internet/WWW towards more interactive and sophisticated services, particularly regarding the evolution of electronic commerce. Therefore a goal of the survey was also to verify some of the most common expectations concerning the factors driving European organisations to the Web. The development of the Internet market, and especially of electronic commerce, is considered as an important opportunity for Europe to achieve economic and employment growth and to accelerate the adoption of innovative information and communication technologies, in the transition towards the Information Society. But there is concern that European markets development lags behind that of the US (expressed for example in the European Commission recent Communication "The competitiveness of European ICT industry"). Therefore the analysis of the expectations and perceptions of European users already engaged in actively using the WWW is particularly interesting.

More specifically, the users categories were selected for the following reasons:

- SMEs, since the 17 million European SMEs represent the backbone of the European economic structure, and the diffusion of networked services and electronic commerce can result in substantial improvement of their competitiveness and profitability. In the survey, almost 70% of the interviewed were companies with less than 50 employees, representing the SMEs group with less tradition in the use of ICT technologies and higher potential benefits to gain from their adoption.

- professionals, since the labour market is evolving towards the increase of self-employment and part-time, flexible working patterns, potentially supported by the use of innovative communications technologies among which the Internet/WWW plays a very important role, thanks to its low costs and capillar distribution;

- universities, libraries, schools and museums have an important role to play as content and knowledge providers to the mass market, and as sources of access to on-line information for large parts of the population, who risk to be excluded by purely commercial services. At the same time, the introduction of the Internet/WWW can profoundly influence these organisations structures, leading to a revision of their role and their interaction within their communities of interest.

- European public administrations also can find in the Internet/WWW a radically innovative channel to improve the effectiveness and transparency of their relationship with citizens. This is true both at the central and local government level, actually recent surveys (such as the ISPO ESIS - European Survey of Information Society projects) prove a strong vitality by European local government organisations, thousands of which in all countries are opening websites and experimenting new services and communication modes with citizens.

The survey analysed separately the motivations of use of the Internet and for opening a website. Concerning the Internet, not surprisingly the majority of respondents in all categories indicated email, access to information sources and easier communication with third parties as the most diffused usages. It is remarkable that one third of respondents in all categories (with even a slightly higher percentage in public organisations) indicated the improvement of coordination and organization as an important goal of Internet use. This underlines how the Internet potential in reshaping organisations is starting to be perceived more fully by users.

As it could be expected, very few cultural and educational organisations and public administrations declared instead to be using the Internet for on line orders, purchase or sales. But also the percentage of SMEs and professionals engaged in doing so is relatively low, confirming the very early stage of development of electronic commerce in Europe.

Exhibit 33 Why do you/your organisation use the Internet? (multiple answers allowed)

	SME	Professional	University, library, school, museum	Public Administration	Total
to do e-mail/on-line communication	63.9%	58.0%	70.4%	65.0%	63.9%
to improve co-ordination in your main activity within/outside your organisation	29.3%	33.3%	33.3%	35.0%	32.0%
to access a wider range of information sources	56.4%	40.6%	61.1%	60.0%	54.4%
to be reached by a wider range of people/organisations	60.2%	43.5%	53.7%	61.7%	55.7%
for on-line sales/orders	14.3%	14.5%	3.7%	0.0%	9.8%
for on-line purchase of goods/services	12.0%	5.8%	5.6%	1.7%	7.6%
to experiment	25.6%	13.0%	24.1%	25.0%	22.5%
other	33.8%	39.1%	35.2%	36.7%	35.8%

Source: Databank Consulting 1997

A similar pattern results from the analysis of motivations to open a website. The driving motivations for all users categories are to improve their organisation/company/ activity visibility, image and/or to advertise relevant aspects of their activity. Advertising products and services is more relevant for SMEs and professionals, but it is also diffused among public administrations.

Again, only a minority of SMEs and professionals (approximately 10%) declared to have opened a website for direct commercial purposes (i.e. for on-line sales/orders), while almost all cultural organisations and public administrations didn't. This confirms the previous observation of the immaturity of development electronic

commerce. However more than a third of the small companies and professionals indicated the ability to reach more customers as an important motivation to open the website, confirming that beyond a generic communication activity the Web is already perceived as a tool to open new markets, even if the users are perhaps still not ready to act on it as a consequence.

Overall, the picture emerging is that users presently perceive Internet/WWW as an important channel of advertising and communication, but not as a tool for performing economic transactions.

Breaking down the data per country, few UK users (17.6%) declared to have opened their website for improving their image, contrarily to France, where the same rate grows up to 83.6%. Coherently, French users display a strong belief in the Internet as an advertising instrument (88.5%), while in the Netherlands only 23.2% of users declared to be on the WWW for explicit advertising purposes. Interesting enough, very few users opened their website for direct commercial reasons (no share in the Netherlands and only 4% in Germany opened their website for on-line sales/orders).

Exhibit 34 Why did you/your organisation open a website?

	SME	Professional	University, library, school, museum	Public Administration	Total
to increase the visibility	67.2%	55.2%	51.9%	62.7%	61.0%
to improve the image	54.7%	32.8%	29.6%	42.4%	43.2%
to advertise relevant aspects of your activity (products, services, research, etc.)	67.2%	50.7%	35.2%	47.5%	54.2%
to widen the range of its target customers	39.8%	26.9%	18.5%	30.5%	31.5%
for on-line sales/orders	10.9%	10.4%	1.9%	3.4%	7.8%
other	29.7%	40.3%	46.3%	54.2%	39.6%

Source: Databank Consulting, 1997

The level of satisfaction for the users presence on the Internet is very high in all countries and for all user categories (see following Exhibit). The average sample score of 4.1 (in a scale where 5 = very high satisfaction) indicates a very positive perception of their experience on the Net. Satisfaction levels are even higher for non-commercial organisations, universities in particular. Data for France are outstanding, with an impressive average of 4.6.

