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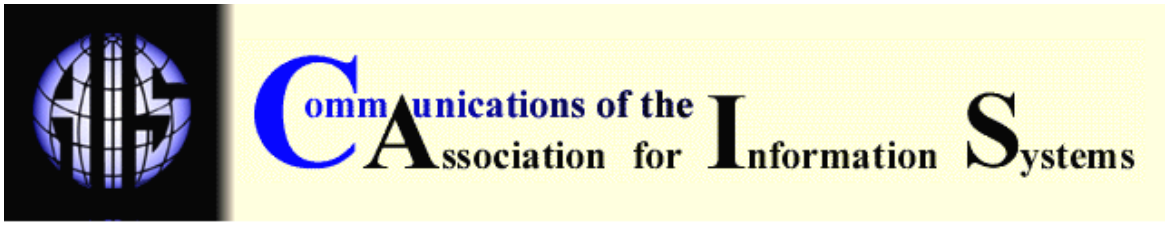

GLOBALIZATION AND E-COMMERCE III: THE FRENCH ENVIRONMENT AND POLICY

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ABSTRACT

- According to most indicators, the use of the Internet and the development of e-commerce (over the Internet) in France are below the level that should be reached given the French level of development.

- This observation can be explained by the late adoption of digital technologies by the French. However, the French lateness is less important for professional uses than for domestic uses. France began to catch up with pioneering countries during 1999-2000, but the collapse of the Internet bubble reduced the pace of adoption.

- The French late adoption of digital technologies is partly the result of the strong involvement of France in the development of two pre-existing technologies: Minitel (principally dedicated to B2C) and EDI (dedicated to B2B). Both technologies provided the users with a sufficient level of service to support their business processes, but hindered their propensity to switch to new Internet-based technology. Consequently, most available indicators underestimate the actual level of e-commerce in France, especially the French business readiness to switching to Web-based commerce.

- The late adoption of technology was not the only inhibitor for e-commerce. In France's recent economic history, decision makers focused for too long on other issues. France had to adapt its economy and its industry to a competitive and global environment. Since the State played a strong role in an economy that was not widely open to competition, a wide set of reforms took place between the mid-1980s and the late 1990s.

- However, this restructuring policy prepared France for the adoption of e-commerce. as France was transformed into a service economy. Most organizations became more flexible by externalizing non-core activities and by implementing modular principles of organization. French companies went international as well. This new business climate favored the adoption of e-business and e-commerce practice by the end of the 1990s.

- When macroeconomic and industrial restructurings were achieved, the French government launched a strong information society policy. Since 1998, the government furthered the deregulation of telecommunication services, reshaped the legal framework to adapt to digital technologies, promoted IT training and innovation, and developed e-government.

- These policies were both a component of and aligned with the year 2000 e-Europe initiative of the European Union (EU), which promoted the development of a strong digital economy. Specific support programs (in R&D and development of content) were combined and an intensive effort for legislation and inter-member benchmarking occurred (to stimulate member states to align on the most advanced state), the Commission and the Council of the EU tried try to stimulate development of a dynamic digital industry in Europe, and to boost the adoption of digital technologies and the new-methods of work and business enabled by them.

- While the European and the French policies impacted the adoption of digital technologies and e-commerce development significantly, they were insufficient to really enable France to catch up. The bursting of the Internet bubble slowed the pace. Moreover, B2C e-commerce was inhibited by the efficiency of the French distribution system that serves at a low cost alternative to the Internet for most of the population. The existing installed base of EDI, especially in the automobile and distribution industries, inhibits B2B e-commerce over the Internet. Consequently, the French e-commerce path of development is unique since it relies less on the Internet than in many other countries. Despite these inhibitors, France is adopting digital technologies and related practices at a higher pace than the other European countries.

- Within France, e-commerce is quite different in the various regions and industries. The Paris area (one-fifth of the French population), the IT industry, the professional services and distribution industries, and large companies are as intensively digitized as most advanced countries, industries, and companies worldwide. However, many regions, industries, and SMEs remain archaic. This digital divide is a major inhibitor to the generalization of e-commerce practices, because it prevents France from benefiting from strong potential network externalities.

KEYWORDS: e-commerce diffusion, globalization, france, environmental and policy factors, government policy, e-commerce policy, business-to-business, business-to-consumer, minitel, late adoption.

INTRODUCTION

While France is one of the most developed countries in the world, with a tradition in developing and using IT (especially telecommunications technologies), most international comparisons point out that the use of PCs and the Internet in France is much less intensive than in countries with the same characteristics. This lag strongly impacts e-commerce based on the Internet.

The early and wide adoption of alternative technologies (Minitel and EDI) partly explains this lag (Brousseau, 2001). Since these technologies are still widely used, the French intensity of use of digital technologies is usually underestimated. Moreover, the in-depth implementation of these technologies in the economy and in the population delayed the adoption of the Internet. However, other factors contribute to the specific French path of evolution toward the digital economy.

Two major factors are highlighted in the paper:

- First, France's low rate of e-commerce adoption is the result of the late adoption of the Internet technologies. Until the very late 1990s, the digital revolution was not identified as a priority by most governmental and business decision makers, because France had to modernize its economy before going digital. While investment in IT was not neglected, the priorities were clearly to deregulate, to go international, and to re-engineer business processes and organizations. This late take off would not have prevented a French catch-up if the bursting of the Internet bubble had not dried up the capital market and ruined enthusiasm.

- Second, many inequalities generate digital divides among the most educated and the less, the Paris region and the French "provinces", large firms and SMEs, modern and archaic

industries. These divides are clearly inhibitors of e-commerce since they check adoption of both digital technologies and e-commerce. Since many potential users and businesses cannot interact digitally with others that are not digitized, many decide to delay adoption.

Both factors are not barriers to e-commerce practices; they are inhibitors, which explains why France is still behind. However, some positive factors developed.

First, the French production system is now composed of firms and industries whose organization allows the implementation of e-business and e-commerce practices. Innovation capabilities have been reinforced especially in IT. Moreover, France benefits from digital skills both in terms of IT production and use. It has a tradition in producing efficient telecommunication equipment and services, as well as software. The early diffusion of on-line services, both in businesses and in the public; the generalized use of smart-cards and mobile phones by the public; and the relatively high-rate of use of EDI and on-line information exchanges by businesses combine to create a climate that is favorable to the development of e-commerce.

Second, the French economy is now quite liberalized and open to foreign competition. Business decision makers are aware of what is happening abroad and seek to implement similar business processes in France.

Third, the enabling infrastructure for e-commerce is there. France benefits from an excellent logistic, legal, and business services infrastructure. Most of the barriers that made Internet access scarce and costly (by 1997) were removed. A few French firms developed viable (and sometimes profitable) e-commerce operations. In many cases, e-commerce companies are subsidiaries of retail chains that are quite successful in the global market.

Fourth, the central government, which strongly influences events because of the importance of the state in the national economy, and because of the centralization of the country, implemented a policy to boost the development of a French information society and digital economy. This policy was reinforced by the European policy aimed at sustaining the development of a unified and dynamic European digital arena.

II. NATIONAL ENVIRONMENT

POPULATION AND DEMOGRAPHICS

Population, Urbanization and Population Density

France is one of the four most populated countries of the EU (Table 1). As most European countries, its population is rather stable, mostly urban, and well-educated. Due to a higher rate of fertility and immigration, it is slightly younger than the average EU member. However, with the extension of life expectation, the aging population is following the European trend (Table 2). Because of its agricultural tradition, a greater share of the population still lives in rural areas as compared to other EU the aging population is countries with the same level of development (Table 1). However, most of the French population lives in quite densely populated areas.

Table 1 points out that there are huge differences among European countries. First, the gap between large and small EU-members is sizable. The big five (Germany, U.K., France, Italy, Spain) are 4 to 10 times more populated than the small countries and there are no mid-size countries. This inequality suggests that many figures are simply not comparable since several smaller countries are less populated than several large cities in the big five. Moreover, it is clear that large countries are less homogeneous (in terms of population characteristics, social and economic structures) than smaller ones. Therefore, comparisons among the figures of large and small countries have to be interpreted cautiously.

In addition, the urbanization intensity is significantly higher in northern Europe than in southern Europe (Germany and U.K., vs. France, Spain and Italy). This difference is also true for the level of development (see GDP per capita, Table 15). However, while France is clearly a Mediterranean country in terms of urbanization, it is clearly a more northern country in terms of development. This dichotomy explains why many French figures reach the average European

figures; France stands as a kind of intermediary country among the Northern and Southern European blocs.

Table 1. Demographic Overview and UrbanizationDemographics

	Population 2000[a]	Urban population (% of total) 2000[b]	% over age 65; 1999[c]	% under age 15, 1999[c]
Germany	82,175,800	87.50	15.84	15.66
United Kingdom	59,766,000	89.50	15.74	18.79
France	58,800,000	75.60	15.65	18.89
Italy	57,298,000	67.00	17.22	14.51
Spain	40,600,000	77.60	16.46	14.85
Poland	38,765,000	65.60	11.82	20.09
Netherlands	15,956,566	89.40	13.55	18.25
Greece	10,645,000	60.10	17.32	15.56
Czech Republic	10,244,000	74.70	13.56	16.90
Hungary	10,228,000	64.00	14.40	17.25
Belgium	10,161,000	97.30	16.36	17.41
Portugal	10,020,000	64.40	16.00	17.04
Sweden	8,880,532	83.30	17.20	18.88
Austria	8,211,000	64.70	14.97	16.97
Switzerland	7,164,400	67.70	14.97	17.07
Denmark	5,330,020	85.30	14.45	18.23
Finland	5,176,000	67.30	14.59	18.54
Norway	4,485,000	75.50	15.40	19.58
Ireland	3,730,000	59.00	11.17	21.56
United States	275,129,984	77.20	11.85	21.20
Scandinavia[d]	23,871,552	78.81	15.75	18.61
European Union[e]	376,749,918	79.54	15.97	16.83
OECD[f]	1,115,304,202	77.55	12.63	20.43

[a]*Source:* International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001. The data for population are mid-year estimates.
[b]*Source:* World Bank Group, WDI Data Query located at http://www.devdata.worldbank.org/data-query/. WDI definition: urban population is the midyear population of areas defined as urban in each country and reported to the United Nations. It is measured as a percentage of the total population.
[c]*Source*: World Bank, World Development Indicators CD-ROM 2001.
[d]Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark, and Finland.
[e]Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.
[f]Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia, and Iceland.

Table 2. Evolution of the Age Distribution

	1995	1996	1997	1998	1999	2000[p]	2001[p]
Population	57,752,535	57,935,959	58,116,018	58,298,962	58,496,613	58,744,113	59,039,713
< 20 Years	26.1	26.0	25.9	25.8	25.7	25.6	25.4
20Y<x<64	58.9	58.7	58.6	58.5	58.4	58.4	58.5
> 65 Years	15.0	15.3	15.5	15.7	15.9	16.0	16.1
< 15 Years	19.6	19.4	19.2	19.0	18.9	18.9	18.8
> 60 Years	20.1	20.2	20.4	20.5	20.6	20.6	20.6

[p]Stands for provisional
Source: INSEE, 2002, (www.insee.fr).

These various elements of population and urbanization are both drivers and inhibitors to e-commerce:

- The aging population could be a strong support for the development of on-line services. However, the low digital literacy of the elderly does not encourage the development of such services.
- The relatively high-share of youth in the total population also could provide a positive effect, since it is the most digitized part of the population. However, French youth remain less intensively trained in IT than their foreign counterparts (Table 45) even if governmental actions are beginning to fill this gap (Table 44).
- The relatively lower overall density of the French population could also impact the demand for on-line services and remote commerce systems positively. Most French live in quite dense areas, but the majority of households do not have access to the Internet (Figure 6). The French distribution system is based on efficient supermarket and a dense web of specialty store networks, (Brousseau, 2001), so the incentive to buy on-line is not very strong. In addition, since the population remains less urbanized overall than in many other European countries, the cost and the delay of implementing a high speed digital network that would cover most of the population is significantly higher.

ECONOMY

GDP & Economic Growth

France's macro-economic climate must be linked with the radical liberalization of the economy that occurred since 1983. Prior to then, the French people believed in strongly "administrated" market economies. In addition to a dense web of regulations, the government directly operated the economy through public expenditures, large state-owned companies, and systematic arbitration of conflict. The peak of this trend was the 1981-1983 period when the French Socialist Party came to power. In 1983, however, the French Socialists made a radical ideological change and became social-democrats. Since then, the French elite—whether "conservative" or "social-democrat"—has been conducting a policy of liberalization of the French economy aimed at enabling France to compete more efficiently in the European integrated market, and more generally in the global economy.

This policy change led to a cut in subsidies to support specific business, deregulation, privatization, and economic restructuring. The European integration process was a major driver for this evolution. The French economy liberalized because of the single market policy (achieved in 1992). The process of deregulation of network industries and privatization of former monopolies is still on its way in the last highly regulated industries (electricity and railways). The government also reduced its level of direct intervention into the economy both because of the emergence of a strong anti-trust regulation at the European level (that forbid public subsidies that distort competition) and because the goal of developing a single currency (achieved in 2001) imposed strong public budget constraints.

The liberalization process of the French economy led to a wide re-engineering of French industry. Focused on the management of organizational change to adapt firms, industries, and the workforce to enable them to face a new competitive environment, French decision makers did not identify the coming digital revolution early enough. These factors partly explain why France took off quite late (Brousseau, 2001).

At the same time, this policy was a prerequisite to enable France to be competitive in the global economic arena. As pointed out in Table 3, French exports grew at a stronger pace than imports in the last 20 years, enabling the trade balance to become structurally positive. The positive trade balance is the main proof of the enhancement of the competitiveness of "France Inc.".

Restructuring the French economy was also an effort to make the economy more dynamic. France is today one of the European countries that enjoys steady growth (Table 5). While growth was lower for the year 2001 in all the western economies, France was one of the countries that benefited from a lighter recession due to the strength of dynamic domestic demand (Tables 3 and 4), especially household consumption and business investments.

Table 3. The French GNP Structure

Billions of Euros	1980	1990	1995	1996	1997	1998	1999	2000
Resources								
GDP	878.1	1,121.0	1,181.8	1,194.9	1,217.6	1,259.1	1,295.8	1,335.9
Importation	142.6	211.7	249.8	253.8	271.2	302.6	317.0	362.1
Uses								
Households Consumption	505.7	627.5	649.0	657.3	658.2	680.7	699.7	717.4
Public Current Expenditures	192.2	251.5	282.2	288.6	294.7	294.3	300.3	306.8
Non-Profit Organizations Expenditures	4.1	5.2	7.0	7.2	7.4	7.6	8.0	8.3
Investment	174.1	236.1	222.1	222.1	221.9	237.4	252.2	267.6
Net Acquisitions of Stocks	0.6	0.9	0.9	0.9	1.0	1.2	1.3	1.3
Inventories Variations	6.9	5.6	4.4	-2.6	-2.0	7.4	5.0	0.0
Exportations	134.8	205.6	266.0	275.2	307.7	333.3	346.6	390.2
Total	1,015.3	1,332.1	1,431.6	1,448.6	1,488.9	1,562.0	1,613.0	1,697.2

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

Table 4. The French GDP Growth by Macroeconomic Categories

In points of GNP	1995	1996	1997	1998	1999	2000
Households Consumption	0.7	0.7	0.1	1.9	1.5	1.4
Public Current Expenditures	0.0	0.5	0.5	0.0	0.5	0.5
Investment	0.4	0.0	0.0	1.3	1.2	1.2
Including Business Investments	0.2	-0.1	0.0	0.9	0.6	0.8
Trade Balance	0.0	0.4	1.3	-0.5	-0.1	-0.1
Including Exportations	1.7	0.8	2.7	2.1	1.0	3.3
Including Importation	-1.6	-0.3	-1.5	-2.6	-1.1	-3.4
Inventories Variations	0.6	-0.6	0.0	0.8	-0.2	0.1
GDP	1.7	1.1	1.9	3.4	2.9	3.1

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

France's increasing international competitiveness combined with healthy growth based on a strong domestic demand, can be interpreted as the result of the French restructuring policy that allowed significant productivity gains in the second part of the 1990s (Table 5). Compared to the other large European countries, France today enjoys the most healthy and dynamic economic climate. While the mid-1980s and the first half of the 1990s were characterized by "austerity" policies resulting in a depressed economic climate, the "dividend" came in the late 1990s.

This macroeconomic climate explains the late French takeoff in the digital economy and the vigor of the catch up efforts. Until 1998, the ability of French firms (and households) to invest in digital technologies was low (weak final demand, depressed investment). Moreover, productivity gains were primarily identified as deriving from industrial restructuring and organizational re-engineering. It did not encourage households and businesses to go digital. Since then, firms that are more efficient invested in digital technologies and e-commerce because these technologies and the related business practices became the new drivers of productivity gains (Tables 6 and 28).

Table 5. Quarterly Growth Rates in GDP at Constant Prices

	1999 Q4	2000 Q1	2000 Q2	2000 Q3	2000 Q4	2001 Q1	2001 Q2	2001 Q3	2001 Q4
U.S.	2.0	0.6	1.4	0.3	0.5	0.3	0.1	-0.3	0.3
Japan	-1.3	2.0	1.8	-0.7	0.3	1.0	-1.2	-0.5	-1.2
Belgium	1.8	0.2	1.0	0.8	0.9	0.2	-0.5	0.0	-0.2
Denmark	1.5	-0.2	1.6	0.3	0.8	-0.5	0.4	0.5	0.2
Finland	1.5	2.1	0.9	1.6	0.7	0.0	-1.8	1.4	-0.5
France	1.2	0.8	0.9	0.6	1.0	0.4	0.2	0.5	-0.1
Germany	0.8	1.0	1.2	0.1	0.2	0.4	0.0	-0.2	-0.3
Italy	1.0	0.8	0.3	0.5	0.8	0.8	0.0	0.1	-0.2
Netherlands	1.3	0.8	0.6	0.5	0.7	0.0	0.3	0.0	0.0
Spain	1.1	1.2	1.0	0.4	0.8	1.0	0.2	0.9	0.2
Sweden	1.1	0.8	1.2	0.6	0.3	0.4	0.0	0.1	0.3
U.K.	0.8	0.4	0.8	0.9	0.6	0.7	0.5	0.4	0.1

Source: OECD, Quarterly National Accounts Database, 2002, www.oecd.org

Table 6. Trends in Multi-factor Productivity Growth[1, 2] 1990-95 and 1995-99
Business Sector, Percentage Change at Annual Rates

	1990-95	1995-99
Finland	3.0	3.6
Denmark	1.5	1.5
Netherlands	1.9	1.5
Sweden	1.3	1.3
United States	1.0	1.2
France	0.9	1.1
Germany	1.1	1.1
United Kingdom	0.8	1.0
Japan	1.3	0.9
Italy	1.2	0.8
Spain	0.9	0.5

[1]Adjusted for hours worked, based on trend series and time-varying factor shares.
[2]Series end in 1997 for Belgium and Italy; 1998 for Denmark, France, Japan, Netherlands, and U.K.; data for Germany starts in 1991.
Source: OECD calculations, based on data from the OECD *Economic Outlook No. 68.* See S. Scarpetta et al., Economics Department Working Paper No. 248, 2000 for details; May 2001.

