

Progress Report

on the trends in 2005 with regards to the main proposals found in the report by the *Conseil stratégique des technologies de l'information* (Strategic Advisory Board on Information Technologies) of 30 mars 2005:

“General proposals to stimulate competition, growth and employment”

Mrs. Françoise Roure
Mr. Jean-Claude Mailhan
M. Jean-Pierre Souzy
Mr. Jean-Claude Gorichon

Comptroller General
General Engineer
General Engineer
Comptroller General

At its 30 March 2005 meeting, the Strategic Advisory Board on Information Technologies (CSTI - <http://www.csti.pm.gouv.fr>) published a report called *Plateforme de propositions pour dynamiser la compétitivité, la croissance et l'emploi* (General proposals to stimulate competition, growth and employment). The report was prepared by a group bringing together institutional ICT players (CGTI, RNRT, RNTL, RIAM, MEDEA+, Syntec Informatique, CIGREF, and Alliance TICS) and was the outcome of extensive consultations with several CSTI members before its final approval at the said meeting.

The purpose of the document was to provide a global outlook on the major role of ICTs in increasing developed countries' competition and growth in France and in Europe, compared to the other great world powers. The report also conducted a systemic analysis of the crucial factors explaining France and Europe's growing gap in these fields and submitted basic proposals that could halt the current trend so that they could once again emerge as prime movers reaping the economic benefits stemming from a few new technologies, among which ICTs, within five years. Therefore, the report wanted to lay the foundations for policies conducive to putting France and Europe back in the lead of developed countries, in one of the rare industries that determines tomorrow's economic growth and competitiveness; foundations shared by all the relevant professions, solutions providers or users alike.

On 15 November 2005, CSTI Delegate Chairman asked the *Conseil général des technologies de l'information* (CGTI, General Council for Information Technologies) to prepare an assessment of reported trends in the field covered by the report. The purpose was to assess the reported trends within a world outlook and the significant advances and movements that were going in the same directions as the ones pinpointed in the document. That is the object of this memorandum, which will only address the striking factors in terms of present or future impact.

I – The Changing International ICT Situation

First observation: the differentiated impact of ICTs on competition and growth is unanimously recognised and substantiated.

The consensus of macroeconomists is remarkable. Most attribute the growth gap between the United States and average growth in the European Union - an ongoing gap despite accidents in the economic cycle, in 2006 - to the US's innovate exploitation of ICTs, in the ICT supply sector per se, and to the way ICTs uses are put to work to transform the processes of the economic society. Closer to home and to a lesser extent, the Scandinavian countries in Europe are an example of this.

Although relocations, which still mostly affect industrially manufactured products, are also seen as a threat in the US, they strengthen the drive of an innovative ICT market, which is considered as the only positive answer to the threat, in that country.

The build-up in Asian countries is also evidence of their priority investment in ICTs, seen as a major factor of their future economic power. Korea, which already earns 20% of its GDP in this field, is aiming for 29% over the next five years. China and India are pursuing the same strategy. After a difficult decade, Japan is the only developed country investing as much in ICT R & D as the United States (% of GDP), viz., twice as much as France and the European average (see Chapter on R & D below).

The drive of ICT innovation, bringing with it future growth, can also be seen in patent filing where major US ICT companies (IBM, Microsoft, and so on) share the top of the honour roll with Korean, Japanese and Chinese groups.

Finally, after the uncertainties and excesses of the “Internet bubble”, the Stock Market has clearly regained its faith in the outlooks for high technology, as the upswing of so-called “technological” shares shows. Indeed the rise is rooted not only in a random anticipation of future markets but based on actual economic results (Google, Yahoo, eBay and others).

Second observation: the capacity of ICTs to be a differentiating factor for competitiveness and growth relies on an ability to take the technologies and resulting innovations and put them on the market. The French deficit in this area gives cause for concern.

In other words, developing business is still a critical engine driving innovation fuelled by information technologies. The move may be spurred by the incumbent players radically and innovatively changing the models of their in-house operations or their relations with suppliers and customers (Wal-Mart in retailing) to preserve or increase their competitive advantage or by new players developing fresh online modes (eBay in retailing, Apple in music downloading with the iPod).

This orientation is compatible with societal concerns, the domain of the public authorities’ competence. Clearly, this does not lead to the withering away of R & D under pressure from short-term “mercantile” concerns. On the contrary, R & D is seen as the breeding ground for the long-term fertilisation of innovation drive, which is US society’s true strategic option.

The ability to nurture a business flow without which no meaningful economic impact can be hoped for, is also rooted in American capability organised in such a way as to promote the creation of start-ups (a capability also extant in France) and especially to support the ongoing growth of small businesses that are becoming large SMEs with international visibility. Today’s new market leaders come from these businesses and the few new leaders in the next five or ten years will come from the businesses now taking shape.