Exhibit 35 Are you satisfied of being on the Internet (1=not at all, 5=very much)?

	France	Italy	UK	Nederlands	Germany	Finland	Total
SME	4.5	3.9	4.1	3.6	3.8	4.2	4.0
professional	4.3	4.2	4.1	3.6	4.0	3.8	4.0
university, library, school, museum	4.9	4.3	4.1	4.2	3.4	4.6	4.2
public administration	4.6	3.6	4.1	3.6	3.3	4.1	3.9
TOTAL	4.6	4.0	4.1	3.7	3.7	4.1	4,1

Source: Databank Consulting, 1997

Most users are experienced WWW users: 43.4% of them started their website more than 1 year ago, but only 7.2% have had a home page for more than three years. The academic origins of the Internet are denoted by the fact that 25.9% of universities or educational institutes have opened their home page more than three years ago. Instead SMEs home pages have on average a shorter existence time, reflecting the more recent commercial evolution of the Internet.

Exhibit 36 Your home page: time of existence

	SME	Professional	University, library, school, museum	Public Administration	Total
Less than 6 months	27.3%	25.0%	13.0%	15.5%	22.0%
Between 6 months and 1 year	32.0%	26.6%	11.1%	32.8%	27.3%
Between 1 and 3 years	38.3%	40.6%	50.0%	51.7%	43.4%
More than 3 years	2.3%	7.8%	25.9%	0.0%	7.2%

Source: Databank Consulting, 1997

An important characteristic of websites is the number of pages featured. There is an obvious correlation between the size of the organisation and the number of pages published on-line. But research on the Web has proven that there is also a natural trend of increase in the websites content, as their originators realise the need for continous updating and improvement and explore the possibilities of interactive communication, expanding its use in their organisations and adding new features and services. Static websites, or sites with very few pages, are likely to reflect a low interest level by their originators, and may eventually be abandoned if they remain in a marginal role.

In the interviewed sample, most users sites have between 10 and 50 pages, which considering the relatively small size of the users is not surprising, and could be considered a relatively adequate dimension, but which does not allow yet for an ample range of interactive applications. Sites with larger content (some with more than 500 pages) belong mostly to universities and public administration organisations. The small dimension of the interviewed SMEs is reflected also in the dimensions of

their websites, consisting in less than 50 pages in more than 80% of cases. This can also depend on the more recent date of opening of SMEs sites.

More interesting, perspectives of growth for websites content are high for all users categories. Approximately half of the sample (60% in the case of public administrations) foresees rapid increase of information and services on the site, and another 17% see the need to revise its structure and content, probably on the basis of the results of actual experience. These results indicate that most users are at the beginning of the learning curve for the use of the WWW, and seem to confirm that there is still a large potential of development and increase of the range of activities to be performed through websites.

Exhibit 37 Your home page: number of pages

	SME	Professional	University, library, School, museum	Public Administration	Total
less than 10	36.2%	40.6%	16.7%	12.7%	29.3%
between 10 and 50	44.9%	39.1%	31.5%	27.3%	38.0%
between 50 and 100	9.4%	10.9%	13.0%	12.7%	11.0%
between 100 and 500	7.9%	4.7%	11.1%	25.5%	11.0%
more than 500	1.6%	4.7%	27.8%	21.8%	10.7%

Source: Databank Consulting, 1997

Exhibit 38 Which are the plans of your organisation about the future of your site?

	SME	Professional	University, library, school, museum	Public administration	Total
Rapid growth (more information, more services)	48.0%	53.2%	56.6%	60.3%	53.0%
To continue as it is now	25.2%	21.0%	11.3%	13.8%	19.7%
To review its structure/content	19.7%	16.1%	13.2%	17.2%	17.3%
Other	7.1%	9.7%	18.9%	8.6%	10.0%

Source: Databank Consulting, 1997

II.4.2 Users and ISPs

This part of the questionnaire aimed at investigating the existing relationships between users and ISPs, in particular focusing on users' satisfaction about service provision from their ISPs.

In most countries the large majority of users connect to ISPs through dial-up modem-PSTN access, with the exception of Germany where ISDN use is more diffused (70.8% of users in the sample). ISDN rate of usage is high in the Netherlands too. The Finnish sample includes also a high percentage of cable connections and some ATM connections. This reflects Finland position as the country with the oldest and more extended ATM network.

Exhibit 39 Which kind of link with your ISP (or gateway) do you use? (data by country)

	France	Italy	UK	Netherland	Germany	Finland	Total
Modem	74.6%	66.0%	68.6%	52.8%	27.1%	23.7%	54.5%
ISDN	17.5%	16.0%	13.7%	30.2%	70.8%	7.9%	26.1%
DSL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ATM	1.6%	2.0%	2.0%	0.0%	4.2%	10.5%	3.0%
Cable	1.6%	0.0%	5.9%	20.8%	0.0%	57.9%	12.2%
Other	11.1%	18.0%	15.7%	24.5%	10.4%	10.5%	15.2%

Source: Databank Consulting, 1997

Concerning users categories, SMEs have in majority simple modem connections to their ISPs (62.6%). The use of high-speed and digital technologies is still the playground for universities and educational organisations (with the exception of Germany where ISDN is quite evenly diffused); universities and educational institutes make a non-negligible use of ATM (12%) and ISDN (36%) technologies for Internet connection. The other categories have negligible percentages in ATM usage for Internet access. One fourth of users utilise ISDN connections. However, it shouldn't be forgotten that universities and research institutes are often directly connected to their national educational backbones without being charged any access fee, making it easier for them to adopt advanced technical solutions earlier than commercial users.