Despite this recovery, the French growth remained behind the average European growth in the second half of the 1990s. The low growth rate partially explains why the level of unemployment (Table 18) remained significantly above the European means in the year 2000. The high level of unemployment is also the other side of the coin of the very good French performance in terms of inflation (Table 7).

Sectoral Distribution

The evolution of the structure of the French production system can be seen even at the aggregate level. Like other developed countries, France is a service economy today, but France

deepened its specialization in services for the last two decades (Table 8). Over the last 20 years, the growth of commercial services was faster than the growth of the whole economy, while the contribution of agriculture and manufacturing industries to GNP decreased. Faster growth occurred for professional services, commerce, and transportation. Public services grew a little faster than GDP, but this growth was mainly the result of the effort toward education and to the growth of health expenditures with the aging population. Industry, on average, grew at a slower pace than the economy. Two industries experienced strong growth: equipment and intermediary products.

Table 7. Economy 2000

Economy	Unemployment Rate 2000[a]	Inflation, GDP Deflator (annual %) 2000[b]	Average GDP Growth, 1995-2000[b]
Ireland	4.10	5.27	9.93
Poland	16.10	7.74	5.47
Finland	9.70	1.25	5.09
Hungary	6.40	6.76	3.66
Netherlands	3.30	2.58	3.47
Spain	14.07	3.45	3.45
Portugal	4.00	2.89	3.30
Norway	3.40	6.89	3.24
Greece	11.10	2.88	3.15
Sweden	4.70	1.57	2.96
United Kingdom	5.50	1.78	2.76
Belgium	7.00	3.61	2.65
Denmark	5.40	3.98	2.65
France	10.02	.53	2.40
Austria	3.60	2.39	2.24
Italy	10.50	2.55	1.95
Germany	7.90	-.59	1.67
Czech Republic	8.30	1.09	1.65
Switzerland	2.70	1.26	1.48
United States	4.00	2.05	4.01
European Union[c]	7.21	2.44	3.40
Scandinavia[d]	5.80	3.42	3.48
OECD[e]	6.56	4.79	3.43

[a] *Source:* International Labor Organization, LABORSTA (http://www.laborsta.ilo.org), Table 3A.

[b] *Source:* World Bank Group, WDI Data Query located at http://www.devdata.worldbank.org/data-query/. WDI definition: Inflation as measured by the annual growth rate of the GDP implicit deflator. GDP implicit deflator measures the average annual rate of price change in the economy as a whole. Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 1995 US$.

[c] Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark, and Finland.

[d] Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.

[e] Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia, and Iceland.

The reshaping and modernization of French industry required switching to an economy based on dynamic manufacturing and services industries serving professional customers. France also developed skills in new industries that are essential in the "new economy": namely commerce, logistics, and transportation. One can note however, the relative weakness of the French finance industry. Second, the industries that developed the most (professional services, logistics) compared to others confirm the idea that France switched to a modern organization of operations based on the externalization of many functions to specialized professionals that led to the development of network firms.

Table 8. The Distribution of the Value Added Among Industries
(In Billions of Euros 1995)

	1980	1990	1995	2000
Agriculture. Forest. Fishing	29.1	33.9	35.5	39.7
Manufactured Products	185.4	215.6	230.6	264.3
Food and Agro-business	28.8	29.2	29.6	29.0
Consumption Goods	34.3	38.8	38.5	41.3
Automobile	13.7	13.6	13.8	21.5
Equipment	26.9	35.1	39.8	47.3
Intermediary Products	51.4	71.9	77.8	91.4
Energy	32.4	27.3	31.1	34.5
Construction	56.2	62.0	57.3	51.8
Commercial Services	377.9	535.6	549.3	630.0
Commerce	72.8	110.8	115.5	128.4
Transport	29.2	40.4	42.8	54.4
Financial Services	37.5	60.4	55.4	52.4
Real Estate	90.6	120.9	130.3	143.5
Professional Services	91.9	140.9	146.0	187.3
Consumers Services	60.7	62.4	59.2	65.0
Public Services	152.9	199.0	222.5	240.6
Education,. Health,. Social Support	86.0	113.4	126.6	136.2
Administration	66.9	85.6	95.8	104.4
Adjustment	-29.6	-47.8	-39.5	-31.7
Total	778.7	999.2	1,055.7	1,195.0

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

For e-commerce, these figures point out again that France proceeded to in-depth restructuring before going digital. The late digital take off can be explained better by these significant changes than through "cultural" factors.

The reorganization of industry in networks of firms and the dynamics of commerce, transport, and professional services are strong drivers for development of e-commerce. It does, however favor the development of B2B commerce rather than B2C, since French consumers already enjoy an efficient distribution system (Table 9). As pointed out by the French deficit of the trade balance for consumers services and consumption goods, French manufacturing and services industries that serve the mass market are less efficient than their foreign competitors (Table 9).

Openness to Foreign Trade and Investment

The evolution of the trade balance is also evidence of the reshaping of French industry. While systematically negative in the 1980s the trade balance became positive in the 1990s (Table 9). This change is explained by several factors. Except for energy, whose trade balance fully depends on the international oil market, French industry became more competitive in exporting goods and services. Moreover, French industry is quite efficient at exporting food and agro-business products, automobile equipment, commercial and professional services. Tourism also plays an essential positive role (Table 10).

The main weaknesses are in consumer goods. While positively evolving with the passing of time, the French trade balance remains negative with most developed countries. It is slightly positive with the other EU members, negative with all the other OECD countries, and positive with the developing world (Table 11). This distribution reflects an insufficiently modernized industry. (Table 9).

Table 9. French Trade Balances by Activities 1980-2000

Billions of Euros	1980	1990	1995	1996	1997	1998	1999	2000
Agriculture. Forest, Fishing	0.2	3.6	1.4	1.8	1.9	1.9	2.3	2.2
Manufactured Products	-15.6	-23.7	-0.5	3.3	15.9	12.5	7.2	-10.1
Food and Agro-business	*0.6*	*3.8*	*5.9*	*6.2*	*8.2*	*7.2*	*7.3*	*7.4*
Consumption Goo	*-0.7*	*-6.2*	*-3.8*	*-2.7*	*-2.1*	*-4.0*	*-4.0*	*-6.8*
Automobile	*3.9*	*3.5*	*3.4*	*3.6*	*9.8*	*9.0*	*8.2*	*9.4*
Equipment	*3.6*	*-0.8*	*5.2*	*7.1*	*11.0*	*10.1*	*7.9*	*9.0*
Intermediary Prod	*-1.7*	*-9.8*	*-2.0*	*1.0*	*2.3*	*-0.4*	*-0.7*	*-6.7*
Energy	*-21.4*	*-14.2*	*-9.2*	*-12.0*	*-13.4*	*-9.4*	*-11.4*	*-22.2*
Services	0.9	0.5	3.4	3.5	5.9	5.3	5.7	8.0
Commerce	*-0.6*	*-0.2*	*0.7*	*0.6*	*2.2*	*2.0*	*2.3*	*3.5*
Transport	*0.5*	*-0.3*	*0.4*	*0.7*	*1.0*	*1.2*	*1.0*	*0.7*
Financial Services	*0.1*	*-0.3*	*0.4*	*0.0*	*0.4*	*-0.3*	*0.1*	*0.8*
Professional Servi	*0.9*	*1.4*	*2.2*	*2.7*	*2.6*	*2.7*	*2.6*	*3.1*
Consumers Servic	*0.0*	*-0.1*	*-0.4*	*-0.5*	*-0.3*	*-0.3*	*-0.4*	*-0.1*
Correction CAF/F(	2.4	3.3	3.3	3.2	3.6	4.1	4.3	4.5
Territorial Correcti	1.4	6.6	8.5	8.3	10.2	10.9	13.4	15.2
Total Trade Balan	-10.7	-9.8	16.2	20.1	37.4	34.6	32.9	19.8

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

Table 10. The French Trade Balance in 2000 by Activities[2]

Billions of Euros	Balance	Imports	Exports
Goods (FOB/FOB)	-21.9	2,147.30	2,169.20
Tourism	99.4	215.5	116.1
Non-Tourist Services	52.7	277.9	225.3

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

Table 11. The French Trade Balance in 2000 by Regions

Billions of Euros	Exports	Imports	Balance	Exports/Imports in %
European Union 15	168.2	166	2.1	101.3
Non EU OECD	46.0	53.1	-7.0	86.8
United States	24.5	27.9	-3.4	88.0
Japan	4.1	12.5	-8.4	32.9
Developing Countries	40.6	25.0	15.5	162.2
World	272.23	268.43	3.8	101.4

*Source:*Ministère de l'Économie, des Finances et de l'Industrie, 17/12/2001 (www.industrie.gouv.fr)

In 2000, imports and exports each accounted for around one-fourth of the French GDP (Table 3). The French economy is therefore wide open. Openness is primarily true with the other members of the European Union, but the U.S. is an essential partner as well (Table 11).

This strong role of France in the global economy can also be seen in the FDI statistics (Table 12). Among large economies and together with the U.K., France exported and imported capital with higher intensity, a reflection of both the attractiveness of the country and the international competitiveness of its industry.

Foreign affiliates represent a significant share of the manufacturing industry, although they are more marginal in services (Tables 13, 14). FDI figures illustrate that French firms are used to

competing in a global arena and that French service companies are quite competitive (with the exception of the finance industry).

Table 12. Inward and Outward FDI Flows as a Share of GDP (Average 1990-98)

	Inflows	Outflows
Japan	0.04	0.67
Italy	0.31	0.70
Germany	0.31	1.68
United States	0.92	0.99
OECD[1]	1.00	1.40
EU	1.38	2.12
France	1.42	2.11
Denmark	1.69	1.72
Spain	1.69	1.01
Finland	1.80	3.32
United Kingdom	2.29	3.38
Netherlands	3.12	5.53
Sweden	3.20	3.75
Belgium-Luxembourg	4.67	3.47

[1] Excluding the Slovak Republic; for outward flows, excluding Greece, Ireland, and Mexico.

Source: OECD, International Direct Investment database, May 2000.

To sum up, the French economy was deeply restructured from the mid-1980s to the late 1990s. In 20 years, this country whose industry was dominated by large state owned companies (so called "National Champions"), where businesses were coordinated by powerful administrative services that managed national plans, and whose economy was heavily regulated, was turned into a country in which most of the markets are now competitive and open to foreign competitors, most of the former public monopolies (except railroads, gas and electricity) were being privatized and deregulated, and in which industry is global and open to global competition.

Table 13. Share of Foreign Affiliates in Manufacturing Turnover[1] and Employment (1998 or latest available year)

	Turnover	Employment
Japan	1.8	1.1
Germany	10.8	6.0
Italy (1997)	16.2	11.5
Finland (1999)	16.2	15.9
United States	18.3	13.4
Sweden	21.9	21.1
Netherlands (1997)	30.4	19.7
United Kingdom (1997)	31.4	17.8
France	31.7	27.8
Ireland	72.3	47.5

[1] Production instead of turnover for Canada and Ireland.

Source: OECD, AFA database, May 2001.

Table 14. Share of Foreign Affiliates in Services, 1998

	Turnover	Employment
Japan (1997)	0.67	0.24[1]
United States (1997)	8.29	3.59
France	9.02	5.26
Finland	15.33	8.93
Netherlands (1997)	16.78	8.85
United Kingdom (1997)	17.17	9.73
Sweden (1997)	18.15	4.83
Italy (1997)	20.96	7.21
Belgium (1997)	26.60	18.86

[1]1994 for foreign affiliates and 1995 for all domestic firms

Source: OECD, FATS database, May 2001.

Restructuring prepared French industry to go digital. Its structures are now modernized around a model of flexible specialization. Firms dynamically re-engineer their relationships with a network of business partners to adapt to competitors' strategies, and to the evolving preference of consumers, and to technological changes. Since digital technologies and networks must be used in such a model, the renewed shape of French industry should be a major driver for the development of e-commerce. In addition, the quality of French professional services companies, the efficiency of the logistics-distribution system, and the openness of the French economy should further facilitate the development of both B2B and B2C commerce. However, the late take off combined with the dot com crash contributed to a specific path of development with less impressive growth. Less cash was burned, since the French managers are more careful and benefit from foreign experiences.

WEALTH

French GDP per capita is a bit above the average level of EU (Table 15).

In comparison, the French GDP per capita is below that of the U.K. and Germany and is significantly below the U.S. and reach the average of OECD countries. It has to be pointed out that these differences in wealth per capita among nations are not really caused by significant differences in productivity. Indeed, when deflated by the numbers of hours worked per year (Table 16) it can be seen that the French GDP per capita is not far from the U.S. level. This date shows that the French industry does not suffer from a strong competitive disadvantage when compared to the U.S., while it is a much less intensive user of IT. Moreover, the French GDP per capita grew at a 3% per year trend for the last five years, confirming the dynamism of the French economy (Table 17).

Table 15. Wealth and Inequalities, 2000

Wealth	GDP in billions US$ 2000[a]	GDP per capita 2000[a]	Share of income or consumption, richest 20% 1987-1998[b]	Share of income or consumption, poorest 20% 1987-1998[b]
Norway	$159.43	$35,548.04	35.80	9.70
Switzerland	$241.01	$33,639.37	40.30	6.90
Denmark	$162.41	$30,470.04	34.50	9.60
Sweden	$227.37	$25,603.08	34.50	9.60
Ireland	$94.76	$25,403.52	42.90	6.70
United Kingdom	$1,416.09	$23,693.92	43.00	6.60
Finland	$120.81	$23,341.17	35.80	10.00
Netherlands	$367.81	$23,050.88	40.10	7.30
Austria	$188.92	$23,008.57	33.30	10.40
Germany	$1,866.12	$22,708.86	38.50	8.20
Belgium	$225.70	$22,212.32	34.50	9.50
France	$1,280.17	$21,771.62	40.20	7.20
Italy	$1,070.82	$18,688.63	36.30	8.70
Spain	$555.00	$13,670.06	40.30	7.50
Greece	$111.93	$10,515.00	40.30	7.50
Portugal	$104.61	$10,439.93	43.40	7.30
Czech Republic	$50.76	$4,955.46	35.90	10.30
Hungary	$45.63	$4,461.60	39.90	8.80
Poland	$157.61	$4,065.74	40.90	7.70
United States	$9,962.65	$36,210.70	46.40	5.20
Scandinavia[c]	$670.02	$28,067.79	35.15	9.73
European Union[d]	$7,792.53	$20,683.55	38.40	8.29
OECD[e]	$25,461.49	$22,829.19	40.19	7.71

[a] *Source:* International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001. ITU definition: the data are current price data in national currency converted to US$ by applying the average annual exchange rate (from the International Monetary Fund, IMF) to the figure reported in national currency. GDP per capita is calculated by dividing GDP in US$ by the mid-year estimate of population obtained from the United Nations.
[b] *Source:* United Nations Development Program, Human Development Report 2000. New York & Oxford: Oxford University Press, pp. 169-172. Dates for the data vary by country from 1987 to 1998.
[c] Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark, and Finland.
[d] Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.
[e] Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia, and Iceland.

In terms of inequalities, France ranks a little higher than does the average EU member does. The U.K. is one of the least equalitarian countries in Europe. The upper and the middle classes, representing more than 80% of the population, is wealthy enough to access digital networks and to consume on-line. From an economic point of view, the smaller percentage of those unable to afford IT is not a significant inhibitor for e-commerce. This issue is, however, political issue since they could become second class citizens that would be excluded from wealth, jobs, and social life. This political aspect of the digital divide is particularly sensitive in France because of the persistent (while decreasing, see Table 18) rate of unemployment that involves a strong social cost (de-skilling of the unemployed population, social support programs, urban violence).

Table 16. French GDP Per Capita and GDP Per Hour Worked, 1999

	GDP per capita (US = 100)	GDP per hour worked (as % of US)
Belgium	73	110
Netherlands	78	109
Italy	68	106
United States	100	100
France[1]	65	97
Germany	70	94
Denmark	79	93
EU	66	91
United Kingdom	68	87
Sweden	68	84
OECD[2]	72	82
Finland	67	82
Spain	54	76
Japan	75	74

[1] Includes overseas departments.
[2] Excluding Poland, Turkey, and the Slovak Republic.
Source: OECD, GDP and population from National Accounts database; working-age population, labor force and employment from Labor Force database; hours worked from OECD calculations, see S. Scarpetta, et al., Economics Department Working Paper No. 248.

