# Colbertism in ICT
# Lessons from the French experience

Frédérique Sachwald

1997

## Contents

## Introduction

Numerous official reports show that France is now conscious of the opportunities of the formidable present developments in ICTs[1]. These reports are generally both enthusiastic about the opportunities of the coming information society and preoccupied with what they describe as France's backwardness. The latter is reported with respect to infrastructures, rates of equipment and social practices. France is described as being late in comparison with the U.S., but also with scandinavian countries and some other EU members - notably Germany. In this context, some authors fear that information society would reinforce American technological and cultural global domination. Despite this well known tendency to dramatize France's relative backwardness in a vital sector, recent policies relating to ICTs break with French tradition in innovation policy. This is all the more remarkable as telecommunications have constituted one major area where colbertism, the French "mission oriented" version of innovation policy [Ergas 1987], has been experimented. In the case of France, the mission given to policies has traditionally been the defense of independence and sovereignty through technological and industrial excellence. Since General de Gaulle, this objective has been strongly related with military considerations.

This paper shows that the technological and industrial success of the telephone network modernization program at the end of the 70s has had an enduring influence on policy design in ICTs. Unfortunaly, success was not easily reproducible since both the types of technologies and the economic environment have changed. As a result, the project to install a large optical fiber network in France at the beginning of the 80s has not been completed. The paper also argues that France could not simply transfer its conception of innovation policy to the European level in order to reach a more satisfactory level of research funding and to gather the diversified competences required by new technological developments.

In the 90s, French authorities have become aware of the opportunities of information society and of the challenges of the third industrial revolution and have devised a number of policy measures, as their foreign counterparts [OECD 1995]. In August 1997, the Prime Minister Lionel Jospin made an important political speech to suggest that policies to promote multimedia activities had to be strengthened[2]. He both said that multimedia industries would become more important than the automobile and that France had to catch up. The speech was welcome as long overdue and gave rise to numerous acerb remarks on public policies. One important point, which seems to have been overlooked by commentators is that French innovation and industrial policies have been changing over the last decade. French authorities consider that traditional colbertist policies are not adapted anymore and

[1] See [Théry 1994, Miléo 1996, Lafitte 1997, Martin-Lalande 1997]. Other reports are underway in 1997.

[2] Speech on August 25, at the 18th Communication University in Hourtin.

in order to promote innovation in ICTs and diffusion of their uses, they now tend to rely on deregulation and the promotion of experiments with innovative services [3].

## 1. French *grands projets* in ICT

The French *grand projet* corresponds to an intense phase of innovation policy in a given sector. Actually, the *grand projet* is remarkable in that it combines the objectives and instruments of both innovation and industrial policies and marshals large resources to achieve technological excellence in a specific field - computers, nuclear energy, aerospace... An extensive set of conditions have to be met so that a *grand projet* can be successful. This first section deals with one of the most successful ventures of French governments, the catching up in telephone equipment at the end of the 70s, and then with less sucessful projects in other ICTs, in order to identify the key sucess factors of a *grand projet*. In this perspective, it is important to emphasize that *grands projets* have not been evaluated in the same way as investment programs from private firms. Since they were conceived to achieve technoligical breakthroughs and to nurture mighty national champions, commercial and economic performance were usually not considred as major criteria of success.

### 1.1 Modernizing an underdevelopped network

*Catching up in telephone equipment*

As an innovation, telephone spread quite rapidly in the United States at the end of the XIXth century. Diffusion was slower in Europe, and particularly in France. France's backwardness in telephone equipment, which was due to a combination of political and sociological factors, persisted until after the second world war [Carré1993].

[3] Besides general policies such as support to research and more particularly basic research within the public sector.

Table 1. Evolution of the telephone density in industrialized countries

| Phones per 100 inhabitants | 1888 | 1913 | 1928 | 1938 | 1948 | 1960 | 1970 | 1980 |
|---|---|---|---|---|---|---|---|---|
| United States | 0,25 | 9,0 | 15,8 | 15,1 | 24,2 | 39,5 | 58,6 | 79,9 |
| Canada | - | - | 13,2 | 11,9 | 17,4 | 30,8 | 45,4 | 66,0 |
| Japan | - | - | - | - | 3,0 | 7,0 | 19,0 | 46,3 |
| Sweden | 0,31 | 4,9 | 7,7 | 11,7 | 21,2 | 35,3 | 55,7 | 77,3 |
| Switzerland | 0,27 | 2,7 | 5,6 | 10,2 | 16,3 | 29,6 | 48,2 | 70,0 |
| Germany | 0,08 | 2,1 | - | 5,3 | 6,0 | 11,0 | 22,4 | 43,4 |
| United Kingdom | 0,06 | 1,6 | 3,6 | 6,4 | 9,3 | 15,0 | 25,0 | 48,1 |
| France | 0,03 | 0,8 | 2,2 | 3,7 | 5,2 | 9,1 | 17,2 | 41,5 |
| Italy | 0,04 | - | 0,7 | 1,4 | 1,6 | 7,1 | 17,4 | 31,8 |
| Spain | 0,05 | - | 0,6 | 1,2 | 1,8 | 5,4 | 13,4 | 29,9 |
| Denmark | 0,13 | 4,7 | 9,3 | 11,2 | 14,8 | 22,2 | 34,2 | 61,5 |

*Remark*: in the contemporary period a second phone is often connected to the "main line", so that the indicator has become less relevant.
*Source*: [Aurelle 1986].

After the war, France gave an important role to "indicative planning", which set economic and industrial priorities for the country, especially with respect to equipment[4]. The telephone was not considered as a priority by the Plan until the late 60s ; the Vth Plan (1966-70) aknowledged a considerable underequipment, but prededicted only a small increase in demand because of technical constraints. By the end of the 60s, public discontent[5] coincided with the desire of the governement, through its specialized agency, DGT (see box 1), to catch up.

For a long time the necessity to provide the French population and economic actors with a performing telephone service had been considered as secondary, given the main objective which was to build a strong national telephone equipment industry.

While the French market was dominated by foreign suppliers, the research branch of the telecommunication administration, CNET (see box 1), aimed at developing switching and transmission "national" technologies which it would then hand over to industrial firms. In the meantime, equipment of the territory had to wait. The DGT has however had to order switching equipment from foreign firms when waiting was not possible. These firms, such as ITT or Ericsson, have had to contribute to French research funding [Cohen 1992].

During the 60s, engineers from the telecommunication administration wanted to go on managing a small network while waiting for French technologies. But complaints from the public and from local politicians had become too loud and in 1969, telephone equipment finally became a clear political priority and an ambitious

[4] The planning process, which involved diverse social actors and produced numerous reports, was not the only influence on French industrial choices. In particular, *grand projets* related to the military sectors were decided by General de Gaulle (in nuclear and aerospace industries in particular).
[5] In 1966, unsatisfied demand for a telephone line represented one year of connection capability.

catching up effort, under the name of "δLP" program[6], was engaged with the VIth Plan (1970-75). The first major decision has been to allow the DGT to borrow funds in order to step up the equipment effort. Until 1967, the Finance Ministry had always insisted that DGT should finance its investment from internally generated funds. The VIIth plan (1976-80) defined telecommunications as one of the Priority Action Programmes[7], which secured funds over a five-year period and thus lifted the annually controlled budget constraint. These decisions enabled a formidable financial effort[8], resulting in a large debt.

Financial efforts were accompanied with reorganization of the PTT Ministry. DGT was not transformed into an enterprise[9], but its autonomy within the PTT Ministry progressively increased in the 1970s. In 1974, the balance of power began to change quite radically within the telecommunication administration. This was largely due to the appointment of Gérard Théry as the new head of the DGT by President Valéry Giscard d'Estaing. G. Théry worked at transforming the DGT into a more commercially minded organization, which meant in particular reducing the power of the CNET. The latter was constrained to concentrate on its R&D function, while the control over industrial and international affairs was assumed directly by DGT. By separating the technological objective and the equipement objective, G. Théry chose to focus on the latter.

Box 1. The PTT and DGT

The Ministry in charge of telecommunications was also in charge of postal services (PTT for *Ministère des Postes des Télecommunications et de la Télédiffusion*). The ministry, which has long been considered as a relatively minor one, presided over two quite autonomous units, the *Direction Générale de la Poste* (DGP) and the *Direction Générale des Télécommunications* (DGT).