Exhibit 40 Which kind of link with your ISP (or gateway) do you use? (data by category)

	SME	Professional	University, Library, School, Museum	Public Administration	Total
Modem	62.6%	56.3%	32.0%	53.4%	54.5%
ISDN	21.4%	28.1%	36.0%	25.9%	26.1%
DSL	0.0%	0.0%	0.0%	0.0%	0.0%
ATM	0.8%	1.6%	12.0%	1.7%	3.0%
Cable	8.4%	12.5%	18.0%	15.5%	12.2%
Other	12.2%	12.5%	20.0%	20.7%	15.2%

Source: Databank Consulting, 1997

The perception of ISPs' quality of services (QoS) shows a rather high level of satisfaction. The average score assigned to different services varies between 3 and 4 (in a scale where 5 means excellent quality). Connection reliability receives the higher scores, real-time multimedia services the lowest (actually, 3.1 seems still rather high considering the actual technical constraints for multimedia applications on the Internet). No meaningful differencies in the answers of different users categories seem to emerge.

Perhaps more surprising, the opinion on network security quality (widely blamed by experts and suppliers as one of the key failings of the Internet) results in an average score of 3.4, which certainly does not seem to indicate unsatisfaction. A possible explanation is that for present uses of the Internet/WWW present security levels are considered acceptable. Security is particularly relevant for transactions on the networks, which as we have seen are not yet implemented by users.

Exhibit 41 How do you judge according to the experience in your organisation the overall quality of the following services (1=poor, 5=excellent)?

	SME	Professional	University, library, school, museum	Public Administration	Total
Reliability of the connection to the ISP	4.2	3.8	4.3	4.1	4.1
Data transfer speed	3.7	3.6	3.8	3.4	3.6
Web navigation efficiency	3.7	3.6	3.6	3.8	3.7
Network security	3.3	3.5	3.3	3.7	3.4
Real-time multimedia services quality	3.2	3.1	2.9	3.0	3.1

Source: Databank Consulting, 1997

Helpdesk facilities are satisfactory but not outstanding in the opinion of the interviewed users. For most interviewed universities and academic institutes the question didn't apply, because of their direct connection to their national educational backbones.

Exhibit 42 **How do you judge the degree of customer services (helpdesk) provided by your ISP (1=bad, 5=excellent)?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
SMEs	4.3	3.7	3.9	3.4	3.2	3.1	3.6
Professionals	3.0	3.5	4.6	3.2	4.0	3.6	3.6
University, library, school, museum	4.6	3.9	3.6	3.6	3.7	3.1	3.7
Public administration	4.5	3.7	3.9	3.3	3.4	4.0	3.8
TOTAL	4.2	3.7	4.0	3.3	3.5	3.4	3.7

Source: Databank Consulting, 1997

Users do not judge expensive to be on the Internet with respect to the benefits it brigs to their organisation. While the breakown of data by category is not very meaningful (all categories score next to the total average), data by country highlight some differences. Germany and the Netherlands score sensibly lower than the other countries under exam, thus displaying a rough cost-benefit assessment rather mediocre.

Exhibit 43 **Do you judge it expensive to be on the Internet with respect to the benefits it brings to your organisation (1=poor, 5=excellent)?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
Personnel cost (internal cost)	4.1	3.9	4.0	3.1	3.3	3.7	3.7
Equipment costs (internal cost)	4.2	4.0	4.0	3.4	3.3	3.6	3.8
ISP tariffs (external cost)	4.1	3.8	3.7	3.2	3.1	3.4	3.6
Traffic costs (external cost)	3.7	3.5	3.7	3.2	3.1	3.5	3.4

Source: Databank Consulting, 1997

On the other side, almost half of the users (nearly 50% overall) are not willing to pay higher tariffs in exchange for guaranteed improvements of performance or additional services, such as higher access speed, guaranteeed reliability of the connection, guaranteed Quality of Service, information security, information brokering architectures, real-time multimedia service provision and extension in connection times. In the case of security, business users are actually divided evenly between those willing to pay more for better guarantees and those refusing. This feature is clearly less relevant for public and cultural institutions.

Exhibit 44 **Would you accept to pay higher tariffs in exchange of guaranteed improvements for the security of the information?**

	SME	Professional	University, library, school, museum	Public Administration	Total
Yes	41.0%	47.0%	22.9%	39.0%	39.1%
No	43.3%	42.4%	52.1%	49.2%	45.6%
Don't know	15.7%	10.6%	25.0%	11.9%	15.3%

Source: Databank Consulting, 1997

In conclusion, users are in general satisfied of the overall service quality provided by their ISPs. On the other side, it is worth noting that users still perceive the need for improvements in several services but are not fully convinced that an increase in the quality of these services should correspond to an increase in the Internet access and usage fees they pay to their ISPs.

II.4.3 Electronic commerce

As previously discussed, exploring users motivations, perspectives and barriers concerning electronic commerce was a key goal of the survey. The questionnaire addressed these issues by investigating both the users opinions on the suitability of the Internet/WWW as a tool for different types of transactions and activities connected to electronic commerce, and by investigating how much the users have acually been carrying them out. The interpretation of the answers carries some ambiguity, because electronic commerce is a label including a wide range of activities and applications, whose boundaries are still unclear and in rapid evolution. While its potential is widely recognized as absolutely relevant, there is still discussion about the ways in which electronic commerce will actually develop in time, which only market development will resolve. Not surprisingly therefore there are some contradictions also emerging from users answers.