A recent report by the *Conseil d’Analyse Economique* (French Council of Economic Analysis) has impeccably underscored that a structural problem of the French economy, particularly in the area of new technologies, is SMEs’ inability to grow beyond a 100-person staff and acquire more than national visibility. As a result, the business pyramid according to company size suddenly hollows out at the centre, as was highlighted by OSEO-ANVAR - a situation in sharp contrast with the continuum observed in the United States, for example.

The deficit of France and of Europe in general in the industries fuelling market development (*see below*) must urgently be corrected. This can only be accomplished through sustained and medium-term effort.

Third observation: 'immaterial' technologies, specifically middleware, are increasingly building up contents; they are the technological sector guiding and driving the market.

The 2005 report insisted on the driving and strategic role of software technologies, as can be seen by Microsoft's virtual monopoly of middleware (Windows as a communication tool between Internet 'applications'), making the company the leader on the innovation market and threatening to place the more traditional stakeholders (computer or telecom equipment suppliers and telecom operators) in a situation of strategic dependence.

With regards to this situation, 2005 saw noteworthy trends, which have only strengthened the major role of software technologies in market development, even if new players are now seriously challenging Microsoft's de facto virtual monopoly.

- In communications between Internet applications, an area where Microsoft had a virtual monopoly with Windows, the build-up of international standards (Open Source, PDF for document) has reopened the supply market by providing dependable industrial alternatives (IBM, Sun Microsystems, etc.).
- New players (Google, Yahoo, eBay, and others) are now challenging Microsoft's domination through strategies including Internet communication middleware. However, the strategies focus on tools and the related economic models targeting content presentation and onlining.

We believe that the move toward growth-promoting software supply, new economic models and new types of content use is a heavy trend, meaning that the incumbent players (telecom equipment suppliers, telecom operators, multimedia content producers, and so on) will have to continue tailoring their responses through offensive strategies. It only takes a quick look at the actual weight of the Walt Disney Company and Apple in the recently announced project,¹ at the difficulties encountered by certain alliances between telecom operators, cable network operators and production studios, and at the waning strategic influence of Lucent, Nortel and even of Nokia or Cisco, to realise that the centre of gravity has kept moving toward those who control the software solutions enabling the new mechanisms that connect end-users with technological content-producing measures.

¹ Announcement on 4 January 2006 that Disney will be supplying additional content to Apple's iTunes Music Store music and video software.

The market trend in these fields is still ongoing in the United States. Asia clearly has strategies to become involved in the medium-term. Although the European market is huge, Europe and France seemed resigned to the decline of their productive activity, aside from several initiatives targeting special sectors (the virtual library) with but a weak impact on economic life.

- Finally, the emergence of a society where the Internet enables communications not only between people but between objects (cars, home appliances, and so on) as well, is taking shape as a credible reality within the next five to ten years. This will be an actual revolution as it modifies the scale of the economic stakes and radically alters lifestyles. The revolution will also focus on the type of players knowing how to 'invent' technological solutions as well as business choices commensurate with a solvable market. These players will unquestionably be the prime movers controlling both middleware and the technologies conducive to the development of new contents.

These three highly significant trends can be analysed from two angles.

- They reinforce the glaring need for France and Europe to develop projects so they can be among the leaders in the above-mentioned software sectors. This is not always the case today and even the, albeit excellent, ICT projects selected for the competitive clusters are not likely to fill the gap.
- They reinforce the fact that the speed of ICT changes will clear the way for opportunities to re-enter the international race in the near future, provided that the conditions for rolling out a precise strategy are secured over time; a strategy that it would be advisable to define, if possible in EU agreements, starting with the several countries that are driving forces in the field.

II – The current trend of the world environment substantiates the analysis and proposals in the CSTI 2005 document

<p>The trend of the world environment, as recalled and analysed in the preceding chapter, clearly shows that <u>the analysis developed in the 2005 CSTI document is still valid and substantiated in view of current trends. In our opinion, the proposals are all the more relevant and urgent.</u></p>
--

Chapters III, IV, V and VI provide a detailed analysis of the measures compliant with the proposals, which were rolled out in 2005, and recall the main suggestions that, for the most part, still have to be deployed.

Nevertheless, three points, which had been insufficiently (or not at all) developed in the 2005 document, clearly need to be detailed.

II.1 – The relation between the ICT drive, growth and employment

The report established that ICT contribution to growth was substantial. The United States' durable, high ICT investments enable the country to develop considerably higher² economic growth than other industrialised countries. ICT dissemination accounts for two thirds of the additional growth while productive industries account for a third.

On the other hand, the report barely deals with ICT impact on employment, aside from a macroeconomic analysis that, along with numerous international economists, considers that the drive of the ICT industry strictly speaking on the one hand, and the intensive and 'intelligent' use of ICT by sectors of the economy to generate productivity gains and develop new business models, on the other, are strong differential growth factors, therefore job-generating.

