DENIS ETTIGHOFFER

VIRTUAL ENTERPRISE
Or
News Ways of Working

Publisher 1992

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THE VIRTUAL ENTERPRISE

ENTERPRISES AND THE COPERNICIAN REVOLUTION

TERTIUS ORDO: THE THIRD ORDER

This book is dedicated to an unknown Tuareg woman, a blacksmith's wife in Tamanrasset, who was singing tearfully about the yoke of nomads bound by duty to labour and children... on television.

Foreword

"We attribute to mankind unique qualities which we believe no other beings nor machines possess, above all the marked ability to build abstract images of the surrounding real world and to determine actions through the interplay of these same images."

L. Couffignal

"Every living creature, including man, is bound to the influence of symbiotic relationships." Such a statement would have raised a storm of intense controversy a few years ago. Today, it seems almost commonplace. It is now recognized that, save for bacteria, absolutely all organisms result from the association of several single organisms which met, joined out of mutual interests, shared genes and shaped more and more complex and efficient organisms a very long time ago. Symbiosis thus shares equal billing with genetic mutations as one of the prime forces of evolution.

This same type of interaction brings together man and the computer. Man first untertook to transform matter through intensive energy expenditure. Coal, then hydroelectric power thus supplied machines with increased work power. Today, with computers at his fingertips, man can launch a molecular research simulation without so much as visiting a lab. Formely, only empirical methods made the discovery of new alloys possible. Billions of tests would have been needed to find the specific alloys used in today's industry. From now on, the tunnel effect microscope connected to a computer allows to assemble, almost on sight, the atoms of a material essential for a specific industrial application.

Thanks to his new symbiosis with computers and telecommunication networks man sees his capacities of action dramatically expanding as he reaches the intangible. We

now have at our disposal a "virtual" power which leaves the industrial age standing. This power is assessed in time and money savings as it becomes possible to simulate, say, the manufacturing processes of Snecma-General Electric motors for the Airbus. Or for certain researchers to drastically lower our perception and understanding treshold - it would have required million of lifetimes to identify and study the 3.5 million human genetic codes. The New Information and Communication Technologies (NICTs) go even further in obliterating time and space: associated with astronomy, they trace the genesis of the universe. So many new horizons for human exploration are opening. The NICTs contribute to the development of mankind as they enhance our perceptions and our capacity to act from a distance. Today, man is telepresent in the office, in space or under water, where he monitors robots, omnipresent and always available as an avatar, soon omniscient. As he enters the 21st century, he is aware that his relations to objects, work, business and his fellow human beings will be transformed. Our evolution is undergoing a formidable gestation. The computer is creating a new civilization right under our eyes.

Yet our mind constructions, ideas, thought patterns and economic analysis are still entrenched in the context of mass production. As conscious our organisations may be that we have reached a post-industrial age, yet they are bogged down in neo-Taylorism. They still have not fully integrated the disruptions brought by the expanding man-computer symbiosis and their devastating effects on traditional organizations, business competitivity and economy.

I have chosen to illustrate these disruptions and their sometimes amazing consequences by attempting to answer a main question: will the white-collar workers' become extinct? If so, how will the aftermath look like? Mechanization first, then robotics, have both led to increased productivity and economic growth. Will they also take over the service industry, which remains "unproductive" while absorbing the gains from the productivity of other sectors?

This book aims at a positive answer. Only an inattentive observer would find its conclusion disconcerting. The white-collars' age will be followed by an age of... virtual representations of white-collars! Companies themselves will be virtual!. In other words, there will be business wherever a connection to the NICTs is available.

The NICTs structure large networks of professional bodies which influence corporate organization and power as well as the way we think, live, study, and work. Obviously our personal and professional environment has already been dramatically affected by NICT's. They will play a role in the way we manage our private/professional, individual/collective times and spaces. Yet our capacity to grasp the on-going changes is limited since we have not yet deciphered the rules of this post-industrial age nor customized our intellectual tools. One of the aims of this book is to bring some means of picturing and analysing the new organizational patterns which will eventually boost the entrepreneurs of the post-industrial age.

Developed countries are crossing the frontier between two civilizations: on one hand, the material, mechanical, industrial, energy-greedy civilization - created for mankind, builded up for machines - but still naturalistic, as it remains, on the whole, symbiotic with nature. On the other hand, the immaterial, cybernetic civilization - hungry for information yet at the same time energy-saving - operating on virtual representations of reality where data symbolize real life. In that world, it is conceivable to make Marilyn

Monroe alive again. Real, ready-to-use objects emerge from the intangibility of screens. The whole planet is reduced to the size of a phonebook. And each one of us becomes more and more dependent on that new nervous system woven by the telecommunication networks.

Like motionless travellers, companies have to be virtually omnipresent in order to keep track of their own resources, know-how, products and customers. They also have to learn how to control from a distance. Work too, is virtually omnipresent. We are turning into "terminal men" in a plugged-in society where our personal and professionnal lives become fully intertwined, and what is left of our spare time melts into thin air. Here we are now: "electronic nomads", frantically zapping through jobs which crumble into many tasks and many places. White collar workers particularly experience a "de-sequencing of tenses", as the rhythms which used to rule the working-classes have become unadequate for them. In the service industry, which represents 70% or all workers and where 45% of people work on a computer, white-collar workers are becoming increasingly expensive, almost too expensive. In spite of all their offices and state-of-the-art computers, they still have not reached a proper productivity. Their productivity is sluggish while blue-collar workers have seen theirs multiplied by seven since 1900.

Some managers of the tertiary sector are seeking production and efficiency enhancement by borrowing the practices of the material industry. In their more or less successful course, they will encounter terminal men who create objects, tools, machines, and even virtual representations of themselves in order to boost their efficiency and productivity.

Although I may have indulged in some occasional emphasis for pedagogical purposes, this book is neither a futuristic essay nor a science-fiction book: the ideas it defends are supported by many concrete, present and reproducible examples and many observations.

The objective of this book is to arouse questionning and brain-storming. - to anticipate and throw light on issues still unanswered, in the perspective of the decade to come. And if, by chance, hope for a better life was brought up, the author's personal optimism would be to blame. This book is not a utopia, nor does it provide with keys to our concerns about the future. At the best these are the reflexions of a frontiersman building bridges between two worlds: industry and information. My conviction is that the post-Tayloristic, virtual enterprises will be structured as networks through which symbols will definitively take over economy and matter.

To see through this exploration, I have tried to avoid the self-centered experts lingo. I offer "projections" and hypotheses, make suggestions based on informed opinions as often as possible. I am aware of the risk. I did not want to write a "Tips for success" type book. Experience has taught me that the curiosity for this kind of book only lasts for as long as it takes to read the table of contents. Any reader with an ounce of common sense generally deals with the rest on his or her own. It's a matter of choice; the numerous examples in the book will no doubt serve to foster projects in the reader's mind.

I must also confess to a loftier, if somewhat immodest, goal: I wish to arouse a true curiosity for the virtual enterprises. The learning process starts once curiosity has set in. And that, first and foremost, is what I hope this book will achieve.

The book is divided into five sections. *History of a Misunderstanding* illustrates in which way Tayloristic and bureaucratic organizations have conceived time and space management when they first attempted to use NICTs for working from a distance or teleworking, in a period of extensive economic growth. This gave rise to an interesting confusion between neo-Taylorism and post-Taylorism, a basic misunderstanding with a simple explanation: telework was a 21st century solution seeking after its market in the 20th century.

The second part of the book, *The Terminal Man*, describes the first effects of NICTs on work distribution. NICTs are turning our post-industrial society into a hypertechnological and hypercommunicating society: work will leave its traditional settings and spread through the networks. We will then witness the growing ascendency of symbol over matter. The advent of virtuality will enhance man's work power to unforeseen heights.

The third part of the book, *TheVirtual Enterprise*, illustrates concretely the different aspects of the new and mutual relationships between organizations and NICTs. NICTs override time and space and allow businesses to become progressively omnipresent and omniscient. But crossing the threshold of the virtual layer of globality requires some preparation. Meanwhile, networks break through and develop their capacity to structure economic exchanges in accordance with the strategies of operators and countries.

Making the most of these new gifts will mean meeting requirements, as we will see in part four. Prior to becoming truly post-Tayloristic, businesses will have to undergo a "*Copernician Revolution*". They will use co-production in order to optimize their immaterial investments into the constitution of their gross margin. This means on one hand developing a networked culture required for remote management and on the other hand learning how to manipulate NICTs and meet the standards of the 21st century in order to create a business globality. Mastering NICTs is now a key to success.

Computers and telecommunications have become essential in the organization of society. The fifth, closing part of the book stipulates that, as they override frontiers, NICTs will be greatly instrumental in regulating the economy of the 21st century. They will bring forth a "*Tertius Ordo*", a *Third Order*. In the midst of a technological crisis, although networks will overrun economical power, many of us will be kept away from the standards of the 21st century. Those who will set the rules of the Third Order will benefit from on a broader field of activity to optimize and expand their corporate wealth. We will put an end to our exploration with a look at the illusory hopes entrusted with telework at the beginning of the century and how the issues it was supposed to answer have been evolving since then.

Finally, I would like to thank everyone who helped me write this book for their encouragement, their comments, and their suggestions:

Patrick Rébuffie, a colleague at Bossard Consultants, whose constant, friendly collaboration helped me carry this project to the end.

Jean Bouvier, Direction des Etudes Economiques et Financières du Crédit Lyonnais.

Bernard Corbineau, consultant.

Jean Wanioski, architect, town planner at Groupe Télémaque, who now dreams of the "smart city".

I would also like to express my gratitude to Gérard Blanc and Anne de Beer, who helped launch the project in their capacity as experts on telework and who agreed to place in my trust documents invaluable to my work.

To my wife Dominique, also, whose friendly yet vigilant support prevented me from sliding into self-indulgent, unnecessary digressions where my intellectual curiosity can so easily lead me.

And finally, a tip of the hat to Jacques Jochem, Directeur Général at Bossard Consultants, who supported this project and allowed me to take the necessary time off in order to perpetrate the book you so carelessly bought.

And many kisses to my family, whose forgiveness I ask after many months of a forced obstacle course through piles and piles of files...

Who said working at home was easy!

Denis C. Ettighoffer

Paris, December 31, 1991

Part 1

HISTORY OF A MISUNDERSTANDING

Misunderstanding: A mistake, a situation having two separate meanings simultanously: the one the protagonists see.. and the one the public sees.

Bergson

Chapter1.

Remote work or telework?

A myth with no other purpose than to announce prematurely the death of the industrial age.

J.-C. Durand, "Mais qui parle du télétravail?", 1984

Hello, please hold...

For a few hours in December 1985, the Bank of New York registered a $26 billion electronic overdraft from the Federal Reserve Bank. The latter, after offering a helping hand, requested payment of $5 million in interest (0.02%) (1). The overdraft was caused by a computer breakdown which lasted but a day.

In the summer of the same year, the French network Transpac, one of the finest examples of packet-switching network technology*, suffered from overloading, then saturation._Suddenly, this electronic highway, jammed by Télétel's increasing demands for general public access, was forced to disconnect. The main victims, companies offering services through Minitel, were quick to launch an impressive press campaign stressing the important losses generated by the event (understandably: the media owned a large part of the services offered to the general public on Minitel). The network's failure questioned Transpac's reliability. Transpac is a key link in the international data exchange circuit: out of the 5,500 contracts drawn by Questel (the largest databank in France) or Télésystèmes, half were drawn with foreign companies (2).