For the purpose of this study, we referred to one of the more extended definitions which is gathering increasing consensus, the definition proposed by EITO '97:

"... e-commerce is the carrying out of business activities that lead to an exchange of value across telecommunications networks ..."

While this wide definition poses some problems in assessing and forecasting the global revenues deriving from electronic commerce (how to measure exactly the value exchanged across the networks?), it allows to describe a set of activities all present in the potential value chain of electronic commerce. Concerning e commerce interactions between suppliers and customers (therefore without including here business on-line networking applications such as EDI type applications) they are:

1. *advertising.* This action is typically performed by inserting company presentations and multimedia product catalogues into the WWW. It generally consists in the creation of a webpage or a website and does not imply any form of interactive communication over the Internet. This is often the case of very small companies without direct Internet access, whose home page is hosted by their ISPs, sometimes in a standardized format along with other similar companies of the same or other sectors. The communication between the companies and their potential customers is performed via telephone or fax and not through electronic messaging systems;

2. *interactive communication and information.* The same as above, but with integrated electronic facilities (e-mail) for communication and information (e.g. an on-line information desk) to respond to potential customers enquiries.

3. *on-line orders.* To allow users to place or receive orders or reservations for goods/services on the WWW, either through electronic forms or simple e-mail messaging. This activity does not include electronic payment transactions, so the user is not required to provide credit card co-ordinates or other financial information to the supplier. Delivery is also separate and usually carried out in traditional ways (mail delivery). This is presently the most diffused mode of

usage of the WWW for e-commerce transactions (for example in the case of reservations of travels or shows tickets). It represents in practice an evolution of established distance selling practices (such as mail-order catalogues) where only the first step, ie the orders, get on-line. It presents the advantages of simple implementation, no major security problems, no major cultural and organisational restructuring needed, and complementarity with existing distribution networks (avoiding potential conflicts).

4. *on-line sales and purchases.* In this case both orders and actual sales/purchase transactions are finalised on the network, by performing electronic payment transactions. Presently the more diffused mode of usage is payment through credit card, while there is some experimentation of different e.cash payment methods. The full implementation of electronic payment requires however alliances between ISPs offering the services and financial operators (such banks) guaranteeing authentication and security of the transactions. The delivery of goods and services however is performed off-line.

5. *on-line sales/purchase and delivery.* The transaction is completely performed on the networks, including order, payment and delivery. This activity can be performed for digitalisable goods and services, such as software, information, audio-visual products (music, videogames, videoclips) and ICT services. This is also a rapidly growing e-commerce area, even if the potential market is limited to customers owning a pc or a suitable terminal enabled to receive delivery of the purchased good/service.

The effectiveness of the WWW as a communication and advertising tool for business users has been one of the main drivers of the commercialisation of the Internet. The dramatic growth of the network in the last years has focused attention on its potential also for actual economic transactions. However users are still cautious about it and wary of the range of problems caused by implementation. It is widely believed that the implementation of new secure electronic payment standards such as SET (Secure Electronic Transaction) or JEPI (Joint Electronic Payments Initiative) will remove a major barrier for electronic commerce development.

From the user point of view, two main behaviours may be identified:

- *dynamic approach,* by which the users consider the Internet/WWW as a real transaction engine for ordering, buying and performing full on-line economic transactions;
- *static approach,* by which the users consider the Internet/WWW as mainly a channel for advertising and communication purposes.

According to the above, it appears very clear that the WWW is the most attracting instrument for electronic commerce over the Internet. The integration of interactive communication features (email) is however an essential feature of its potential development.

The first question asked to the users was about the suitability of the Internet and the WWW for commercial purposes. Three main areas have been addressed:

- *advertising* (corresponding to step 1.);
- *communication* (corresponding to step 2.);
- *transaction, including ordering, selling, purcahsing and paying* products and services (corresponding to steps 3., 4. and 5.).

As an overall result, users interviewed believe that the Internet/WWW is very suitable for advertising (54%), information exchange and communication (59.7%) but only a minority consider it suitable as an economic transaction engine (16%).

Concerning the Internet/WWW advertising role, approval is homogenous across users categories. Considering the breakdowns of answers by country instead, a surprising minority of the German sample users deny its suitability, possibly because of an understanding of the "advertising" activity as being strictly related to purely commercial purposes and not including a more general promotion of users activities and profile.

Exhibit 45 Do you/your organisation consider the Internet and the WWW a suitable instrument for advertising (by country and category)?

	France	Italy	UK	Netherlands	Germany	Finland	Total
Not suitable	0.0%	0.0%	5.9%	8.9%	30.6%	4.3%	8.0%
Suitable	41.7%	42.0%	35.3%	30.4%	34.7%	44.7%	38.0%
Very suitable	58.3%	58.0%	58.8%	60.7%	34.7%	51.1%	54.0%

	SME	Professional	University, library, school, museum	Public Administration	Total
Not suitable	6.0%	16.2%	5.9%	5.0%	8.0%
Suitable	46.3%	29.4%	31.4%	35.0%	38.0%
Very suitable	47.8%	54.4%	62.7%	60.0%	54.0%

Source: Databank Consulting, 1997

Very similar results were obtained when the users were asked to give their opinion about the suitability of the Internet and the WWW as an instrument for information exchange and communication. It has to be noticed that the breakdown of results is homogeneously split between user categories.