The analysis below develops the impact of ICT dissemination on employment. It also deals with the risks of job relocation in the ICT manufacturing industry.

ICT dissemination increases productivity, improves competitiveness, and promotes growth.

A business invests in ICTs to stay in the race against its competitors and to increase its productivity. A firm is all the more likely to make such investments as computer prices are steadily dropping. At first and at constant production, an ICT capital increase entails the decrease of unskilled jobs. Actually, the automation of production processes or of management tasks causes productivity gains as the ICT investment replaces recruitment or entails the non-replacement of an employee leaving a job. Consequently, employment, mainly unskilled labour, drops.

However, the report underscores that ICT investment only leads to improved productivity if the following conditions are met, i.e.,

- The deployment of ICTs generates a product that has to be finalised by organisational measures (*Business Processing Reengineering*).
- The higher the initial amount of ICT equipment, the more another ICT investment is productive, due to growing rate of return from ICT deployment

Furthermore, ICT impacts on productivity are probably greater as well as more diffuse than those that can be directly measured today. The networked dissemination of new uses is a source of gains in competitive advantage and growth whose effects will only be felt in the long run. Also, reengineering projects require a lot of time before successful completion.

² Sustained, high US growth over the past decade was made possible by ICTs. Estimated ICT contribution ranged from 0.9 to 1.5 growth points per year in the United States during the second half of the nineties compared to a maximum of 0.3 to 0.4 yearly growth points in France.

ICT investments may also entail the creation of skilled jobs,³ especially for the deployment of the matching tools and required support measures. However, these jobs hardly compensate for the loss of production or management positions due to productivity gains.

The impact on employment only becomes positive during the second stage. With ICTs, the business has new capabilities for differentiating and customising its supply, thus improving how it tailors its products to demand. It also has increased innovation capabilities giving it an edge over its competitors. Thus by making a business more competitive, ICTs help it expand its markets and increase its production, and correlatively employment.

Furthermore, ICTs promote an abundance of new uses that spur new demand (consumer electronics, digital photo, mobile telephony, computer exchanges, messaging, DTT, and so on). ICTs even generate new fast-growing segments in many industries of the traditional economy, e.g., online banking, e-business, travel & leisure, music and video, and so on. The booming demand and new segments drive the economy, provided that ICT manufacturing industries organise so that supply keeps up.

The ICT manufacturing industry and the risk of relocation

The report recalls that the ICT manufacturing industry has been enjoying a very strong drive for several years and that the impacts of competition come into play powerfully and swiftly. This can be explained by the fact that, in this industry, the productivity generated by ICT dissemination operates at full throttle whereas the cycle times⁴ for the different components on the ICT market are noticeably shorter than in other economic sectors.

Considering this situation, in-depth changes have earmarked the route of ICT companies. Alongside big companies that have had to make considerable efforts to hone their competitive edge, the development of activity, and especially innovation and technological know-how capabilities, rests mainly on innovative small businesses. The February 2005 report of the French Council of Economic Analysis (*Désindustrialisation, délocalisations* - Deindustrialisation and relocation - by Lionel Fontagné et Jean-Hervé Lorenzi) highlighted the role of average sized SMEs (more than 100 employees) as a potential breeding ground for tomorrow's market leaders and as a fabric playing a major part in exports, especially in new technologies. However, France has not managed to turn the numerous innovative SMEs that it generates in this industry into large SMEs with export visibility and job-generating capabilities.

³ Or the recourse to services and advisory consulting that create jobs in IT & S companies

⁴ Moore's Law leads to changing components every eighteen to twenty-four months; silicon etchers are putting out new generation chips at the same rate. Computer equipment has a life cycle ranging from two to five years, depending on whether it is a microcomputer or a heavy server. Commercial off-the-shelf software changes every eighteen months, major versions every three to five years. Communication services (networks, telecommunications, the Internet, and so on) offer new technical possibilities that become commercial offers almost every year.

Furthermore, the issue of relocation⁵ in the ICT industry affects the manufacturing industries (telecommunication equipment, consumer electronics, electronic components and computer equipment), IT & S services, software industries and telecommunication services, to different extents.

The ICT manufacturing industry is losing jobs massively in western countries. The employment drop has been to the order of 30% since the past five years⁶ in France, Great Britain and the United States whereas the trend has been steady worldwide. The industrial job fall-off can be explained by the emergence of China whose share in the ICT industry reached 20% of the world market in 2004. At the same time, ICT equipment exports accounted for 25% of all Chinese exports that same year. The relocation of ICT goods manufacturing in China is underway and ongoing.

The impact of relocation on the software industries is noteworthy but little affects the R & D share that leads to the major innovations on the market (Microsoft, Google, and so on). Today this share is still one of the main factors of the gap between the jobs in the ICT industry in the United States and in Europe. In any case, France's activity in the software industries remains much too weak and scattered.