This growing economic dependence on telecommunications is further illustrated in a book entitled *Minitel Stratégie*. The authors, recalling the shipping exchange experience of Lamy Transport, stress how angrily the users reacted each time the network was

* At the time there were only 810,000 minitel sets in use, 1,400 services available and 11,8 million calls per month. Professionnal services were growing 60% (3). The same breakdown in 1990 would affect 12,660 services and 5,600,000 minitels sets, representing 41% of the French working population.

down. According to their report, the system met such a success that German, Belgian, Dutch and British freighters hastily bought Minitel terminals in France in order to use them from home through the international telecommuting network (4). With the 27.1% increase in freight within the European Community in 1988 (5), such "teleservices" have become invaluable institutions with addicted clients.

Thanks to the spectacular growth of telecommunications-based teleservices, some companies have developed new pools of income and profit. There, telecommunications play a strategic role for all partners, clients as well as suppliers. They can no longer afford to be "cut off from the world," to paraphrase TDF's 1989 Pager Operator ad campaign, which won over some 11,000 users within a few months. Nor can they be cut off from "the office world": in France, more than one in two workers have a terminal on their desk (6). Not to mention the telephone, present almost everywhere (93,4%), while the cellular phone has made considerable inroads, with 157,000 equipped vehicles in 1989 only (7).

Although France holds the last position in Europe for cable and satellite reception, the French will have to face the formidable impact of the NICTs on their private and professional lives. Jacques Mereau's report on consumption leading to the year 2000 shows that the main areas of growth are leisure to 8.7% and telecommunications to 6.9% (8). The number of computers per capita has become a sign of social and economic national growth: a report by the European Communities Commission entitled *Les Télécommunications et l'Europe* forecast that 20% of European households would own a personal computer by 1995 (9). We no longer feel excessive guilt when bringing a television set to the office. On January 1, 1991, Computer Channel launched a project for a TV channel intended for computer scientists. Programs are broadcast via satellite to registered clients. The fees cover the installation of a Eutelstat II antenna. The sector is expected to increase more than 100% in Europe. It is true that television is supplanting work: it steals 60 billion hours of our time each year, amounting to five hours per day and per person. With progresses varying in speed according to methods, companies and individual or collective behavior, we are witnessing a major transformation of both economy and society. Should it find itself, for some reason, cut from communication networks, our economy would be deeply affected. Within a few years - slightly more than a decade - the spreading of NICTs has completely overturned our work habits and our day-to-day life. We have all become "terminal men" members of a community reminiscent of Mac Luhan's global village. The advent of the *homo-communicabilis*, or "terminal man", clearly reveals the soudness of the vision of Mac Luhan and others, who believe that in the shaping of a society, communication tools and media have always been more important than content.

The very abundance of possible applications for information and communication technology is transforming the nature and the context of work. We now witness the increasing part played by networks intermediation as we learn to work from a distance, or telework.

However, the majority of managers, executives, and employees are still immersed in a Tayloristic culture and class struggles. As a consequence how could they really feel concerned by a flexible organization which has always been reduced to work-at-home? *By hitting the wrong century*, such a limited view actually bypassed the destabilization that the many applications of the NICTs were bringing on. Telework in the Tayloristic mode suddenly turned into a "true-false" notion, as the evolution of work and the effects

of the development of the tertiary industry could not be reckoned with *for lack of indicators and measurement tools*. Notwithstanding that the tertiary departments of companies found the shock of novelty rather hard to face and fiercely resisted any attempts at flexibility.

This reluctance, coupled with a recession, drove companies to shift towards alternative solutions, since telework failed to interest them. Governments, for their part, still hoped to make *telework an instrument for national and regional development*. That is another mistake which, on one hand, bypassed market constraints and on the other, underestimated the unprecedented capacities of NICTs to obliterate frontiers and facilitate a global exchange of services.

Telework, the right solution in the wrong century

We could begin our story in 1940 when George Stibitz and Samuel Williams, researchers and mathematicians, created the first electronic calculator. George Stibitz named his invention the Complex Number Calculator. In January 1940, he had one installed at the Bell Company in Manhattan. His teleprinter sent the input data signals and produced the results a few seconds later. In September, a teleprinter was placed 250 miles away, at Dartmouth College in New Hampshire. And under the eyes of amazed members of the American Mathematical Society, Stibitz demonstrated the first electronic calculations made *from a distance*.

France, fifty years later: the trador of TV commercials Médiapolis works for six channels and dispatches every week 1 500 spots representing 2 200 brands. With the help of statistics, surveys, and an optimization software, the team of telebrokers work with feverish haste, one eye on the ratings and the other on Minitel terminals, keeping track of time gaps on the channels and closing deals for the juiciest time slots on the telephone.

These anecdotes illustrate different forms of telecommunications-based task relocations. Telecommunications will make working from a distance possible and in the same time both challenge the traditional work order and change the very nature of human activity through the increasing dematerialization of work itself. In the context of the 60's-80's, a new concept emerged: telework or remote work. At the time, relocation, especially home-based work, was already well known... and discouraged as it too easily bypasses our rigid social laws. Actually, some steps were taken - certain bills in 1957 - to try and stop its development. Most trade unions more or less overtly put up resistance to any novelties which would have introduced some flexibility into the collective work order.

Then recession came; firms tried to reduce the social cost of work, but nonetheless, in such a context, would not risk to develop telework. Realistically, they resorted to forms of relocations less likely to generate conflict: temping, subcontracting, decentralized labour, etc. As a result, during the past twenty years, companies made overheads reducing decisions, excluding the alternative of telework which they considered impractible. The gap then widened between the pragmacity of business decisions and the increasingly mythical aura telework took on for the general public.

So the story of telework is the story of a misunderstanding which arouse on the frontier between two coexisting worlds shaped by different rules: *telework is a 21st century solution seeking after a market in the 20th.*

Hidden immigration: off-shore work

Some of the laborers working on the tunnel under the English Channel commuted by plane from Ireland to Gatwick, England, where they took a bus to the construction site. The insurance company New York Life, however, does the complete opposite. All their contracts are sent everyday by plane to Castle Island in Ireland. There, thanks to a transatlantic link with the company's computer department in Clinton, New Jersey, the employees process medical insurance claims. Resources are made available to them by their colleagues at the computer department who are sleeping at that moment. New York Life thus saves at least 25% on salaries and general expenses. Turnover is very low compared to the United States. There are also advantages for the local population: most of the 52 employees are young women who say they would probably have emigrated to the United States or to continental Europe had these positions been unavailable.

Ireland has become a specialist of this type of relocated data processing. However, new competitors are constantly jumping on the bandwagon. According to Phillip Jennings, Secretary-General at FIET*, Spain and Portugal could follow in Ireland's footsteps and become involved in telework (13). For many countries such as Ireland, the contraints of the balance of trade and the availability of a vast pool of man-power are such that telework must be given full consideration.

The relocation of subcontractors thanks to the use of telecommunications is not a new phenomenon. In the last five years, however, it has greatly developed under the term *off-shore work*. In this exchange of human resources, differences in salary scales are used to transfer work to more affordable areas when tasks can be performed on computers connected to the global telecommunications networks. Clients and subcontractors, or head offices and relocated units are linked together through the networks. In the same manner, as early as 1981, Citicorp moved its credit and collection department to South Dakota, while the main offices remained in New York. And while salaries in Ireland are half those of the United States, they are seven times lower in India for software developers. This type of "intellectual" subcontracting is also quite recent. According to specialists, even if you add salaries, overheads and management and communication expenses, development costs are still half of what they would be in France. East-European countries, even Viet-Nam, are being seriously considered for this type of exchange, although they still don't have full access - at the time of writing - to the global networks. Off-shore work will develop all the better if it is encouraged by governments and if the demand for software maintenance remains high*.

Relocating thanks to telecommunications

In the service industry, *off-shore work* does not take workers to the work site, as in Gatwick, actually it brings work over to the people via telecommunications. Some countries view this tendency as a positive effect of global telecommunications networks

* Fédération Internationale des Employés, des Techniciens et des Cadres - International Federation of Employees, Technicians, and Executives - a union with 9 million members in the service industry representing around 100 countries.

* Indosuez Development Center (IDC) in Bombay of one of the pionneers, thus saving 6 million francs. Others followed: Unisys, ICL, Digital Equipment, AT&T, Bull, Hewlet-Packard, Siemens, Texas Instruments…(14)

and to Europe it is the latest stake in the internationalization of work in the service industry.

Although relocation may be slowed down by many technical, cultural, linguistic or methodological obstacles its progress is irreversible. Especially when people speak the same language: take the example of the Caribbean which are linked to the United States via satellite and where wages for medical data capture amount to only 20% of their American equivalent. Governements tend to encourage these electronical channels, as data transfers are not closely watched. Ireland, with the help of the European Union, is building an optical fiber network to encourage investors interested in off-shore work. India, supported by the Department of Electronics, opened its first "teleport" in a free zone and welcomes electronics and software companies with extremely attractive conditions. The danger of such zones lies in their multiplication: many countries are now joining the game and may be prompted to overbid. This may jeopardize the future of these business centers especially if you take into account how difficult it is in the service industry to lower the white-coller workers' turnover. This instability will be the more manifest as the telecommunications prices will fluctuate due to the on-going deregulation**.

In an interview for the April, 1990, issue of *International Management*, FIET's Secretary-General, previously quoted, expressed his fear that this form of work relocation may have negative effects on employment. If, for economically depressed regions in the European Union, it has the power to bring back to life entire communities which otherwise would have had to emigrate, the creation of a European domestic market may intensify the competition on working conditions between Union members. There are already disparities which may raise the spectre of "social dumping" brought up by the latest studies of the European Communities Commission in charge of Employment and Social Affairs. The internationalization of work through telecommunications will certainly be a major issue to both governments and trade unions in the future. An issue which was considered secondary in the 70's, when telework was still in its infancy - and a difficult childhood it was.

** In the Caribbean, 4,000 people telework for large US companies. Mostly women, they capture marketing, accouting and financial data and update files. Processed data is delivered by satellite thanks to a teleport created by Caribbean Data Services from the Dominican Republic (C. Loviton, "La vie à distance", Belfond, 1989)

Chapter two

Telework, a false true concept

"Metro, boulot, dodo" , as French say: *"commuting, working, sleeping"*. Out of this Parisian triad, the Swiss have created the term "pendular" ("pendulaire") to refer to this humdrum routine which takes us from home to work and back. During the 70's, the Americans coined the term "telecommuting" to illustrate how telecommunications and computers could partly supersede these daily trips. The word "telecommuting" was invented in 1973 by Jack Nilles, former Director of the NICTs program of the Center for the Future at UCLA.

The land of free enterprise has a long tradition of home-based work*. The idea that you can make it all easier through the use of telecommunications is more favoured there than in France. Alvin Toffler made it all the more clear in his book *"The Shock of the Future*" in 1972, by conjuring up the return of the "family business". Meanwhile, in the early 80's, reports on the impact of the NICTs upon organizations multiplied in France. Speaking of this form of remote working, B. Brabet and J. Voge, at a 1981 IDATE conference (Institute for Telecommunications and Economy Development and Planning), defined telework as "a professional activity which requires the use of telecommunication tools."

Within a cultural context so different from the American way of life, remote work through telecommunications may give rise to an unfair cheap vision. It would first be seen as working at home and be reminiscent of a 19th century picture of social outcasts bound to their machines. This misunderstanding has caused considerable harm to an idea so much ahead of its time. Suspiciously poked at by the social forces, telework appears to be a phenomenon which, while certainly creating a buzz, hardly produces anything concrete and even then, only in very rare circumstances.