Exhibit 46 **Do you/your organisation consider the Internet and the WWW suitable instruments for information exchange and communication (by country and category)?**

	France	Italy	UK	Netherlands	Germany	Finland	TOTAL
Not suitable	0.0%	4.0%	0.0%	7.1%	16.3%	0.0%	4.5%
Suitable	21.3%	34.0%	36.0%	23.2%	53.1%	53.2%	35.8%
Very suitable	78.7%	62.0%	64.0%	69.6%	30.6%	46.8%	59.7%

	SME	professional	university, library, school, museum	public administration	TOTAL
Not suitable	5.2%	7.4%	0.0%	3.3%	4.5%
Suitable	36.6%	39.7%	35.3%	30.0%	35.8%
Very suitable	58.2%	52.9%	64.7%	66.7%	59.7%

Source: Databank Consulting, 1997

Coming to the direct commercial aspects of the electronic commerce, the majority of users (45.1%) think that the Internet is not a very suitable instrument for economic transactions, limiting in few cases their judgement to a "suitable" answer. This is the case of SMEs and professionals, who are more sesitive to the business use of the Internet than universities or public administrations. At a national level, most positive answers were given by UK and Finnish users.

It is remarkable that the cause of the partial refuse of the Internet as an engine for economic transactions doesn't seem to come from the users' perception of the network security: 45.6% of users who judge the Internet not suitable for economic transactions had the opinion that the security of the Internet is good (28.9%) or excellent (16.7%). Only 5.3% of users considering Internet not suitable for economic transaction define the security of the network as bad. This can be also due to the embryonic stage of the electronic commerce market and to the unavailability of suitable instruments allowing the market to take-off.

Exhibit 47 **Do you/your organisation consider the Internet and the WWW a suitable instrument for economic transactions (by country and category)?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
Not suitable	42.3%	53.1%	24.5%	58.2%	59.6%	29.3%	45.1%
Suitable	36.5%	40.8%	55.1%	23.6%	25.5%	56.1%	38.9%
Very suitable	21.2%	6.1%	20.4%	18.2%	14.9%	14.6%	16.0%

	SME	Professional	University, library, school, museum	Public Administration	Total
Not suitable	44.3%	32.3%	60.0%	50.0%	45.1%
Suitable	38.9%	50.8%	26.7%	34.6%	38.9%
Very suitable	16.8%	16.9%	13.3%	15.4%	16.0%

Source: Databank Consulting, 1997

Exhibit 48 **Perception of network security by those users judging the Internet and the WWW as a not suitable instrument for economic transactions**

	Bad	Poor	Medium	Good	Excellent	Total
Not suitable	5.3%	14.9%	34.2%	28.9%	16.7%	100.0%

Source: Databank Consulting, 1997

As outlined above, it seems that the quality of network security is not perceived as a major motivation for their judgment of Internet/WWW unsuitability to economic transactions. Since security is in fact a real problem, once the user starts thinking about actual implementation of transactions, there seems to be additional barriers before the consideration of implementation problems at the basis of many users negative judgment. These barriers may reside in a scarce understanding of the potential benefits to be gained from on-line economic transactions; or in a general feeling that the overall status of the Internet/WWW development is still too immature to allow these transactions, including technical, regulatory, organisational problems; in a natural caution to face the introduction of a radically innovative distribution channel which may cause a range of problems in the organisation of the distribution network and the very positioning of a company in the market; and naturally in the still scarce direct experience of the users in on-line transactions.

In any case, the survey results point to the conclusion that the simple implementation of safe electronic payments standards will not by itself generate an acceleration of electronic commerce diffusion, and that other barriers (such as increased awareness of potential benefits and solution of organisational innovation problems) must be overcome to stimulate its development.

The survey results confirm that the usage of the Internet/WWW as a commercial channel is in the early learning phase. Most users still have to discover the

potentialities of the Internet as a business engine. Most users (67.8%) never used the Internet for real commerce transactions (see following Exhibits). Business categories (SMEs and professionals) display a higher familiarity in the economic transactions than universities and public administrations. An even higher number of the interviewed users (86.1%) never participated in initiatives aiming at introducing electronic commerce in their companies and organisations. Once again, positive answers from business categories were higher, but not as higher as it might have been expected.

Exhibit 49 **Did you ever use the Internet for real commerce transactions (including ordering and purchase/sale of on-line services)?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
yes	27.0%	28.0%	35.3%	28.6%	30.0%	46.8%	32.2%
no	73.0%	72.0%	64.7%	71.4%	70.0%	53.2%	67.8%

	SME	Professional	University, library, school, museum	Public Administration	Total
yes	40.3%	37.7%	24.1%	15.0%	32.2%
no	59.7%	62.3%	75.9%	85.0%	67.8%

Source: Databank Consulting, 1997

Exhibit 50 **Did you ever participate in any pilot initiatives aiming at introducing the electronic commerce in your organisation?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
yes	17.5%	4.0%	7.8%	26.8%	16.0%	8.5%	13.9%
no	82.5%	96.0%	92.2%	73.2%	84.0%	91.5%	86.1%

	SME	Professional	University, library, school, museum	Public administration	Total
yes	14.9%	20.3%	9.3%	8.3%	13.9%
no	85.1%	79.7%	90.7%	91.7%	86.1%

Source: Databank Consulting, 1997

A confirmation that users interest and belief in e-commerce potential benefits is still relatively low results from the answers on planned initiatives. Almost half of the users who never made economic transactions over the Internet are not planning to do it in the near future. However, more than a third of the sample (including a surprising 48% of cultural organisations) is evaluating the possibility to do so. Only 9.5% of users are planning to start within the next 6 months, even if this percentage slightly increased when considering SMEs and professionals. These results confirm the evaluation that the development of electronic commerce is still facing substantial barriers and its diffusion may be slower than expected.