In the area of services, although India's role in IT service subcontracting has been substantially reinforced vis-à-vis the Anglo-Saxon countries, the magnitude of its impact is still smaller than what can be observed in the ICT industry. Although a large share of service activities are naturally protected against relocation, the service industry players in France project that the pace of relocation will pick up. Considering the expected growth outlooks, relocation impact on the volume of employment should remain weak but the structure of the needed core skills in France will markedly changed.⁷

Although the telecommunication service industry is undergoing far-reaching technological changes prompting a sharp drop in employment, by nature the industry is protected against relocation.⁸

It is highly unlikely that the level of wages in emerging countries will be in line with the salaries of developed countries, any time soon. On the contrary, it is likely that the high wage inflation currently observed in China for ICT jobs will drop once its market share begins to stabilise. Actually, China will then have an abundant supply of ICT engineers and technicians, considering the very sharp growth of the flows of ICT students graduating from Chinese schools. A similar situation should be observed in India.

⁵ The CGTI and the *Conseil Général des Mines* (General Council for Mining Engineering) conducted a study on relocation in the information and communication technologies industry, at the request of the Minister Delegate in charge of Industry. This part of the document draws heavily on the conclusions of the study that was communicated to the Minister in February 2006.

⁶ The burst of the Internet bubble is not the only factor explaining this trend.

⁷ Experts in system architecture or urbanisation application software, advisory consultants proficient in the main package tools on the market, to the detriment of base developers whose functions will be increasingly outsourced.

⁸ Except for call centres.

Therefore, it seems that the ICT manufacturing industry will be durably exposed to relocation, except for research and technology activities, areas where France has a competitive edge. The impact of relocation on IT services, telecommunication operators and the software industry (or at least on its more innovative part, the strategic market-driving engine) may be comparatively limited, on the other hand.

In this situation, recent work⁹ by DARES (*Direction de l'Animation de la Recherche, des Etudes et des Statistiques*, Directorate for the Coordination of Research, Studies and Statistics) and the *Commissariat général au Plan* (prospective unit of the French Prime Minister) called *Les Métiers en 2015* (Jobs in 2015) provides a base for a future outlook on the industries and core skills that will stimulate growth and employment. Thus, computer experts are among the professional families that should see their number grow substantially¹⁰ over the next ten years. None the less, the developments will only be possible if the engineers and technicians graduating from the school system at that time meet the needs of ICT businesses.

II.2 –An Internet society where communication is no longer limited to individuals but involves numerous everyday ‘objects’ reaching maturity in the short-term (2010)

The Internet we now know, which is mainly designed for use by humans with a navigator or email software, is a relatively disparate assembly of networks, standards and software whose operations and apparent synergy results more from an ingenious pile-up of successive alterations than from serious, well thought-out planning.

The way it operates now, the Internet has moved much too fast from an experimental network where – in wonderment but rather incautiously – researchers and engineers were obviously testing concepts to an essential focus of the economic life of societies and nations.

Its security, reliability and capacity to withstand attacks or disasters remain to be proved!

Despite this stumbling block, the acceleration of access time, productivity gains and connections between humans, mainly thanks to IP technology, has all too quickly persuaded the players in different environments and various economic circles to make the Internet the backbone of their future activity.

Therefore, in our opinion, the system on which economic decision-makers and the captains of industry have grounded their otherwise warranted hopes is actually not very reliable and not at all coordinated. Furthermore, the widespread application of a network designed for humans who know how to adjust to slowdowns, incidents and snags, to new networks, which have not existed until now, such as objects, and to networks that operate with a much better service quality than the Internet's, such as telephony, brings with it a risk that we feel has not been fully weighed.

⁹ *Premières Informations et Premières synthèses*, December 2005

¹⁰ From 2005 to 2015, an increase of 149,000 jobs reaching 604,000 jobs in 2015 – the rate of yearly recruitment during this period would be 4%.

Therefore, increased investments in the development requirements for future networks where the traffic between automatic machines and between objects should quickly exceed human user-traffic and in the stakes, economic models, technologies and innovations stemming from the new revolution are fully warranted.

II.3 – The interactions between information technology innovation and content distribution and consumption modes radically change certain economic models and demand the rethinking of traditional schemas, in cultural terms as well as in terms of economic models and access to knowledge

As has already been said, one of the most striking current trends is the build-up of ICT in content distribution and consumption modes. This has generated new players who combine technological innovation and creation of new economic models. This can be seen in the consolidation of e-business (Amazon, eBay, and so on) where the players have become active investors in the most recent technological industries, from Google or Yahoo for content presentation (search engines and portals) to Microsoft, Google or Apple for cultural contents, of course.

The very recent examples of the ties forged between Apple and Disney through the takeover of Pixar Studios is a good example of convergence going beyond content distribution modes and taking an interest in the actual production of contents; the validity of the model remains to be established.