Table 17. French GDP & GNP Per Capita 1980-2000

In Euros/Inhabitants	1980	1990	1995	1996	1997	1998	1999	2000
GDP per Capita	7,972.4	17,351.4	19,886.5	20,326.8	20,908.9	21,746.3	22,393.0	23,170.2
GNP per Capita	8,017.3	17,282.4	19,781.4	20,315.1	20,957.2	21,847.7	22,540.5	23,356.4

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

Table 18. French Working Population, Unemployment, and Salaried Employees 1990-2000

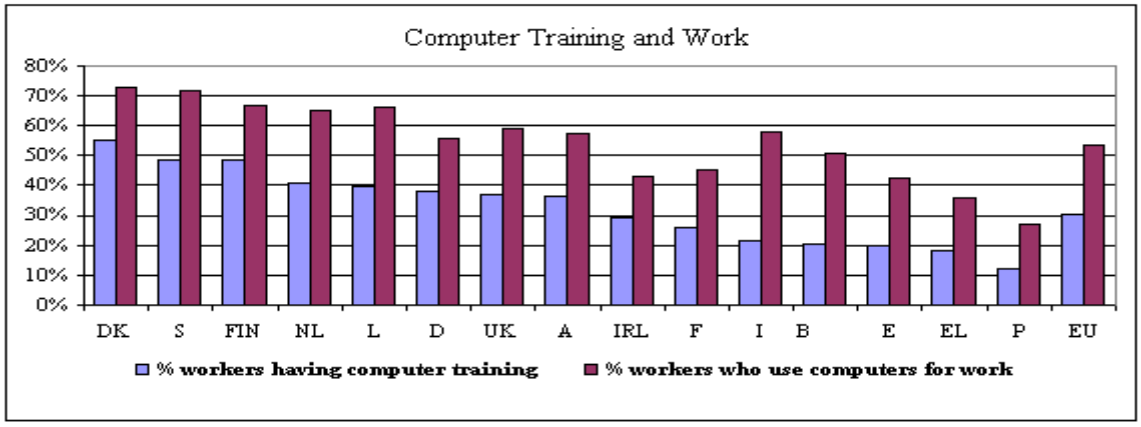
In Thousands	1990	1995	1996	1997	1998	1999	2000
Population	58,170.9	59,429.7	59,634.3	59,838.8	60,049.3	60,293.8	60,628.4
Working Population	25,431.7	25,998.0	26,295.4	26,479.6	26,645.4	26,926.4	26,958.2
Unemployment	9.4%	12.0%	12.8%	12.9%	12.3%	11.7%	10.3%
Salaried Employees	79%	78%	77%	77%	78%	79%	80%

Source: INSEE. Comptes Nationaux. 2002. www.insee.fr

Potential E-commerce Participants

While French wealth and inequalities should rank France in the set of countries where e-commerce is used intensively, France remains behind most of the developed countries when considering the use of e-commerce on the Internet.

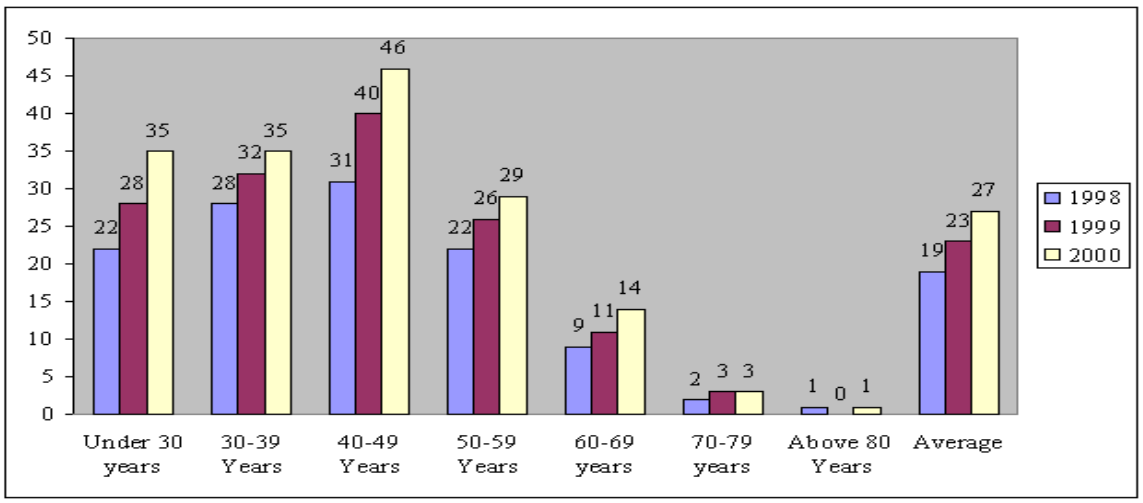
One of the main causes is the under-training of French citizens and workers in the use of digital technologies. When compared to Europeans, French workers use computers less intensively in the work place (Figure 1). One of the causes of this situation is that people in France are able to access on-line services though Minitel. French efforts to promote digital literacy were also insufficient. Behind the aggregated numbers, it must be pointed that France deals with at least two digital divides leading to highly different evaluations when trying to assess e-commerce readiness.



Source: European Commission, [2001a]

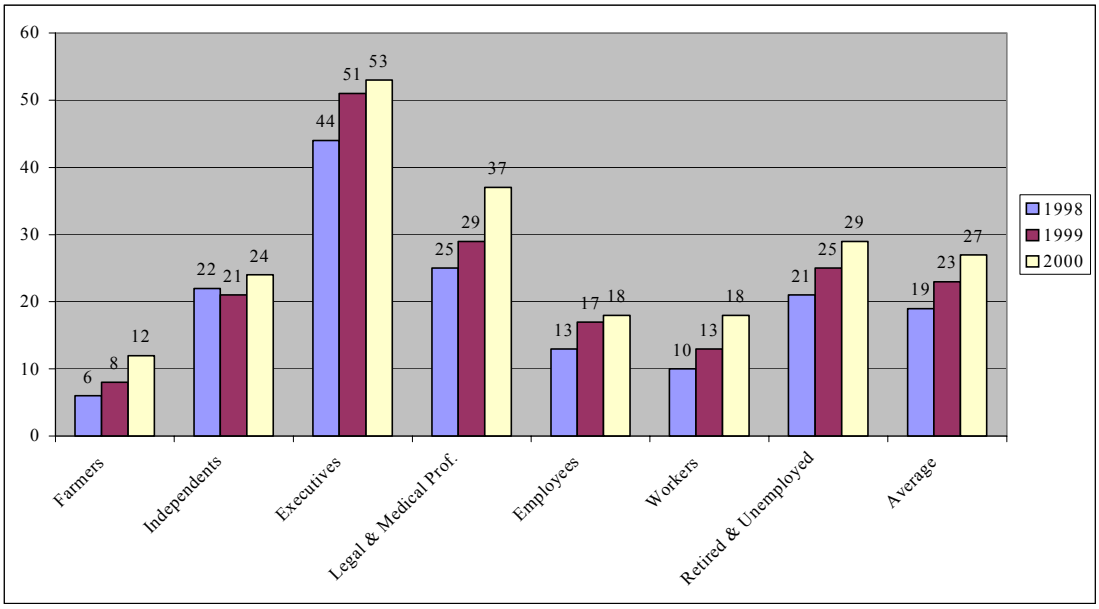
Figure 1. Digital Literacy

First, as in many countries, age and professional skill are strong determinants in using digital technologies (Figures 2 and 3). While the lack of reliable figures does not easily permit international comparisons, it seems that France is characterized by a high rate of inequality in access to digital technologies. French under 49 and executives seem to use computers and the Internet as intensively are their foreign counterparts. The intensity of use remains quite low for many categories, especially for farmers, blue collars workers, and even white collar workers (Figure 3).



Source: European Commission [2001a]

Figure 2. Households with PCs according to the Age of the Reference Person



Source: INSEE, Enquête Permanente sur les Conditions de Vie des Ménages (EPCVM), n°106, 2001

Figure 3. Households with PCs according to the Social Status of the Reference Person

Second, the gap between the Paris region and the rest of France is huge. Since France is a highly centralized country, Paris is not only the center of political power, it is the center of the economic activity as well. It accounts for one-fifth of the French population and almost one-third of French GDP (Table 19). Paris is therefore wealthier than the rest of France. Its population is more dynamic and better educated. Paris also concentrates many of the activities that relate closely to the digital economy. As a result, it is one of the most dynamic regions in Europe (Table 20). The data explain why Paris is an area where the level of development of the digital economy is quite comparable to many large developed cities, while the rest of France (with the exception of 2 or 3 other large cities) is far behind.

Table 19. Paris and France

	Paris region	Rest of France	Paris region vs. rest of France in %
Population (in millions)	10.9	47.5	22.3%
GNP 2000 (in millions of Euros)[1]	395,228	988,125	39.9%
PIB/Inhabitant (in Euro, 2000)[1]	35,946	20,638	174.2%
Value Added/Employee (in Euros, 1999)[1]	70,580	49,850	141.6%
Employment/Total Population in %[1]	45	36	125.0%
% of Engineers and Executives in the Active Population	24	9	266.7%
Distribution of IT Start-ups[1, 2]	50.7	49.3	102.8%
Percent of SMEs with an Internet Access[3]	73	57	128.1%
Geographic Distribution of Employment in the Computer Industry[4]	47.8	52.2	91.6%
Geographic Distribution of Employment in the TV and Communication Industry[4]	26.1	73.9	35.3%
Geographic Distribution of Employment in the Software and Information Service Industry[4]	58	42	138.1%

Source: [1]INSEE, [2]IAURIF, [3]UFB/locabail, [4]GARP, [5]ESE INSEE

Table 20. Paris and the Other Major European Cities

	GNP/Inhabitant index	Share of National GNP (in %)	Total GNP growth for the past 10 years (%)
EU Average	100		
Frankfurt	179	7	+70.4
Brussels	166	14	+58.8
Paris	165	29	+51.0
Stockholm	148	23	+37.9
London	145	23	NA
Amsterdam	119	46	+54.5
Milan	119	20	+40.3
Madrid	82	16	+85.1

Source: CROCIS, "L'île de France et les Métropoles Européennes", Enjeux Ille de France, N° 25, 01/2001

When comparing European countries, it is clear that the most advanced countries, in particular in Scandinavia, are wealthier and more urban with a better-educated population. They are also less centralized than France. Decentralization stimulated the emergence of multiple local experiences and initiatives, while their homogeneity When comparing European countries, probably enabled these initiatives to percolate in the whole society. In contrast, many French initiatives were national and did not fit well with the specific needs of local populations. French citizens are not as familiar with English and Minitel already supported a wide portfolio of on-line services.

INDUSTRY STRUCTURE

Industry Concentration and Structure

The French economy is one of the most service-intensive economies in Europe, although it is far from the U.S. in that respect (Table 21). French industry is divided between large and small companies (Table 22), while Germany and Italy, for instance, are characterized by a dense web of SMEs that are active on the global market. Large companies are more internationalized, more high-tech, and in general more modern than the network of small companies that are their subcontractors. They employ more skilled workers, use IT more intensively, and are managed as most of their global competitors. In contrast, French SMEs often do not go international and do not feel the necessity to use IT intensively. Those that use IT intensively work generally with large clients that pressure them to go digital. This is the case in the mechanical construction industry where French automakers extensively implemented EDI in the late 1980s (Brousseau, 2001).

Table 21. French Industry in Perspective

	France	Germany	Italy	Spain	U.K.	U.S.	Japan
Population (in millions)	58.7	82.1	57.6	39.4	59.6	275.5	126.5
GNP (in billions of Euros)	1,404	2,032	1,165	606	1,533	10,804	5,145
Share of Manuf. Indus. In GNP (in %)	19.1	23.5	21.7	19.5	20.7	16	23
Share of World Exportations (in %)	5.3	8.8	3.9	1.9	4.6	12.5	7.7

Source: Ministère de l'Économie, des Finances et de l'Industrie, 17/12/2001; (www.industrie.gouv.fr).

Of course, these features are very much dependent on the industry: some industries are mostly composed of small firms (intermediary goods and consumption goods), while others are more concentrated and dominated by large firms (equipment), even very large firms (automotive industries) (Table 23). The latter are more likely to go digital than the former because large firms are generally more digital and because competition tends to force both their competitors and

partners in the industry to adopt IT. There are therefore clear contrasts among industries in term of degree of digitization. While France modernized for the last two decades, its industry remains highly hierarchical between national champions (that are no longer public, and no longer national monopolies) and a web of smaller companies that are less dynamic. This difference generates a third type of digital divide.[1]

Table 22. French Manufacturing Firms

Firm size (No. of employees)	No. of Companies	Total Employment	Total Sales	Export (FF millions)	Investment (FF millions)	Sales/ employee (FF 000)	Export /sales (%)	Invest/ sales (%)	Benefit/ sales (%)
Small (20-499)	20,696	1,474,959	1,467,672	373,045	59,506	995.1	25.4	4.1	2.6
Large (>500)	887	1,454,781	2,684,945	982,236	121,297	1,845,.6	36.6	4.5	3.0
Non Significant*.	760	38,517	136,588	44,803	1,857	3,546.1	32.8	1.4	2.9
Total	22,343	2,968,257	4,289,205	1,400,084	182,660	1,445.0	32.6	4.3	2.8

* Non Significant relates to holding companies
Source: SESSI, (Service des Etudes et des Statistiques industrielles), [2001a]

Table 23. French Industry Structure

Market Type	Market Share of the Four Main Competitors (C4 Index)	Market Share of Small Firms (20-499 employees)	Market Share of Firms Owned Mostly by Non-Residents
Consumption Goods	5.6	46.8	36.9
Automotive Industry	63.7	7.7	20.1
Equipment	13.9	38.6	39.3
Intermediary Goods	7.8	50.6	36.4
Total	---	40.4	34.5

Source: SESSI (Service des Etudes et des Statisiques industrielles), 2001a

Innovation Capabilities

France's innovation capabilities are generally considered strong since the French (public and private) R&D system performed well since World War II. After the war, the French developed national technologies dedicated to large public equipment (ground transportation, aerospace, energy, nuclear, etc.). France was successful in developing self-sustainable technological systems and exported them. This innovation explains some of the large French successes, such as Ariane (Space), Airbus (Aerospace), Alsthom (High speed trains) and Alcatel (Telecommunications). Thanks to these technological champions, the French trade balance remains positive for high-tech and medium-high-tech products (Table 24).

[1] The three digital divides are:

- The first is among individuals is a function of wealth, education, and urbanization. This divide exists both at work and at home.
- The second is linked to the physical loction of firms and individuals, whether they are in Paris or elsewhere.
- The third is due to the size of firms that access and use the Internet and digital technologies.

These three divides do not overlap systematically. Large firms located in the countryside can be intensive users of IT, especially if they employ highly skilled workers, while small firms with unskilled workers will be low intensive in IT, even if they are in Paris. (See also Brousseau, 2002c.)

Table 24. Contribution to the Manufacturing Trade Balance, 1999
(As a percentage of manufacturing trade)

	High-technology	Medium-high-technology	Medium-low-technology	Low-technology
United States	5.0	0.4	-0.9	-4.5
United Kingdom	2.4	1.0	0.6	-4.2
Sweden	1.7	-2.2	-0.7	1.1
Japan	0.7	14.4	-0.8	-14.3
Denmark	0.5	-3.1	-0.9	3.6
France	0.4	1.6	-0.6	-1.6
Belgium-Luxembourg	-1.2	-0.1	1.1	0.2
Finland	-1.5	-7.2	0.8	7.8
Netherlands	-1.6	-0.9	0.8	1.8
Germany	-2.6	7.4	-0.5	-4.6
Spain	-4.0	0.6	2.4	1.1
Italy	-4.2	-0.1	0.5	3.8

Source: OECD, STAN database, May 2001.

This strength in managing large innovative projects aimed at developing integrated technological systems became a weakness with the globalization of the economy. The focus of the French R&D system on large integrated projects can explain why France missed the digital revolution at its early stage, and therefore why the French ICT industry is weak compared to the French innovation capability (Table 25).

Table 25. Share of ICT Value Added in Business Sector Value Added, 1999

	ICT Manufacturing	ICT Services
Finland	6.9	6.3
Sweden	3.1	8.4
United Kingdom	2.5	8.2
United States	2.8	7.7
France[2]	1.7	8.1
Netherlands[2, 3]	1.8	6.7
Denmark	1.5	6.6
Japan[1, 5]	4.3	3.8
Spain[1, 2, 4]	0.9	7.1
Belgium[4]	1.0	6.3
Italy	1.3	5.8
Germany[1, 3]	1.6	5.4

[1] 1998.
[2] Postal services included with telecommunications services.
[3] ICT wholesale (5150) and rental of ICT goods (7123) are not available.
[4] ICT wholesale (5150) is not available.
[5] Includes only part of computer related activities (72).
Source: OECD estimates, based on national sources; STAN and National Accounts databases, June 2001.

- First, the innovative regime in the digital era is based on a decentralized process of step-by-step innovation, since standardized interfaces enable integration of the decentralized designed set. French firms were used to designing large integrated systems. As a result, few French companies are in the computer market.

- Second, in the knowledge-based economy, the decentralization of the innovation process goes with the intensive use of Intellectual Property (IP). Inventors purchase a technology, marginally enhance it, and then resell the enhanced technology to other innovators. The French tradition was to build comprehensive and independent technological systems under the leadership of one National Champion and/or the government. Firms did not develop capabilities to use IP instruments (as illustrated by the relatively low flows of IP revenues in the trade balance; Table 26). Therefore, French IT companies partly missed therefore the digital revolution because they were not involved in the decentralized R&D process that sustained it. They lacked competence in participating in such a process.

Table 26. IP Revenues Flows as a Percentage of GDP 1999 or Latest Available Year

	Payments	Receipts
Belgium	1.71	2.05
Switzerland (1998)	0.51	1.14
Denmark	0.61	0.95
Germany	0.77	0.59
United Kingdom(1998)	0.22	0.43
United States	0.14	0.40
Italy	0.36	0.29
Japan	0.08	0.19
France (1998)	0.22	0.18
Finland	0.05	0.08
Spain (1998)	0.18	0.03

Source: OECD, TBP database, April 2001.

This specific feature largely explains the French difficulty in catching up despite tremendous investments in IT by the end of 1999 (Table 27). Because of its post-WWII tradition, France failed to develop a computer industry that would have been able to be integrated in the global computer industry. At the same time, the French telecommunication industry benefited from the national ability to innovate by developing large national projects. By the mid-1980s, France had one of the most digitized and modern telecommunication network in the world. But that strength became a weakness with the development of the Internet, because the French national system of innovation was unable to recognize that the Internet architecture would dominate digital networks and that French innovation capabilities were poorly prepared to contribute.