DGT gained much independence and prestige during the 1970s when it was in charge of the modernization of the telephone network. This evolution was reversed in 1981 when the socialist government came to power. The PTT Ministry reasserted its control over DGT, which became much more subordinated to the wider objectives of the government. This had quite drastic financial consequences for DGT, which has had to pay annually a sort of tax from 1982 on and had to accept to increase telephone tariffs in 1984.

The CNET (*Centre National d'Etudes des Télécommunications*) has been created in 1944 as an R&D center. Since the 50s, the CNET has been controlled by the DGT. It was offically in charge of technological innovation, but progressively assumed large power over procurement of telecom equipment. In the 60s, CNET

[6] "δLP" (for increase in main lines), included a quantitative objective in terms of installed telephone lines .

[7] It was the fourth such Plan ("*Améliorer l'équipement téléphonique du pays*"), which aimed at reducing the delay for connection to 3 months and a half by 1980. This objective implied that the number of lines had to be doubled between 1975 and 1980.

[8] Only comparable to that made in favour of the nuclear sector.

[9] Proposals to transform DGT in this way met with strong social and political oppositions in the 70s.

has actively lobbied in favour of an industrial policy in the field of telecommunications. One main objective of the CNET has been to create a French transmission and then switching industry. In order to do so, from the 1950s on, the CNET tried to adapt foreign technology to french needs (transform it into french technology in a way) and to transfer research results to local firms.

In 1990, has been transformed by law into a public enterprise ("*établissement public*"), France Télécom. Its board is composed of representatives from the State, its personnel (who retains the civil servant status) and the users [Curien, Gensollen 1992]. The Ministry (*Postes, Télécommunications et Espace* in 1990) supervises France Télécom and is responsible for regulation and competition policy in telecom services. In 1997, the socialist government decides to go ahead with partial privatization of France Télécom.

Research within CNET and in association with one supplier[10] led to the first digital exchange (E10) as early as 1970. But this switching equipment only suited rural areas with low telephone density. It was installed in such an area, in Brittany. As a consequence, for its 1975 tender to supply new switching system for urban areas as part of the network modernization program, DGT chose the older but more reliable crossbar technology. DGT selected two foreign firms as suppliers, Ericsson and ITT, but required that they sell their French subsidiaries to Thomson. As a result, Thomson became a major switching supplier, along with Alcatel, thus reducing the latter's bargaining power vis-à-vis the DGT. Indeed, at the end of the 1970s, the degree of competition seems to have increased substantially [Cawson *et al.* 1990].

The network modernization program was a great technical success. At the beginning of the 1970s, the number of telephone lines increased by 300 000 a year, and there were 600 000 demands in stocks. Between 1977 and 1982, the number of lines increased by 2 million annually [Curien, Gensollen 1992]. From 1969 to 1982 the number of telephone lines was multiplied by 5, from 4 million to 20 million, and the network had been entirely automated. By 1980, France had caught up with other industrialized countries (table 1).

*Creating a French switching equipment industry*

During the post-war period, French PTT have implemented an industrial policy with two objectives. On the one hand, the administration wanted to foster a French industry in this foreign dominated sector. On the other hand, it wanted to promote a competitive market structure in order not to depend on a unique supplier. The two objectives were contradictory because an internationally competitive French firm would have had to be comparable in size with its American, Swedish or German counterparts, which in turn meant that it would have become a national monopoly. PTT have been caught in this contradiction and have alternatively promoted the

[10] SLE-Citerel, a joint subsidiary of Ericsson and Alcatel.

cost control objective and the industrial policy objective[11]. DGT saw the formidable equipment project of the 1970s as an opportunity to reconcile the two objectives.

From the industrial policy point of view, the *grand projet* has been less successful than from the technical point of view of network equipment . CNET transferred digital technology to Alcatel, which developed a larger version of the E10 (E 12). But the latter did not achieve very good performances and was abandonned in the early 80s. Thomson launched an expensive R&D program to have an operational digital system by 1980. The firm met with difficulties and its MT20 was delayed. Moreover, the financial effort which had been necessary to develop the digital system contributed to Thomson's financial difficulties. DGT supported its two French suppliers' efforts to export, both financially and politically. Indeed, most contracts have been won in developping countries, with the help of the French government [Cawson *et al*. 1990]. In such a context, prices were low and these markets were not a source of large profits for firms.

In 1983, Thomson agreed fo merge its telecom business with Alcatel in order to focus on its other product lines. DGT was not favorable to this merger of its two suppliers, which it wanted to compete both on price and technological improvements. The two national champions (nationalised in 1982) nevertheless convinced the Prime Minister and the President against the PTT Ministry. In 1986, Alcatel acquired the telecom subsidiaries of ITT, thus becoming a world player. During the 1980s, CGE, Alcatel's parent company, has worked at emulating Siemens [Cohen 1992]. This meant spreading its resources on quite diverse businesses and may explain why it partly lost its technological advance in digital switching [Cawson *et al*. 1990]. These developments certainly raise doubts as to the efficacy of French industrial policy in the telecommunication sector. Indeed, CGE/Alcatel, which had been nurtured by DGT as a national champion during decades, ended up following independant and international strategies at odds with the objectives of DGT. The main example being the merger between CGE and Thomson telecom businesses, which reduced DGT's freedom of choice and contradicted its innovation strategy. Alcatel has become a major competitor on world telecom equipment markets, but has stopped acting as a typical national champion.

### 1.2 Pitfalls in reproducing success

*Riding on the "telematics" revolution*

At the end of the 70s, the telecom administration embarked into new equipment projects. It thought that it could emulate its own success in the modernization of the

[11] The attempts to shape the industrial structure and to transfer foreign technologies led to the choice of diverse suppliers. The network was thus heterogenous, which meant additional costs [Curien, Gensollen 1992].

telephone network. Actually, DGT decided to enter these new ventures both for internal and external reasons. Internal reasons have to do with organization dynamics, while external reasons are related to the French approach to innovation policy.

During the 70s, the resources of the DGT had increased tenfold, but this was clearly related to the catching up project and could thus be reversed. During the project, DGT had substantially increased its productivity, which meant that, as an organization, it was quite logically led to look for new ventures which would enable it to keep and exercise its resources and competences. Moreover, the growth of the telephone network had resulted in a lower profitability of the average line. Indeed, most new lines were connected to private homes, which typically generate much less trafic than professional premises. As a result, the average trafic per line diminished. This evolution was compounded with a reduction in prices - in the previous period, high rates had been used to stem demand. As a result of these different evolutions, the average yearly revenue per line was reduced in half between 1970 and 1985 [Curien, Gensollen 1992]. This constituted an incentive to look for ways to stimulate traffic on residential lines in order to increase the profitability of the network.

In the late 70s, the post oil shock crisis is turning into a structural crisis, with an increasing unemployment rate, and the government is looking for ways to trigger new activities. In this context, the "Nora-Minc" [1978] report will have a crucial impact. In december 1976, President Giscard d'Estaing had commissioned a report on the impact of the development of computers on society. The report by Simon Nora and Alain Minc, both high civil servants, was published in 1978. It contributed to the build up of two myths around telecommunications: the advent of the information society on the positive side and the fear that IBM was becoming a world "big brother" on the negative side [Chamoux 1993]. The authors emphasized the technological convergence between telecommunications and computing, and coined a new word to express the phenomenon : *telematics*. They alerted France to the threat to sovereignty which could result from the telematic revolution being lead by other countries. The threat would of course come from the United States, IBM being presented as the world telematic giant to emulate[12]. S. Nora and A. Minc [1978] recommended that DGT play a leading role in organizing a nationally coordinated program in the field of telematics.

In 1978, DGT was convinced that it could master a new *grand projet* in the field of telematics and had enough prestige and power to exploit the receptive political climate. DGT thus proposed a series of projects aimed at engaging the French industry into information technologies. In November 1978, during a ministerial meeting, the government decided to develop a number of new telematic services:

[12] In this respect, the Nora-Minc report had a similar analysis of the "American challenge" as J-J. Servan Schreiber [1967] in the influential book he had published some ten years earlier (and which will be discussed again below about European policies).

tele-wordprocessing, a telecopy machine for large diffusion and videotext. Only this latter project did effectively go ahead; it became the Minitel.