The composition of the CSTI is such that it can contribute to in-depth reflections on this convergence and the resulting conclusions; not only from the standpoint of defending a cultural model but also of making medium-term investments in the new economic models stimulating competition and growth in the relevant fields as well as in the new access modes to knowledge that will foster innovation starting at the undergraduate level in schools, and in research organisations.

III – Assessment of the actions implemented in 2005, which were compliant with CSTI report proposals

III.1 – The public authorities and top private industry leaders should make ICTs – the engines driving economic growth and strategic leadership – the national (and European) priority. Indeed the situation still gives cause for concern.

In 2005, there were, of course, positive signs that will be addressed in detail in the following paragraphs.

- The deployment of competitive clusters: they have had the immense merit of forging closer ties between public and industrial laboratories. Although they do not target ICTs specifically, the latter may reap huge benefits from the clusters, as can be seen in the recent honour roll of clusters and selected projects (see paragraph III-3 below).
- The call for applications, called TIC-PME 2010 (2010 ICT-SME), which was issued by the Minister of the Economy, Finance and Industry and the Minister Delegate in charge of Industry: its purpose is to accelerate the widespread use of ICTs, - modernise entire sectors of the economy and turn them into an authentic tool stimulating the competitiveness of our economy (see paragraph III-4 below).
- The 5 January 2006 speech by the President of France: he explicitly mentioned the determination to invest in ICT projects as a major challenge for the future.

We are forced to admit, however, that these signs have not yet triggered a burst of conviction on the part of public or private leaders, so that ICTs become a challenge harnessing national energies. In this respect for example, look at the gap between the commitment to ICT challenges and to the issue of a lower rate VAT in the building or catering industries, on the one hand, or to the issues of energy, aeronautics or road and railway infrastructures, on the other. We feel that two weaknesses persist.

- Although the discourse on the major role of ICTs as promoting growth and economic leadership is now widely taken up, the discourse seems conventional rather than expressive of a strong conviction likely to translate into a commitment to action. We feel that this stems from the elites' still deficient understanding and personal assimilation of the challenges, technological and market trends and of the relatively critical role of the different industry components and their interactions. Precisely because all this is complex, it requires a personal investment in all these topics with an ongoing overview of the world scene; this would, for instance, warrant that the leaders devote information and reflection seminars on the issues at a rate of about 2 to 3 hours per month.
- On the ICT aspect per se, the outlook is still - and in a very traditional manner - focused on equipment and infrastructures (ADSL and VDSL, DTT, acquiring PCs, and so on), all of which is obviously a vital prerequisite but not enough to play a leading role in the transformation of use dissemination and consumption modes, with the new economic models this implies, as was said earlier. Although the issue of infrastructures is being properly addressed, the gap remains in the area of immaterial technologies that actually command the economic models of the next decade.

The leading elites' required personal investment (see above) has to embrace this understanding so as to attain a true culture of the intangible that would be an essential lever of the economy in much the same way as the second half of the Twentieth Century was able to promote the innovative material technologies, which are now the foundations of our economy (in the automotive, aeronautic and space, railway and nuclear industries).

III.2 – Implementation of the proposal for simplified governance of the ICT industry

The report had a proposal called “*The need for a coherent and responsive sector can only be filled by a simplified governance structure for innovative technologies which uses all public instruments.*”

It is advisable to recall that governance encompasses three areas simultaneously, i.e., telecommunications, the Internet in a situation open to co-regulation, and the audiovisual sector at the core of the convergence.

In 2005, the number of structures involved in governance increased, viz., the creation and implementation of AII (*Agence de l’Innovation Industrielle*, Agency for Industrial Innovation), ANR (*Agence Nationale de la Recherche*, National Research Agency), and the ICT-focussed competitive clusters. The new organisations will have (or already have) begun to produce positive impacts (see § III.4 below) filling some gaps. However, the superposition of these structures on extant organisations, which have not been simplified, continues to increase the complexity if not opacity of public policy readability, as rationalisations, eliminations or reunifications have not been carried out at the same time.

Budgetary and hierarchical internalisation of the ADAE (*Agence pour le Développement de l’Administration Électronique*, Agency for the Development of the E-administration) within the French State (in the new DGME - *Direction Générale de la Modernisation de l’Etat*, General Directorate for State Modernisation, created in early 2006), an agency dedicated to electronic relations with members of the public, potentially creates an efficient lever improving and disseminating good practices and accelerating change.

Overall, the problem of the disquieting dispersal of executive structures remains, thus bolstering a situation little conducive to fostering anticipation and structuring strategic choices. The latter should be governed by an overall, carefully coordinated rationale so that ICT industry development and the acceleration of ICT uses combine to produce a significant impact on the economy.

By making a “hollow choice”, so to speak, the result is serious leadership deficiency in the search for the required macroeconomic coherence of strategic options. However, ICTs can only fully develop their potential as an economic force driving industrial and economic development and, therefore, competitiveness, sustainable growth and employment, if coherence is ensured at the appropriate level.