Exhibit 51 **Would you be ready for using the Internet for commercial purposes in a near future (only to users who answered NO to question in Exhibit 49)?**

	SME	Professional	University, library, school, museum	Public Administration	Total
planning to start within the next 6 months	13.8%	9.8%	0.0%	9.8%	9.5%
planning to start within this year	7.5%	4.9%	0.0%	2.0%	4.3%
evaluating the possibility	35.0%	36.5%	48.7%	31.4%	36.9%
no	43.8%	48.8%	51.3%	56.9%	49.3%

Source: Databank Consulting, 1997

According to the results of the survey, on-line orders with separate payments is still the most used kind of economic transaction over the Internet (54.5%). SMEs have the highest share in sales with separate payment (46.3%), as suggested by their commercial nature. Purchases with electronic payments have been done by 29.7% of interviewees, while only 5.9% of users sold their goods with electronic payments, which constitutes an appearent mismatch probably due to the composition of the users' sample. Public administrations still make little use of the commercial potentials of the Internet and the WWW. It must be remembered that the survey's definition of "electronic payment" includes payment through credit card or communication of other financial data over the networks, and not only pure e-cash transactions.

Exhibit 52 **For which kind of commerce transaction did you utilise the Internet (only to users who answered YES to question in Exhibit 49)?**

	SME	Professional	University, library, school, museum	Public Administration	Total
orders with separate payment	44.4%	72.0%	61.5%	55.6%	54.5%
purchases with electronic payment	35.2%	28.0%	23.1%	11.1%	29.7%
sales with separate payment	46.3%	24.0%	15.4%	22.2%	34.7%
sales with electronic payment	5.6%	8.0%	7.7%	0.0%	5.9%
other	3.7%	12.0%	15.4%	22.2%	8.9%

Source: Databank Consulting, 1997

Traded products vary from goods (61.6%) to services (42.4%) and on-line information such as reports or databases (27.3%). The statistical distribution of the answers is not very homogeneous either by country and by category.

Exhibit 53 **What did you commerce (only to users who answered YES to question in Exhibit 49)?**

	France	Italy	UK	Netherlands	Germany	Finland	Total
goods	56.3%	92.9%	50.0%	21.4%	66.7%	77.3%	61.6%
services	43.8%	14.3%	61.1%	78.6%	46.7%	18.2%	42.4%
on-line information	0.0%	14.3%	22.2%	50.0%	40.0%	36.4%	27.3%
other	6.3%	0.0%	5.6%	7.1%	0.0%	9.1%	5.1%

	SME	Professional	University, library, school, museum	Public Administration	Total
goods	66.0%	50.0%	76.9%	42.9%	61,6%
services	37.7%	61.5%	23.1%	42.9%	42,4%
on-line information	17.0%	46.2%	38.5%	14.3%	27,3%
other	5.7%	0.0%	15.4%	0.0%	5,1%

Source: Databank Consulting, 1997

Finally, users who already used the Internet for economic transactions show an overall good degree of satisfaction about its functionality, with very few exceptions such as public administrations in France and universities in Germany.

Exhibit 54 **Are you satisfied of the overall quality of the economic transactions via the Internet (only to users who answered YES to question in Exhibit 49) (1=not at all, 5=very much)?**

	France	Italy	UK	Nederland	Germany	Finland	Total
SME	3.8	3.2	3.6	3.8	3.8	4.0	3.7
professional	4.3	3.5	4.3	3.5	3.6	2.6	3.6
university, library, school, museum	N/A	4.0	3.8	3.0	2.0	3.7	3.3
public administration	2.5	3.0	4.0	3.5	N/A	3.0	3.2
TOTAL	3.8	3.4	3.8	3.6	3.6	3.4	3.6

Source: Databank Consulting, 1997

These data, merged with the answers given to the questions addressing a possible time forecast to start electronic commerce operations for users who never made use of it may suggest a sort of discontinuity in the evolution of the electronic commerce over the Internet. People who are doing it are satisfied with it, but the majority of interviewed users who never did it do not plan to start in the near future (1 year). This can also be due to the profile of the sample, which included users from all business sectors plus the educational/cultural sector and public administration. Results from a sample including a stronger representation of the high-tech sectors, which are more familiar with the use of communication networks, could have been more positive.

In conclusion, the main emerging trends from the user survey are:

- *The users give a very positive evaluation of the Internet/WWW as a channel for advertising and communication. The WWW explosion and the strong increase of the number of websites opened by users should be mostly interpreted at present as a wish to be on the Internet, but not to act over the Internet. A static approach seems still to prevail;*
- *Actual implementation of electronic commerce applications is mostly concentrated in the on-line order activity, with very few users carrying out on-line sales, purchase, payments and delivery. Electronic commerce results in a very early phase of its development.*
- *While most users plan to invest in the improvement and growth of their websites, only a minority plans to invest soon in e-commerce applications and many users define the Internet/WWW as unsuitable for economic transactions. Their diffidence, possibly resulting from scarce awareness of potential benefits or a general feeling of present inadequacy of networks and services in this area, may point to a slower than expected take-off of e-commerce in Europe.*
- *The survey results point to the conclusion that the simple implementation of safe electronic payments standards will not by itself generate an acceleration of electronic commerce diffusion, and that other barriers (such as increased awareness of potential benefits and solution of organisational innovation problems) must be overcome to stimulate its development.*
- *Users are in general satisfied of the services provided by their ISPs, including those carrying out e-commerce transactions. However, many of them do not seem prepared to pay higher tariffs in exchange for better quality services or performance guarantees. This may point to a difficulty in achieving users acceptance of the evolution of Internet pricing system from the present flat rate system to more articulated and higher tariffs, taking into account usage time and higher traffic volumes generated by multimedia applications. This maybe a problem since suppliers consider this evolution necessary to compensate for investments in the network and services technical improvements.*

Conclusions

This study contains the results of three surveys carried out to relevant Internet market players in Europe: Telecom and Internet backbone operators, ISPs and non-residential users. In addition, new trends about the evolution of the Internet and the WWW have been traced based on an in-depth statistical analysis.