Nevertheless, Table 30 below points out that these elements began to change recently. France is one of the EU countries that invests the most in R&D, software, and education, with most of the increase taking place after 1995. Such figures seem to confirm qualitative observations. In the 1990s, France began to reshape its innovation capabilities to adapt to the new competitive environment. Public funds were dedicated to the support of innovative efforts by SMEs. The French IP system was reshaped, companies were encouraged to train their personnel in IP, and public research institutions were stimulated to cooperate more closely with the business sector. While the French innovation system remains influenced by its traditional organization, it is evolving. This change influenced the French ability to develop some strong competitive advantage in digital technologies, especially in software.

France benefits from another driver for the Internet and e-commerce: the importance of its IT industry. Several large international computer companies (IBM, Apple, Microsoft) located their European headquarters in France. The presence of these essential players is a strong driver since they promote the innovative use of IT (both by their clients and their business partners). They also have a favorable influence on the emergence of innovative start-ups that are more able to interact with them than if these large firms were only abroad. The strong French telecommunication equipment manufacturers and telecom operators also played a positive role after they changed their views about the Internet in 1997.

Table 27. Business R&D Expenditure by Selected ICT Manufacturing Industries, 1999[1]

	R&D in ICT/GDP	R&D in ICT in millions of current PPP dollars, 1999[1]
Spain	0.06	130
Italy	0.13	1,789
Denmark (1998)	0.14	185
United Kingdom	0.16	2,215
Belgium (2000)	0.25	669
Germany	0.29	5,743
France (1998)	0.30	3 851
Netherlands (1998)	0.31	1,203
United States	0.50	46,638
Japan	0.71	22,260
Sweden	0.85	5,925
Finland	1.08	1,273

[1] 1999 or latest available year.

Source: OECD, ANBERD database, May 2001Internet technologies

The number of persons employed in the information and communications technology sector rose at a sustained rate since 1998: 3.8% in 1998, 3.4% in 1999, and 3.7% in 2000. In 2001, the information and communications technology sector employs an aggregate workforce of nearly 3 million.

The information and communications technology sector is growing by 13% a year. The gap in growth rates between the information and communications technology sector and the rest of the economy has widened, to 9.5%, from 4.4% in 1996. Between 1996 and 2001, the sector accounted for 20% of France's total economic growth (Table 28).

Table 28. Growth of the Information and Communications Technology Sector and Overall Economic Growth in France (annual growth rates)

	1996	1997	1998	1999	2000	2001
IT Industries	5.6	10.8	11.6	10.5	13.5	13.8
Non-IT Industries	1.0	2.4	2.8	2.3	3.4	2.7
Whole Industry	1.2	2.8	3.3	2.8	4.0	3.5

Source: Ministère de l'Économie, des Finances et de l'Industrie, 2001, http://www.minefi.gouv.fr/

Recent adjustments in the telecommunications and Internet sectors should not overshadow their ability to innovate and their potential for further expansion. Demand for engineers and experts in the information and communications technology sector is steady.

HUMAN RESOURCES

As most European countries, France invested significantly less in education than the U.S. (Tables 29, 30). As a result, the share of the population with a university degree is significantly higher in the U.S. than in most OECD countries (Table 29). In that respect, France seems to rank a little bit below the average for developed countries.

This lag is partly due to the specificity of the French education system. The level of the upper-secondary education system is generally considered quite high in France. Until the 1970s, university degrees were not a prerequisite to enter the job market. The university system capacity was small and it was not developed sufficiently rapidly when the need for higher education led an increasing share of the population to enter universities. While the pace of evolution was too slow, France made huge efforts in education since the 1980s. As a result, in the younger generation, 60% of each age class received an upper secondary degree of education; and 18.5% of the 25-34 year age group are university graduates.

Table 29. Human Resources

	Distribution of the population aged 25-64 by level of educational attainment, 1999				Expenditure per student on public and private institutions, 1998 (PPP dollars)
	Below upper secondary education	Upper secondary education	Non-university tertiary education	University level education[1]	All tertiary level[2]
United States	13	51	8	27	18,493.1
Switzerland[3]	18	58	9	15	16,563.3
Sweden	23	48	16	13	13,223.5
Total OECD[6]	36	40	11	14	11,463.6
Netherlands	35	42	2	20	10,756.5
Japan	19	49	13	18	9,870.6
Denmark	20	53	20	7	9,562.0
Germany[5]	19	53	15	13	9 466.0
United Kingdom[4]	18	57	8	17	9,421.9
Belgium[4]	43	31	14	12	7,784.3
Finland	28	40	17	14	7,327.0
France	38	40	10	11	7,004.8
Italy[3]	56	30	4	9	6,294.9
Spain	65	14	6	15	5,037.8

[1]Tertiary type A and advanced research programs (ISCED 5A and 6).
[2]Data refer to total tertiary education (ISCED 5A, 5B and 6).
[3]Expenditures per student include public institutions only.
[4]Expenditures per student include public and government-dependent private institutions only.
[5]Expenditures per student data refer to 1997.
[6]Average of the available countries.
Source: OECD, Education database, May 2001.

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Table 30. Investment in Knowledge as Percentage of GDP, 1998

	R&D	Software	Higher education	Average annual growth rate 1991-98[5]
Italy	1.02	0.48	0.59	-0.61
Spain	0.90	0.46	0.83	4.34
EU[4]	**1.81**	**1.03**	**0.73**	**3.07**
Belgium	1.87	1.39	0.42	
United Kingdom	1.83	1.34	0.78	3.57
France	2.19	1.16	0.76	2.96
Germany	2.31	1.17	0.68	2.15
Netherlands	1.95	1.66	0.65	3.76
Denmark	1.92	1.52	1.12	5.89
OECD[3]	**2.23**	**1.21**	**1.25**	**3.41**
Japan	3.01	1.09	0.60	2.65
Finland	2.89	1.17	1.10	6.78
United States[1]	2.60	1.51	1.94	3.85
Sweden	3.80	1.90	0.85	7.58

[1]Education data includes post-secondary non-tertiary education (ISCED 4).
[2]Average annual growth rate refers to 1992-98.
[3]OECD total refers to the available countries and the average annual growth rate excludes, Belgium, Czech Republic, Korea, Mexico, and Switzerland.
[4]Average annual growth rate excludes Belgium.
[5]1995 US$ using purchasing power parities.
Source: OECD, National Accounts database; Education database; MSTI database and International Data Corporation, March 2001.

The French situation shows contrasts. On the one hand, the relatively poor level of education of the population (as compared to most other developed countries) is probably one of the inhibitors to an intensive use of it by the population. On the other hand, it seems that the recent efforts to modernize significantly broke these barriers. The younger generations are better educated and more technology literate than the older ones.

Table 31. High-skilled IT Workers[1] and High-skilled Workers[2] in the EU and the US (Average Annual Employment Growth—1995-99)

	High-skilled workers	High-skilled IT-related workers	1999 Share of high-skilled IT workers in total occupations
Netherlands	4.90	10.99	3.16
Sweden[3]	3.17	3.96	2.82
United States	2.92	4.97	2.40
Finland[3]	9.44	48.87	2.29
Denmark	3.55	10.03	2.18
United Kingdom	2.47	11.86	2.04
Belgium	3.21	10.89	1.85
France	1.13	4.74	1.70
EU-14[4]	**2.81**	**8.83**	**1.65**
Germany	1.64	7.66	1.51
Spain	6.34	14.71	1.13
Italy	5.80	7.14	1.08

[1] High-skill IT-related occupations are defined here as ISCO-88 classes 213, 312 and 313, while computer workers refer only to the sum of the first two classes, see box.
[2] High-skill occupations refer to ISCO-88 classes 1, 2 and 3.
[3] 1997 instead of 1995.
[4] 1995 estimated.
Source: OECD, based on the Eurostat Labor Force Survey and the U.S. Current Population Survey, May 2001.

INFRASTRUCTURE

Transportation Infrastructure

France benefits from an excellent transportation infrastructure that is both efficient and pervasive. Due to the dense web of existing road infrastructure, and the continuing lobbying efforts of the truck and the automaker industry, the road is the preferred means for moving individuals and freight (Tables 32, 33). But France also benefits from a quite efficient railroad system which is heavily subsidized by the government. For a long time, it inhibited the development of air transportation, but the French capabilities developed over for the last 20 years with the development of medium and long distance travel, with the increased wealth of the population, and with the rise of competition that brought prices down. France benefits from a competitive national carrier (Air France), but its main competitive advantage is the capacity of Charles-de-Gaule Airport near Paris. It is one of the main airports in Europe (with London, Amsterdam, and Frankfurt) but it benefits from larger potential of extension. As a result, the Paris airport is the European hub of many passenger and freight carriers.

Table 32. The French Freight Transportation System (in billion t-km)

1999	Railroad	Road	River	Pipelines	Total
EU	188.6	1,102.1	117.5	76.6	1,484.8
	12.70%	74.23%	7.91%	5.16%	
France	52.1	182.5	6.8	21.3	262.7
	19.83%	69.47%	2.59%	8.11%	

Source: Direction des Transports Terrestres (M‡j le 01/06/01)
www.transports.equipement.gouv.fr/

Table 33.The French Person Ground Transportation System (in million of person-km)

1999	Car	Railroads	Bus	Total
EU	3,303	261	314	3,878
	85.17%	6.73%	8.10%	
France	700	67	41	808
	86.63%	8.29%	5.07%	

Source: Direction des Transports Terrestres (M‡j le 01/06/01) www.transports.equipement.gouv.fr/

The French transportation infrastructure can be considered as a driver for e-commerce. The dense web of railroad and road, together with the existence of many efficient transportation and logistics management companies, support delivery linked to on-line sales. Most of the companies that developed on-line business models and B2B work practices did not experience difficulties in identifying subcontractors (freight, parcel service, courier and delivery companies) able to do the tangible work for them. The French air-transportation capabilities are also a facilitator for the development of e-commerce application in foreign markets.

Information and Telecommunications Infrastructure

In terms of ICT infrastructure, France always ranks a little bit below the mean of the most industrialized country. It is largely behind the U.S. and Scandinavia for most of the figures, and generally a little behind the U.K. and Germany. It is, however, above Italy, Spain and other Mediterranean countries (Tables 35 through 39). Internet figures (Table 39) do not significantly differ from the other indicators related to the ICT infrastructure. Some exceptions need to be pointed out.

Table 34. The French Transportation Industry

1999	Number of companies	Number of employees (in thousands)	Value added (billions Euros)	VA(in %)
Air	211	62.6	4,616.92	10.27%
Sea	389	11.6	581.29	1.29%
River	1,044	3.6	132.17	0.29%
Road Freight	42,866	312.0	10,677.68	23.74%
Road Local Transport	16	1.0	125.92	0.28%
Road Transportation	29,985	168.6	6,210.47	13.81%
Railroad	12	174.8	7,328.38	16.30%
Metro	1	38.5	2,644.53	5.88%
Ski	188	6.8	458.41	1.02%
Logistic Platforms	1,330	40.7	1,722.22	3.83%
Infrastructure Management	1,071	44.0	5,713.48	12.70%
Logistic Management	3,127	119.0	4,760.37	10.27%
Total	79,940	983.5	44,971.85	100.00%

Source: Direction des Transports Terrestres (M‡j le 01/06/01) www.transports.equipement.gouv.fr/

- In terms of (TV) cable network, France remains far behind the other most developed nations (Table 35). This lag is largely due to the big failure of a national plan to equip French cities with fiber to the home cable system in the late 1980s. Despite the investments made by the late 1990s, the French cable TV system remains weak, limiting the ability to develop high-speed access to the Internet. This limit does not exist in large cities where cable and DSL access were easily available since 2000. However, it persists in small cities and rural areas.

Table 35. Telecommunications Infrastructure

Telecommunications Infrastructure	Telecomm Investment as % of GDP, 2000[a]	Main phone lines per 1,000 population, 2000[a]	Cell phone subscribers per 1,000 population 2000[a]	% Digital phone lines, 2000[a]	CATV subscribers per 1,000 population 2000[a]
Denmark	.69	752.55	609.92	100.00	264.76
Norway	1.33	729.10	702.56	100.00	183.57
Switzerland	.91	719.95	644.58	100.00	360.11
Sweden	1.09	682.03	713.70	100.00	199.31
Netherlands	1.02	619.12	671.20	89.00	388.55
Germany	3.16	601.15	585.88	100.00	247.03
United Kingdom	.57	582.39	669.56	100.00	56.89
France	.26	580.17	494.09	100.00	45.24
Finland	.75	546.95	726.43	100.00	183.54
Greece	1.08	531.64	559.04	93.36	1.22
Belgium	.40	499.36	548.86	100.00	372.86
Italy	.81	473.89	737.25	99.00	1.05
Austria	.45	473.63	785.53	100.00	123.37
Portugal	2.12	430.49	665.16	100.00	92.30
Ireland	.40	426.27	667.56	100.00	179.62
Spain	.40	421.22	609.26	86.60	11.82
Czech Republic	2.37	377.94	424.25	85.72	93.23
Hungary	1.19	364.69	293.35	85.80	157.12
Poland	.87	282.36	174.05	77.60	92.61
United States	.29	699.74	397.91	91.60	252.13
European Union[b]	1.22	546.46	624.78	98.04	115.83
Scandinavia[c]	.99	677.33	691.20	100.00	207.55
OECD[d]	.73	524.53	457.27	94.82	145.37

[a]*Source* of data: International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001. ITU definitions: main telephone lines refer to telephone lines connecting a customer's equipment (e.g., telephone set, facsimile machine) to the Public Switched Telephone Network (PSTN) and which have a dedicated port on a telephone exchange; telecommunications investment refers to the annual expenditure associated with acquiring ownership of property and plant used for telecommunication services and includes land and buildings; cellular mobile telephone subscribers refer to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the PSTN; digital per cent refers to the % of main lines connected to digital exchanges (indicator does not measure the percentage of exchanges that are digital, the percentage of inter-exchange lines that are digital or the percentage of digital network termination points); "CATV subscribers" refers to households subscribing to a multi-channel television service delivered by a fixed line connection. The per capita values are calculated using the estimated mid-year population value.
[b]Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark and Finland.
[c]Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.
[d]Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia and Iceland.

- While investing significantly in IT, France does not perform well (compared to its size) in producing information technologies (Table 36).
- Table 37 confirms that the French economy chose to focus its IT expenditures on telecommunications and services as a whole, while it neglected to invest heavily in hardware
- Table 38 points out the tentative catch up of France in digital technologies, since France was one of the countries that increased its investments in IT significantly for

the 1990s. More generally, France's poor relative statistical performance is mitigated by the strong evolution that occurred in recent years.

Table 36. IT Infrastructure, 2000

IT Infrastructure	IT as % of GDP, 2000[a]	PCs per 1,000 population 2000[b]	IT Hardware production, US$M 2000[c]	IT Hardware exports, US$M 1999[c]
Sweden	4.96	506.73	$243.08	$584.02
Switzerland	4.72	502.48	$746.22	$1,164.67
Netherlands	4.21	244.41	$3,282.50	$22,050.24
United Kingdom	4.10	301.17	$16,166.73	$19,527.42
Denmark	3.99	431.52	$128.46	$894.41
Finland	3.76	396.06	$785.17	$866.13
France	3.66	304.76	$7,134.88	$9,604.06
Germany	3.48	336.35	$12,000.72	$12,430.98
Czech Republic	3.43	122.02	$161.50[g]	$266.00
Belgium	3.41	228.94	$2,063.40	$3,183.94
Norway	3.29	490.52	$246.30	$444.23
Austria	3.04	276.46	$496.98	$772.52
Hungary	2.86	144.70	$2,880.00[g]	$3,317.00
Ireland	2.29	364.61	$10,013.14	$15,686.49
Italy	2.10	139.45	$5,753.55	$3,481.56
Portugal	1.95	249.50	$518.11	$76.54
Spain	1.90	142.86	$1,800.40	$1,419.87
Poland	1.76	68.88	$303.37[g]	$75.00
Greece	1.35	70.46	$129.45	$66.00
United States	4.56	585.18	$88,488.62	$38,488.00
Scandinavia[d]	4.11	462.89	$1,403.02	$2,788.79
European Union[e]	3.33	263.59	$60,516.60	$90,644.18
OECD[f]	3.60	312.01	$231,341.80	$182,730.10

[a] *Source:* International Data Corporation, The 2000 IDC Worldwide Black Book. IT is defined as "the revenue paid to vendors (including channel mark-ups) for systems, software, and/or services.

[b] *Source:* International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001.

[c] *Source:* Reed Electronics Research, The Yearbook of World Electronics Data, 2000. Surrey, U.K.: Reed Electronics Research, 2000.

[d] Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark and Finland.

[e] Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.

[f] Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia and Iceland.

[g] 1999 data.

Table 37. IT Intensity[1] by Component, 1999

	Hardware	Software	Other IT services	Telecommunication equipment and services	Total
Spain	0.7	0.7	0.5	2.3	4.1
Italy	0.7	0.7	0.8	2.5	4.7
Japan	0.9	1.4	1.3	4.4	8.0
EU-14[2]	1.1	1.6	1.2	2.5	6.4
Germany	1.1	1.8	1.1	2.3	6.3
OECD-28[3]	1.3	1.7	1.3	3.0	7.3
France	1.0	1.7	1.7	2.3	6.6
Belgium	1.2	2.1	1.1	2.5	6.8
Finland	1.5	1.8	1.0	2.4	6.7
Denmark	1.4	2.2	1.4	2.4	7.4
United Kingdom	1.4	2.0	1.7	2.7	7.8
Netherlands	1.5	2.4	1.3	2.8	8.0
United States	1.7	2.1	1.5	2.6	7.9
Sweden	2.0	2.9	1.6	2.7	9.2

[1]IT expenditures as a percentage of GDP.
[2]Excludes Luxembourg.
[3]Excludes Luxembourg and Iceland.
Source: OECD, based on World Information Technology and Services Alliance (WITSA) / International Data Corporation (IDC), 2000.

Table 38. Growth in Total and in ICT Investment at Constant Prices in Selected OECD Countries. 1999 Index (1990 = 1)

	Aggregate investment	ICT investment
Japan	0.9	2.4
Italy	1.2	2.5
Germany	1.3	2.7
Finland	1.0	3.6
Australia	1.4	3.8
France	1.3	4.0
Canada	1.3	4.4
United States	2.0	4.9

Note: Estimates of "harmonized" price indexes assume that price ratios between IT and non-IT products have the same time patterns across countries, with the United States as the benchmark.
Source: OECD, STI/EAS estimates based on National Accounts (SNA93), March 2001.