*What success for the Minitel venture?*

DGT wanted to transform the innovations in store in French laboratories, and especially at CNET, into successful products. In this perspective, they had been impressed by the VHS videotape recorder success and had become convinced that they should go for a Japanese type strategy. That meant that after the choice of a product-market target, the objective was to mass produce so as to lower costs and be able to rapidly export on a large scale. In order to rapidly assure such a large diffusion, DGT suggested to distribute its videotext terminal, Minitel, free of charge. To counter the opposition of the Ministry of Finance, the telecommunication administration emphasized that Minitel would replace telephone directories, that were themselves free.

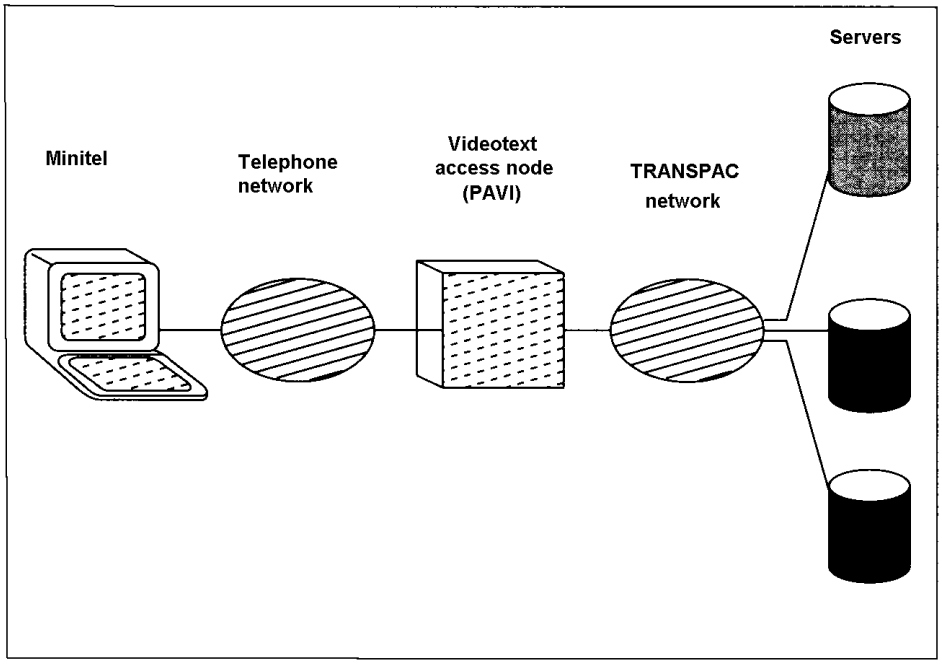
The neat Japanese strategy aimed at competing with American technology had been devised technocratically and met with political opposition. This was due in large part to the fact that Minitel represented a potential threat for the local press depending on revenues from announcements. Oppositions led to a process of reevaluation of the project. As a result, the programe was both reduced and delayed. At first, the objective had been to distribute 30 million terminals over 15 years [Cohen 1992]. This target seemed too ambitious once it was realized that the need for videotext had not really been proven. This led to proceed to experiments and to decide that Minitel would be given only to those who would ask for it[13]. DGT also proposed an important innovation with the *kiosk* function, where the administration transports information for service providers and invoices users on their telephone bill[14] (figure 1). This constituted in particular a channel of diversification for the local press, which then became an ally and contributed to the success of the French videotext system [Chamoux 1994].

The diffusion of Minitel thus really started after 1981-82. In 1993, 6.3 million terminals had been installed, meaning that more than 20% of the 30 million telephone lines were equiped [Libois 1994]. At the beginning of the 90s, France had, by far, the largest diffusion of videotext in Europe [Bouwman, Latzer 1994]. Minitel has been successful in attracting numerous new services ; in 1994, it served as a channel to more than 30,000 services, including electronic commerce [Libois 1994]. Minitel, through the Teletel network thus generates substantial revenues - about $1bn a year in the 90s, one half going to service providers and the other to France Telecom. The success can be partly attributed to the decentralized organization of the Teletel network, with service providers being directly related to the network (Transpac), without a central computer as in the case of the less sucessful British version of the videotext, Prestel [Bouwman, Latzer 1994]. Coordinated marketing

[13] The objective being then that 50% homes would eventually be equiped.
[14] France Telecom takes a 9% commission rate.

efforts by network operators and service providers have also contributed to successful diffusion.

Figure 1. Minitel and the Teletel network




*Remarks* :
- The Teletel network is composed of three main elements: terminals (Minitel), servers and videotext access points (PAVI).
- Transpac is a packet-switched network which enables an independence between price and distance. Transpac was created in 1978 as a private subsidiary of DGT.
*Source* : adapted from [Libois 1994]

The success of the French decentralized videotext system has induced imitation in other European countries. Imitation of the decentralized architecture did not go along with the adoption of the other main feature of the French system: the supply of free terminals. This may have contributed to the fact that Minitel has not generated exports and has largely remained a French venture. This may also be related to the fact that Teletel has been considered as a typical example of French industrial policy [Chamoux 1994]. In the end, the "Japanese strategy" which DGT had imagined at the end of the 70s did not work. Since no other country bought the unsophisticated French terminal, the profitability of the Minitel project is doubtful (table 2 gives one estimate). The success here rather lies in the social diffusion of a new interactive medium. Minitel has not been a product for export, but a channel to increase connection time, and a learning experience for the French population at large and for a number of firms, which have gained expertise in electronic services and electronic commerce.

Table 2. Assessment of Minitel's profitability, 1984-2000, $billion

| Discounted revenues | | Discounted costs | |
|---|---|---|---|
| Services, including the electronic "yellow pages" | 3.85 | Terminals | 2.91 |
| New products | 1.04 | Repearing and recycling o terminals | 0.39 |
| Advertising | 0.75 | Marketing, sales | 0.96 |
| Savings on paper "yellow pages" and assistance | 0.65 | Network infrastructure | 1.86 |
| Leasing of Minitel terminals | 2.23 | Other network expenses | 1.27 |
| Other revenues | 1.64 | Other expenses | 1.56 |
| | | Taxes | 0.24 |
| **Total revenues** | **10.16** | **Total expenses** | **9.19** |

*Source*: [Blanché, Barbet, Benzoni 1993]

Some argue that this "first mover" experience of France would have created an obstacle to the present diffusion of Internet[15]. This is true to the extent that Minitel has become an efficient and lucrative channel for services, even if it is now technologically obsolete. In the mid-90s, Minitel generates comparable revenues as Internet on an international scale. This parity of course will cease as electronic commerce through Internet increases[16], but it explains that firms which have already built their business through Minitel want to take advantage of it. Moreover, a large number of French users of Minitel have been quite satisfied so far. La Redoute, for example is the largest French mail-order retailer and third largest in the world. It has had a Minitel service since the early 1980s and today over 20% of its revenues are generated by online services[17]. La Redoute set up a Web site in 1995 to sell its clothing collection. This presence on the Web gives La Redoute a further opportunity to sell its products to EU countries and Switzerland, but it does not represent much business yet. One problem, as for E-commerce generally, is to find a secure payment mechanism on the web[18]. The main problem of the kiosk system on Minitel is that the user pays for the connection, which may become unacceptable as French people get to know Internet better.

### *The failure of the* Plan câble

The *Plan câble* is the other grand projet which has been quite directly influenced by the experience ofthe telephone network modernization.

[15] In 1997, France registered about 250,000 professional users and 100,000 individual ones.
[16] According to [EITO 1997], global revenues generated by commercial Web Sites was negligible in 1995 and about ECU 1 bn in 1996. Predictions for growth are nevertheless impressive.
[17] 17% from Minitel and 3% from Audiotel (a kiosk system available by telephone) [EITO 1997].
[18] At present, customers order online, but payment has to take place offline.

In september 1979, the French government launches a new techno-industrial initiative in favor of optical fiber networks. Biarritz is chosen to demonstrate the potentialities of local cable networks in order to provide digital telephone and interactive TV services. At the time, CNET sees the equipment of the French territory with an optical fiber network as a way to replicate the success of the telephone program. France was behind its neighbours in terms of cable network and, here again, a late start was considered as an opportunity to operate a technological jump, by adopting optical fiber. Members of the DGT were convinced that building a national broadband communication network represented a formidable industrial potential. Between 1979 and 1981, DGT elaborated different projects in this perspective.