Telework: a false true concept? False, yes, if you see it through 19th century glasses and cannot conceive of a new type of working community and a new type of worker!

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* According to Link Ressources, 14 million americans work at home. C. Lovinton records 13 million independant businesses (including 3,7 million women).

True, yes, because more than ever, every operation in our working activities rely on telecommunications. Teleworkers, "terminal people", are now almost commonplace.

To define, or not to define

There is a long tradition of home-based trades performed by craftsmen or freelance workers. From furniture repair to jewellery, labour consumming processing industries made good use of these pools of work-force into which they could dip according to their needs. Homeworkers were paid on piecework rate, with no fixed fees or overheads, and had no protection against the precariousness and the infringements that their position sometimes entailed. They benefit from a better protection today, as most of them are wage-earners. In the early 80's, home-workers amounted to 35,000, only a tiny percentage of the active French population (0.2%). In 1985, the OECD (Organization for Economic Cooperation and Development) registered 59,600 home workers in France, or 0.24% of the active population (15).

There is also a long industrial tradition of relocating in order to get closer to markets or to raw materials or human resources. At the end of the 70's, city councils realized how important it was to safeguard jobs and thus tried to attract businesses. Industrial parks then developed overnight, with varying successes. Sometimes companies were given interesting advantages: for Etablissements Jaeger* et Leblanc, the workshops buildings were offered. Companies save money on the cost of picking up the workers and play a positive part in the community by preserving jobs (16).

At the same time, the explosion of the service industry, combined with the arrival of the first electronic office equipment, boosted new forms of remote work, including homebased work. In 1980, Western Germany numbered some 20,000 home workers using electronic office equipment (17), according to the Federal Employment Bureau. Some employees were encouraged to do repetitive data processing work at home. The upsurge of the phenomenon worried the trade unions, hostile to homebased work. In France, the social forces, concerned about the possibility that working from the home could be given a second wind by telecommunications, put the pressure on. Eventually, the Secretary of State in charge of the protection of manual workers incited the government to review the status of homebased work.

In June, 1980, Raymond Barre, then French Prime Minister, asked G. Braun, deputy of the Vosges, for an evaluation of the impact of telecommunications on homebased work (18). Although this interesting report concerned only a minor part of the active population, the media used its conclusions to devastating effect. In spite of the deputy's cautionary comments as he presented his findings in March, 1981 (in an introduction which stated: "*the concept of homebased work is but one aspect of remote work and must also be distinguished from telework*" p. 71), confusion ensued: an opposition formed which distorted his statement, coming up with the idea that telework and remote work equal homebased work. Hence the developement of this new form of work management was serously impaired from the very start by a misunderstanding. The

* In France, Jeager was reluctant to invest in a new assembly unit. They signed an agreement with the local authorities of Archigny. This small town, only a few miles away from Jeager, was concerned about local jobs, especially for women. The town provided the firm with workers and premises, thus perserving jobs and taxes.

opposition hit a nerve, yet the media and the social forces seemed to be much more interested in the issue than business managers.

In 1985, a final report published by FAST (a research center connected to the European Union) and entitled *"Sur le travail à distance en milieux urbain et rural européen"* ("On remote work in urban and rural regions in Europe") did nothing to clarify a situation rather confused by the multiplication of more or less restrictive definitions and interpretations. For some, the simple fact of working at home using the telephone was a form of telework, but others would disagree. Besides, the exclusion of certain activities caused prejudice to the study of the phenomenon and led to a simplistic view of telework. The intensiveness of telecommunications usage itself is put into question: this is going too far as points out Sylvie Crépeau, of the IDATE institute: *"We don't have any evaluation tool for telework, since no quota has been established"* (19).

When the upsurge of technology changed the scope of the applications of relocation, confusion reached its climax. It is not the worker who is relocated, it is the service! In other words, the worker still operates within the walls of the company and instead of moving to the client's offices, he establishes a remote connection, as in maintenance or monitoring remote services. Here comes one of the major arguments in favor of telework: cutting down on travelling expenses. Should the worker who virtually visits his customer, without leaving his seat or his office, be called a teleworker?

Because of these awkward and often arbitrary limits imposed on telework, symposiums on the subject are mired in endless negotiations which leave little chance for companies - the most concerned party - to express their point of view. In fact, once all ideology is left aside, everyone recognizes that the hold of NICTs on business becomes more and more intricate. We can come to the same conclusion when, as in the previously mentioned FAST report, we conjure up the characteristics of the various forms of relocation. In 1983, in an attempt to formulate the idea of decentralisation or relocation associated with remote work, the French dictionnary Petit Larousse gave this definition: "télétravail: organisation décentralisée des taches, les travailleurs les accomplissant à distance grace à l'utilisation de la télématique." – "telework: decentralized organisation of tasks, when workers perform their tasks from a distance with the help of data telecommunications." In the United States, the inventor of *telecommuting*, Jack Nilles, emphasizes the idea of "satellite location" (20). And to set aside the only too natural remark that many companies have branches or agencies which satisfy this criterion, he also adds for better comprehension: "built or made available to the workers near to their homes... by their employer." David Nye (21) is even more specific: "the worker performs there the tasks which he previously performed at the main office or in another large building of the company." The inventors of the mining cottages of the 21st-century do not provide any more specific definition of the basic teleworker.

In 1985, at a special conference on the issue of telework organized by the AFCET (French Association for Economic and Technical Cybernetics), I myself pointed out that while etymologically speaking, "telework" means "work performed from a distance", the prefix "tele" gives it another meaning: *work performed through the use of NICTs.* I will maintain this position throughout this current exploration of telework. Meanwhile, telework remains a product without a market.

I'm sorry, you seem to have a bad connection...

Bell Pacific Telephone moved from San Francisco in 1985 in order to modernize its offices and lower its expenses. This involved the risk of loosing their most qualified personnel. Besides, while the head offices were moved, an after-sales service agency had to be maintained for the San Francisco clients. Meeting clients 25 or 30 miles away from the new offices would have taken half-a-day's work, and in the majority of cases, be postponed untill the next day. By maintaining a local agency, however, a business benefits from a better response to the market and a better quality service to clients - who are always approached by the competition. The company estimated that replacing the dozen or so specialists who refused to move would have cost $2.65 millions in hiring and training. Bell Pacific seized this opportunity to turn the operation into a showcase for telework – and a brilliant publicity campaign – by transforming the service center... into a teleoffice! Located in the suburbs, equipped with the latest in telecommunication tools – computer, fax machine, photocopier, voice mail, etc. – the agency also has a 10 seats teleconference room, used both as a showroom and as a workspace for the center... or rather, for the teleoffice of the teleworkers! (22)

In 1978, when it was still known as DGT (Direction Générale des Télécommunications - General Telecommunications Agency), France Télécom also launched a telework program for similar reasons. Their aim was to have a showpiece of their own, but also, in the long term, to offer new types of telecommunication services (23).

The fact that Bell Pacific could use telework to improve its corporate image does not necessarely make its maintenance center a model. In any case, their employees use telecommunications to perform their tasks. Anyway, from a basic orthodox point of view, a naive question is called for: should'nt many centers, branches or offices on Earth be considered teleoffices!?

Here is another example: the Continental Illinois Bank of Chicago. It no longer exists today, but is often cited as an example of telework. In 1981, it opened a teleoffice 12 miles from Chicago.

Banking was then going through a fast changing due to the dematerialization of bounds and money and the expansion of electronic transactions. With terminals spreading and software programs, mostly for commercial applications, becoming increasingly sophisticated, banks were forced to embark on a vast training program to keep their employees up to date. This is reminiscent of what happened in the automobile industry after extremely sophisticated robots and machine tools had appeared. Certain tasks, which previously required a large work force in rather irregular cycles, were now outsourced (post-printing, cheque processing, bill processing) in order to reduce the enormous overheads. Other banks chose intermediate solutions by creating data processing centers in order to avoid becoming entirely dependant on subcontractors, or for security reasons, or just to make use of their internal available resources. This approach had the advantage of creating a minimal reservoir of labour for unqualified tasks which the employees themselves often viewed as extra or temporary jobs.

In the same way, the Continental Illinois Bank of Chicago opened a data processing center in one of its suburban training facilities. Temporary workers were paid by the task and only two permanent employees worked from home... but they were not connected to any network (24). Tasks were performed by trainees and temps on word

processors. Could this really be called a teleoffice, located as it was in essentially a training center? And without any type of specialized link? At the very least, there is interference...

Bell Pacific, much like Continental Illinois, had to consider a total reorganization to solve its specific problems. In the end, the originality of their approach lies more in showing and approving their corporate image than in really experimenting telework.

Since the real stakes were too often ignored, telework has progressively become *"a myth which serves no other purpose than to declare prematurely the end of the industrial age"* (25).

The teleworker you are calling is not in service

Sometimes the myth was so powefull that it generated a confusion between remote work and telework.

Pierre Bertaud is director of PBS, a French firm specialized in word processing which works for large insurance companies who outsource part of their typing needs. First located in Paris, they eventually expanded their clientele to the surrounding area. Their routine is quite simple: twice a day, a dispatch rider picks up the tapes with the dictated material while delivering the processed documents. PBS, one of the first to offer this type of service, has also realized how difficult it was to retain its personnel. Their female staff, working on specialized word processors, had a high turnover rate which impaired production control. We were then in 1979, when the Institut Auguste-Comte launched a survey on telework. Pierre Bertaud highlighted in an interview how his approach could benefit companies and conjured up the idea of having personnel out of town, working from a distance. Without losing a beat, the Institut concluded, in its widely spread report, that PBS worked remotely... from its clients! Which is actually the case for many of us. In 1980, one of PBS's collaborators, originally from the Meuse region, had a private meeting with a future minister of Postes et Télécommunications, Gérard Longuet. The latter, then deputy and member of the local Conseil Général, tried to convince the PBS representative to launch the first experience of task relocation. It worked: in 1981, Pierre Bertaud opened the first production unit in Demange-aux-Eaux, in the Meuse region, under the direction of this same collaborator back on her native soil. The routine remainded the same: a dispatcher picked up the tapes and delivered the processed documents. The work was impeccable, the expenses kept to basic, and prices, as a result, kept to a minimum. The salary scale, quite motivating for the region, stabilized personnel and insured regular, even production. Yet, whatever the press, always quick to jump to conclusions, wished to believe, *although PBS had partly relocated its production in the Meuse region, it was not involved in telework.*

In 1987 PBS began to consider delivering the processed documents through remote printing. Then the Paris office was kept only as a commercial outpost while the entire production was moved to the Meuse, to general satisfaction. Today, PBS delivers 40% of its production through remote printing. And full-blown telework is just around the corner. A voice mail system (telescribe) is being tested which will allow to receive the data, formely provided on tapes, via telephone connections.

As its Parisian clientele - almost 100% of its business - was increasingly outsourcing its typing tasks, PBS was able to relocate its activities, at Demange-aux-Eaux (40 jobs),

then at Grand-Pré in the Ardennes (18 jobs), and at Triaucourt-en-Meuse (another 18 jobs). There were no teleworkers at PBS beforehand... or at least at the time when the topic was supposed to be a hot one. *This is rather the case of a company which cunningly relocated its production* while keeping overheads down.

Freelance International Limited is another classic example of telework (26).