The number of households with computers almost doubled since 1997. Today, there are personal computers in almost one-third of all households. According to research institutes, between 26 and 33% of all French households owned a computer at the end of 2000, as compared to only 16 to 19% in 1997. The growth in computer ownership by French households is in line with the average reported for other European countries.

The use of mobile phones and digital television increased sharply. As of 30 June 2001, 55.1% of France's population—representing more than 33 million people—owned mobile phones. Only 10% owned mobile phones in 1997. Because cable television was launched recently in France, cable systems are digital. The same is true for for satellite television. France is Europe's second-largest market for digital televisions after the United Kingdom. The potential for growth beyond the 13% of all households that currently own digital televisions is significant.

In 2000, between 7 and 11 million persons in France used the Internet (depending on how "Internet use" is defined), up from 1 to 2 million in 1997. Access to the Internet from home, public terminals and work is growing in France at a more sustained pace than in the rest of Europe.

These figures confirm the French path to the digital economy. Because the French IT industry was more oriented toward traditional telecommunication technologies than toward computers-in-network technologies, French decision makers did not identify the Internet revolution sufficiently early in the 1990s. This failure led France to under-invest in computers and digital networks for the first part of the decade. When the Internet took off, the French had to invest in the development of new applications and hardware. The lack of an installed base was an inhibitor to the early development of the Internet. Since voluntary national plans were launched, the Internet in France began to take-off in the late 1990s.

Internet

Until 1999, the Internet infrastructure was poor. Because the telecommunication operators had not recognized the importance of the Internet and because of the low density of CATV systems, broadband access was not available, and connection costs were high because local calls are time metered (Table 40). Both because of the competitive race among ISPs to capture Internet users and because of governmental decisions aimed at bringing connection prices down, the

Table 39 Internet Infrastructure

	Internet hosts per 1,000 population 2000a	Internet users per 1,000 population 2000a	Access cost, 30 hours, peak, US$ 2001b	Access cost, 30 hours, off-peak, US$ 2001b
Finland	102.25	372.30	$29.50	$21.53
Netherlands	101.75	244.41	$50.65	$30.81
Norway	100.93	490.52	$47.92	$47.92
Sweden	67.08	455.83	$56.05	$35.87
Denmark	62.66	365.85	$34.46	$34.36
Austria	58.85	255.75	$48.29	$32.50
Switzerland	36.64	297.86	$62.46	$45.31
Ireland	29.64	210.19	$56.99	$32.31
Belgium	29.54	228.94	$80.85	$41.72
United Kingdom	28.08	301.17	$35.24	$28.09
Germany	24.83	292.06	$24.13	$24.13
France	19.09	144.56	$30.79	$30.79
Italy	17.80	230.37	$40.12	$28.38
Czech Republic	15.55	97.62	$46.24	$16.06
Spain	11.22	132.70	$42.17	$26.85
Greece	10.39	93.94	$34.49	$29.09
Hungary	10.21	144.70	$61.79	$36.13
Poland	8.77	72.23	$29.11	$29.11
Portugal	6.20	249.50	$41.00	$25.16
United States	292.83	346.58	$22.05	$22.05
European Union[c]	27.78	237.88	$43.22	$30.11
Scandinavia[d]	80.08	424.15	$41.96	$34.92
OECD[e]	91.76	256.03	$39.43	$29.66

[a] *Source:* International Telecommunication Union, Yearbook of Statistics 1991-2000. Geneva: International Telecommunication Union, 2001. ITU definitions: Internet hosts refer to the number of computers that are directly connected to the worldwide internet network (however, the statistic is based on country code in host address and may not correspond with actual physical location); Internet users is an estimate of the number of Internet users.

[b] *Source:* International Telecommunication Union, World Telecommunication Development Report 2002, Reinventing Telecoms. Geneva: International Telecommunication Union, 2002.

[c] Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark and Finland.

[d] Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.

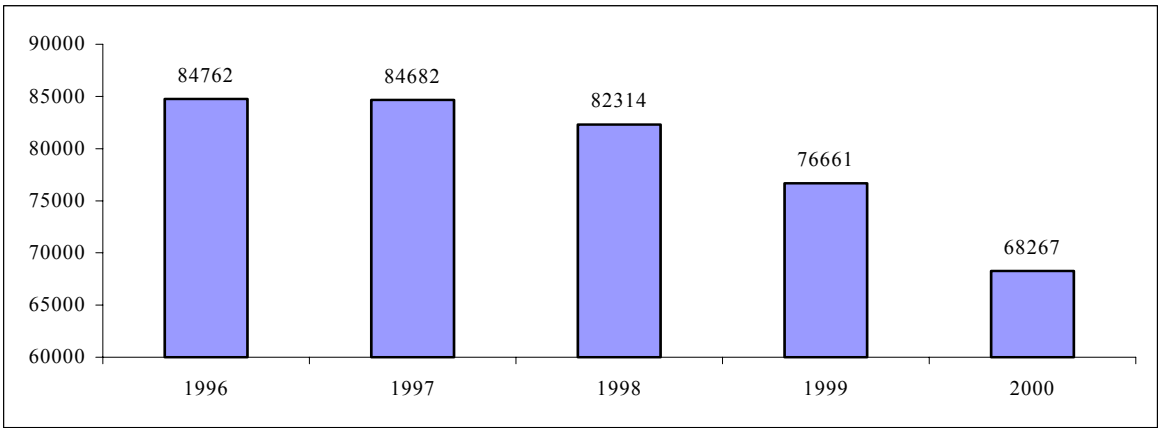
[e] Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia and Iceland.

Table 40. Number of Internet Hosts Per 1,000 Inhabitants, gTLDs Adjusted[1], July 1997 - October 2000

	1997	2000	OECD share (%), October 2000	Average price for 20 hrs Internet access 1995-2000, in PPP dollars
OECD	20.33	81.52	100	56.37
United States	56.51	234.20	70.7	31.71
EU	12.25	37.43	15.5	
Japan	8.40	32.49	4.6	59.12
United Kingdom	15.66	52.50	3.5	49.65
Germany	10.27	31.67	2.9	64.59
Italy	3.68	32.61	2.1	48.78
Netherlands	21.86	81.62	1.4	48.84
France	5.26	19.19	1.3	54.06
Sweden	35.00	106.31	1.0	36.89
Finland	68.07	159.06	0.9	30.88
Spain	4.01	15.74	0.7	78.32
Belgium	7.93	39.65	0.4	72.84
Denmark	26.02	72.48	0.4	54.15

[1] Global Top Level Domains (gTLDs) are distributed to country of location.
[2] Internet access costs include VAT and cover both peak and off-peak.
Source: OECD, *Communications Outlook 2001*; OECD calculations based on Netsizer (www.netsizer.com), May 2001.

situation evolved positively since then. Broadband access is available in large cities: 39% of professional users and 14% of domestic users had broadband access by the end of 2001 [IPSOS, 2001]; the number of people with domestic broadband access increased by a factor of five in 2001 [Médiametrie, 2001]; and access costs decreased widely to the average European level (Tables 39 and 40). Average access cost for 20 hours per month decreased from $54 for the 1995-2000 period to $30 in 2001). In addition, the use of Minitel began to decrease significantly in 2000, confirming the progressive switch of French citizens to the new technology. However, a large share of the population, especially the elderly, continue to use Minitel (Figure 4) because they consider the Internet useless and too costly [Sofres, 2002].



Source: France-Télécom, quoted by, P. Mathonnet, D. Kaplan, Tableau de bord du commerce électronique Mission pour l'Economie Numérique, Issue 1.0, Novembre 2001

Figure 4. The Decrease of the Minitel Use (in thousands hours of connection)

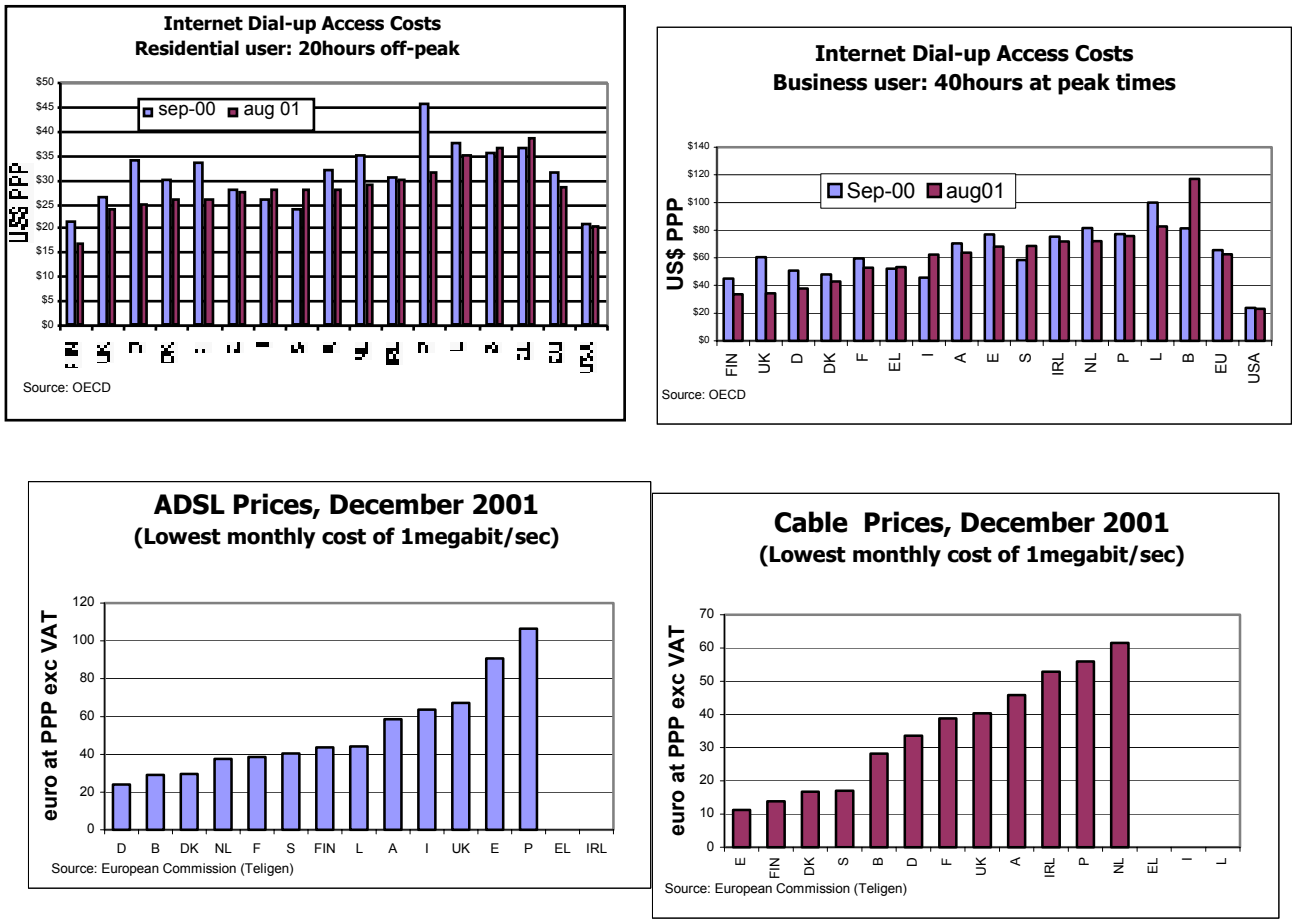


Figure 5. Internet Cost

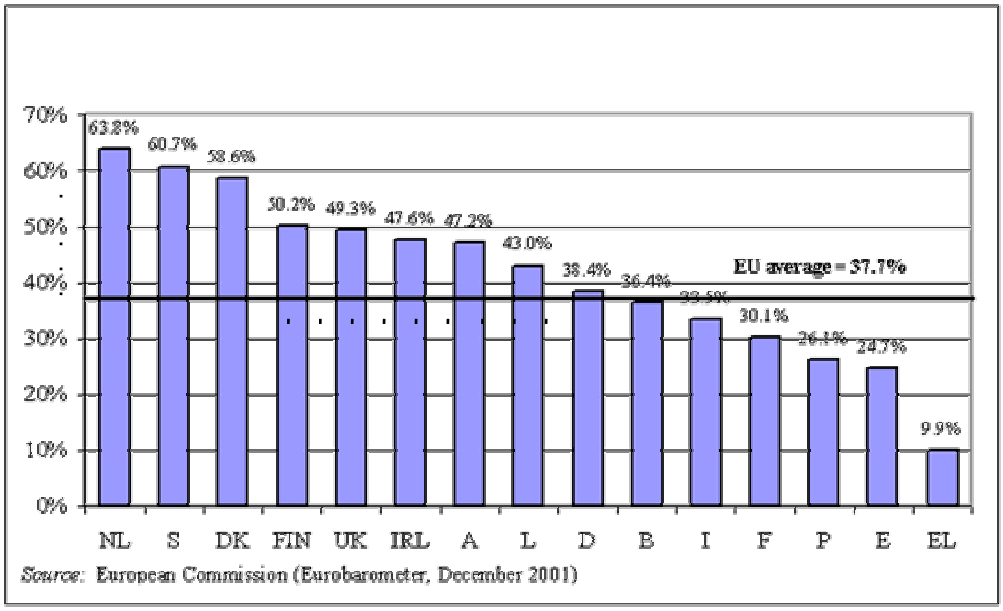


Figure 6. Internet Penetration; % EU Households Connected, December 2001

This view of the elderly is obviously related to

- the availability of alternative means to access on-line contents (the Minitel or digital TV),
- the low interest in e-commerce due to spatial distribution and the organization of marketing channels,
- the costs of the equipment required to access the Internet and with the costs of using the Internet

SIDEBAR 1

HOUSEHOLD PENETRATION IN FRANCE AND IN EUROPE

Internet penetration in EU households increased from about 18% in March 2000 to 28% in October 2000, 36% in June 2001, and stood at 38% in December 2001. The rapid rise during 2000 and early 2001 may have reached a plateau.

The slowdown in Internet take-up may be explained by the fact that Internet connections are linked to the availability of Personal Computers which sets an upper ceiling to penetration. Internet through TV sets and mobile devices remains marginal but may grow rapidly in the future. The EU countries with the highest penetration levels have reached Internet penetration rates of around 60% of households and further growth will be limited. The fact that they may no longer be driving EU Internet take-up may also explain the slowdown in EU growth.

Internet use in the whole population is higher than that shown by household penetration rates. In November 2001, almost 50% of the population (over 15 years) used the Internet either at home, at work, at school, in public access places or on the move. Over 80% of Internet users go on-line at least once a week. In absolute numbers, there are nearly as many Internet users in the European Union as there are in the U.S. Usage increased in all different locations but by far the highest growth is in use at home. However, growth in Internet penetration in Europe last year was still slower than in the U.S.

Business Internet penetration is far higher than for households. Almost 90% of enterprises with more than 10 employees connect to the internet and more than 60% offer a Web site.

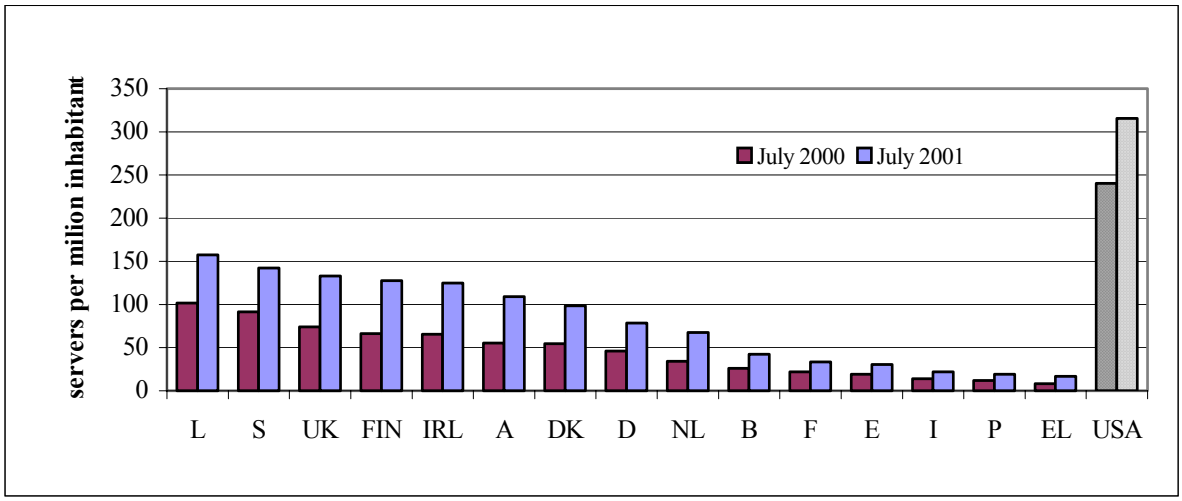
Business Readiness and Environment

As pointed out above, the French industry benefits from an efficient web of dynamic and internationalized professional services, logistics management, and distribution companies. This web is a major driver for both B2B and B2C e-commerce. However, at the same time, the French financial industry is quite weak as compared to its main competitors (the U.K. and Germany).

More precisely, the French banking systems performed quite well at financing the traditional French innovation system based on "strategic national projects". Public funding was combined with long term loans to develop research programs, while long-term loans to developing countries enabled them to buy the French turnkey projects of infrastructure. For the last 15 years, the French government worked hard to transform the French financial system into a market-based system in which specialized players, in particular venture capitalists, would emerge. From 1985 to 1995, the financial industry was widely deregulated. Since the late 1980s, various measures were taken to stimulate the development of a venture capitalist industry.

While France continues to lag behind the EU mean in its capability to finance innovation through venture capital (Table 41), its efforts enabled the development of an actual venture capital industry able to finance the burgeoning start-ups that were born in 1999-2000. Table 42 points out that French venture funds were intensively invested in ICTs, with a bias in favor of communication technologies that reflect the French specialization in these technologies.

While the French finance and banking industry is generally considered less efficient than its foreign competitors at financing innovation and industry in general, it developed a quite efficient payment system relying on providing almost any citizen a bank account with related payment means and services. The French law makes it mandatory to have a bank account and to pay large amounts through a traceable means (e.g., check, wire). Moreover, the French banking industry started to develop a single payment credit card system by the late 1970s. This system



Source: OECD, *Communications Outlook 2001*; Netcraft (www.netcraft.com), May 2001.