At the beginning of the 80s, DGT's autonomy was severely reduced, both because of the criticisms it had met about its technocratic methods and because of the new attitude of the socialist government towards this administration (see box 1). Members of the DGT nevertheless managed to win approval for the Plan Câble by the Ministry in november 1982. This ambitious program envisaged cabling 1.5 million homes by 1987 and 6 million by 1992.

The *Plan câble* ran into all sorts of difficulties: technical, administrative and political. At the beginning of the 80s, optical fiber technology was actually not entirely operational and prices were much higher than what had been anticipated by the administration. As a consequence the project to develop optical fiber networks comparable to the telephone network[19] was rapidly abandonned in favour of a less ambitious solution using more traditional metallic cables. This meant that the potential for interactiviy through the network was limited.

The implementation of the Plan câble implied cooperation between a higher number of actors than had been the case in the telephone network project. Cable networks are local, which means that their installation implied the cooperation between DGT and local authorities. Local politicians wanted to have their word and use cable transmission to demonstrate their modernity. The government wanted to assure that private cable operators would not size the new networks. In particular, since the networks were supposed to be used for TV transmission, the national authority in charge of TV distribution, TDF, had to agree. In order to reconcile these different objectives, the development of local cable networks was hampered by a complex system of administrative appovals and funding [Chamoux 1993].

DGT became upset with the technical and adiministrative difficulties of the project and progressively pulled out. In march 1984, its director, Jacques Dondoux, publicly recommended to develop new TV channels through usual hertzian technology[20]. New channels have effectively been authorized from 1985 on. They have

[19] That is to say "star shaped" as opposed to "tree like" networks.
[20] This option was previously considered as technically impossible.

constituted a source of competition with cable channels and contributed to freeze the situation.

After the 1986 elections, a liberal government took over and decided to stop the *Plan Câble*. This enabled DGT to favor narrow band technology for data transmission and to postpone broadband network until the XXIst century. After 1988, socialist governements tried to reverse this course, but the situation had become even less favorable because of competition from satellite transmission[21].

The failure of the *Plan Câble* can be attributed to several factors. Given technical considerations, it was actually over ambitious. Moreover, it was clearly ill prepared, with insufficient cooperation between the different actors. The administration was not solely facing technologically dominated industrialists, as it had been the case for the telephone network, but also local politicians and media producers. In the 1990s, network interactivity is still quite limited and is to be developed. The development of these new networks, based on optical fibers, has been given a new label : "information highways"[22].

After the mitigated success in telematics and the failure of the *Plan Câble*, DGT has refocused on its core functions. It has abandonned its ambition to lead the French industrial policy in ICTs and in the 1990s, it concentrated its efforts on preparing deregulation of telecommunications (box 1).

### 1.3 Is colbertism still feasible ?

French policies in ICT during the 70s and 80s, and in particular the *grands projets* analyzed above, are typical of the French colbertist tradition. Since Colbert, the French state has built up a specific interventionist tradition which consists in dedicating resources to catch up in a given industrial sector, and then confront international competition. *Grands projets* have been the channels for "high tech colbertism" [Cohen 1992] through which the state directly took on the responsibility to develop an activity, in place of deficient private initiative. Modernization of the telephone network at the end of the 70s can be considered as the ideal example of a successful *grand projet*; in the 80s, the replication of the same logic of state intervention has been much more problematic.

*Success factors of a* grand projet

[21] TDF1 had been launched at the end of 1985.

[22] France does want to develop these new networks. See the conclusion, which deals in particular with an important 1994 official report to the Plan [Théry 1994].

E. Cohen [1992], identifies common characteristics of French *grands projets*, whatever the sector in which they have been experienced after the second world war (nuclear energy, high speed trains, ICTs...).

State initiative is implemented through the creation of a specific administrative body. The latter may preexist but, in order to accomplish its new mission, it needs to escape a number of administrative rules. In the case of the modernization of the telephone network for example, DGT both kept its administrative status and was allowed to behave as an industrial firm in order to invest massively and undertake a number of new ventures. A second fundamental characteristic is the fact that the State provides regular and sufficient funding to the *grand projet*. Here again, this usually implies departures from usual administrative and budgetary rules. In the case of DGT in the 1970s, the Ministry of finance was opposed to the methods used to allow funding to the catching up program out of the annual budget rule[23].

Innovation or technological prowess is only one element of a gr*and projet.* The *grand projet* actually creates a whole system which integrates research and industry. Integration is achieved through two complementary means. Firstly, the *grands corps* play a fundamental role because they are instrumental in having a homogenous elite controlling the whole program. Within the French civil service structure, "*corps*" are groups of officials of similar functions within a career structure. The *grands corps* are the most prominent and they are marked out by their small size and their strong camaraderie. They constitute main reservoirs of talent from which individuals are drawn for senior interesting posts. In the case of the telephone catch up program for example, the *corps* of telecommunications engineers played a key role. They have held important positions at CNET, DGT and industrial suppliers[24]. Traditionally, the *Ingénieurs des Mines*, one of the most influential *corps*, hold many of the key posts within the Industry Ministry... and within large companies. To a certain extent, *grands corps* generate a sort of substitute to business culture within the context of industrial policy and *grands projets*[25]. They have certainly played a key role in creating an integrated system with CNET-DGT and the industry in the case of the telephone program and another with CEA-EDF and Framatome in the case the development of the French nuclear energy.

The second important point is that this research-industry integrated system is publicly controlled: the *grand projet* subordinates industrial firms' objectives to the public mission. The State manages to impose national goals to industrial firms through technology transfers, public procurement and export promotion. *Grands projets* may thus succeed as vast techno-industrial ventures, but they cannot pretend to be profitable in the private sense of the term. As mentioned above,

[23] As mentionned above, this was achieved in particular through a five year planning contract.

[24] The latter can be public or private. Civil servants from "*grands corps*", be they engineers or not have numerous opportunities to move from the administration to large companies (the phenomenon has received a nick name in French : "*pantouflage*").

[25] But of course, these people have been trained as civil servants and have begun their careers in administrations...

*Grands projets* are not driven by a market rationale but, fundamentally, by a political one.

These characteristics of the *grand projet* constitue its key success factors. In other words, if some of these characteristics cannot be obtained, the whole system is upset and the government initiated project may well fail.

*Industrial policy in ICT*

After the successful modernization of the telephone network, the French state[26] wanted to replicate a *grand projet* type strategy in other information and telecommunication sectors. We saw above that this replication was much less successful. The failure may be related to the alteration of the environmental conditions which had been favorable to the initial program.

French industrial policy through *grands projets* constitutes one type of "closure" pattern [Cawson *et al*. 1990], that is to say one type of strategic action aimed at securing a dominant position in the market. In this pattern, the closure is dominated by the state which controls the government-industry relationship and chooses which firms to include and which to exclude. As we saw above, this control is necessary for the public strategy to succeed. The modernization of the French telephone network allowed the DGT to pursue an effective closure strategy which privileged certain firms because it has been able to use its procurement power. What happened in the 1980s is that the evolution of the technological and economic environment rendered this control over firms more and more difficult to achieve.

One source of difficulty in the 1980s lies in the very dynamics of the *grand projet*, or more generally of focused industrial policy. If industrial policy reaches its objectives, the developmental state breeds successful firms, which sooner or later will flex their muscles and force a bargained rather than a directed form of relationship with the state. This has been the case with the modernization of the French telephone network and the growing independence of CGE/Alcatel.

The two other sources of difficulties have to do with the evolution of the environment. Generally speaking, there is no such thing as a stable state-economy-society relationship since constant pressures force any apparently stable pattern to be continually reproduced. In the case of ICT, technological change and internationalization have acted as interdependent forces to reinforce the capacity and willingness of firms to implement their own strategy.

[26] The State is certainly not a monolithic actor. In the case of industrial policy in ICT, DGT was not the only administrative body to promote public intervention.

The introduction of digital technologies has led to a certain erosion of boundaries between telecommunication, electronic and computer sectors. Hence the very notion of ICTs and the recent excitement around multimedia. This evolution should also be related to the increasing interactions between industrial equipment and goods on the one hand and services on the other. The erosion of boundaries has triggered various strategies by which firms have attempted to complement their own resources with those of others. It constitutes one major explanation for the cooperative ventures trend. Given the structures of telecommunication, electronic and computer industries, interfirm cooperations were bound to have an international scope.