Turning overheads into variable costs is certainly a valuable objective. It makes it possible to reduce cost prices and consequently consumer prices. In a business which provides part-time workers according to demand, the structural costs are proportional to the activity; and margins are really interesting. All consulting and services firms know that a temporary worker generates a wider margin on overheads than a permanent worker. This formula also has its disadvantages, but this is not the point we wish to illustrate here.

Freelance International Limited (FIL) was founded in 1962 by Mrs. Steve Shirley, an independent software developer. In a few years, she found herself heading a computing consultancy and development business. Her formula of "specialized temping" took shape gradually. A central server keeps track of all available resources and expertise. The temporary workers split their time between their home and the clients' premises by using whatever equipment the clients make available to them. In other words, the management of human resources is coordinated through connections with the homes of the workers, but the actual work is performed essentially with the clients, individually or in teams. This formula needed adjusting as the company developed, since some constraints appeared, as is the case for all businesses involved in *body-shopping* throughout the world* . Although it was in a position to spare many expenses such as property, FIL also had to improve project management, methods, and personnel qualification. Regional offices were thus created, each of them managing about 100 employees. These offices hunt for contracts and handle general marketing and publicity. They are also in charge of recruiting and training, in order to keep up with the constantly evolving world of computing.

In 1988, FIL's growing ranks amounted to 1,000 collaborators, mostly independent workers from the United Kingdom, the Netherlands and Denmark, all paid by task. According to its founder, success is such that FIL has now to bear a permanent full-time salaried work force representing 20% of its total collaborators. And while property expenses can hardly be said to be a burden (only around 10 regional offices), we cannot fail to notice a rise in what we could call connection expenses, now 30% of each invoice, such as company cars, coordinating team work, or telecommunications for what is now a seven level hierarchy. "Our overhead charges are comparable - adds S. Shirley in an interview for *Harvard Expansion* (fall of 1988) - the advantage is that these expenses are variable, so that we can experience fast growth when expanding. On the opposite, we can reduce these costs just a rapidly. It has happened."

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* *Body shopping*, has made the success of many computing services companies. It consists in leasing rare, expensive specialized staff, such as software developpers, for temporary missions generally related to software maintenance or requalification, as the client company's regular team needs extra help. As development languages and environments were diversifying, services companies had to specialize. Nonetheless, many of them provide with a valuable expertise, for instance in object-oriented environments or network managment, playing an increasing role as consultants. This is probably where the limits to the development of the niche exploited by FIL lies.

FIL's story is exemplary. This is a company which could *benefit from costs cutting through the use of NICTs* while remaining flexible and close to its clientele considering the covered area. The use of data communications for human resource coordination is still a secondary issue in this case. FIL's originality, the source of its advantage over its competitors, could be a lesson in management. Yet why should it be cited as an experiment in remote work!? All companies involved in this same business should then also be mentionned.

If we consider telework per se, we miss the actual economic and strategic stakes and the role the NICTs have come to play in the way organisations are evolving. This quarrel over words, meanings, definitions and the excessive manipulation of what telework is supposed to be hide a simple, concrete reality: rather than wondering how we can measure the intensity of usage, location or distance between this and that, we should question the economic and strategic dependence of businesses on telecommunications as well as the dependance of the workers themselves. In other words: *a teleworker is first and foremost a worker who, if cut off from telecommunications, would be unable to perform his or her task.* With this fundamental definition, relieved from pedantry, we shall be able to review telework with different eyes. From now on we may consider that the experiences of the past few years were only the early awkward steps towards the work of the future.

We can only rely on hints to find our way, since we do not dispose of instruments for measure or analysis. Our economic and organizational references have not yet adapted to a post-industrial society which will give birth to the 21st century worker.

Chapter 3

Measuring... without instruments

Who is that man in white? Could he be a teleworker? Our man is riding a tricycle through the halls of the Lafarge plaster factory in Saint-Loubens. He is equipped with a radio indicating him how the machines are doing. This prevents him from sitting all day long in front a set of monitoring dials. Since he remains in permanent contact with the machines under his care, he is virtually present. Paradoxically enough, those who insist that the teleworker is a relocated worker will probably pass this one over. Paradoxically again, imagine this same man working for an outside service company: a shift from industry to service which would make him statistically visible. This "statistic shift" towards services clearly shows how firms are increasingly externalizing some of their activities. They prefer to call on outside agencies for tasks formerly performed by their employees. This is one of the major developments of the 80's and 90's. Beyond the statistical observations, this phenomenon, although it was ignored by the 1985 FAST report, *is similar to a form of "rampant relocation", just like temping.* This illustrates how difficult it is to mark out the component parts of a society in the throes of profound mutations.

Another reason for reviewing a poorly designed statistical apparatus. An apparatus which, according Michel P. Rousseau in his study entitled *Management des Economies locales*, fails to adapt to what he calls "demassification": "A lot of industrial statistics leave out firms which employ less then 10 workers", thus leaving out all starting businesses and many others. Generally ignored, they in fact represent 80 to 90% of all French businesses and are far from being plain craft workshops. Many small service companies find a niche with high added value and access international clients thanks to the NICT's.

The purpose of this book is not to discuss how statistical tools should be adjusted to reflect the new economic order. However, we would like to underline some points essential to an understanding of telework, which requires an acute vision of human working organization. This involves undertsanding how, in such an extraordinarily complex society, collective organizations must adapt themselves to their environment, but also how and why a new type of white collar worker will emerge.

The absence of visibility of the service industry, due to our failure to adapt our statistical apparatus to the new economic order, may lead companies as well as governments to ill-advised decisions. We must keep in mind that, according to a 1989 CEC (Commission of the European Communities) report on employment, the statistical analysis of these new, growing employment sectors is far from easy. As a result, statistics on employment in the coal and steel industry (which only employs 650,000 people in the European Community) are much more richly detailed than those of the service industry, which employs more than 4 million people.

The works of Gérard Blanc and Anne de Beer

In France, the names of Gérard Blanc and Anne de Beer are well familiar to all those interested in telework. Throughout their studies, they stress the poor quality of indicators: according to them, "books on the subject abound with examples which favor a few cases with low numbers, while neglecting other activities, more frequent but difficult to survey. Since there are no studies large enough to be representative, all attempts to assess numerically the phenomenon remain arbitrary" Gérard Blanc and Anne de Beer underline the fact that all the related litterature published during the past 15 years has been but sustaining a rather recurrent column. They have counted eighty studies on homebased or remote work published between 1969 and 1984 alone (28).

In their May 1985 and December 1986 reports on remote work in suburbia, they picture the visible part of the iceberg of telework. They stressed the fact that planned or official remote work causes a lot of ink to flow. A lot of noise which distorted the image of the real innovators and hid the "rampant" (Sylvie Crépeau, IDATE 83 report) or "unconscious" (according to Gilles Charbonnel) telework of people who work at home or elsewhere, in a situation of permanent or accidental relocation with the aid of computers.

The demassification and the versatility of tasks generated by the gradual disappearance of the Tayloristic organization model make possible and even require an individual approach to work management. It is hardly surprising that Gérard Blanc and Anne de Beer demonstrate then that the development of these forms of individual work organization – so difficult to identify and measure – are mostly the concern of free-lance managers or agents with a strong sense of autonomy and personal organization. A far cry from the home worker chained to his terminal.

Because we lack indicators and proper measuring tools, we have, as Gérard Blanc and Anne de Beer write, an "inverted vision of reality". Antoine Brunschwig, directeur of studies at the Comptoir des Signaux (a French consultancy and engineering firm specialized in telecom), agrees: "At first associated with menial tasks, telework is now the domain of executives, managers, knowledge teleworkers ." (29) As a result, there is a lot of noise about a small number of experiences, from which we cannot learn much on scientific bases. These experiences are based on 19th century models in that they mostly focus on homebased telework, the least significant according to studies.

The European Fund for the improvement of working and living conditions made a census of all experiences related to homebased work and all the studies in progress on this same topic.
The results? There are currently in Europe more people researching on telework than actual teleworkers. (30)
It these figures are accurate, we can be thankful that not all of them are publishing!

Unadequate measuring tools

Hubert Dussotel, president of the French Association for the Development of Telework (Association pour le Développement du Télétravail) states that forty companies in the United States regularly practice telework while 400 are currently experimenting it. Between 20 and 30 thousand people worldwide were teleworkers in 1984 and a 300% growth per year was expected until 1995, which would mean, according to Dussotel's article in the October 1995 issue of *Minitel Magazine*, that by then 20 million Americans would work from their home more than twice a week. However, with a 300% yearly growth, and starting at 30,000 in 1984, the teleworkers would amount to 21,870 million in 1990 and 5,3 billion in 1995! But, if we consider the possibility of a misprint and try 30% rather than 300%, we are far from the estimated 20 million teleworkers for 1995 and the American teleworkers would amount to 5,3 million... If the definitions themselves are questionable, what are we to do with such figures? They are the reflection of a myth and disconnected from reality.

In 1989, Link Resources had counted 5.7 million teleworkers for... 1990! What a remarkable quickness, when these companies release in January of 1990 the results for 1989 and, in advance, those for 1990! To conclude these cutting remarks, *The Futurist* (31) quoted in 1989 the Link Telework Group, which had counted in 1987 15.8 million american teleworkers, 3.4 of which were full time workers. Yet according to Monica Kelly, president of Electronic Services Unlimited Inc., only 100,000 people are involved in teleworking, or 0.8% of the active population.

This complete disparity of figures is due to a lack of precision in the methods and above all in the criterias we use. The quest for teleworkers had become a type of free statistical sport with incertain results. Thus two sociologists published an article entitled "Looking for telework" and beginning with: "Telework, hell or heaven". One of them finally released his hunting trophies in the March 1989 issue of *Ressources Temps Réel:* he had counted two thousand teleworkers in the world, each working from their home!

It's unfortunate their quest didn't take them to J.C. Penney Company, an american specialist of sales by phone (32). Between 8 and 9 thousand people work from home terminals from 20 to 35 hours a week during peak periods. Fifty percent of all sales are made within 6 weeks. Call transfers are monitored automatically from 14 regional telesales centers. Each teleworker is assigned to one of these centers in normal periods and to two centers in case of overload or a system breakdown.

Different and sometimes biased points of view compete, resorting to figures not as instruments of rational scientific research but unfortunately to assert their ideas... or to generate publicity! Institutional organizations are no exception, as they have often failed to go thoroughly enough into the real impact of the NICTs on working. The Ministère du Travail (French Labor Ministry) seems to have other fish to fry, and the ILO

(International Labor Organization) is unable to give any definition of telework. As a result, the field is occupied by very few institutions who seem to have just integrated telework into their business, rather than as a research and development program.

An attitude which Francine Goyer, in charge of home-based telework for France Télécom, inadvertently confirmed in an article for the September 1989 issue of *Télématique Magazine*. Speaking of a telework experience at their Lyon-Cetely center, she said: "If we can prove that this form of organization is profitable, we'll be able to sell it to others."

Unfortunatly, with this type of experiment, the laws of the market are unable to play their role and the obligation to succeed, most notably for France Télécom who backed the project, raises some problems. "The costs to make this operation [still talking of Cetely] viable are higher than those of this same service beforehand", states Alain Bregent, Director of Personnel in Lyon, who spoke to *Les Echos* on June 21, 1989 (the article was entitled "France-Télécom juge et partie", or "France-Télécom, judge and judged"). He also indirectly confirms a shift in France Télécom policy in *Fréquences Télécom 89*: "We felt the experiment was interesting since it was issued from an operational establishment... Although telework does not belong to France Télécom strategy, we are willing to assist those who wish to undertake a similar experiment."