Figure 7. Secure Servers

Table 41. Investment in Venture Capital as a Percentage of GDP, 1995-99

	Early stages*	Expansion*
Japan (1995-98)	0.0038	0.0127
Denmark	0.0066	0.0173
Italy	0.0089	0.0247
Spain	0.0073	0.0385
France	0.0149	0.0429
Germany	0.0183	0.0405
EU	***0.0157***	***0.0514***
Finland	0.0272	0.0443
Sweden	0.0250	0.0537
Belgium	0.0349	0.0697
United Kingdom	0.0104	0.1063
OECD-19	***0.0425***	***0.0929***
Netherlands	0.0474	0.1086
United States	0.0696	0.1373

*Early Stages refers to the financing of the launch phase of a start-up; Expansion refers to the financing of its development before introducing it on the financial market
Source: OECD, based on data from EVCA (Europe); NVCA (United States); CVCA (Canada); Asian Venture Capital Journal (The 2000 Guide to Venture Capital in Asia). Data compiled in the second half of 2000.

called "Carte Bleu" is attractive for customers since it is unique and therefore widely used by retailers (840,000 of them accept card payment). As a result, in 2000, almost any French adult had a payment card. Indeed, 40.9 million credit cards were in use in 2000 (19.3 million Visa, 16.3

M Eurocard, 5.8 M CB) up from 19.5 millions in 1990. Payment cards are the second means of exchange (after checks) and should facilitate the rise of B2C e-commerce. Cards are used both for cash withdrawal (64 billions Euros in 2000) and for retail payment (157 billions of Euros) [Groupement Carte Bancaire, 2000 and Banque de France].

Table 42. Share of High-technology Sectors in Total Venture Capital (in %)*, 1995-99

	Communications	Information technology	Health/biotechnology
Japan (1995-98)	6.18	17.02	0.47
Italy	7.44	2.79	1.32
Spain	9.12	7.31	2.58
United Kingdom	6.88	9.45	6.61
EU	***8.15***	***11.46***	***6.77***
Sweden	5.61	11.70	10.26
Netherlands	8.08	16.60	5.95
France	12.12	11.46	7.51
Germany	7.27	17.43	9.25
Finland	6.82	17.94	10.57
Denmark	6.81	18.87	10.54
Belgium	23.42	26.24	9.61
OECD-19	***16.66***	***32.79***	***12.47***
United States	22.01	45.24	15.50

*Venture capital funding other domains of activities represents the remaining part of total venture capital up to 100%.

Source: OECD, based on data from EVCA (Europe); NVCA (United States); CVCA (Canada); Asian Venture Capital Journal (The 2000 Guide to Venture Capital in Asia). Data compiled in the second half of 2000.

Another positive factor is Francophony. French is spoken in 55 countries by 150 million people (among whom 110 million are daily French speakers). The francophone space represents both a linguistic area and a cultural area where common values are shared and in which France leads. Francophony provides many opportunities for French companies developing on-line services to serve a wide market, although only the European and the Northern American markets are wealthy enough to support significant markets.

Basic E-commerce Facts

Most assessments about the level and intensity of e-commerce sales rank France in the lower quarter of developed (or European) countries (Table 43, Figure 8).

Traditional EDI is used intensively in the distribution and automobile industries, both of which represent a significant share of French industry (Table 8).

SIDEBAR 2

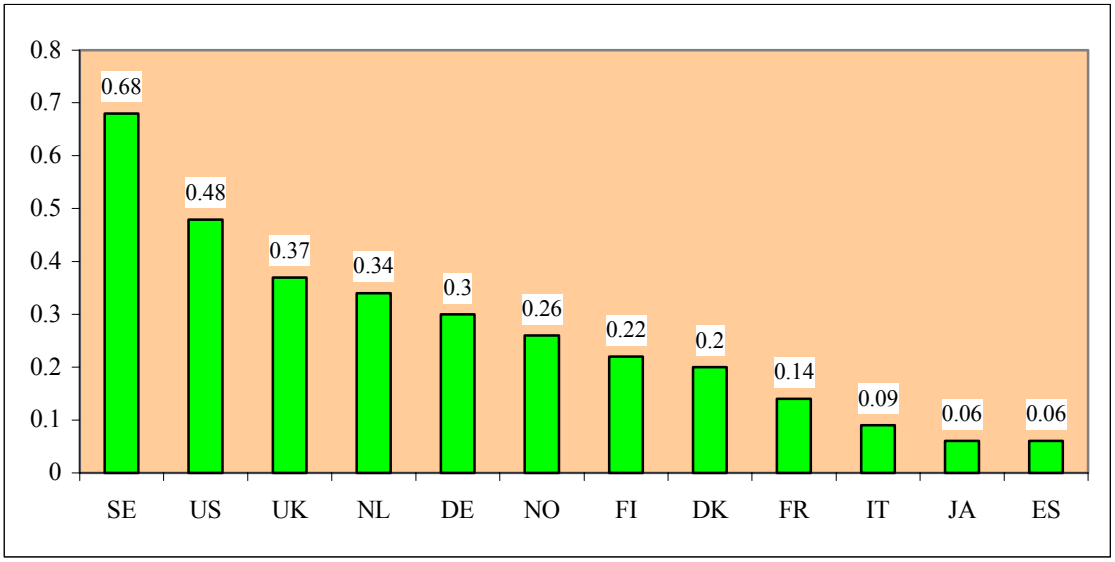
E-COMMERCE ON THE MINITEL NETWORK

The professional association of on-l;ine service providers (FEVAL) estimates that Internet sales accounted for 670 million Euros (in 2001) while the Minitel generated 550 million Euros of sales. In addition the Minitel generated 440 million Euros of revenue for on-line information services providers (potential registration fees are not taken into account). These 440 million correspond to information services and not to telecommunications (access) services as sold by ISPs. Indeed the “Kiosk” system enables the telecommunication operators to charge telecommunication bills for the information services provided by third parties. Information services providers do not therefore bill the users directly, while they provide fee-based services ranging from database access to transactional services [Brousseau, 2002b and c].

Table 43. E-commerce in 2000

E-commerce	Secure servers per 100,000 population 2000[a]	Secure servers with strong encryption per 100,000 population 2000[a]	B2B trade in US$M 2000[b]	B2C trade in US$M 2000[b]	% e-commerce Sales of GDP 2000[b]
Sweden	11.23	6.29	$2,360.79	$736.23	1.36
United Kingdom	10.25	6.33	$13,815.62	$3,873.00	1.25
Switzerland	14.58	9.11	$2,291.27	$496.47	1.16
Denmark	6.82	4.09	$1,474.51	$261.39	1.07
Norway	8.03	4.84	$1,402.42	$308.03	1.07
Germany	6.07	4.60	$15,171.02	$3,185.51	.98
Austria	7.68	5.63	$1,487.05	$315.11	.95
Finland	9.09	6.30	889.98	$213.64	.91
Netherlands	4.84	2.73	$2,734.78	$441.04	.86
Italy	1.77	1.10	$5,544.70	$841.43	.60
Belgium	3.37	1.50	$1,156.11	$170.01	.59
France	2.67	1.25	$6,170.95	$1,119.60	.57
Ireland	8.98	6.19	$346.70	$82.76	.45
Spain	2.28	1.27	$2,001.21	$405.99	.43
Greece	1.12	.74	$295.48	$50.00	.31
Portugal	1.33	.86	$285.72	$39.56	.31
United States	28.30	25.11	$118,457.20	$44,084.29	1.63
Scandinavia[c]	9.16	5.53	$6,127.71	$1,519.30	1.14
EU[d]	4.98	3.18	$53,734.62	$11,735.30	.84
OECD[e]	10.09	8.39	$268,500.30	$69,146.65	1.33

[a]*Source:* Netcraft. http://www.netcraft.com. Strong encryption is defined as having a key length greater than 40 bits (systems limited to a 40-bit key are classified as 'weak' since it has been shown that messages encoded using a 40-bit key with RC4 can be broken in about a week by a good computer science student using facilities available in a good computer science lab).
[b]*Source:* IDC, Internet Commerce Market Model, Version 8.1 (2002).
[c]Only countries included in the 44-country sample are used in the classification. Scandinavia here consists of the following countries: Norway, Sweden, Denmark and Finland.
[d]Only countries included in the 44-country sample are used in the classification. EU here includes the members of the European Union excluding Luxembourg.
[e]Only countries included in the 44-country sample are used in the classification. OECD here denotes the OCED member countries, excluding Luxembourg, Slovakia and Iceland.



Source: OECD, quoted by, P. Mathonnet, D. Kaplan, Tableau de bord du commerce électronique Mission pour l'Economie Numérique, Issue 1.0, Novembre 2001.

Figure 8. E-commerce Sales as a Percentage of Retail Sales, 2000

While French figures should be up-graded to obtain a better idea of the actual situation, it is clear that the recourse to the Internet to trade is less developed than in countries of similar development. This situation is not a surprise since there are fewer Internet users and on-the-Internet service providers in France. This shortage of participants is further reinforced by a lower propensity of Internet users to trade on-line. Few French companies buy or sell on-line (Figures 9 and 10).

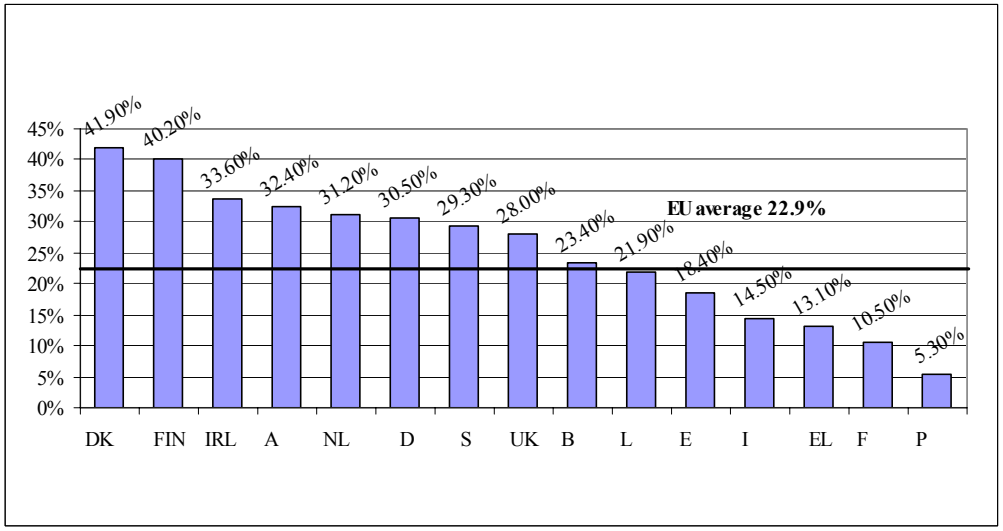


Figure 9. Percent of European Companies Buying Online

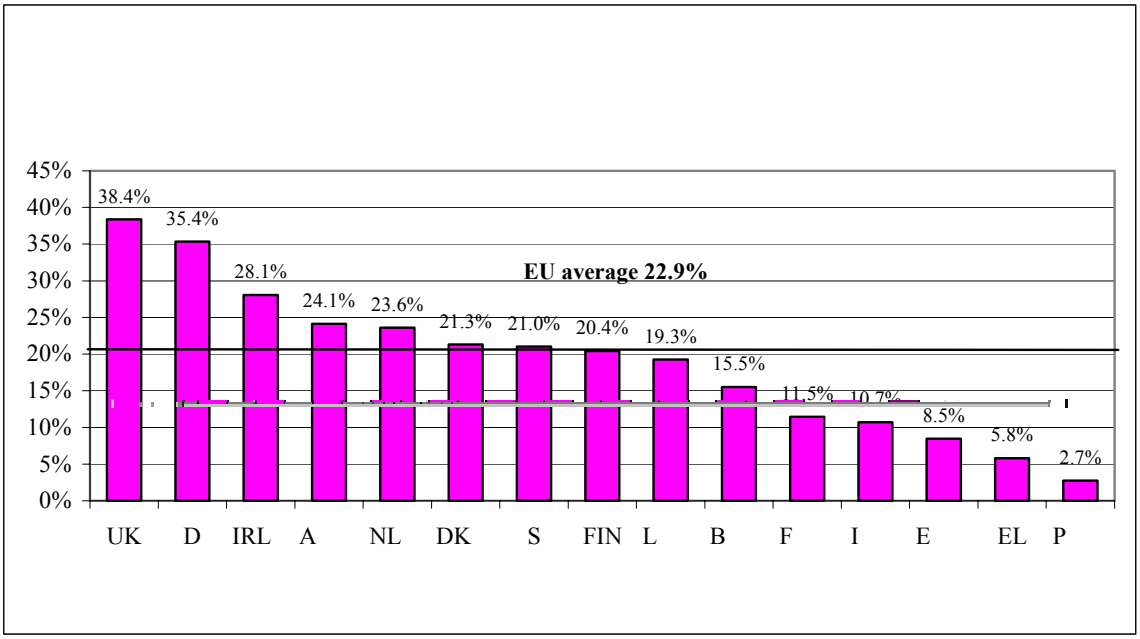


Figure10. Percent of Companies Selling On-Line

- French Internet users seem to be more reluctant than their foreign counterparts to buy or sell on-line (Figure 11).

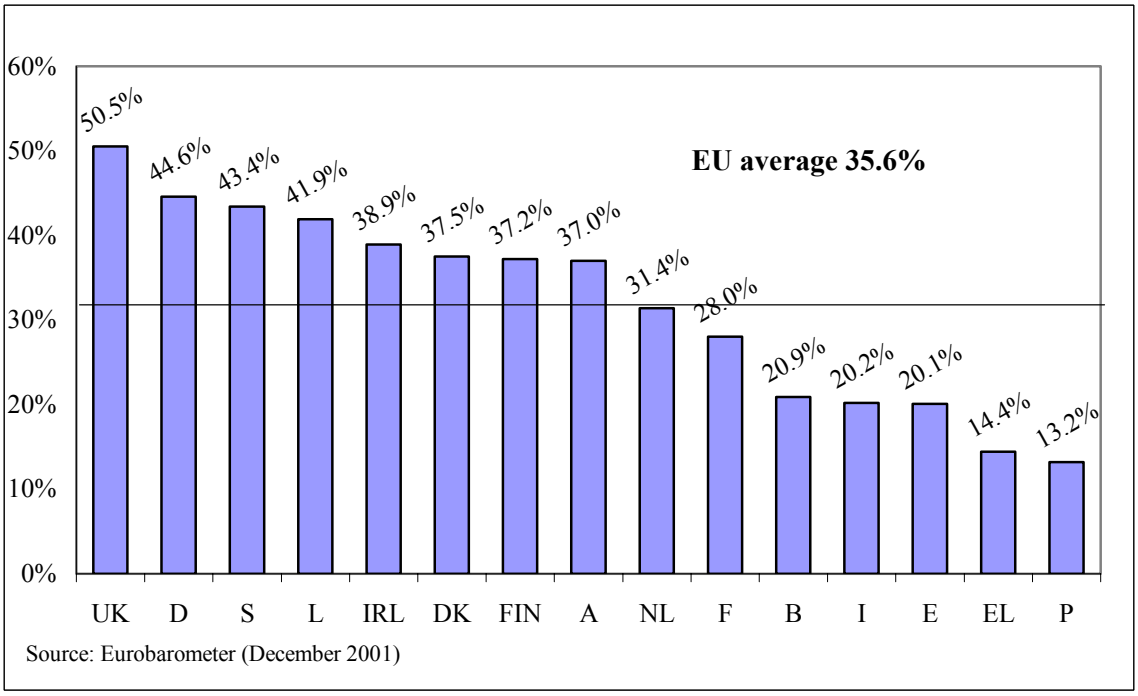


Figure 11. Percent of Internet Users Buying On-Line

SIDEBAR 3

E-COMMERCE DEMAND

In Europe, final demand from consumers for electronically traded goods and services grew slowly during 2000-2001. In October 2000, 31% of EU Internet users had purchased on-line and this figure rose to 36% by November 2001. These percentages slightly underestimates growth in absolute numbers, as the number of users increased by nearly a quarter. However, only 4% of users classified themselves as frequent purchasers and this small percentage is a major problem for e-commerce.

There are variations between EU Member States in the proportion of Internet users who purchased on-line. The pattern broadly corresponds to that of Internet penetration, higher proportions in northern Europe, lower in the south. The relatively higher on-line consumption of the U.K. and Ireland may reflect the greater availability of English language services on-line. U.K. and Ireland may also benefit from greater familiarity in using credit cards. In Germany, greater experience of off-line catalogue shopping may raise the propensity for on-line shopping.

Many willing shoppers apparently do not complete their shopping due to high shipping/delivery costs. Another factor is trust, how confident are consumers in being able to obtain redress in the event of an on-line dispute. Lack of trust works against small firms. Large companies benefit from their brand image. Trust may be another explanatory factor behind the greater on-line consumption of anglophone countries who are, perhaps, more easily targeted by large U.S. companies.

SIDEBAR 4

USE OF THE INTERNET BY BUSINESS IN EUROPE

At the European level, overall take-up by businesses is still relatively slow. On average, around 20% of European companies buy and sell over the Internet, with Germany, Ireland and the U.K. spearheading the sales part and Denmark and Finland strong on the on-line purchasing side. Big companies are buying and selling more on-line than small companies and the services sector is clearly in the lead regarding the use of the Internet to sell or purchase goods and/or services.

In six Member States, more than 30% of all enterprises purchase some or all of their supplies via the Internet, with Finland and Denmark above 40%. At the other end of the scale, only 5% of Portuguese and 10% of French enterprises use the Internet to purchase their supplies. The percentage of companies selling on-line varies from more than 30% in the U.K. and Germany to less than 10% in Spain, Greece, and Portugal. The same level of disparity applies to the use of electronic marketplaces where figures range from 3% of companies in Portugal to 21% in Germany.

These results confirm other benchmarking results and the conclusions drawn from measuring Internet penetration and Internet access costs. In those countries with a high level of Internet penetration and low Internet access costs, more companies use the Internet to buy and sell on-line than in less developed countries.