Building on the results of the surveys, major original assessments have been obtained in three main investigation areas:

1. the evolution of the WWW in Europe and its technical and economic implications;
2. analysing the evolution of the relationships between telecom operators and ISPs in the European Internet service provision market;
3. Internet users and the evolution of the electronic commerce.

Conclusions are outlined in the following paragraphs.

1. The evolution of Internet/WWW development in Europe

Both the Internet and the WWW are growing very fast in Europe, as shown by most reliable statistical sources. The study confirmed that WWW development in Europe, considered a very important condition for the exploitation of the more advanced applications and services offered by the Internet, is keeping up with the pace of growth in the US and may possibly be closing the present gap of diffusion. The WWW represents today the most popular and fast growing Internet service. The ISP survey results indicate that more than half of Internet traffic (52%) is WWW traffic.

By analysing the distribution of websites in Europe, the study demonstrated that in Europe the growth and the development of the WWW in not uniform but follows precise evolutionary trends. The most important conclusions are:

- the WWW doesn't follow the same development model of the Internet as a whole. The Internet as an infrastructure (i.e. in terms of host penetration) has precise trends in development, based on consolidated indicators, which show higher penetration and growth rates in the Northern European countries (particularly the Scandinavian countries, including Finland which has the highest Internet hosts penetration rate in the world) and lower rates in Southern European countries (particularly remarkable in Italy, whose economic development level and market size make surprising the relative low rate of hosts penetration).

- The analysis of webpages absolute numbers and correlation with hosts penetration by country shows that the WWW follows different and sometimes antithetic development models per single EU country, both in terms of penetration rates and quantity of content. More specifically, the study found a polarisation between a Northern European Web development model (with relatively low ratios of webpages on hosts penetration, the extreme example being Finland) and a

Southern European Web development model (with an unexpected high number of webpages and a high ratio of webpages on hosts, the extreme example being Italy).

- While Internet access and usage tariffs levels present a correlation with hosts diffusion by country (as remarked by several sources such as OECD, ITU, lower tariffs correspond to higher hosts penetration), this does not seem true for Web development. European countries with high Internet tariffs (Austria) present Web dynamics similar to countries with low tariffs (for example, Finland) while countries with low Internet tariffs (Italy) present different Web development patterns.

- WWW usage and development seems instead to be influenced by the economic structure of the country and specific social approaches to the Internet and the WWW. The countries where the economic structure is characterised by a prevalence of Small and Medium Enterprises (SMEs) present a very high vitality in the multiplication of webpages. Since smaller companies often do not reach the critical threshold for opening a proprietary website (possibly requiring a specific host), and tend to have their pages hosted by ISPs, this may be an explanation of why in these countries a high number of webpages corresponds to a relatively low number of hosts.

- An important indicator of the WWW evolution is the language featured by websites. By analysing a sample of European sites, the study found an overall trend towards the reduction of the percentage of English-only sites and the increase of bilingual or national language only sites (which are already the majority). This proves that WWW usage is driven by the need to serve local users and indicates a growing regionalisation and local characterisation of its content. Again, this trend did not present an evident correlation with the Internet hosts diffusion patterns, being present in all EU countries.

These results allow to draw some important conclusions on the trends of Internet/WWW development in Europe:

- First of all, the traditional view of the gap between Northern and Southern European Internet development dynamic based on hosts penetration is partially misleading. Clearly there is a strong actual and potential demand in Southern European countries for use of the Web services, but there is also a risk that weaker infrastructure development may constrain its development and lead to worse problems of traffic congestion. There seems to be a need for actions supporting the upgrading of infrastructures and removing barriers to hosts development in Southern European countries. Moreover, it seems confirmed that European SMEs are actively interested in the development of the WWW (even if the users survey pointed out several barriers and problems).

- Since electronic commerce development is strongly connected with WWW development, the vitality of Web growth across Europe and also in Southern European countries seems to confirm a positive potential of growth in the whole European Union. The lower relevance of tariffs levels in the Web development

model, however, seems to indicate that Internet tariffs dynamics may also be a less important factor than expected in electronic commerce development, versus other factors such as the economic and cultural environment.

- in conclusion, the study results indicate that a strong regional/national characterisation of the WWW development is in process in Europe. The Internet growth is driven by global indicators strongly linked with telecommunication infrastructures, while the WWW, a complex combination of services providing content and interaction, is driven by other logics, more linked to local rather than to global needs.

2. The evolution of the Internet service provision market in Europe

The competitive scenery of the Internet service provision market in Europe is undergoing a rapid evolution. Internet backbone operators and Global operators are in direct competition for the transport and IP interconnection traffic at the international and world level, while PTOs, New Entrants and ISPs face each other at the local access level interfacing end users. Large multinational and national companies are the only end users directly targeted by Internet Backbone and Global Operators, but services at the local level are delivered by their local partners acting as ISPs. National Telecom Operators have entered in force the Internet market in the last two years, are usually already leaders in the access market, and pursue aggressive strategies of development of their customer base and their products and services portfolios.

The market is heading towards a shake-out of the large population of ISPs (especially local ISPs) whose early competitive advantages (early entrance in the market, low prices, closeness to local users) are rapidly vanishing. Key aspects in the market evolution are the pressure for change of peering agreements (commercial agreements for the exchange of Internet traffic among ISPs and backbone operators) and the increasing number of vertical and horizontal alliances between operators, ISPs, content and value added services/applications providers excluding weaker competitors.