Whatever are our own appreciations about the impact of the NICTs on collective of individual work relocation, a set of simple criterias for analysis must be determined and complied with. Nonetheless, this is not the role of France-Télécom, but rather of the French Labour Ministry who is strangely absent from the debate, quite unlike its European counterparts.

A statistical apparatus unfit for a new economic order

France, like all industrially advanced countries, has witnessed a decline in its agricultural population: it fell from 42% in 1901, to 24.6% in 1957, and 7.3% in 1986. (9.3% to 3.1% in the United States).

French workers in the services industry rose from 7.2 million in 1962 to 12.5 million in 1982. Meanwhile, the tertiary sector in Japan rose from 45.3% to 57% of the working population, against 43.8% to 61.3% in France, and 61.2% to 69.3% in the United States. These figures must be interpreted with caution if we consider the disparity in social and professional organization in these countries. Nonetheless experts agree on a heavy trend which should raise the proportion of workers who have joined the ranks of the tertiary sector up to 70% of the working population. A sector with a wildly eccentric profile, according to Jean Fourastié (34). It is in fact a grab-bag of disparate activities, ranging from hairdressers to soldiers, with honorable mentions to superintendents, office workers, house or office cleaners, science researchers, computer specialists, etc., in short, anyone who can't be fit anywhere else.

What do we know of the service industry? Well, it requires "manpower"! A 1981 study by the OECD on information-related activities between 1960 and 1978 came to the following conclusions: three quarters of the total growth in employment in the services industry are due to the information sector. Between 1962 and 1982, French banks and insurance companies saw their work force rise from 254,000 to 578,000. This was due to a low productivity and to the higher part of labour in the productivity when compared to manufacturing. A capital factor which allowed women and a younger, less

qualified generation to join the job market. Numerically speaking, these jobs make up the largest percentage of the workforce in the service industry, the first in line to bear the shock of the future... and the first to resist the NICT's.

We know that this labor force is expensive. Yet its production, like its productivity, is difficult to assess simply by looking at results, even less at efficiency. "The value of man prevails", J. Fourastié insists, with a highly qualified tertiary sector in mind. Yes, of course, but disparate as it is, the service sector requires the creation of statistically homogeneous conglomerates and the decision to officially establish a specific sector for information-related activities. And where does our "terminal-man" fit? An OECD study by Stuart Wall of Cambridge University (35) makes a first attempt at subdividing the information sector. He proposes four major sectors:

1. Information creation: scientific researchers, consultants, etc.
2. Information processing: executives and management, supervisors, etc.
3. Information sharing: educators, communication specialists, etc.
4. Information infrastructure: NICTs operators, etc.

But the shift seems to be hard to take with the past still weighing us down. Adam Smith in his *Wealth of Nations*, then Karl Marx in his *Kapital*, placed immaterial, intellectual activities in a sterile class... For them, only industry was productive. This distinction dies hard: in the 70's, the productive – the factory – was still separated from the unproductive – the office – even in the company's accounts.

Although the information sector has become an important consumer of technological and immaterial investments, it still cannot be compared to the secondary sector. This situation is made even clearer by the previously quoted OECD study, which recommends a statistical revision. Stressing that this is more than just an elegant theory, G. Wasskett also shows in this study that *the rapid decline in the price of capital* (the price of the NICTs equipment) *will be a major factor in its widespreading ratio.* However, we will not always be able to easily assess and compare the huge discrepancies in investments between certain professions of the services industry. This problem is made even more complex by the fact that indicators must take into account the growing percentage of immaterial investments in gross capital formation. The evolution of our service, post-industrial economy entails the growth of immaterial economy. It is perceptible in the nation's accounts, although we are not always able to concretely determine its components.

Economists desagree over this situation. Some of them, according to *L'Expansion* in September 1987, stress the regular decline of productive investments in France: from 13,4% in 1980, they allegedly fell to 11.6% of the GNP in 1986. "*That is an illusion*, the government economists answer, *in so far as national finances do not include immaterial investments into productive investments*". Yet these jobs (research and development, publicity, training, software, patents, etc.) are growing faster than traditional (hard) investments. According to M. C. Kaplan and D. Vallet, of the Crédit National: "they now represent more than a quarter of total investments".

We could not dream of a better demonstration. Our statistical apparatus is being revised. Will it finally take the information sector in consideration? Will we remain white-collar, "invisible" teleworkers?

Chapter 4

Telework meets the future

In April 1982, R. Daude, chief telecommunications engineer, gave a lecture on how to modernize the telex machine. In early 1980, Minitel systems were making a timid appearance, memory cards did not exist, nor did laserdisks. Modems, mikes, fax machines, and cell phones were an elite's privileges* .

Nonetheless, that 1980-1990 period witnessed the disturbing upsurge of technology into our private and professional lives. A true culture shock among white collar workers, whose unprepared personnel were on the front line. Ready to block any form of change, the social forces protested or deceitfully resisted against the "malicious" presence of technology. Fantasies developed about machines intrinsically carrying within themselves a regression for society and social benefits The opposition front easily found support in women who, for the most part having just left the home to undertake a professional life, were in no hurry to move back.

From the early 80's the speed and intensity of the developement of the technical NTICs supply became major instruments of the modernization of office work management. The implementation process, based on trial and error, can be very hard-working and painful in its consequences.

Thus very large bureaucratic structures have undergone difficult times for failing to invest in the necessary supporting measures and to give proper though to the evolution of their management methods. Such structures, including administration, don't derive real profit from their investments, or at least not at first. These "great, bureaucratic and tayloristic companies" (36) were the ones to launch self-imposed, planned, spectacular experiments in telework which were mostly theoretical and ignored the real stakes. At the time (1984), Michel Godet, scientific consultant for the French Ministry of Science

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* In 1983, the Institute Rémy-Gendron noted that white collars were slowly moving towards modernity. Executives and managers expressed little interest for office automation.

In 1982, 1.1% of French companies were equipped with word processors; 1.2% in 1983. Only 0.4 PC, 3.2 word processing machines, 8.3 terminals were recorded for 100 executives.

In 1989, 3 million PC, 580,000 fax machines and 160,000 radiotelephones were recorded.

and Research professed in an article entitled "From technical shift to social shift" ("Du virage technologique au virage social"): "Unfortunately, it seems that technological change is a long way from stimulating the social change needed to overcome any crisis".

Our information society was entering a technological crisis without grasping its far-reaching effects. At first, this crisis manifested itself through the fear of a change in the established order: telework simply was not popular. A far cry from Alvin Tofler's positive theories in *The Shock of the Future* and *The Third Wave* which supported homebased work and so appealed to the American public in the 80's. Many large companies, including some in the United States, relocated only activities considered of low value. The reason why the *Bell companies* of the world were interested in relocating through telework was to ensure the relevance of their private and public communication networks.

Hence, the 80's were mostly interested in the various ways in which the contract between companies and individuals could be modified. Theories on third wave companies made their management and inner-workings evolve. Companies also discovered that they had to consider using the NICTs for strategic reasons. With these new priorities, work relocation, encouraged by telework, was far from a major issue.

Telework thus entered a difficult period, characterized by:

- the reluctance of the tertiary sector to question its organization,
- the development of an opposition to telework.

The tertiary sector, reluctant to question its organization

The impact of the NICTs is unprecedented in our history. As technology expanded its possibilities while cutting prices, the NICTs only needed some twenty years (from 1970 to 1990) to drastically transform the conventions of work organization, business strategies, and political and economic policies. The industrial organizational models which confined individuals to the controlled use of production equipment had taken more than a century to shape. As modernism cannot be enforced, we are likely to need more than twenty years to question the post-industrial models which will perpetuate for some time the practices of yesterday. The changes brought by the spreading use of the NICTs will take a long time, as they tackle the very heart of the social organization of companies, their status models, and age-old habits. Everything must be revised, including the office as an organization of space. This process will also be slow because the organizational models of the 70's and 80's remain tayloristic: they favor division of labour as the best way to minimize possible errors. Not necessarily a bad idea. It transfered rural and illiterate people to the industrial world by dividing tasks among them.

Such was the dogma of the period. Each service or production unit improved its internal system without generating general improvements, as each unit was separate from the next. We still find this tayloristic culture in our offices and the surrounding educational system reproduces a hierarchical, conformist distance. This is unacceptable today as it allows your superior to think: "You know well enough to do your work." And "enough" often means "as little as possible". Information is not disclosed because

information is part of status. In this pyramid shaped system we forget that, even in nice designer offices, commitment requires understanding. Michel Godet (37) adds: "Apparently, technology is the flexible party, while structure and behavior are inert or rigid". He insists on the importance of a support system: "Human investment prevails material investment, because human resources make the difference". I stressed this very point in 1986 during a seminar about modernizing administration: "Productivity will result from the mobilization of people and the intelligent use of technology". Certain French experts, such as Y. Lasfargue of the ISG (Institut Supérieur de Gestion - High School of Management) emphasize how crucial it will be to achieve the man-technology symbiosis if we want to avoid major malfunction within companies.

The NICTs shifted from a confidential status to massive spreading throughout a population of executives and employees. Companies needed workforce commitment in order to realize the full potential of office automation. But first and foremost, they had to provide a specific culture, and school had to take over towards the younger generation. For this reason, increasing investments in training have since been a major supportive action in the introduction of the NTIC's into companies.

Last but not least is the problem of hierarchical distance and its insidious effects, highlighted by Octave Gelinier (38). Inspired by the work of Geert Hofstede and Daniel Bollinger, Gelinier considers that the French are world champions in hierarchical distance. The larger and more bureaucratic the structure, the stronger the hierarchical distance. Paradoxically, this distance undermines the hierarchical power itself by triggering an authority crisis. This is why unions are so powerful, in their position as leaders and communicators via their various delegations. In fact, unions did not hesitate to pressure management, itself wary of the rise of NICT's, to block certain reforms in work organization.

In this context, extremely favorable to opposition, unions have become another obstacle to the transformation of organizations. Demassification, in the form of decentralization or relocation, engenders a more user-friendly and cooperative attitude in management, a threat to the unions. As a rule, unions are opposed to telework, for they fear it would endanger the rights of the worker. The DGB (the German Unions Confederation), when asking for a bill against "electronic home-based work", alleged that teleworkers were in fact "invisible scabs". In 1983 and in 1989, at the 15th and 18th Conventions of the American Federation of Labour (AFL-CIO), the Federation adopted a series of resolutions against home-based computer work. They emphasized the reduction of wages, the erosion of careers and of working conditions. The Services Employees International Union (SEIU) did the same (39).

In his book *Tous ensemble* François de Closets tells how, in the early 80's, the unions succeeded in freezing for three years a variable working hours system at the company Solmer with delegates legally holding the right to veto in spite of the workers' wishes. But most of all, he demonstrate the unions' inability to come up with any new ideas on the social ground. Initiative is left to managers or to groups of employees outside the reach of the unions (40).

A special issue of *Secrétaires d'aujourd'hui* ("secretaries today") about CEBIT 79 (a trade show on electronic office equipment in Hanover) discussing the "office revolution" warned us to avoid yet another clash due to resistance to change. It never happened. A 1984 a Gallup Express survey showed that 70% of French people whished

to find alternative ways to negociate their working time. That battle was much more insidious and underhand: it left very little chance for teleworkers, even part-time.