Internationlization has been a major force driving firms' strategies in most sectors since the 1980s and it certainly explains a fundamental recasting of industrial policies since national markets and national resources have become notoriously insufficient to succeed. France has battled to preserve national policies in the 80s, but has progressively aknowledged the consequences of globalization; the *national champion* strategy has become obsolete. One reaction from the French authorities has been to turn to the Community to try and reproduce their industrial strategy at the European level, as argued below in section 2.

## 2. Extending French policies to Europe ?

In the 60s, French industrial policy largely relied on the promotion of national champions, those firms which had been chosen as "instruments of a policy of industrial patriotism" [Hayward 1995] and which, as such, were supported by the State. At the end of the 60s, trade liberalization resulted in increasing international competition. In 1967, Jean-Jacques Servan-Schreiber forcefully explained that European firms were exposed to the "American challenge" and called for action. The idea was not to return to protectionist policies, but rather to promote the competitiveness of European firms. He actually proposed a eurochampion strategy by which governments would provide financial assistance to large European corporations, especially in electronics, data processing, aerospace and nuclear energy. J-J. Servan-Schreiber [1967] was ahead of his time since industrial policies remained largely national in scope, even if France did try to extend the national champion logic to European partners[27].

In the 1980s the context had become much different with globalization and the increasing pace of innovation requiring new approaches to competition, and thus to public policies. Since the end of the 70s, "national champion" like policies have largely lost their attractiveness. Firstly industrial policies have to a large extent been recasted as innovation policies. Secondly, globalization and the requirements of technological innovation have combined to stimulate international network research.

[27] France attempted to build pan-European consortia (such as Unidata in 1973 between Siemens, Philips and CII), but this failed in part because CII (which became Bull) decided to pursue a cooperation with the American firm Honeywell. See for example [Cohen, Bauer 1985].

In this context European level public policies appeared particularly attractive to promote innovation.

## 2.1 Fighting European weaknesses in ICTs

At least since the beginning of the 80s, ICTs appear as a persistent worry for European policy makers, both at the national and at the Community levels. This is due to the lag of European countries in fields which are largely interpreted as the driving technologies of the third industrial revolution and of the much heralded information society. European countries had implemented national policies to promote telecommunication and electronic industries since the 1960s, but these areas appeared as major priorities for Community wide policies in the 80s.

*ICTs and the Single market*

The recognition of the European lag in ICT and the need for cooperative action to retrieve the situation was a major spur to the initiatives which eventually lead to the Single European Market. ESPRIT (European Strategic Programme for Research and Development in Information Technology) was a major step in this process [Sharp 1991].

In 1980-81, Viscomte Davignon[28], invited the heads of Europe's leading electronics and IT companies to a series of discussions in order to probe the possibility of a 'precompetitive' research program. The model was the successful Japanese Very Large Scale Integration program (VLSI) in mainstream memory chips. Davignon worked with the so called 'Big Twelve'[29] through 'Round Table' meetings and came up with the idea of a strategic program based on the collaboration among European companies, as well as with universities and research institutes. This preparatory process eventually led to ESPRIT. In 1982, the Versailles European Summit agreed to lauch the pilot phase (1983-84) with a budget of ECU 11.5m[30]. The success of this phase enabled[31] to launch successively ESPRIT I (1984-88, ECU million 750), II (1988-92, ECU million 1600) and III (1990-94, ECU million 1300).

The preparation of ESPRIT and first collaborative research programs mainly involved the Big Twelve, that is to say old national champions. They were able to exchange views and information, so that they progressively came to a convergent

[28] Who has been Commissioner for Industry from 1977 to 1985 and Commissioner for Research and Technology from 1981 to 1985.

[29] ICL, GEC and Plessey from Britain; AEG, Nixdorf and Siemens from Germany; Thomson, Bull and CGE from France; Olivetti and STET from Italy; Philips from the Netherlands.

[30] The rule was that the Community funded 50% of the cost of the research ; 50% was industry funded.

[31] Judged in terms of the quality of the projects and of the high level of interest shown by firms.

analysis of the future. In particular, they thought that protectionism was not a sensible response to increasing competition in world ICT industries. Globalization required that European firms set their sights on foreign markets and improve their competitiveness. Moreover, once these firms had lost their national champion status, they became convinced that they should maximise the advantage to be gained from a truly European market. ESPRIT thus contributed to create a constituency pressing for the completion of such European wide unified market.

The need for a unified European market was felt beyond ICT industries. At the very beginning of the 80s, a number of European multinationals (including Volvo from Sweden), began to lobby in favor of more integrated markets in order to increase their competitiveness and fight *eurosclerosis*. Viscomte Davignon certainly welcomed their initiative and contributed to its success. The European Rountable of industrialists was thus formed to lobby in favor of Community wide programs[32]. The ERT was very active and successful in promoting the idea of a Single European market [Cowles 1995].

In september 1983, in this context of the preparation of the Single market program, the French socialist government issued a memorandum which advocated the creation of a "unified European industrial and scientific space" [France 1983]. The memorandum took European technological and industrial lag as its starting point. It drew a number of examples from ICT sectors to illustrate the dramatic situation of the European industry. The memorandum then resorted to a well known French argument by explaining that Europe was progressively falling into technological dependence (vis-à-vis the U.S and Japan). In order to face the "challenge of the third technological revolution", the memorandum recommended that industrial and scientific cooperation should be the next historical step of European construction.

According to the French memorandum, Europe's research potential was comparable to that of the United States but was less efficient because it was too fragmented. The solution consisted in promoting common research programs among European countries, instead of funding exclusively national ones. The idea was that Europe should go beyond ESPRIT-type programs and fund Community wide projects in such fields as new generations of semiconductors, telecommunication switchboards, satellites or biotechnologies. Policy recommendations focused on the promotion of cooperative research within Europe, but, beyond, the French memorandum suggested a number of policy instruments which could create a favorable context to forge European champions (adequate commercial policy and competition policy, European norms and public procurement, large infrastructure programs).

[32] At the time, it was formed between the following firms : Fiat, Renault, Volvo, Bosch, Shell, Unilever, ICI, Ciba-Geigy, Lafarge Coppée, Saint Gobain, Philips, Olivetti, Siemens, ASEA, Thyssen, Nestlé, BSN.

The French memorandum has been welcome and useful in advancing the Single market project [Cowles 1995]. However, it largely failed in its attempt to project French national industrial policy methods onto the EC plane. Its most radical proposals in terms of larger European research budget and stronger commercial common external policy have not been implemented[33]. The 1986, the Single European Act (SEA) gave for the first time a legal base to Community innovation policies, but the main rationale of the SEA and the achievement of the common market was liberalization and increased competition as a means to strengthen European firms' competitiveness [Sharp 1991, Sachwald 1994, 1997].

*Cooperative research: European and international ventures*

ICT concentrated the largest research funds in European framework programs, with two main programs, ESPRIT and RACE (R&D in Advanced Communications Technologies for Europe).

ESPRIT represents a watershed in the history of Community intervention in R&D because it introcuded a new approach[34]. It involved business from the very start and it was firms themselves which suggested those areas on which Europe should concentrate its efforts. This feature was certainly a major asset in the final acceptance of ESPRIT in 1982, because large European IT firms had first been sceptical about the ability of Brussels bureaucracy to run so ambitious a project [Guzzetti 1995].

[33] This episode may be compared to President Mitterrand's 1985 EUREKA initiative. For France, EUREKA, which was proposed as a counter to President Reagan's Star Wars program, could have been an ambitious research initiative. Actually, EUREKA was implemented as an umbrella mechanism for encouraging collaboration between firms from all Western European countries.

[34] [Guzzetti 1995] explains the main historical steps in the Community research policy since the 50s. For IT, see also [Sharp 1991].