More specifically, trends of development for ISPs are the following:

- large ISPs are likely to become part, or closely allied, with telecom operators; non-carrier ISPs will have major difficulties in order to survive in the Internet service provision business;

- small ISPs focused only on access services will not be able to survive, unless they move towards the supply of value-added services such as electronic publishing and technical consultancy for the establishment and management of websites; it will be difficult for them, however, to get into the more profitable content aggregation and specialised applications business since at present they seem to lack the core competences. Therefore their number is likely to decrease.

  Concerning suppliers market and technical development strategies, the following conclusions can be drawn from the surveys:

- both operators and ISPs consider the offer of Intranet/Extranet services (mainly to the business market) and of Webcasting type services as the most important drivers of demand development in the near future. Electronic commerce type of applications are also included in development strategies (especially concerning improvement of security and performance guarantees as preconditions) but they are considered more as a medium-longer term perspective. The offer of websites hosting/housing, design, maintenance and consultancy services is considered a key component of both operators and ISPs portfolios and constantly improved. Internet telephony is considered as technically very immature, but potentially affecting strongly the structure of the whole telecom market. Its potential is considered greater for international voice and fax traffic, and at least one major operator (MFS/Worldcom/UUNet) is planning a commercial offensive in this field.

- Operators are investing heavily in IP backbones capacity and technical performances improvements (with ATM the technology of choice). Concerning access technologies, besides ISDN suppliers are investing in xDSL solutions and experimenting with wireless and satellite access technologies. In the next few years the implementation of new generation IP protocols optimised for multimedia traffic is also foreseen.

- All suppliers are trying to extend their positioning in the Internet value chain towards the provision of more value added services, in order to improve the very low profit margins due to the present flat-rate Internet pricing system. Suppliers already propose articulated pricing schemes to high-end business users. Suppliers foresee the need to move beyond the flat-rate pricing system towards pricing systems taking at least partially into account usage time and higher traffic volumes from multimedia and real-time applications. However it is not clear how this transition can be made, given strong resistance by the users.

3. Internet/WWW non-residential users trends

The study survey excluded residential users and focused on professionals, SMEs, educational and cultural organizations (schools, universities, libraries and museums), and public administrations with an active website and a home page, in order to analyse the more advanced European Internet users population.

Main emerging trends from the user survey are:

- the users give a very positive evaluation of the Internet/WWW as a channel for advertising and communication. The WWW explosion and the strong increase of the number of websites opened by users should be mostly interpreted at present as a wish to be on the Internet, but not to act over the Internet. A static approach seems still to prevail;

- actual implementation of electronic commerce applications is mostly concentrated in the on-line order activity, with very few users carrying out on-line sales,

purchase, payments and delivery. Electronic commerce results in a very early phase of its development;

- while most users plan to invest in the improvement and growth of their websites, only a minority plans to invest soon in e-commerce applications and many users define the Internet/WWW as unsuitable for economic transactions. Their diffidence, possibly resulting from scarce awareness of potential benefits or a general feeling of present inadequacy of networks and services in this area, may point to a slower than expected take-off of e-commerce in Europe;

- the survey results point to the conclusion that the simple implementation of safe electronic payments standards will not by itself generate an acceleration of electronic commerce diffusion, and that other barriers (such as increased awareness of potential benefits and solution of organisational innovation problems) must be overcome to stimulate its development;

- users are in general satisfied of the services provided by their ISPs, including those carrying out e-commerce transactions. However, many of them do not seem prepared to pay higher tariffs in exchange for better quality services or performance guarantees. This may point to a difficulty in achieving users acceptance of the evolution of Internet pricing system from the present flat rate system to more articulated and higher tariffs, taking into account usage time and higher traffic volumes generated by multimedia applications. This maybe a problem since suppliers consider this evolution necessary to compensate for investments in the network and services technical improvements.

Glossary

ADSL	Asymmetric Digital Subscriber Loop
ATM	Asinchronous Transfer Mode
DNS	Domain Name System
FTP	File Transfer Protocol
GDP	Gross Domestic Product
HTML	Hypertext Markup Language
ICT	Information and Communication Technology
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ISPO	Information Society Project Office
NSF	National Science Foundation
OSP	On-line Service Provider
PSTN	Public Switched Telephone Network
RIPE	Réseaux IP Européens
SME	Small-Medium Sized Enterprise
SMTP	Simple Mail Transfer Protocol
TCP	Transmission Control Protocol
TLD	Top Level Domain
URL	Uniform Resource Locator
WWW	World Wide Web

References

Arnum E.: *Internet Cross-Subsidiation: Traffic, Spending, and Government spending on the Internet. A Close-up study of the commercialisation of the Internet and the growth of the NSFnet Backbone Services from January 1993 to January 1995*, EC Study, DGXIII, 1995.

EEMA (European Electronic Messaging Association), *The European Internet featuring The European Internet CyberRoadmaps*, 1995.

EEMA (European Electronic Messaging Association),*The global Internet CyberRoadmaps*, 1997.

EITO, *European Information Technology Observatory*, 1997.

ENSR (European Network for SME Research): *The European Observatory for SMEs*, Fourth Annual Report, 1996.

EUROSTAT, *Enterprises in Europe*, Fourth Report, 1996.

ITU, *Challenges to the Network, Telecoms and the Internet*, 1997.

Network Wizards, www.nw.com

OECD, *Communication Outlook*, vol. I, 1997.

Rèseaux IP Européens (RIPE), www.ripe.net