The opposition front

The president of an association recently observed that he had difficulties in recruiting and keeping a secretary. Being the sole wage-earner, the secretary quickly got bored, alone in the office, keeping the administration in order. Her only links to the world were her telephone and her Minitel, until she finally left for home at the end of the day.

This anecdote, which clearly shows our refusal of solitude (remember we are social animals!), softens somewhat David Riesman's harsh judgement (41). For him, "people go to the office more to escape their homes than to earn a living". Companies and institutions are totally unprepared for the legitimate fears generated by the spread of NICT's. Telework tends to marginalize, much like women's confinement home* ._This image is replete with anachronistic, macho relics of the past and broadcast by some researchers ready for combat. Telework is also viewed as a type of social second choice, ready to catch any social outcast, such as the handicapped or convicts. In short, telework is associated with a loss in professional, and social, status.

This question of "professional status", or self-image, in our latin society explains much of our reluctance to accept any form of social innovation. Even part time telework has little success because it is also the domain of temporary staff with low qualifications. This is certainly why telework develops so poorly in France. It was not until 1980, when a bill was finally proposed, then with the edicts of 1982, that this practice, normally left to temporary workers, gained a clearly defined status, most notably in public service. In 1983, part-time work made up 7% of all workers and 11% in 1985. In 1985 also, if we consider the whole of the working population, 97% of part time workers were women. For women who, after the second world war, reached the then envied status of secretary, then gradually became executives, telework represents a social regression. Then it is hardly surprising that women are more reluctant than men to accept telework, and secretaries most of all. A 1985 FAST study in on work-at-home in urban areas (43) stresses that "telework is rejected mostly by those whose jobs are the easiest to relocate." This is a paradox only in appearance.

Another obstacle to telework is of a more technological nature. The 1980 workplace was very different from today. ISDN didn't exist, icons and symbols were still being imagined in Palo Alto laboratories. Ergonomics were still rudimentary, links were costly. Computer screens were said to be potentially dangerous to users (44). At the time, after promises of a brilliant future, the market for home computers was multiplied by three in 1983 and professional applications by two. Home computers tried to infiltrate companies again. IBM abandoned its line of home computers, Sinclair desapeared, and in 1986, Amstrad attempted with some success to break into the professional market, along with Atari who focused on small laptops.

The opposition front was taking shape... In 1980, the British Ministry of Energy was forced to abandon a modernization project under the pressure of unions. Civil servants

* In 1936, 45% of French women worked, essentially as wives in the agricultural sector. In 1987, they still amounted to 45%, but with 95% of them as wage earners (76% in the USA). Today, 25% of French executives are women.

demanded compensation for using terminals (45). Reactions and attitudes were much the same in France. In March 1987, in a study on the subject, *Force Ouvrière Hebdo* published partial results from a survey of its readers and those of *Preventique*. A total of 5,000 readers were polled. Although devoid of any statistical value, the answers were still quite interesting. They shed new light on how personnel and executives felt about the new technology.

Does technical progress serve mankind? According to 15% of the readers, it does not (38.9% for building and public works alone). Should man adapt to technology? 22,8% said no (32% in the public sector). And almost 60% of all surveyed answer negatively to the following: "Do new technologies improve the working conditions of all workers?". Only 22% answered yes! For 49.2% of wage-earners, according to the survey ("L'avenir social face aux nouvelles technologies" – "The impact of new technology on social prospects"), progress was first of all measured in quality of life. 61% of wage-earners positionned performance and productivity at the bottom of the list of tools for evaluating progress. Then how negative can be the arguments on telework productivity.

According to passing references in the survey, executives seem to adapt much more readily to the spread of NICT's. This is a false impression, if we refer to field observations. On the contrary, many employees – most notably in administration – have been using the NICTs to question organisation, against the wish of executives. At least, such was the case in the beginning. With the advent of personal computers, and most notably of application software in 1983, the attitude of executives progressively changed, even though they still remained within opposition ranks. Modernizing a company organization means hard work and problems - and a lot of lost desenchantment should we add: "The economical success of the reconstruction of a service, according to a study (46), leads to a discrepancy in personnel qualifications between the new service and traditional ones. As a result, 60% of workers who moved to the new service wish to be transferred back, because the demanded commitment is considered excessive."

This is the main cause of the many observed failures in the spreading of the NICT's: the technological crisis calls into question the way we work. As it tackles established status, executives are involved. Aside from the hierarchy they wish to preserve, executives assimilate the use of certain tools and the access to certain professional practices to their professional and social status. The the success of laptop is an example. The difficulties encountered in spreading audio and video conferencing are another. They partly come from the fear of losing a "tribal custom" directly linked to status: the right to travel. Which is not at all the problem since the spread of NICTs is, in fact, a way to improve communications between precisely those who DO NOT travel.

Therefore, in 1985, in mid-stream, the first reactions in a context rife with opposition were more than reserved. Most telework experiments were interrupted, projects were abandoned. The economic assessments did not match the expectations. There were still many technical problems: entertainment cable networks were behind with plans, compatibility was not ensured, there were legal and union difficulties. Above all, there was dreading of marginalization from personnel needing, as anyone, social status and aknowledgment. Telework, much touted by the media, did not live to the expectations it had raised. It was still too early. At the time, Papert Seymour wrote: "Computing today is a subculture for engineers and organizations." (47)

The lack of technological knowledge, especially in telecommunications, and the insufficient visibility of actual stakes and costs led companies to all but ignore this new work organization, save for a few cases. For unions, the already mentioned risk of demassification and mostly the risk of a "supposed loss of social benefits" put a stop to any form of innovation. Everyone forgot that these same benefits were owed to technical progress, which had revolutionized work and, consequently, economic development. The American professor Robert Solow received the Nobel Prize in economics in 1987 for demonstrating it with stunning brilliance.

The protagonists, frozen in their attitudes of class struggles enherited from industrial times had yet to understand that those who would be confronted with the growing intensity of the use of the NICTs were mostly executives and white collar workers. The structure of the services industry completely changed within ten years only. In the banking sector, for example, employment fell from 42.7% in 1979 to 23.4% in 1989, while senior executives rose from 43.9% to 58.7% and junior executives from 13.4% to 17.9%. And the mouvement goes on. We can easily guess at the consequences on the cost of salary and the imperative necessity to improve productivity. During the 80's, telework (understood as relocation), with the help of the NICT's, developed *but in completely different forms than what was first expected.*

From myth to reality: defining the real stakes

The economic crisis (1970 to 1980), triggered by the oil crisis, forced companies to greater economic vigilance. They were now confronted more than ever with the need to cut costs and to gain more flexibility in human ressources management. With this in mind, we could infer that telework failed because companies dreaded to destabilize established systems and to aggravate classical organizational problems. This is hardly convincing when we consider the poor impact of the phenomenon on the statistical ground. Although the technological crisis together with the employment crisis left telework in the lurch, never was work so much relocated and people so widely made to work from a distance as in this particular period. What most strikes the observer is how invisible were the real and essential stakes: the economic sanctions. Arguments surrounding telework were endogenous: people thought and argued from within their own value system, almost to the point of egotism. In fact, because we failed to reconcile economic logic with that of the social partners, telework developed in unexpected forms.

On February 21, 1983, at the French National Assembly, deputy Bruno Bourgbroc asked the Ministry of Postal and Telecommunications Service (PTT) about the current state of telework experiments launched by the DGT (General Telecommunications Agency) and whether an extension to civil service in general could be considered. The answer came on April 7: "After a year, each experiment was evaluated on a social, organizational, and technical level. [Nothing more is said on this particular point.] The experiments continue so that we may establish a policy for the use of telework and consider the possibilities and practical conditions to further develop telework in our services. The minister is in no position to guess at the eventual extension of telework in civil service in general." The ensuing stakes of any policy of relocation, decentralization or work-time management were not mentioned, not then, or ever.

This self-centered view of telework played its part, sometimes screening off the real stakes. When a manual switchboard was replaced by an automatic one at Ile Rousse in Corsica, it is actually the real-estate costs, making the construction of a teleshop impossible, which forced the PTT administration to come up with and negotiate an experiment in telework. Territorial communities were not free of this "self-centeredness": they expected advantages from telework-based job relocations, but they never gave much thought to the economic constraints that companies were actually dealing with. These constraints, in fact, forced companies to revise their management of resources, and to decentralize jobs without so much as mentioning telework.

For Evelyne Molliet, data processing manager at Digital in Valbonne: "The decision to make development engineers work at home equipment provide them with the means to develop their ideas any time, on week-ends, at night, anytime at all... worry free. A guarantee for enhanced creativity and better production." (48) A 1990 study by the International Organization of labor (ILO) went further stating that this organization facilitates a better communication between developers and their American colleagues and, most of all, justifies laying down a work plan with fixed objectives. The productivity of these developers being hard to control, giving them the opportunity to optimize the development tools over longer periods by eternalizing their work seemed ideal. This new phenomenon is the end result of the irreversible externalization of human ressources.

The growing outsourcing of services

The growing externalization of services during this decade was the first move towards work relocation. Companies only preserved strictly essential posts and outsourced more and more services. These services (delivered both to individual and companies) include training, research, consultation, and help of all kind. Their development was strong. In 1988, companies witnessed a 15% rise in gross margin, confirming their high level of activity since 1982. This strong development of the outsourcing market (for certain services, at least) can be explained with various motivations:

- companies are then enabled to curb their overheads, particularly when salaries make up a large percentage of exploitation costs (maintenance, secretarial work). As many of these services may undergo important variations in workload, it is difficult to evaluate precisely their optimal size;

- externalization, which does not necessarily imply subcontracting across the board, allows the company to limit recruiting and human resource management problems in situations which could otherwise effect productivity (security, cleaning...) or when qualified personnel is hard to find (computer specialists, specialists in highly specific domains, specialized training, etc.);

- the productivity/cost ratio is often much more favorable when resorting to subcontracting rather than temping;

- and it becomes possible to make use of recent technological developments allowing interesting applications of remote services.

Of course, externalization does not necessarily result in a noteworthy geographical relocation of jobs. Most outsouced activities remain geographicaly close to their clients.

But the use of the NTIC's make it possible to treat distance as an opportunity of better management rather than as a constraint.

Another form of relocation derives from mergers. Company mergers imply certain reorganizations which dramatically increase the risks of computing malfunctions and incompatibilities. The merger of several heterogeneous data processing units may induce problems of maintenance and network monitoring. For these various reasons, certain companies externalized and relocated their data processing management in the form of *facilities management* (FM, for short). In the vast majority of cases of FM, the computer system is located at the client's computing unit. Arlaud, a distribution company, chose this telemanagement approach. The employees, behind their 200 terminals, are the counterparts of the employees of New York Life in Ireland. They are connected to a remote third party computing telecenter. This telecenter generates important savings as it makes use of its resources much more intensively than any other classical unit. This same choice of facilities management was adopted by the Conseil Général of Haute-Loire and the one of Meuse in 1985, when they were faced with difficulties in finding locally the computing know-how essential to the installation of a classical operation center. Thanks to telecommunications, the service sector (serving firms as well as individuals) gave birth to a new generation of teleservices which facilitate this externalization. According to Ungere-Costello (*Les Télécommunications en Europe, en l'an 2000 - Telecommnucations in Europe by the year 2000*): "almost two thirds of the prosperity of advanced countries will be engendered by activities closely related to information."