Table 3. European R&D framework programs

| Research and technological fields (main programs) | 2nd framework program (1987-91) | 3rd framework program (1990-94) | 4th framework program* (1994-98) | |
|---|---|---|---|---|
| | ECU million | ECU million | ECU million | % |
| Information and telecommunication technologies (ESPRIT, RACE, telematics...) | 1 600 | 1 350 | 3 626 | 27.7 |
| Industrial and material technologies (BRITE, EURAM...) | 665 | 750 | 1818 | 13.9 |
| Standards, measurements and testing | 180 | 140 | 307 | 2.3 |
| Energy | | | | |
| - nuclear fission | 470 | 200 | 441 | 3.4 |
| - Controlled thermonuclear fusion | 610 | 460 | 895 | 6.8 |
| - non nuclear energy (JOULE...) | 120 | 160 | 1067 | 8.1 |
| Life sciences | | | | |
| - biotechnologies (BRIDGE...) | 120 | 165 | 588 | 4.5 |
| - Medecine, health (MHR, BIOMED...) | 80 | 130 | 358 | 2.7 |
| - Agriculture, marine sciences (ECLAIR...) | 190 | 330 | 971 | 7.5 |
| Environment and climate (STEP, MAST...) | 260 | 415 | 907 | 6.9 |
| Transport | - | - | 256 | 2.0 |
| Targeted socio-economic research | - | - | 147 | 1.1 |
| Training and mobility of researchers | 290 | 520 | 792 | 6.0 |
| Total | 5 400 | 5 700 | 12 300 | 92.9** |

* This includes the original budget of ECU 12 300 million plus ECU 800 million due to the accession of Austria, Finland and Sweden.
** "Cooperation with third countries and international organisations" represents 4.4% of the budget, "dissemination and optimisation of results", 2.7%.
*Source*: EU Commission

ESPRIT, which has represented a relatively modest effort in terms of public funding[35], has enabled to dispell mistrust among large European IT firms. The latter considered themselves as competitors and would not work together. As a result of cooperation, R&D efforts could reach the critical mass held to be indispensable for profitable research. The program was also useful in this perspective in that it stimulated firms to cooperate accross traditionally separated disciplines. Cooperation has reached accross sectors and has thus helped extending the range of applications of IT in both traditional and innovative areas [Guzzetti 1995].

Over the whole experience of ESPRIT, cooperation has involved increasingly diversified participants. During the first pilot phase, the Big Twelve were represented in 70% of the project approved. From ESPRIT I on, smaller companies participated more, even if was often along with large firms (50% of the total number of projects). Besides, research bodies took part in 71% of ESPRIT I projects. In ESPRIT II, the influence of the Big Twelve further diminished, leaving more scope for small and medium-sized firms. This diversification of participants weakens the criticism of ESPRIT as a means to transfer the power of former national champions

[35] The Review Board of ESPRIT I (1984-88) estimated that its budget (ECU 1500 million) represented 6% of the total Community R&D investment by industry in information technology.See also [Gusmao 1997].

at the European level[36]. Conversely, the argument could be strengthened by the fact that projects have tended to drift away from the "pre-competitive" stand set as a requirement in the early programs towards more close-to-market projects.

The analysis of the distribution of ESPRIT projects among European firms is only one aspect of the assessment of the program. Another important one is the influence of ESPRIT over the world distribution of cooperative ventures of large European firms. Indeed, one recurrent preoccupation of European authorities has been that firms would rather cooperate on R&D projects with American and Japanese partners rather than with European ones[37]. This trend has been one of the motives for programmes such as ESPRIT [Guzzetti 1995]. French authorities have been traditionally particularly preoccupied by the phenomenon. This attitude has to be related to the national champion policy, which tends to lean in favour of European champions rather than leave firms choose what they consider could be the most relevant partners. This has been the case for example in the computer industry over the 1960s and 70s and in the video recorder sector in the 70s [Cohen, Bauer 1985].

ESPRIT has been an efficient channel to increase, both quantitatively and qualitatively, intra-European cooperations[38], but it has not supressed the need for firms to turn to American and Japanese partners in order to complement their R&D resources in IT[39]. Michael Hobday [1994] has examined the case of semiconductors in detail from this point of view. He shows that cooperation between European and American firms, through various external growth operations, has been an enduring pattern over the 80s, even if intra-European agreements have progressively become relatively more important. According to him, "*the outward orientation is fairly natural, historical set of linkages which enable European firms to gain access to superior US (and to a lesser extent Japanese) technology, as well as the US market... In areas where US and Japanese firms lead, intra-EC partnerships could well be suboptimal*." [Hobday 1994, p.173]. As a result, when there were conflicts between corporate strategy and EC policy, semiconductor firms gave priority to their own objectives over public policies. Siemens and Philips for example were involved in pan-European partnerships such as JESSI[40], but also entered joint ventures with IBM (Philips) or Toshiba (Siemens). Siemens also rejected the

[36] A somewhat different argument emphasizes the role of cooperative research between main IT groups in creating a "technological oligopoly" [Mytelka 1991].

[37] See [Sachwald 1994] for a review of empirical studies on this point.

[38] This observation has been made more generally by studies of European R&D cooperative programs [Laredo 1994, Gusmao 1997].

[39] This argument can also be made more generally about external growth operations by European firms from the mid-80s to the mid-90s [Sachwald 1994, 1997]. M. Sharp *et al*. [1994] showed this in detail in the case of biotechnology.

[40] The Joint European Sub-micron Silicon Initiative (1988-95) has been a major Eurêka program. It focused on the development of new generation DRAMs and EPROMs by European firms. The EC funded 12% of the cost of the project (ECU 3bn) under its framework program. Many of the semiconductor projects ESPRIT III were linked to JESSI. In 1996, MEDEA (MicroElectronics Development for European Applications) was launched as a successor to JESSI.

EC policy idea to build a giant European chip operation through a merger with SGS-Thomson[41].

The example of EC policy in the area of semiconductors thus leads to a similar conclusion as the examination of French industrial policy towards national champions in the 70s [Cohen, Bauer 1985]: large firms retain sovereignty over decision making, regardless of public wishes and subsidies. In both cases, the underlying rationale is the same: only firms are in a position within markets to take strategic decisions and they certainly emphasize their expertise against governmental wishes and proposals. As a consequence, public policies will be more successful when their objectives coincide with corporate strategies. It can be argued that it was the case for semiconductors in the 80s, when Siemens' and SGS-Thomson's dynamic strategies were reinforced by public support in R&D. In the 90s, the Franco-Italian firm, SGS-Thomson, has achieved better performances than expected when it was formed in 1987..

Another important conclusion with respect to public policies, in the field of innovation in particular, is that they should not support very close-to-market projects [Hobday 1994]. Besides the usual economic argument in terms of public goods (which mostly supports policies in basic research), this conclusion follows from the fact that close-to-market projects are highly influenced by firms' strategies.

## 2.2 High Definition Television

At the end of the 80s, High Definition Television (HDTV) could appear as an opportunity for French policies to prove their effectiveness in grand modernization projects. Indeed, the European consumer electronic industry was suffering from saturated markets and overcapacity. It had lost the previous battle, leaving the Japanese manufacturers dominate the VCRs and camcorders segments, which were the most profitable of the industry. To overcome the saturation of the television market worldwide, all manufacturers were keen to introduce a significant new technology that could have revitalised sales. In this context, HDTV, aiming to provide cinema quality pictures, was identified as just the technological development which the consumer electronic industry had been desperately waiting for. Moreover, it was also considered as a large potential market for semiconductors.

### *Fighting Japanese domination*

Japanese producers had managed to dominate the video segments of the consumer electronic industry by clever market strategies to impose *de facto* the VHS standard for VCRs. In the mi-80s, Japanese manufacturers were ahead of

[41] See also below, about Thomson's and Philips' strategies with respect to HDTV.

both Europeans and Americans and proposed a world standard for the future HDTV. Japanese manufacturers saw the possibility to establish a single standard while traditional color television had different standards according to countries[42], which constituted a sort of natural protectionism for markets. So the issue was clearly whether there would be a single - Japanese - world standard, or whether Europeans would succeed in developing their own standard. France took the lead of resistance to the Japanese strategy. At the 1986 CCIR[43] held at Dubrovnik, the Americans backed the Japanese proposal in favor of the adoption of their MUSE standard[44], but Europeans, which had been convinced by the French argumentation [Cohen 1992], managed to have the decision postponed until 1990.

One major difference between the MUSE standard and what Europeans proposed to work at was the fact the future European standard would not require that all equipement and consumer TV sets be changed[45]. But that would nevertheless be necessary if they wanted to receive effectively better, high definition, images.