That fewer companies sell than purchase on-line is probably the result of the higher costs of on-line selling. Buying only requires a connection and a credit card, whereas selling requires a Web site to be set-up and maintained with adequate security and possibly logistics organization. This European disparity between buying and selling on-line (Figures 9 and 10) is not observed everywhere. In France, in particular, the percentage of companies buying on-line is the same as the percentage of companies selling on-line.

However, French dynamic performance is better than static figures suggest.

- B2C transactions on the Internet increased tenfold from 1998 to 2000. Aggregate volume was 4 billion francs in 2000, up from a mere 400 million francs in 1997.

- Over the past three years, France's share of European e-commerce over the Internet doubled. It rose to 8.8% of consumer purchases in 2000, from 4.8% in 1998, and increased over the same period to 11% of all B2B transactions, from 5% earlier.

The Parisian "niche" and the French pace of development enabled almost 100 on-line sellers to survive by the end of 2001. Among them 30 companies are already profitable. The profiling of these profit-making on-line sellers is stimulating. Less than 10 of them are pure e-commerce firms. Their common characteristic is to have adopted reasonable business (that is not quite innovative most of the time). Main companies in this category include RueduCommerce, Chapitre.com, and Kelkoo. The remaining 20 profitable on-line sellers are all subsidiaries of traditional big players: either retailers (e.g., Alapage, Fnac.com, Darty.com), or transportation companies (sncf.com) [Le Monde 26/03/2002].

NATIONAL POLICY

Given the gap between the U.S. and Europe, and France in particular, in the development of the Internet and e-commerce, both the European Commission and the French Government implemented policies to stimulate the evolution of Europe and France toward a digital society. These policies, implemented in the late 1990s, were in a sense the follow-up to former policies in the Union and member states to strengthen European competitiveness. In particular, these policies led :

- to the deregulation of most network industries throughout Europe,
- to coordinated efforts in high-tech industries (ranging from integrated R&D programs to support for the emergence of "continental champions"),
- to creation of a single market that is more competitive and allows firms to exploit economies of scale fully, and
- to the implementation of the single currency in January 2002, that forces members to run joint economic policies.

Since the EU policy was the force in many European countries for the modernization of policies to adapt industry to a more competitive and global economy, the Union played a major role in the design of national e-policies. Indeed, the stakes raised by the information society and e-commerce were perceived as calling for a deepening of this modernization policy. In addition to additional deregulation in the telecommunications and services industries, the rise of digital networks and related new practices was seen as a way to promote change in many fields such as the functioning of public services or government performance. Moreover, most national states identified that the relevant level of action was the European regional one. Since a European single market existed, it would be irrelevant to develop incompatible national policies in digital networks and e-commerce. In addition, many national states recognized that a unified Europe would be more able than each state to develop and implement policies that would fit the basic principles of the European humanistic and democratic principles…. and economic interests. Put another way, coordinating national policies was seen as the only way to balance the U.S. hegemony in all areas of digital networks: regulation of the networks and of the content, enforceable legal principles, privacy, control and security of digital exchanges, anti-trust issues, e-commerce, and e-business.

France's national policy in e-commerce cannot be understood without considering the EU policy. The European Commission, which is the administration that implements the EU policy under the control of the European Parliament, uses two major tools:

- Directives that are approved by the Council make adoption by each member's national laws mandatory in order to harmonize them according to the guidelines stated by the EU. These directives are not laws per se, but they make the implementation of legal principles mandatory in each national law. Consequently, when the EU publishes a directive, a 2- to 4-year delay occurs before it is enforced in all member states.

- Integrated programs distribute funding according to the priorities decided by the Council of Government. These funds support coordinated policies in R&D and support specific industries (especially, agriculture, culture, and education).

For digital technologies and e-commerce, the EU policy principally involves passing directives aimed at harmonizing and adapting the European institutional framework. The policy also focuses on the development of several European programs aimed at stimulating R&D and the development of innovative uses of IT. Member states coordinate their national policy in such areas as education and e-government to stimulate the spread of IT throughout Europe.

Although France launched a decentralization policy in the 1980s, it remains a highly centralized country. Cities and regional governments are quite limited in their power over economics affairs, technological policy, education, and public infrastructure. While the economy was considerably liberalized in the 1980s and 1990s, the national state continues to influence the behavior of businesses significantly. Consequently, the central government is the principal designer of e-policy. The liberalized environment (EU antitrust policy, WTO) and the intrinsic nature of the digital revolution favors decentralized innovation. The French elite became convinced that the traditional interventionist public policies were not working. Therefore, the government implemented a policy that is principally based on the design of an appropriate institutional (legal) framework and incentives, rather than on direct intervention into the economy. Such a policy is efficient if local governments, business and citizens use the tools provided by the government to leverage their own efforts. A part of the French policy is also performed at the diplomatic level when the French government negotiates the making of EU policy in Brussels.

French and European policy are designed in close co-operation. Indeed, the EU plays a strong role in harmonizing national policies so as to deepen the integration of European national economies. Moreover, the EU identified IT as a strong driver for the modernization of Europe. It strongly urged national governments, and also local authorities, businesses and citizens, to "think digital" and to develop innovation related to IT. In the following pages, we will develop the main features of the French policies regarding the information society and then e-commerce. However, this presentation should be complemented by the analysis of the EU policy, which is described in Brousseau [2002b].

In both cases, the aim of the policies is twofold.

- First, it is to reduce the digital divide between Europe (or France) and the U.S.
- Second, it is to use the innovative potential of these technologies, especially when they are applied to business and governmental practices, to boost reforms in Europe and France.

At the same time, most European decision makers do not consider that these technologies impose a specific social logic. The purpose is to use these technologies to stimulate the rise of a more flexible, democratic, and equitable society based on a dynamic economy featured by a sustained development path.

FRENCH PAGSI: THE KNOWLEDGE BASED ECONOMY AND THE INFORMATION SOCIETY AS A MAIN TARGET

The French government implemented a voluntary policy aimed at stimulating the rise of the Information Society and Digital Economy in 1998. The new government led, by Prime MinIster Lionel Jospin, made France's entry into the information society one of the government's top priorities and launched a program called PAGSI (Government Action Program for the Information Society), which is still in force in 2002. The objective was to "build an information society for all" to prevent a widening of the "digital gap" and to help France catch up with other countries in terms of Internet use.

This official involvement contributed to the removal of obstacles that hindered the development of the Internet in France. The program based on a set of priorities and a budget around Euro1.5 billion for the past four years, began to produce results. Given the main obstacles identified in 1997, PAGSI focuses on seven main targets:

1. Developing Internet access
2. Stimulating the use of ICTs in education
3. Setting a cultural policy aimed at developing content and services
4. Meeting the challenges of industrial and technological innovation
5. Using IT as a tool for modernizing public services and for stimulating the use of IT by the population and businesses
6. Encouraging the emergence of effective regulation and a protective framework for digital networks
7. Facilitating the development of e-business and e-commerce

These objectives are now discussed in detail:

1. Developing Internet Access.

In 1997, while the French Telecommunication market was largely open to competition, access to the Internet was scarce and costly. Dial-up on the telephone network was costly because of time metering of local calls. In 1998, the government implemented a special regulation aimed at suppressing metered time access to Internet servers. In addition, it resolved the conflicts among cable operators and telecommunications operators that delayed the deployment of cable access to the Internet. It also promoted the development of ADSL and wireless access to the local network.

More generally, the French government promoted competition among telecommunication operators and ISPs to multiply the channels and decrease the costs of access. The major act in that respect was the Decree of 12 September 2000 that broke up the monopoly on local loops and allowed private operators access to France Telecom's local networks.

SIDEBAR 5

TELECOMMUNICATIONS LIBERALIZATION IN FRANCE

In France, the liberalization of telecommunications began in 1986 when a principle of open competition in mobile communication was implemented. The national public telecommunication operator, France-Telecom, became independent in 1990, right before competition was launched in long distance telephony (1991). In 1996, France Telecom was privatized and the Law on the Regulation of the Telecommunication Market was passed. It implemented a principle of generalized competition, regulated by an independent Regulation Commission: the ART, established on 1/1/1997. The new law allows the ART to license large networks and services; a simplified registration process governs the entry of small networks and local services. It supervises the settlement of interconnection tariffs that are either negotiated or regulated depending of the size of the competitors. In 1998, universal service obligations were made mandatory to all network operators. In 2000, the local loop was fully deregulated. According to OECD, France is now one of the countries in which the telecommunication market is the more open to competition.

At the same time, the government took more voluntary actions to develop access. In particular:

- It decided in 2001 to promote the development of broadband Internet by generalizing the principle of open access to the mobile Internet providers and satellite service providers. It also removed barriers to the subsidization of telecom infrastructure by local authorities and decided to force telecom operators to implement broadband capacities and access. Over the next five years, broadband access to the Internet will be made available nationwide, including in areas with few facilities. The CDC, a public bank specialized in the support of local governments, set up an assistance fund to which it will contribute 1.5 billion francs

from its own assets over the next 5 years. Low-interest, 30-year loans will be available for local governments, jointly financed by banks as part of a 10-billion franc program. In addition to financial assistance, a dedicated agency, CIADT, called for access to the national electrical power grid for the development of an optical fiber telecommunications network.

- Since substantial inequalities remain in terms of access to computers and the Internet, the government took several measures to enable more people to take advantage of new information technologies. By 2003, 7,000 public terminals will be set up at public libraries, post offices, employment centers, information centers, town halls and voluntary agencies. These terminals will include 2,500 public "digital facilities" where, in addition to gaining access to tools, the public will be offered a free introduction to multimedia in the form of a "passport to the Internet and the new media".

2. Schools with Computers and Access to the Internet

Until 1997, the Government was not involved in the development of multimedia training in schools. During 1994-1996, the only governmental policy was to push local public authorities (responsible for the infrastructure of education in France) to subsidize the connection of schools to the Internet. However, nothing was done to stimulate the development of content and the digital literacy of teachers. Moreover, since the contents available on the Internet were mostly in English, the incentives to use it were poor.

French authorities were reluctant to develop a voluntary policy in favor of IT since a major plan of computerization of schools, launched in 1983-1985 failed because the French government of that time made the wrong technological choice. Briefly, in the early 1980s France recognized the importance of developing digital literacy and launched a major plan to equip schools with at least one computer per room. However, French PCs (manufactured by Thomson) were preferred to IBM and Apple PCs, resulting in a useless park of computers because of the shortage of software and what the pupils learned in school was useless at work where IBM PCs were preferred. This costly and inefficient plan of school computerization discredited both the Government and the teachers that had supported it, resulting in a "wait and see" policy when the Internet began to develop.

The French government, therefore, decided to implement a new policy based on the idea that the dominant standard technology should be adopted and that the policy should address more than the issue of connection. The development of content and the enhancement of teachers' digital literacy were considered priorities.

Today, multimedia training is available in all teacher-training institutions and many specific and advanced programs have been launched. However, because of the shortage of IT specialists, it is quite difficult for the school system, especially at the high school and university levels, to keep skilled people to teach MIS to students.

The vast majority of schools are now connected to the Internet (Table 44). However, when compared to other European countries, France remains behind the most advanced countries in the use of the Internet and computers at school (Table 45).

Table 44. Percent of Schools with Access to the Internet

	1997	2000
Grade school	0.6	30
Junior high school	11	89
High school	32	98

Source: French Ministry of Education, 2001

Table 45. Pupils Per Computer in EU Schools

	Off-line computers				On-line computers			
	Primary	Secondary	Prof./tech.	All Schools*	Primary	Secondary	Prof./tech.	All Schools*
Denmark	4	1	2	3	6	2	3	4
Finland	7	7	3	6	12	8	4	8
Sweden	10	4	4	7	14	5	5	8
Netherlands	8	9	3	8	44	15	5	28
Ireland	12	8	1	9	30	13	2	18
Austria	11	9	6	9	39	11	7	17
United Kingdom	12	6		9	23	9		15
Belgium	11	8	3	10	33	14	6	24
France	16	10	3	11	49	22	7	27
EU	15	9	4	12	37	15	8	25
Spain	14	14	4	14	39	28	7	30
Italy	22	9	8	18	59	19	19	46
Germany	23	14	29	20	63	23	48	40
Greece	67	17	5	20	183	43	11	53
Portugal	26	18	6	25	56	40	10	54

*All Schools = means of Primary, Secondary, and Prof./tech.
Source: Commission of the European Communities, e-Europe 2002 Benchmarking, European youth into the digital age, 2001

A new engineering school specializing in Internet and digital technologies was created in 2000. It is supposed to complete the existing French system of education in IT that already involves a large number of engineering schools which specialize either in telecommunication or computing and two business schools, which specialize in MIS, as well as several university departments.

3. Setting a cultural policy aimed at developing content and services

In line with the e-Content European Program (Brouseau, 2002b), the French government identified the lack of French content on the Internet as one inhibitor to its democratization and intensive use.

Moreover, due to

- French historic and cultural heritage
- the attractiveness of the label "France" to many foreign citizens, and
- the French know-how in software development and on-line services (Minitel),

the development of the WWW is perceived as an opportunity to enlarge the distribution of French cultural, entertainment, and information services.

Developing content should consolidate France's presence on the Internet, allow the development of on-line cultural industries and services, stimulate the valuation of France's tourist capital and niches, and open new spaces for artistic creation.

Steps were taken to provide support for multimedia publishers and authors, to encourage the development of French-language multimedia and on-line content. A fund managed by the National Center for Cinematography provides support for the creation of French multimedia products and their translation into other languages. A fund for innovation allows all multimedia SMEs to benefit from the advances of research in the domain. A modernization fund for daily

newspapers and news services contributes to the digitization of these media and their archives. The Ministry of Education coordinates a web of firms involved in the production of multimedia educational content, and grants products with an “educational interest” a special label. In addition, the French Ministry of Education launched in 2001, a plan to support public universities in the development of on-line education programs. In each of their own areas of expertise, the various ministries are supporting the development of French content. France is, however, still at the very beginning of that process.

In the same spirit, The French government supported the development of strong French companies in the communication and entertainment industry. Vivendi-Universal or TF1, for example, is the product of such a policy. It did not benefit from any public subsidies, but the company, and many others involved in the media industry, received support from the national or local authorities that facilitated the provision of licenses in France and abroad, and initiated or facilitated mergers and acquisitions.

However, to date, French "voluntarism" did not turn into a really significant, comprehensive and consistent program. Many initiatives were taken and the industry and the research community benefited from the spreading of public funds. These means are insufficiently coordinated and concentrated, resulting in uncertain impacts.

4. Meeting the Challenges of Industrial and Technological Innovation

The fourth aspect of the governmental policy was to enhance the French research capabilities in ICTs. The governmental action plan had two targets:

- to stimulate a close cooperation between public research and private businesses;
- to reinforce the public research capabilities in IT.

More Funds and a New Organization for Public Research and Development.

Public funding for private innovation multiplied by four in 1998 and by three in 2000. Moreover, the government targeted some specific domains considered of strategic importance: IT and biotechnology.

In July 2000, the government decided to allocate an additional 1 billion francs for research and to increase the number of persons working on information and communications technology in the public research sector by 25% over the next five years. Grants from the National Science Fund (FNS) and the Technological Research Fund for work on information and communications technology were increased by 50% in 2001. The number of people working for the National Information Technology and Computer Research Institute (INRIA) is expected to rise significantly by 2003 (to 1,180 from the current 755), as will the Institute’s budget (which was increased by 60 million francs in 2001). The National Center for Scientific Research (CNRS) added 40 new positions in 2001 and reorganized to create a new department fully dedicated to research in information and communication sciences and technology.

Significant and Effective Incentives for Business

Government incentives for businesses to make use of the Internet and upgrade their information systems were implemented. Measures were taken to make more venture capital available (a fund of 900 million francs was created in 1998 and an additional one billion franc fund was approved in 2000 (Table 41)). Tax incentives were offered to life-insurance funds that invest in equities and venture capital. The 1999 Finance Act created special warrants for employees of new companies, which allow firms to grant their employees a special stock option plan. The legislation, which encouraged start-ups in France, was extended in 2000.

These measures, together with the development of the Internet bubble, significantly impacted the French ability to launch new innovative businesses. The number of firms listed on the Nouveau Marché of the Paris Stock Exchange (the French market for the introduction of successful start-ups) rose from 24 1997 to 179 in 2001. New firms in information technology account for a steadily rising proportion of all start-ups. From 3.9% of the total in the first half of 1996, their share rose to

5.7% in the first half of 2000 and 6.5 in the second half of that year (Table 42). In 2000, almost one in every 15 start-ups was in the information and communications technology sector. More important, the absolute number of high tech start-ups went from 7,653 in 1998 to 10,777 in 2000.

5. e-Government: Modernizing Public Services and Encouraging France to go On-line.

In 1997, the government and its agencies could not be reached via the Internet. Since then, making government services available on-line became a priority of the government's modernization program. Access to government agencies via the Internet improved considerably. In April 2001 the Parliament's member T. Carcenac pointed out that close to 4,200 Web sites had been created in the public sector (including local authorities, universities, national government agencies, ministries, decentralized public services) over the previous four years. Most services were still considered insufficiently interactive.

Free access to essential public data expanded rapidly. The official Gazette and legal announcements are posted on the Web since January 1998; official government reports since January 1999; and requests for proposals by government agencies since July 1999. The National Library's site, which was opened in January 2000, provides free access to 35,000 works on the Internet, as well as 45,000 images. The government journal for voluntary agencies and collective agreements went on-line in 2001. Some 1,100 official forms can be obtained on-line as of the beginning of 2002 (up to 600 by the end of 1999). This growth represents all the administrative forms that individuals must manage and most of the current administrative registration procedures for businesses.

More than 80 major on-line public services are now available. In particular, since 2000 all laws and public decisions can be retrieved on line. In 2001, several on-line procedures were launched after the implementation by the French administration of digital signatures. For example, tax registration and on-line reverse auction for public procurement were implemented.

Modernizing the Operations of Public Institutions

In conjunction with the effort to facilitate the access of citizens and business to governmental services, the French government boosted the diffusion of IT in public administration. The objective was, to catch-up with the private sector in terms of computerization and to use the digital revolution to implement changes in the public methods of management.