Access to databases, to more and more personalized teleservices, to high value telecommunications services, to expert systems, etc., they all are telework situation. In the service sector, trade is the leading source of telecommunication expenses in France, with 30% spent (49) for services to companies alone*. Two phenomenons are responsible for this growth in telecommunications expenses: the creation of new services and, much harder to evaluate, the externalization caused by workers moving from the manufacturing sector to the services sector. This is harder to evaluate, because although this transfer, of which we know very little, is the main reason behind the growth of services (remember the man in white on his bicycle at Lafarge in Saint-Loubens), the very positive global assessment of this growth is but a statistical mirage, one sector stealing from the other!

The rise of temporary work

The rise of temporary work is the second move of the relocation of jobs and the use of telework. The increase in employment in the services sector significantly affected the number of its part-time and temporary workers: 80% of all temporary jobs are in the service industry. Temping represents various atypical forms of employment on the rise: part-time work, short-term contracts, seasonal work, intermittent work. In 1989 alone, it rose by 30%. The vulnerability, should we say the precariousness, of this form of employment is one of the greatest problems we are currently facing. In this sector also, some telework or remote work activities have been implemented: telesales or phone

* The sector of services for business reached in 1988 a turnover of 146 billion francs, with an annual progression of 13% and a 220 million francs gross margin. Services for business represent 1,4 million workers.

surveys, and also... the jobs of hostesses of erotic Minitel services (*"messageries roses"*). There are two opposite tendencies on the rise: calling in temporary agencies with unskilled tasks and or on highly-skilled specialists otherwise inaccessible to small businesses. According to Uni-Cadre, the number of contracts rose from 4,860 in 1987 to 20,039 in 1988.

Independent work, the entrepreneurial form of temping, supplier of specialized missions, is also in full expansion in the services sector. Actualy, an independent workers may be less expensive than some salaried workers. As unsettling as it can be, today independent workers compete with wage-earners and the use of telecommunications is their ally. Self-employment represents 8 million individuals in the European Community and 13 million in America.

> *Blanche, who lives near Chartres, is an independent teleworker. On her IBM personal computer, she creates images and animated graphs for videotex servers. As soon as her work is ready, she sends it via modem to her client's computer. The client checks the work on Minitel. Then, by phone, he discusses with Blanche the modifications needed.*

The decentralization of services

The decentralization of services is the third move of relocation. In a report on remote work, the Institut Auguste-Comte describes a now often quoted example of telework, the installation in Nantes in 1978 of a remote unit of the Direction Générale des Impôt, or DGI (General Taxes Agency) in charge of collecting the radio and television tax. This decentralization was motivated by difficulties in recruiting, salary conflicts in the civil service, and the cost of offices in the Parisian area. According to the report's authors, the expected savings from this relocation were supposed to widely compensate for the increase in telecommunications expenses ensued by the move to Nantes. In the same spirit, the computing unit of the financial department of the Postal services (SISF) moved from Paris to the Bordeaux suburbs in 1989. The difficulty was to reconsider a new infrastructure on a Parisian site which would in the end gather almost 300 people. The research, software development, networks and production maintenance services were all relocated. The main computer resources, however, partly remained in the Paris region, save for a few services which found a home in Bordeaux. The stakes were the same as with the DGI above. This experiment in relocation mainly concerned people who are now working from remote terminals, far from the former Parisian center.

Therefore the deploiement of jobs outside large urban centers is made all the more possible as the NICTs get things moving on. And as a result, competition increases between local communities who wish to attract these jobs. The relocation of jobs, at least in the public service, administration, or certain large companies, is indeed facilitated when the constraints of the local market are bypassed. Competition is then characterized by a effort from local communities to offer employees and executives the best possible training environment and quality of life. These services, of course, include highly efficient transport systems and telecommunication facilities. Since 1990, shared technical ressources centers have been proposed to businesses. France-Télécom, who had been in the position to sweep that market in the 70's and 80's by renting teleservice facilities to local businesses, abandoned this approach. Today, the French company

Télésystèmes has taken over and is elaborating a "SITCOM" network specialized in long-distance.

In Great-Britain, British Telecom's NICTs service center in Aberdeen is particularly successful. It offers telemarketing, videoconferencing, and e-mail facilities. A similar center opened in Glasgow. In Nottingham, the Advanced Business Center is a joint venture between the public and private sectors providing local businesses with an access to advanced teleoffice facilities. This project aiming to stimulate the competitiveness of local small businesses was sponsored by Plessey, a British telecom equipment manufacturer who pulled out in 1989, and by the City Council, with the support of the British Government via the Urban Program. The offices are rented according to a previously negotiated fee. More than forty firms, employing roughly 120 people, are based on the Center. The development of partnership networks through satellites centers is being considered.

While firms stick to the field to preserve their markets, interest for such advanced telecommunication microcenters or multimedia rooms will no doubt rise quickly. Small businesses, especially those with less than twenty employees, a dynamic sector and a growing part of "new jobs" (most notably in the services sector), will find this alternative particularly attractive. It is indeed difficult for these firms, considering the required investments, to purchase their own, highly sophisticated telecommunication equipment. Therefore companies – sometimes administration – have been conducting "jobs relocation" programs by keeping in mind general or specific economic constraints while giving poor thought to the advantages of telework. When considering the employment crisis, it is obvious that this flexibility introduced by companies neither benefited the employees nor favored telework, the social partners involved having lacked the necessary audacity. People dreaded the conflicts, the inner obstructions and the revisions resulting from a new work organization. Changing the organization means changing our relationship to authority and control. Oursourcing, temping and independent work allow to bypass these issues - being the customer, companies have it easy.

In most organizations, the capacity for independence and a customer-oriented attitude are hardly common qualities. With so many obstacles, it is easy to understand the lack of interest for the discovery of new pools of productivity and in the ensuing negociations between employers and employees. However, as we shall see, very soon we will have no other choice: forced by economic necessities as well as by our need to preserve our quality of life, we will have to learn to live and work from a distance. By setting organizations free of certain spatial constraints, the NICTs have put remote work within the reach of employees.

But do we really want to call into question a world where everyone has been conditionned for its working position? Under the pressure of crisis, the policy for national and regional development has created a multi-level France. Political and social egotisms fought to preserve either their industrial infrastructure or their jobs, even if it was done at the expense of others. Woe to the weak, to the city who's down the list, to the isolated one!

In the course of our journey through telework and the misunderstandings it arose, we cannot set aside the hopes for national and regional development that governments had pinned on it.

Chapter 5

A tool for national and regional development?

In 1983, Jacques Delors, then Director of the Research Center "Travail et société" ("Work and Society") at the University of Paris-Dauphine, carefully spoke of telework as a tool for national and regional development: "Our hopes are twofold: on the one hand, to renew the rural sector, and on the other, to define a work-home relationship different from the one of the second industrial revolution. To do so we need to analyze cost over advantages, not just within companies, but on the community level. How can we cut down on energy, transportation and property costs? This is all the more important that France, with less than 90 people per square kilometer (compared to 200 to 250 in other European countries), suffers from two plagues: population drain in some regions and a relative increase in collective costs. When we attempt to lower costs, we also reduce access to information as well as sociability. Can telework help France to rebalance its territory and avoid the intermittent (two or three times a year) occupation of certain regions it is experiencing today?" Today, the answer is still no: opposing the will of governments, firms and teleworkers refuse to go along.

Telework: a "product with no market"

Many small towns, cities or villages are experiencing an economic recession*._Employment is anemic, the industrial insfrastructure is aging. Services are minimal. Young people leave for large urban centers to get an education, and often decide to stay there. Every business creation is a hapenning which city councillors yearn for. Some institutions, local communities, or associations have attempted to revive the rural sector through telework, and constantly failed. Theories that relocation is now made possible by telematics quickly hit a wall, due in a large part to market sanctions.

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* France is a lot less decentralized than Germany or Italy. Furthermore, the governement or local authorities do little to make up for disparities between regions. According to the EEC, the French subsidies devoted to local economic development between 1981 and 1986 were 4 times less than the British ones, 10 times less than the Germans' and 15 times less than the Italians'.

Source: A. Bucaille and Berold Costa de Beauregard, "Forces de l'entreprise allemande", Harvard Expansion, suimmer of 1990.

Local communities are wondering too. As there is no political consensus on regional development, some towns continue to monopolize jobs and property for the benefit mainly of offices. Homes are moving to the suburbs, far from the urban areas of activity, and the huge infrastructure that commuting requires must be financed. Consequently, cities are showing an interest in telework as a means to cut costs since "commuters" are expensive for the community. This interest is nonetheless carefull in the light of the above mentionned reluctance and the rather poor impact on energy savings.

Telework has become an environmental argument for reducing air pollution by decreasing the number of vehicles on the road. When the oil crisis was reaching its peak, telework was proposed by environmentalists as a means of saving energy. The idea is that telework, as it reduces travels to the office and back could be a source of considerable savings. However, the theory was known to be false as early as 1977, after a study on the contribution of telecommunications to energy preservation sponsored by the American Department of Commerce and performed by the University College of London. (52) The study showed that general commuting was much more important than home-to-office commuting: 58% for miscellaneous reasons in Lathey in the United-States against 42% for work. In London, results were 52% for miscellaneous travel, and 48% for work on business days only. For a full week, weed-end included, numbers changed to 64% and 36%. In 1983, a survey by the Direction Régionale des Transports in the Ile-de-France area on the evolution of commuting between 1965 and 1979 showed that commuting to work and back fell from 55.1% in 1965 to 35.8% in 1979, in favor of personal commuting, which rose from 39% to 50.3% during this same period (53).

In such a situation, we can hardly expect wild enthusiasm for an organizational model which has poor impact on energy savings and, much more, is uneasy to implement. Commuting is always increasing, supported by an important increase in trade. Rather than vainly trying to find ways to save petrol we should focus on saving on time lost in traffic jams and in transit systems. For the Parisian area alone, this lost time represents an estimated 5 billion francs; our stretching caravans of collective commuters account for 60 to 90 minutes on the road per person per day, or *the equivalent of one to two months of work per year, per person*. This confiscated time is lost for everybody. Individuals suffer from this rigid collective organization. Since we are flexible, we bend: we punch in at the same time, we leave at the same time. As far as companies are concerned, they just keep track of shipping and delivery problems: the client will pay! Stores also leave for the suburbs, where property is less expensive. Companies take care of their own problems, and so is the community.

This form of telework, often mixed up with work-at-home, will not save energy. On the other hand, the point is to reduce urban jams by avoiding unnecessary trips and, most of all, to control the flows in order to gain on production time. The NICTs will play an important role in this regard.

Urban employees and executives are discovering for their part that the countryside is great... to a certain point! When all is said and done, however, such issues are of little importance to the globalisation of business. Mapped-out decentralization has more to do with strategic efforts to break into specific markets.

Are telecommunications serving decentralization?

We expected telecommunications to revive the contryside by creating new jobs and new activities. But a company's deploiement strategy depends primarly on the local wealth when it comes to opening an agency or a unit close by a pool of prospective clients. If it ensues in job creations, all the better. According to the firm's management system, the new agency or unit will be more or less autonomous, depending on whether it is judged on outcoming results or adhesion to guidelines. In fact, during the last decade, the NICTs have been used mostly as a tool for decentralized management, with various results: very few companies actually master the NICT's, and specialists are few.