After their political success in the war of standards in 1986, Europeans had to develop a competing technological solution. Traditionally rival firms, such as Philips and Thomson, found a cooperative framework with the EU95 HDTV Eurêka research program (1986-92). This program has been efficient in orchestrating research efforts from about 30 participating firms[46]. As a result, in 1988, Europeans were able to demonstrate the feasibility of their technical solution (which nevertheless relied on a number of Japanese components). This technical success could have been the first step in a French *grand projet* of catching up with the Japanese. Actually, such a scenario will prove impossible both because of the rapid pace of innovation in television technology and because of uncontrolable strategies from diverse actors, and more particularly from TV broadcasters.

*Meeting consumer demand*

Terrestrial broadcasting of the MAC standard would have provided few benefits for the viewer, or for the broadcasters. HDTV required satellite broadcasting in order to

[42] NTSC in the U.S., PAL in France and SECAM in the rest of Europe.

[43] Consultative Committee for International Radio. The process of standard-setting involves national broadcasting organizations and national governments.

[44] Multiple Sub-Nyquist Encoding. It had been developed by the Japanese state broadcasting authority NHK. It was supported by the MITI, the Ministry of Post and Telecommunications and leading Japanese firms [Dai *et al*., 1996].

[45] The idea was to work on the British MAC (Multiplexed Analogue Components) standard to elaborate an intermediate standard (D-MAC or D2-MAC).

[46] The program also included associate participants; the total number of participants reached 60 in 1991 [Dai *et al*. 1996]. Public funds contributed to research spending for 35 to 50% [Cohen 1992]. The specific HDTV research program was part of a larger European research strategy since certain projects from ESPRIT, RACE and JESSI were developing components which were necessary to HDTV. France also subsidized Thomson for its R&D on HDTV.

yield its greatest benefits in terms of image quality[47]. But direct broadcasting by satellite (DBS) suffered a number of setbacks in European countries at the end of the 80s. In november 1986, the European Commission issued a directive (expiring at the end of 1991) which gave the MAC/ packet family official status as the standard to be used by direct TV broadcasting satellites accross member countries. DBS were supposed to be launched in 1986-88, but were delayed by financial or technical problems [Bloom 1994]. In 1988, the Luxembourg based SES-Astra (*Société européenne de satellites*) launched its first private low power telecommunication satellite and rented several channels to Rupert Murdoch. He began to broadcast Sky-TV programs in february 1989, using the PAL standard[48]. This technical solution made it possible to increase the supply of programs without extra-decoding devises. This idea was thus that TV viewers were more interested by new inexpensive channels than by high quality images. Rupert Murdoch's analysis was correct and Sky became a strong first mover. When British Broadcasting Satellite service was introduced 14 months later, it could not withstand Sky competition. At the end of 1990, Sky took BSB over and stopped its D-MAC broadcasting. In France, Canal +, which wanted to protect its proprietary system of decoding also resisted D-MAC broadcasting [Cohen 1996].

In the meantime, the American administration began to change its mind on standards. In 1990, the American cable-TV equipment maker General Instrument revealed that it had devised a way to compress and transmit digitally HDTV signals within a norma 6MHz channel. This opened the way for a full digital system and the American administration decided to launch a tender to provide a terrestrial digital HDTV system. A fully digital system was actually not available[49], but this attitude has been important to the extent that it undermined the Europen standardization attempt. European governments and the Commission progressively changed their approach between 1991 and 1993 and finally supported production of wide-screen television programs an any technicla format [Cohen 1996, Dai *et al*. 1996]. Since 1993, the Commission rather focuses on regulation and competition policy. During the second half of the 90s, digital satellite TV has been developing in the US and operators have tried to capture part of the cable market[50]. They have also made some attempts to penetrate the European market.

What appears clearly is that the French conception of the appropriate policy (influencing the European approach) focused mainly on infrastructure and networks, while cooperation with broadcasters and program-makers was crucial. As a result, consumer electronic firms have been waiting before they launched massive investments in reception equipment (antennas, decoding devices). The whole technological and industrial dynamic was thus blocked. Actually, HDTV did not lend itself to a *grand projet* strategy because technology was not settled enough

[47] With cable holdiong an intermediate position between terrestrial and satellite broadcasting.
[48] Astra launched low power telecommunication satellites which were outside the scope of the European Commission's broadcasting directive (limited to high-powered DBS services).
[49] On the different attempts and proposals since then, see [Dai *et al*. 1996].
[50] In 1997, US satellite broadcasters had about 4.5 million subscribers, while more than 65 million homes subscribe to cable channels.

and because decision makers were too dispersed[51]. The European dimension constituted a further obstacle to the success of a French type *grand projet*. Finally, it is interesting to remark that consumer electronic firms like Thomson and Philips benefitted from subsidies within the European policy, while they constituted a research consortium on fully digital technology in the U.S [Cohen 1996]. As the survival of the European standard appeared to be increasingly uncertain in the 90s, Thomson and Philips increasingly used public funds for HD-MAC and saved their own resources for development work on digital systems [Dai *et al*. 1996]. In 1993, Thomson Consumer Electronics won the first world market for decoder of digital signals opened by the American satellite TV, DirectTv [Théry 1994]. In 1995, Thomson had sold a million decoders in the US and signed a contract with Canal + in France to supply such devices for digital TV in Europe [Thomson 1995].

## Conclusions: Information highways and information society

### *Providing for infrastructures*

France's vision and policies in ICT have been strongly influenced by the traditional structure of its innovation policy and in particular by the importance of "*grands projets*". In the case of ICT, the latter was strongly reinforced by the success of the rapid modernization of its telephone network with the δLP program at the end of the 70s. The specific characteristic of the *grand projet* was the strong relationship which it established between innovation and industrial policies through the equipment phase. We saw above that the role of public procurement was crucial to the success of any *grand projet*. As a result, the *grand projet* was particularly well adapted to infrastructure programs, like those in the nuclear industry. Success was already been more mitigated in high speed trains or aerospace with the production of a famous "white elephant", Concorde.

After the sucessful modernization of the telephone network, DGT tried to reproduce the logic of the *grand projet* by devising new ICT infrastructures. The attempt failed because DGT had actually entered into a new game, with new technologies, but also diversified potential new products and markets. Technologies as well as demand were much more uncertain and DGT did not possess the necessary entrepreneurial and commercial competences to succeed. It entered a new game without realizing that the environment conditions were so different from its previous experience, where the procurement relationship had been more central.

In 1994, the Prime Minister, Edouard Balladur, commissioned an official report on information highways to Gérard Théry, who had been head of DGT during the δLP modernization program. The objective was both to build a French vision of the

[51] This analysis, based on the requirements for a *grand projet* to be successful (see above) is developed by [Cohen 1996]. [Cawson *et al*. 1990] reach the same type of conclusions about what they call "closure" strategies in different segments of the eclectronic industry.

potential development of information highways and to make policy recommandations. This report [Théry 1994] constitutes an interesting step in France's policy making in ICT because it is still influenced by the *grand projet* mindset, but takes into account the specific features of products and markets to be developed. As a result, the report firstly recommends to launch an ambitious policy of optical fiber network building. One traditional argument is that France is less equiped than other countries, not only the United States, but also Germany in particular. In this perspective, G. Théry [1994] mentions the experience of the telephone modernization to argue that the infrastructure effort should be massive so as to enable French firms to realize economies of scale and experience. The author considers that the effort is financially reasonable and would enable France Telecom to take advantage of its technological advance with ATM techniques[52]. At the same time, G. Théry [1994] suggests to launch experiments in order to devise and test new services, which could represent future markets. These latter recommandations have actually been the more influencial on French recent ICT policies.

*The development of services*

Recent French policies in ICT emphasize the importance of deregulation on the one hand and of the development of services and software on the other hand. The idea is that public policy should stimulate interactions between infrastructures, equipment and innovative uses of ICTs. Policies sould not simply aim at information highways, that is to say infrastructures, but at developing the information society.