In January 2000, the government's planning department (Commissariat au Plan), issued a report (Lasserre's report) claiming that the public sector caught up with the private sector in computer use. By April 2001, more than 675,000 personal computers were in use at government agencies, at least half of which were connected to the Internet or to an intranet, and more than 300,000 could receive e-mail (30% of all work stations in 2001, up from 5% in 1997).

By mid-2000, an Intranet linking the entire Central State Public Administration was launched. All ministries are now connected to the government's intranet (AdEr), a fast, secure system designed to facilitate the sharing of information by agencies. Regional information networks (the intranet linking national government agencies in a region or department) are valuable instruments for promoting interdepartmental cooperation at the local level. All regional information networks were operating since the end of the first quarter of 2001; 85% were already in use at the end of 2000.

The results of these policies are obvious. Surveys of a sample of public sites conducted in 2000 and 2001, show that the number of visitors rose by a factor of 4.5 from 1998 to 1999 and doubled again between 1999 and 2000. French Internet users are among the more intensive users of e-Government services (Table 46). According to several surveys, the quality of these services is high. Moreover, civil servants use the Internet more intensively than French citizens in general: one-third of all civil servants use either the e-mail, the Web or an intranet, while only one-fourth of French citizens do (Sofres 2002 www.internet.gouv.fr). While it is too early to assess whether this policy will be able to modify significantly the efficiency of public services and the relationship between the public bureaus and the citizens, it is obvious that e-government applications play a strong role in encouraging business and citizens to go on-line, both because of the quality of the services and because of the influence of the government in France.

Table 46. On-line Contacts with Public Services:
Changes between June and November 2001

In % of all Internet users	June 2001	November 2001
Sweden	63	67
Denmark	57	63
France	49	55
Belgium	47	50
Netherlands	46	47
Total EU 15	**43**	***45***
Italy	42	44
Germany	41	43
Spain	42	42
United Kingdom	38	37
Finland	42	36

Source: EOS Gallup Europe, Internet and the Public at Large Flash Eurobarometer 112, European Commission, Directorate General « Press and Communication », November 2001

It must be recognized that, while government is one of the domains in which France seems to belong to the group of most advanced European nations, many services still need to be developed to really generalize the notion of e-government. Moreover, public administration is still far from functioning as on-line public services. As in private companies, organizational changes and process re-engineering are complex to manage, and take time. E-government and e-administration initiatives remain pioneering applications that do not reflect the performance of the entire French administration, but they play a strong demonstration role for civil servants, for public and private decision makers, and for citizens.

6. Reshaping the Legal Framework for Digital Networks.

Because of the early attention to privacy in a digitized society (Law on "Computers and Society", passed in 1976), and of the early development of on-line services (Minitel began operations in 1982), the French legal framework already adapted to many aspects of digital networks. However, the French government passed a series of laws in 1999-2001 to adapt the French legal framework to the development of the Internet and electronic commerce. Since many of these measures (e.g., freedom of encryption, recognition of digital signature.) relate to e-commerce, they will be detailed in the next section. One of the essential elements in the reshaping of the French legal framework is the Law on the Information Society (LSI) that was passed in the summer of 2001[2]. It seeks to raise public confidence in networks by guaranteeing freedom of expression on-line, setting forth the legal framework for electronic commerce and improving security. The legislation also aims to extend Internet access to all by improving access to computerized data and promoting the expansion of networks throughout the country.

The later aspects of LSI were already been mentioned as components of the Internet access policy of the French Government. We focus therefore on the public liberty aspects of the LSI, which seeks to:

- Reinforce on-line privacy and on-line freedom of speech. The European principle of banning racist and sexist speeches, as well as certain forms of pornography, and of protecting personal life are maintained. Freedom of speech over the Internet is recognized by aligning the Internet with the rules that regulate other media. However, ISPs are not liable for content and governmental agencies are able to track and to sue individuals or organizations responsible for publishing unauthorized content. For privacy, it is now

[2] Note: Because new laws must be approved by the two Chambers in exactly the same wording and because the Left lost the election in Spring 2002, The LSI was only incompletely passed under the former legislature. The new majority in France seems to wish to implement the same legal framework, while it chooses to divide the LSI in several bills to be definitively passed in 2003 and 2004

mandatory to erase all archives related to the use of the Internet. Databanks of personal records can be created more easily than before, but the rights of the individuals for their personal data is reinforced (any individual can check personal information in any databank, modify it and claim relief). Authority of the National Commission for Information Technology and Liberty (CNIL) to control how these databanks are used was expanded. This regulation does not discriminate between public and private databanks.

- Promote on-line democracy. The law implemented a principle of systematic on-line consultation about legislation. In addition it set up a forum of the rights and laws of the Internet. This is a consultative body, composed of representatives from various government components, businesses, and of "Civil Society". It aims to constitute a think tank on needed evolutions of the law, of regulatory frameworks and of the institutional frameworks to govern the Internet and the activities it supports. Both innovations, while they remain experiments, are important in the French institutional context, since they recognize a de facto right to "co-regulate" private entities and individuals.
- Reinforce network security: Cryptography is fully permitted, but the Law is designed as a regulation to govern Police digital search. It also increased sentences against digital crime (e.g., viruses; former law of 1988). The Government took two additional measures to improve network security:
- In 1999, it created a computer emergency response team (CERT/A) in charge of detecting attacks on government information systems by “hackers”, as well as monitoring technological advances.
- It created an agency to fight crime involving information and communications technologies (Decree of 16 May 2000); this interdepartmental agency was granted nation-wide jurisdiction. It provides assistance to all agencies responsible for fighting computer crime.

7. Facilitating the Development of E-Business and E-Commerce.

This aspect of French policy is developed in the next section.

E-COMMERCE POLICY

E-commerce policies are only one aspect of more general policies launched by the EU or by the French government to stimulate the use of the Internet and to develop the information society. In addition, there are two main elements:

- developing a legal framework adapted to e-commerce and
- setting up a task force within the Ministry of Economics, Finance, Commerce and Industry aimed at making recommendation to the Government to take relevant legal measures or to implement specific policies

Legal Framework to Protect Exchanges and Privacy

*Encryption: Total Freedom of Use in France***.** In 2000, the government decided to amend the law of 1996 that was no longer appropriate as it restrained the use of encryption, without allowing the authorities to combat cyber crime efficiently. The new law is based on the following:

- It implements total freedom to use encryption products, with one restraint to maintain control over exports, which result from France's international commitments;
- It suppresses the mandatory nature of having recourse to a third party while it extend the role of these intermediaries to other tasks, such as certifying electronic signatures. Recourse to self-enforcement and private enforcement is encouraged. However, certifying entities are allowed to apply for certification by a public authority.
- It allows the authorities combat the use of encoding procedures for illicit ends. To this end, the pre-existing legal frame was supplemented by new obligations to reveal the transcription

of encoded documents to the legal authorities when they so request. Moreover, the technical capacities of the authorities were reinforced.

*Data of a Personal Nature: Ensure a High Level of Protection***.** The implementation of the 1995 European directive dedicated to the protection of data of a personal nature was performed in 2001. It recognizes the freedom of creating databases, based on personal data, but forbids merging such databases (either within the government or among private operators). It reinforces the right of citizens to control the content of these databases and to forbid certain types of uses. It reinforces the capabilities of the *National Commission for Information Technology and Liberty* (CNIL) and its power to control ex-post how personal data are processed.

*Digital Documents and Electronic Signatures: Lift the Legal Obstacles***.** Legal obstacles to fully digitized exchanges were removed by modifying the law to allow secured on-line exchanges. The "Evidentiary Law and Electronic Signatures" was passed in 2000 and acknowledges the legal force of electronic documents and signatures.

The E-commerce Task-Force

In 2001, the *Mission pour l'économie numérique* (Digital Economy Task Force) was established. It coordinated the work of nine working groups and the completion of an e-commerce scoreboard (Table 47). A second phase of work started in 2002 with the setting-up of an "international" group as a 10th working group.

The authority of the working groups does not let them make decisions. However, they are granted resources to prepare decisions. Their strength comes from the mix of representatives from different components of public administration and the business world. They group various skills and benefit from certain legitimacy due to their ability to take into account various stakeholders' interests.

E-COMMERCE DRIVERS AND INHIBITORS

The French case illustrates the complexity of the web of factors influencing e-commerce adoption. As will be argued hereafter, some factors are clearly drivers or inhibitors, while others play a more dialectical role. Moreover, the role of some factors can evolve with the passing of time. For example, late adoption by one group of users is at the beginning an inhibitor, because it prevents adoption by other groups. It can then favor catch-up because late adopters benefit from the experience of early adopters, and can implement the most recent technologies or the most advanced practices.

In the case of France, early adoption of e-commerce practices in the 1980s, through the spread of Minitel (for B2C) and EDI (for B2B) clearly played an ambiguous role (Brousseau, 2002c). Both technologies accustomed the population and businesses to on-line sales. Moreover, they stimulated business process re-engineering. In that sense, these technologies stimulated readiness. However, they also slowed the adoption of the Internet, both by households and businesses. Slow adoption impacted e-commerce adoption because most innovative practices were developed on that new platform. French e-commerce participants remained national, depriving themselves of the benefit from their 10 years of experience when e-commerce became a global activity. In the long run, it is not clear whether early adoption will continue to be an inhibitor or not. Indeed, readiness should favor catch-up (to the limit that the dot com crash severely reduced enthusiasm and dried up the capital market).

Table 47. Working Groups of the E-commerce Task Force

Working Group	Description
I: Macro-economic and sectoral impact.	In a first phase, the Group made an analytical survey of available studies concerning the impact of ICTs on growth. It now focuses on the production of statistical data for to analyzing the impact of ICTs on work organization and labor productivity, and how various contextual factors (such as labor flexibility, monetary policy, lead times, and effectiveness of training) influence the impact of ICT.
II: The digital economy and businesses.	The group puts forward 22 proposals for action in two main areas: government support of SME interest in ICTs, and better coordination between local and national levels (support systems, coordination with local stakeholders, and training policy).
III: The digital economy and competition law.	The group studied the competition issues raised by changes in B2B relations arising from the digital economy, especially through the marketplace. It focuses on the relationship between competition law and the industrial/intellectual property rights protecting both hardware and software; the impact of digital technologies on the competitiveness of the relationships between distributors and between distributors and consumers.
IV: E-consumers and confidence.	Following the work done by this group in the field of consumer protection, a press release on codes of conduct and seals of approval will be issued in 2002. The initiatives by the OECD, the European Union, and large businesses in the GBD is carefully studied in order to ensure the consistency of the French regulation of consumer protection.
V: On-line financial services.	In the first phase, the group issued recommendations on the security of payment facilities used on the Internet. It is now responsible for implementing them, in particular by designing an information repository (development procedure and payment facility conformity); creating a security label, investigating the feasibility of setting up a central certification authority to issue digital certificates; improving user protection.
VI: Security of electronic procedures.	This group is responsible for designing and the "*e-Ministère*" (e-Ministry) program aimed at implementing most governmental services on-line.
VII: On-line public procurement.	This group is responsible for the generalization of the uses of Internet tools and marketplaces in public procurement.
VIII: Legal certainty of electronic procedures.	This working group focuses on determining the legal "weak points" of electronic procedures and, where appropriate, proposing legal or practical solutions.
IX: Fraud control.	This working group will set up a technological intelligence network ("e-watch") to acquire and pool the special technical expertise needed by inspection and auditing directorates.
X: International.	The purpose of this group is to coordinate French action in international bodies.

There are however clearer driver for the diffusion of e-commerce. Two of them are common to B2B and B2C.

- The first is the French level of wealth and the quality of its infrastructure (telecommunication, transportation, legal and financial). Both for consumers and firms, cost of entry into this activity (and risks) are relatively low since a modern, dense, and reliable economic and logistic infrastructure is available.
- Second, the French economy is quite open and internationalized. Foreign firms already operate many activities and can implement international practices. French firms, at least the large ones, are competing on the global market and do experience and implement e-commerce abroad.

In addition, some other factors play a more specific role in each of the e-commerce segments:

- In the B2B market, ,
  - The French and EU modernization policies existed for the last 20 years. Firms became more flexible, more internationalized, more accustomed to competition and reorganized accordingly. These changes were a necessary condition for the implementation of e-commerce practices.

- Public policy and the effort made by the telecommunication operators in favor of the Internet, while late, were essential to popularize B2B e-practices and to stimulate adoption (both through decreasing prices and providing subsidies to innovators).
- Third, the readiness of business services companies was a vector of diffusion, both because French firms benefited from an efficient supply of consultant services or ready-to-use on-line services, and because business services providers gave an example of successful implementation.

- In the B2C segment, the availability of several platforms in addition to the Internet (Minitel, but also mobile telephony and digital TV) is an essential factor since it enables reaching several clienteles. It partly compensates for the low diffusion of the Internet. It can sustain the development of multi-channel e-commerce systems in which fixed costs (database design and maintenance, security, advertising) are written off on different and complementary markets. Moreover, synergies can exist among channels. For example, personal identification systems inherent to mobile telephony can be used to secure on-line transactions.

Inhibitors of e-commerce which are common to B2B and B2C fall into three categories.

- The digital divide really ranks first. In the case of B2B, it is the difference between small and large firms and the difference between Paris and the rest of France that is essential. In the case of B2C, it is more the difference between the wealthy, educated and urban citizens and the others that play a significant role. In both cases, it delays adoption because potential business adopters face small markets.
- The late take off of the Internet in France reinforced the impact of the digital divide. Delayed adoption of the Internet and related technologies played a negative role because it combined with the dot com crash. The latter arose while France was catching up. It resulted in extended adoption delays.
- The third major inhibitor is the French specialization in IT. The focus in France on traditional telecommunication technologies led businesses, the government, and the public to ignore for too long the potentiality of digital technologies, and of the Internet in particular. This focus delayed adoption and created a shortage of digital skills, both at the individual and collective levels.

As far as more specific segments are concerned, additional inhibitors can be identified:

- In the B2B segment, the French system of innovation can be considered an inhibitor. Large organizations which aimed at developing domestic and consistent technological systems were poorly adapted to the market-oriented and decentralized innovation process that characterize the new economy in general, and more specifically, digital technologies. Centralization resulted in a poor ability of the French innovation system to absorb the new technological base and to turn it into successful applications. The poor ability of French SMEs to innovate (and to use IT) is another reason for the poor development of B2B e-commerce. Innovation is traditionally performed by large firms that cumulate the technical expertise and the financial ability to sustain it. SMEs do not innovate spontaneously and B2B e-commerce failed to develop in the industries where there were no large leading firms.
- In the B2C segment, the poor equipment of households is clearly an inhibitor since the potential clientele is still too tiny to amortize most necessary investments for firms to go on-line. This poor level of equipment is also a consequence of the weak supply of services. There is, indeed, a vicious circle that characterizes the adoption of most network technologies in an early stage of development. Another factor that seems to play a strong role is the efficiency of the existing distribution channels that are both quite competitive in terms of costs and spread over the French territory. On-line merchants of physical goods hardly compete with these channels, except in some niches. The last inhibitor is probably the excessive centralization of France. While the

country is quite heterogeneous in terms of life style and wealth, most business models developed in France apply to only a part of it, resulting in low adoption in average.

In the near future additional factors might influence the French path of development of e-commerce:

- First, some of the causal relationships qualified above as “vicious” might naturally become “virtuous”, because the logic of the diffusion process of network technologies and practices might come into play. Network technologies are characterized by a S-shaped curve of adoption, with slow pace in the first phase linked to small externalities of adoption due to the small installed base. This dynamic inverts when a threshold of diffusion is reached, since new adopters benefit from strong network externalities due to a wider installed base. When the diffusion rate is above this threshold, new adopters rush in. Such a virtuous logic could be facilitated in France due to the readiness of both business and consumers.
- Second, the government invested in efforts to further IT education. A more computer-literate population should be more likely to buy or sell on-line.
- Third, the strong efforts of the public administration to go digital might play a role, due to the traditional structuring impact of the administrative practices in France on life styles and the economy.

Hence, the complexity of the analysis of the drivers and inhibitors of developing e-commerce lie in the dynamic of adoption. Adoption is impacted by factors that evolve with the passing of time and among which the relationships evolve: the distribution of the technology (often referred as the digital divide), the early adoption (based on a different technology) and the impact of exogenous events (like the Internet bubble).

V. CONCLUSIONS

France’s level of development in e-commerce reflects a “middle of the road” standing that characterizes the use of the Internet in France as well. Statistics on French digitization and e-commerce are around the Europe average. This position seems to reflect the peculiar nature of France that shares characteristics both with Northern Europe countries (level of development, skill of the population) and Mediterranean countries (low digital literacy, less intensive urbanization). It also reflects the digital divides that characterize France and that seem to be an important inhibitor to the digitization of the country.

These factors, together with

- traditional organization and processes in industry,
- the National system of innovation, and
- governmental bodies that did not favor the adoption of the Internet technologies

inhibited the early, rapid and innovative development of Internet-based business methods and commercial practices. However, recent French history is also the history of the progressive removal of barriers to the implementation of new methods of work and commerce. Indeed, over the last 20 years, the French industry and innovation system were re-shaped. Moreover, the market and industry underwent a process of liberalization and internationalization. Together, these changes generated the necessary conditions to develop e-commerce practices.

In the past five years, the Government implemented a policy favoring a French "new-economy". The development of the Internet and equipment in IT was encouraged, digital training was developed, the legal framework was reshaped, and e-government skyrocketed. Together with the financial and media bubble over the Internet, these policies exerted a strong influence on the

adoption behavior of business decision makers who rushed into e-business and e-commerce in the late 1990s.

This rush occurred only shortly before the dot com crash. An insufficient level of cash and energy was dedicated to allow France to really catch up. Many potential adopters delayed their decision to go digital in 2001, reducing the pace of adoption.

While less than expected in 1999, all figures about e-commerce confirm an increasing intensity of use. France is therefore progressively switching to a digital economy. The advantage of this slower and later process of digitization is that the users and service providers are more careful about the long-term viability of the applications they implement. E-commerce is now being implemented when really useful and profitable.

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EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
2. the contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. the authors of the Web pages, not CAIS, are responsible for the accuracy of their content.
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