Parliament has the power to strengthen the synergies that flourished under the impact of accelerated technological convergence between IT, telecommunications and the audiovisual sector, especially with regards to regulation. It is for Parliament to appreciate the timeliness of merging the functions of the CSA (*Conseil Supérieur de l’Audiovisuel*, the independent administrative authority guaranteeing broadcasting freedom) with those of ARCEP (*Autorité de Régulation des Communications Électroniques et des Postes*, the French Telecommunications and Posts Regulator).

It is the executive's responsibility to anticipate as best it can and to support legislative changes by taking strong, readable initiative serving to strengthen public instruments in the short term.

The CSTI's proposal that a decision for the short-term creation of "*a simplified governance structure for innovative technologies which uses all public instruments*" is still appropriate and topical.

III.3 - ICTs are powerful factors fuelling the transformation of production and services, which requires inventing new, more competitive business models

The CSTI report affirmed a key conviction in this area, i.e., the drive of numerous economic sectors has to be stimulated by extensive ICT use provided that it is finalised by a transformation of business models and processes. This move chiefly involves the relations between businesses that are interdependent in the product and service marketing process, e.g., subcontractors, full-line suppliers, and distribution channels. The CSTI expressed the hope that initiatives would be taken to encourage the rollout of this sector-focussed (or per ecosystem) policy.

In 2005, two events occurred that were strong harbingers of the needed approach and that could also be essential accelerators.

- In July 2005, the MEDEF's (*Mouvement des Entreprises de France*, the largest union of employers in France) commitment to this policy, materialised by the MEDEF Executive Committee's validation and publication of a report called *Favoriser l'usage des technologies de l'information et de la communication (TIC) dans les PME pour leur compétitivité* (promoting the use of information and communication technologies [ICTs] in SMEs to stimulate their competitiveness)
- In July 2005, the Minister of the Economy, Finance and Industry and the Minister Delegate in charge of Industry launched a call for projects, which was also based on this policy, and granted 7-million euros to fund the initiative. The 28 September 2005 press release of Minister Thierry Breton and Minister Delegate François Loos detailed the expected goals of the projects.

In September 2005, declarations of intent were submitted for some 75 projects (first stage of the procedure). This stage selected 25 projects that featured the main characteristics appropriate for meeting the goals and with a structuring economic impact on their entire sector. By late February 2006, the 25 projects will have to submit a complete file formally, for approval and support funding allocation. There is a strong likelihood that the vast majority of the projects will present a favourable situation at the time of their acceptance.

This is a very positive factor especially since there is a broad consensus among the professional federations, Chambers of Commerce and Industry and even the relevant industrialists about the relevance of the goal and the chosen time. Nevertheless, much attention and energy still need to be harnessed since the rollout of the agreement in principle will still run into stumbling blocks

because, as it will be collective and even cooperative, the work involved will challenge still highly individualistic habits.

III.4 – Research and innovation efforts must be increased and focussed to give impetus to ICT industrial and economic activity

Since the publication of the report, the public authorities have finalised a set of new instruments to harness the energies of businesses, research and higher education and the regional and local authorities for industrial development. At the same time, noteworthy efforts have been scheduled for public research and new incentives for industrial research have been decided (research tax credit, status of young innovative business, taxation allowing for the deduction of research and development expenses in 2005).

The new updated measures concern research, industry, employment and town and country planning and affect every innovative business sector (not only ICTs).

- *Agence nationale de la recherche* (ANR)
- Competitive clusters
- *Agence de l'innovation industrielle* (AII)
- At the European level, active participation in preparing the Seventh FPRTD (Framework Programme for Research and Technological Development) and setting up technological platforms

The almost simultaneous rollout of the instruments is part of a bold goal, expressed at the highest level of the State and widely supported by businesses, research organisations and the regional and local authorities.

The targeted goals - a multi-dimensional set requisite for modernising businesses and territories - consist of the following.

- Improving France's attractiveness by promoting the location of research, development and industrial activities in specialised, internationally recognised areas (clusters)
- Participating in European research and innovation efforts in the best conditions, and ensuring the transfer of research results toward the conquest of future business markets in the best conditions
- Developing highly skilled specialised jobs in research, industry and services and fostering ongoing training and undergraduate education coherent with business and territorial development.

Within this framework, the place of ICTs in research and industry or their enhancement of territorial attractiveness is being better supported.

Actually, as was said in the report, the ICT industry in France is different from other sectors of excellence (land and air transportation, pharmaceuticals, agribusiness, energy, defence, and so on) because brilliant successes coexist alongside a general weakness in the medium term.

- The public or private share of R & D dedicated to ICTs is low compared to the United States and Japan
- There are few world-leading French firms able to carry structuring programmes
- For many years, public action has focused on a single major programme, i.e., microelectronics around Crolles
- The lack of any real industrial fabric for software is a handicap for the future, which will not be remedied by public players' infatuation with open-source software

It would be to France's advantage to maintain and develop the ICT manufacturing industry.