In the 1990s, the policy of the French Ministry of industry actually focuses on the promotion of innovative information services, which should be tested before launching an ambitious investment policy in broadband infrastructures. In 1994, the Ministry started to support innovative projects which mainly aim at testing new services[53]. These projects are quite diverse: press, information teleservices, teaching, electronic commerce, health services... In february 1996, the Ministry[54] has launched a new call for propositions aimed mainly at small and medium enterprises. This was again a success, with more than 600 proposals. French administrations participate to the experimentation strategy. All ministries have opened web sites and are working at developing them. According to the Industry Ministry, the project to use electronic individual cards and a national network as part of the health service represents a "major step towards the French information

[52] Asynchronous transfer mode, a standard for high-speed packet switching, providing quality of service and bandwidth management features. As we saw above, this argument of the technological performance is also a quite traditional one. Equipment and diffusion gap is emphasized by a recent official report from the Senate [Lafitte 1997].

[53] 500 projects out of the 635 which have been submitted to the Ministry after the 1994 call aimed at developing services rather than infrastructures. The data base relating to these projects may be accessed through Internet (www.telecom.gouv.fr.).

[54] This was done in collaboration with ANVAR (*Agence Nationale de Valorisation de la Recherche*), which focuses on innovation by SMEs. FF 1.9bn are available for this operation.

society"[55]. The Ministry of Education, in collaboration with local authorities, aims at increasing substantially the equipment of schools with microcomputers and access to information networks[56]. France also supports the development of multimedia products (with a budget of FF 17.5bn in 1996). Besides direct and financial support, the Industry Ministry monitors complementary measures relating to network security, cryptology, electronic billing and electronic signature[57].

*Information society calls for innovative policies*

Various studies and reports consider that past innovation policies in ICTs have had mixed results. The best example is the Minitel because it has been considered as a success (as explained in the text above). Its large diffusion means that a large part of the French population has become familiar with network services and electronic commerce. However, the specific and closed Minitel-Teletel system may now constitute an obstacle to the wider diffusion of more diverse opportunities through Internet. This is one reason why the French government experiments with less interventionist policies. It supports private intiatives rather than proposing a grand innovative and centralized project, which of course is less impressive and may seem less efficient.

Actually the present stance of public policies in favor of the diffusion of ICT corresponds to the evolution of France's innovation policy in general. P. Mustar [1994] has argued that since the 80s, French innovation policies have become less colbertist. In particular, innovation policy is less centralized and less focused on *grands projets*. Policies give a more active role to firms, including SMEs to a certain extent. In particular, French authorities have developed various schemes to facilitate cooperation between firms and public laboratories or universities. As a matter of fact, the adequacy policies in favour of ICT should not be narrowly considered. For example, a number of studies as well as innovators have pointed to the insufficient development of private venture captial, which constitutes an obstacle to the development of start-ups in all high tech industries. Innovation in favor of ICT should thus benefit from the further evolution of French innovation policy in general.

France now pays more attention to the diffusion objective of innovation policy. Colbertist policies have proved well adapted to technological breakthroughs, the implementation of which relies on public procurement. Conversely, as we saw in this paper, they are ill suited to promote diffuse innovations related both to technological advances and to new social practices. The evolution of French

[55] Interview at the Ministry of Industry.

[56] The idea is to avoid the mistakes which led to the failure of a previous school equipment program in the 1980s [Lafitte 1997]. Problems were related to a centralized choice in favour of French computers and to the lack of adequate software.

[57] It also follows closely international developments and negociations on these matters, which are fundamental for electronic commerce. The U.S on the one hand and a number of European countries on the other hand have different positions on some issues.

innovation policies thus corresponds to the characteristics of the so called "third industrial revolution" which actually has much to do with services. Moreover, both the pace and the diversity of the innovation process makes centralized policies quite ill adapted. Besides these technical considerations, the evolution of French innovation policies has to do both with convergence between industrial countries in these matters and with the growing role of EU policies[58]. The European budget in R&D is modest, but it supports important pre-compeititve research, leaving relatively more responsibilities to national policies in terms of diffusion. Besides, it promotes international cooperation between firms and academic laboratories.

[58] R. Gusmao [1997] argues that European cooperative R&D programs now exert a strong influence on the choice of research subjects by French laboratories. See also [OCDE 1995].

## References


Aurelle, B., 1986, *Les télécommunications*, Paris, La Découverte.

Blanché, J., P. Barbet et L. Benzoni, 1993, "Le secteur des télécommunications", B. Coriat and D. Taddéi (eds.), *Made In France/2*, Paris, Le Livre de Poche.

Bloom, M., 1994, "The Consumer Electronic Industry," Sachwald, F., (ed.), *European Integration and Competitiveness*, Aldershot: Edward Elgar.

Bouwman, H., Latzer, M., 1994, "Telecommunication Network-Based Services in Europe", C., Steinfeld, J. Bauer and L. Caby (eds.), *Telecommunications in Transition*, Thousand Oaks: Sage Publications.

Carré, P., 1993, *Le téléphone. Un monde à portée de voix*, Paris, Gallimard.

Cawson, A., Morgan, K., Webber, D., Holmes, P. and Stevens, A.,1990, *Hostile Brothers. Competition and Closure in the European Electronics Industry*, Oxford: Clarendon Press.

Chamoux, J-P., 1993, *Télécoms, la fin des privilèges*, Paris, PUF.

Cohen, E., 1992, *Le colbertisme "high tech",* Paris, Hachette.

Curien, N., Gensollen, M., 1992, *Economie des télécommunications. Ouverture et réglementation*, Paris: Economica.

Dai, X., Cawson, A., Holmes, P., 1996, "The Rise and Fall of High Definition Television: The Impact of European Technology Policy", *Journal of Common Market Studies*, June.

EITO, 1997, *European Information Technology Observatory 97*, Frankfurt.

Ergas, H., 1987, "Does Technology Policy Matter?", B. Guile and H. Brooks (eds.), *Technology and Global Industry*, Washington D.C.: National Academy Press.

France, 1983, "Les propositions de la France pour la création d'un espace européen industriel et scientifique unifié", Luxembourg: *Europe Documents*, n°1274.

Gusmao, R., 1997, "Le poids de l'Europe dans le système français de recherche", *Futuribles*, juil-août.

Guzzetti, L., 1995, *A Brief History of European Union Research Policy*, Luxembourg: Office for Official Publications of the European Communities.

Hayward, J., 1995, "Europe's Endangered Industrial Champions", J. Hayward (ed.), *Industrial Enterprise and European Integration*, Oxford: Oxford University Press.

Hobday, M., 1994, "The Semiconductor Industry", Sachwald, F. (ed.), *European Integration and Competitiveness*, Aldershot: Edward Elgar.

Libois, L-J., 1994, *Les télécommunications, technologies, réseaux, services*, Paris, Eyrolles.

Lafitte, P., 1997, *La France et la société de l'information*, Rapport de l'Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques, Paris, Sénat, 7 février.

Martin-Lalande, P., 1997, *L'INTERNET : un vrai défi pour la France*, Paris, Report to the Government, Paris.

Miléo, T., 1996, *Les réseaux de la société de l'information*, Paris, Commissariat Général du Plan.

Mustar, P., 1994, "La politique d'innovation en France : le colbertisme entamé", Sachwald, F. (ed.), *Les défis de la mondialisation. Innovation et concurrence*, Paris, Masson.

Nora, S., Minc, A., 1978, *L'informatisation de la société*, Paris: La Documentation Française/ Seuil.

OECD, 1995, *Politiques en matière de technoliges de l'information : structure organisationnelle dans les pays membres*, Documents de travail, n° 43, Paris: OECD.

Sachwald, F. (ed.), 1994, *European Integration and Competitiveness*, Aldershot: Edward Elgar.

Sachwald, F., 1997, *L'Europe et la mondialisation*, Paris: Flammarion.

Servan-Scrheiber, J-J., 1967, *Le défi américain*, Paris: Denoël. (English edition, 1969, Pelican)

Sharp, M., 1991, "The single market and European technology policies", C. Freeman, M. Sharp and W. Walker (eds), *Technology and the Future of Europe*, London: Pinter Publishers.

Sharp, M., Thomas, S., Martin, P., 1994, "Transferts de technologies et politique de l'innovation : le cas des biotechnologies", Sachwald, F. (ed.), *Les défis de la mondialisation. Innovation et concurrence*, Paris: Masson.

Thèry, G. ,1994, *Les autoroutes de l'information*, Paris: La Documentation Française.

Thomson, 1995, *Annual Report*, Thomson Multimedia.