A strong ICT manufacturing industry (components, equipment, software, services, content elements) is likely to provide clear competitive advantage.

- The ICT manufacturing industry contributes vigorously and meaningfully to growth
- The control of certain ICT components (micro and nanoelectronics, sensitive software, secure networks, and so on) belong to the domain of national sovereignty
- Manufacturing equipment and software guarantees that the special¹¹ user needs will be upgradeable
- Thriving ICT innovation brings high value-creating potential. The ICT industry, which is far from having reached maturity, is a hotbed of innovation and ideas that may have windfalls in numerous other economic sectors and may generate employment. For instance numerous examples¹² show that businesses developing in the ICT industry may generate levels of value unknown in other industries, within a few years

¹¹ For example, accounting management software and the problems US software packages have in taking into account certain rules and practices of French businesses (apart from the language problem that is usually addressed).

¹² The example of GSM that turned Nokia from a paper pulp plant into a mobile telephony leader - The example of Microsoft or Google in the United States – The example of the security markets that should generate numerous applications and industrial activities.

- Seamless interaction between technologies and usages leading to tailoring ICT products¹³ and services to new uses is only possible within the confines of the same territory. Using an imported technology is not always without effect in terms of cultural heritage
- The level of ICT education and research is a comparative advantage that needs to be enhanced. Importantly, technological expertise, either in the ICT industry or in software publishing, needs to be developed.

The first decisions made under the ANR, the competitive clusters and to a lesser extent the AII bolster this outlook and substantiate the priority given to ICTs for the development of a sustainably competitive economy.

R & D: The French National Research Agency (ANR)

The ICT manufacturing industry relies on a very high innovation potential for which research and development are critical. However, ICT R & D efforts are very different depending on the country. In 2003, the United States dedicated 0.65% of its GDP to the effort, Japan 0.76% whereas France allocated a mere 3.31%, an amount slightly over the European average standing at 0.27%.

The Ministry in charge of Research put out a report on ICT R & D in the large industrial countries, which provides statistic data up to and including 2005. The report underscores that even the European “standstill” in the area of ICT R & D has worsened over the past five years. Compared to the United States, the investment difference increased by 15%, levelling off at USD -39 billion in 2005. Compared to Japan, whereas the difference was positive in favour of Europe in 2001, it became negative as of 2002 and reached a projected USD -2.4 billion in 2005.

In the area of industrial research, France enjoys leverage¹⁴ limited to 4.3 whereas it amounts to 7.1 in the United States and exceeds 10 in Japan, Canada, Korea, Sweden or Finland. Correlatively, whereas the first ten companies filing patents worldwide are all in the ICT Industry, France is one of the countries where the number of ICT patents per capita is the lowest in Europe (12 compared to 74 per 1,000 in the United States).

The ANR was first instrumental in gathering together different extant ICT research and technological innovation networks and bringing budget level with the amounts of the early 2000s, thus correcting the sharp drop in funding in 2003-2004. Nevertheless, the above-mentioned deficit is still high, especially since the ICT share in the total research budget is still lower than the share in competitor countries. Even within a total R & D budget amounting to 2% of the GDP, tipping the scales of the financial effort toward ICTs to bring it level with the United States or Japan would mean raising the ICT R & D budget from 5 billion euros to 8 billion euros.

¹³ Example: the fact that France has a strong creative and movie production industry was an asset for the development of videogame software publishing activities

¹⁴ Leverage measures the relation between the amounts businesses invest in ICT R & D and incentive public appropriations.

ANR programmes dedicated to ICTs are listed below.

- *ARA Sécurité des Systèmes Embarqués et Intelligence Ambiante* (SSIA, embedded system security and ambient intelligence)
- Mass of data: *Modélisation, Simulation, Applications* (MDMSA, modelling, simulation, applications)
- Pooled organisation for transferring technology and for maturing innovative projects
- Research programme called *Calcul Intensif et Grilles de Calcul* (intensive computing and computing grids)
- *Programme National en Nanosciences et Nanotechnologies* (PNANO, national programme for nanoscience and nanotechnologies)
- *Réseau National de Recherche en Télécommunications* (RNRT, national telecommunications research network)
- *Réseau National de recherche et d'innovation en audiovisuel et multimedia* (RIAM, national network for audiovisual and multimedia research and innovation)
- *Réseau National des Technologies Logicielles* (RNRTL, national software technology network)

Numerous other ANR programmes call on ICTs to different extents.

- *Réseau National des Technologies pour la Santé* (RNTS, national network of healthcare technologies)
- *Plan d'Action National sur l'Hydrogène et les Piles à combustible* (national action plan for hydrogen and fuel cells)
- PREDIT Programme (transport): ICT integration, technologies for safety
- *Programme Ecotechnologies et Développement Durable* (eco-technologies and sustainable development programme)
- *Programme National de Recherche sur le Génie civil et urbain* (national research programme on civil and urban engineering)
- *Programme solaire photovoltaïque* (photovoltaic solar programme)

In any case, as underscored by the report, a substantial increase in the public and private research effort for ICTs is crucial. The goal of doubling public appropriations by the 2008 deadline is still a major challenge. In this respect, the European Commission's proposal to increase ICT R & D effort by 80% for the 2007 to 2013 period, which can be found in the i2010-Roadmap, is a first encouraging sign.

Competitive Clusters

The government finalised its decision on competitive clusters with the selection of 66 clusters. Six are "world-class" projects, nine are "international outlook" projects. The clusters will be receiving 1.5 billion euros in public funds over three years so they can hone the competitive edge of the French economy by developing synergies between businesses, research units and training & education centres located within a given geographic space.

Among the six world-class clusters, three involve the ICT industry.

- Secure communication solutions (Provence-Alpes-Côte d'Azur): the goal is to integrate hardware and software for the transmission, exchange and processing of secure and reliable information. The targeted markets are electronic components, RFID (radio frequency identification) solutions (electronic labels), chip cards, and subsystems for mobile telecommunications
- Minalogic (*Micro NANotechnologies et LOgiciel Grenoble-Isère Competitivité*, micro-nanotechnologies and software Grenoble-Isère Competitiveness) (Rhônes-Alpes): the main goal is to create sustainable competitive advantage in electronics and embedded software on-chip, based on the values in use for miniaturisation, intelligence and connectivity
- System@Tic (Paris and Ile-de-France region): the organisation and operations of society (retailing, finance, healthcare, safety, energy, transportation, the environment, defence, and so on) based on a set of 'complex systems'¹⁵ for management, supervision, regulation and control. The System@Tic cluster encompasses construction, observation, analysis and control of artificial systems (land or air transportation systems, reservation systems, and distribution networks)

Two "international outlook" projects also concern the ICT industry.

- *Images et réseaux* (Images and networks; Brittany): the cluster focuses on new digital image technologies (digital terrestrial television, high-definition television, high-speed network television) and on new broadcasting modes (new fixed and mobile networks for the broadcast of digital contents). The goal is image everywhere, always and for everyone.
- *Image, multimédia et vie numérique* (IMVN - Image, multimedia and digital life; Ile-de-France): the Cluster has set a goal of strengthening competitiveness and creativity of digital content design, understanding digital life usages and markets, increasing the relevance and competitiveness of multimedia products and services and taking a quantitative and qualitative leap forward in information and knowledge engineering

Other competitive clusters¹⁶ on a regional or national scale addressing topics related to energy, transportation or healthcare also involve the extensive use of ICTs.

¹⁵ Complex systems combine the functions of sensors and of information processing, communication, decision-making and action-taking on the physical environment.

¹⁶ For instance:

- EnRRDIS (renewable energies Rhône-Alpes, Drôme, Isère and Savoie)
- Nuclear cluster (Burgundy)
- *MédiTech Santé* (Ile-de-France): world-class project on innovative therapy
- Alsace Bio Valley (Alsace): international outlook project
- *Nutrition Santé Longévité* (Nord-Pas-de-Calais) on nutrition, healthcare and longevity
- Mov'eo [merge of Vestapolis and Normandy Motor Valley] (Ile-de-France): safe cars and mass transit for humans and their environment
- I-Trans (Nord-Pas-de-Calais, Picardie) for innovative transport systems
- *Véhicule du future* (Alsace Franche-Comté): the automotive industry

The Agency for Industrial Innovation (AII)

To date, the start-up of the AII has not yet brought together the conditions with enough scope and drive to define and launch stimulating ICT programmes for industrial innovation.

For instance, the status of the draft programme on secure high-speed networks, which was among the applicant programmes submitted to the AII as early as the first Beffa report, is still not known. However, the priority given to ICTs was expressed at the highest level of the French State with the decision to start work on the European multimedia search engine called **Quaero**.

Conclusion

The changes undertaken since the publication of the report are moving in the right direction but the deficit is still great in the following areas.

- Funding R & D
- Organising the transfer of R & D results to industry and promote a tighter innovative SME fabric, thus helping small business to reach critical size and become visible on the international arena

The rollout of the Lighthouse programmes that the CSTI chose to submit to the government at its 30 March 2005 meeting could complete these policies. Actually, the European Commission as well as large member countries such as Germany (the D21 initiative) have opted for defining ICT research and development priorities mainly based on new uses. The Lighthouse programmes target the implementation of different innovative, critical and strategic technologies for the future within the comparatively short-term. Together, the programmes contribute to the development of innovative uses and services. The programme topics will have to be part of a societal outlook, as for instance healthcare, demography, transportation or development and project a material, consensual and highly appealing image if they are to mobilise the political decision-makers and public opinion.