> *In order to get closer to its clients, a leasing company decided in1983 to restructure by creating local agencies. General expenses went up 43%, mainly because of the new organization... and because of the NICT's. In reality, the experiment did not include decentralized management and any autonomy for the agencies.*
> *- Listings were sent by shuttle, since there were no teleprinters,*
> *- the computing central unit and the maintenance teams had to be reinforced,*
> *- new specialized lines were put in place,*
> *- credit files were manually processed*
> *- litigation cases were handled by phone, between the main office and the agencies,*
> *- coordination trips were numerous,*
> *- all mail was dispatched and rerouted to the main office,*
> *- all formal letters were word-processed on the central unit, and dispatched locally .*
> *Local management resources, mainly data processing, were eventually installed to lower liaison costs. The company had simply remained too centralized.*

In the 60's-80's period, companies paid little attention to telecommunications costs. As a result, when companies considered relocating their activities or exploring a new market, telecommunications did not seem to be an issue or a key factor in the decision making. Local subsidies, tax exemptions, services, training, job conditions and transit facilities mattered much more. In France, relocating a company or an institution has more to do with circumstances and political opportunism than with any deliberate focused local strategy.

As for firms, they still don't show much interest for telework. Some of them rather examine other solutions such as the industrial zones of the future (technopolis, teleport, telesite, advanced telecommunications zone...). The most attractive regions in the world are those who have strategically set up their communications networks in order to give access to specific employment or consumer markets. This phenomenon should reinforce the supremacy of areas which provide important concentrations of intelligence and sophisticated networks, as is the case for the big rich cities in the world.

To attract this intelligence, some cities endeavour to innovate in order to improve the surroudings and the quality of life. The great French weeklies *Le Point*, *L'Express* and *L'Expansion* now regularly publish compared reports on the quality of the services provided by French cities to both people and firms. As an indirect consequence, the business world finds a renewed interest in collaborating with the city to improve environment, training, research, and education. Services, roads and leisure are as many ways of keeping or attracting entrepreneurs and high-quality human resources. But the NICTs are still considered of secondary importance by councilors and the majority of companies. They can even have an effect completely opposite to what was expected.

Jean Chapolin is French, and not nearly as famous as his creations, Inspector Gadget and Care Bears animated cartoons. By applying market rules and an international division of labor to animation, he created cartoons which were produced in Asia and sold first in the United States, then in Europe. This synergy between three continents shaped an animation triad through the NICT's. "Satellites allow for permanent links, and the timelag between the creative studios (Los Angeles) and the production studios (Tokyo) is used to solve a problem or change a drawing without slowing down production." As we use particularly precise specifications, Tokyo can also subcontracts with seven other studios, who dispatch the work through a chain of South-East Asian companies.
L'Expansion, December 5-18, 1986

The NICTs can stop job relocation

Contrary to certain beliefs companies are in fact slowing down their investments in relocation, paradoxically because transit facilities enable movement and widen the scope of their influence and clientele. The increasing speed of transit, by reducing transportation time, is modifying the concept of market proximity. For example, the French TGV (Train à Grande Vitesse: "high speed" railway system) is completely revolutionizing territorial management. Some firms decided against opening units in Lyons or, conversely, in Paris, because it had become much easier and cheaper to travel between certain regional capitals. Sometimes, when regulation measures are lacking, the centripetal quality of big cities, thanks to this new ease in transit, attracted resources which would otherwise have stayed and developed at home. This is what senator Pintat, in charge of a decentralization project, condemned as the "black hole effect". For this reason, certain planners whish to involve urban headquarters into making use of low-cost production infrastructures, relocated but easily accessed by highway or TGV, as the dynamic activity surrounding the TGV stations can attest. In his own way, the President of Bouyges Immobilier, stressing the staggering increase in property costs in the Paris region, very much agreed in his June 1990 article in Les Echos: "The key element in the real-estate market (...) is relocation (...). Only by orchestrating decentralisation together with the location of railway and air traffic centers will we be able to imagine the upcoming restructuration of our cities."

This phenomenon is somewhat similar to the impact of the TGV on market proximity, brought to light during an interesting seminar in Kiruna, under the aegis of the OECD and the Swedish government in June 1990, and entitled "Télécommunications et développement régional" (Telecommunications and regional development). According to the speakers, there is as yet no obvious link between regional development and telecommunications. The NICTs infrastructure is not sufficient in and of itself to create the required conditions for a development of new service activities which would encourage jobs relocation. On the other hand, it can contribute to widen market zones and open the doors for existing companies to attack – and sometimes undermine – monopolies and local small business! In other words, the regions favoured by telecommunications and transit facilities are the ones which were economically stronger in the first place. This conclusion deserves immediate balancing: the recent installation of telephones lines the Sri Lanka countryside has allowed small farmers to directly keep track of the current rate of agricultural goods in large cities.

Cities were in fact taking advantage of farmers. As a result, farmers demanded, and obtained, higher prices for their production. (54)

The major impact of the NICTs may rather lie in their capacity to increasie the ease of the exchangeability of services. Small businesses gain easier, cheaper access to services, expertise and know-how that their local resources could not provide at an acceptable cost. The word "local" must be used with caution since we are bound to think more and more global and get rid of the "geographical tyranny of the traditional landowner" and of the frontiers themselves.

We often make the mistake of thinking that telecommunications per se increase production. In fact, they rather affect the spatial structure of social and economic relationships. In the best of cases, they strengthen and stimulate the existing structures, when accompanied by a series of actions intended to promote pools of regional expertise. The simple fact of installing telecommunications cables does not create instant employment and business, anymore than a TGV station creates instant economic growth.

In 1984, the Association d'Étude et Aide pour le Développement Rural in Turriers (Association for rural development study and assistance) brought a few experts together in order to draw a list of activities which could be performed from a distance. On paper, the suggestions seemed technically and economically feasible, since there were already firms in each of the chosen market sectors. Yet Turriers still had to face a basic problem: which entrepreneur would accept to move to the village and develop one of the chosen activities? The little village of Turriers in the Southern Alps still has not found an answer to this question. In the end, telework –a product without a market – simply doesn't sell. This is the case even for the most underprivileged members of the community, the socially and physically handicapped, who had considered telework an interesting way of avoiding marginalization. France produced nothing comparable to the Best Western International phone reservation program. Thirty female convicts were hired for the experiment. It allowed BWI to circumscribe the overflows thanks to a toll-free number available from 5 a.m. to midnight. During the first five years of the operation, the center generated more than $72 million in reservations. Today, the program handles 10% of all calls. It has prevented the loss in clientele sometimes associated with saturated phone lines. The convicts, who received a salary equal to that of any Best Western employee, were chosen for their typing speed, commercial qualities, and geographical knowledge. More than 152 convicts worked for Best Western, and 34 were hired upon their release. (55)

R. Meyer (56) shows in his report entitled "Gagner du temps sur le temps" (Gaining time over time) that even in his vehicle, the (terminal) man can be linked to the world thanks to... office automation. In 1987, the French spent an estimated 20 and 25 billion hours in their cars. This means we spend 5 years of our life, on average, in a vehicle. These vehicles can be equipped with portable electronic equipment and the RDS (Radio Data System), in order to optimize travel time and receive personalized information.

In 1981, G. Metayer (Travail à distance dans les activités d'études, Rapport ICS) observed that remote work was at the crossroads of an economic conflict between expenses and time losses in commuting on the one hand, and the cost of technical solutions which substitute information exchange for human travel on the other. But he

was not then in the position to see that the word "substitution" is inappropriate. There are no alternatives. Through an implacable logic, the NICTs release "virtual" work from time and space. Telework does not substitute to office work, it gives it another dimension. Besides, the office has already moved to the car!

Yet if work has been circulating with increasing ease through networks in the 1970's through the 1990's, the "terminal-man" remained, for his part, confined in the traditional model of the tayloristic organizations of the industrial era. Telework, an alternative of organization of time and space, fails to interest companies and social partners. Jack Nilles, a specialist on the subject, wrote in the October 1984 issue of *Managing Telework:* "Telework was perhaps introduced too quickly and could turn out to be a technology in search of its market." In my opinion, it is in fact a solution in search of the problem it solves, much as a product searches for its market.

The exchange of services and the international division of labor

Any company wishing to curb its expenses while remaining flexible "buys" work at a lesser economic and social cost whenever it can. New job competitors with low and easy access to the emploiement market via telecommunications network will thus be of great interest to them.

Teleworkers in developing countries are still not major services purveyors. Yet in some countries, some companies are already exporting their services. The Brazilian firm CMA Engenharia is a good example. Samsung in the Corean Republic is another: as early as 1987, they were 68th in the top 100 list of data processing companies world-wide. These developing countries partly pin their development on this form of activity and strongly resent any obstacle to the international exchange of services. According to a 1989 study on the internationalization of software and computer services, trade is mostly centered (for now) within the OECD. It must be said, however, that some countries are strongly muscling in on this developing new market. Between 1984 and 1987, Brazil experienced a 501% growth in this sector and rose from the 10th rank to the 4th worldwide in this sector, while India followed with a 203% growth (21st rank). (57) _

In order to block these new competitors, an alternative may be to create or buy firms in these same countries. Thus American Airlines "externalized" its computing department by creating a subsidiary in Barbados which markets computing services. (58) In this manner, international firms can infiltrate countries which will eventually become clients and at the same time benefit from lower wages costs. Moreover, some people know how to play on invisible import/export by resorting to networks as yet uncontrolled by customs. Off-shore work thus led to what we provokingly dubbed "hidden immigration". This manner of circumventing the law through telecommunications may unstabilize the traditional markets.

Manufacturing japanese firms just have to create production units in the concerned areas in order to bypass the OECD custom barriers. On the other hand, a number of Japanese services companies choose to externalize software production with partners in South Korea, Taiwan, and China, and were thus able to propose low cost products with a very attractive margin – an asset when negotiating with large European distribution networks. For example, the Japanese firm Itoh was involved in a joint venture with the Chinese to develop software for the Japanese market. The potential dangers are

contained by the previously mentioned language barrier and by the weakness of specialized telecommunications resources in these countries... for now.

The exchangeability of some services is bound to develop as the NICTs come to play an increasing role in the national infrastructures. "Exchangeability" is perhaps not the right term in the context of information production, a sector where work is being redistributed on an international level. "Interchangeability" of teleworkers is perhaps a more appropriate term. These teleworkers, far from being found only in the Paris, Chicago or New York suburbs, are located in Barbados, in the Kamataka province, or in South Korea. An economic paradox now becomes faintly visible: the same person may ruin his/her own position as a wage-earner when he/she consumes - as local businesses with a large work force cannot always keep up with this new competition.

Much like factories of the 1950's, certain countries are discovering that the cost of work in the information business can either be a strategic strength or a weakness. As a result, some companies, who want to be on solid ground when it comes to cutting production costs, prefer to invest in foreign countries. Some of them even try to set up private networks in order to possibly redirect international flow to their advantage. Texas Instruments not just created a software joint firm in the Kamataka province in India, they also contributed a million dollars to the construction of a relay ground station. (59)

The effects of "work without frontiers" call into question our basic idea of the teleworker as a comfortably home-based, in the suburbs or in the countryside. Work is immaterial, it is present virtually anywhere a NICTs connection is available. As a consequence, some firms may become more and more versatile, when they relocate in order to benefit from certain advantages, most notably fiscal, or from the low cost of international networks connections. Remote, paid-by-the-task work, such as in Castleisland in Ireland, is encouraged. The Irish government is considering an expansion of this sector with 37,000 new jobs expeted. Taking maximum advantage of fiscal incentives which may represent up to 120% of investments, many foreign businesses do not contribute to local wealth. They import and reexport, salaries being their only expense. Such systems benefit from a negative capital cost and bring no cumulated local wealth, since the investment in intelligence is equally nil. They are precarious and may result in firms volatily whenever the slightest, potentially serious problem in conjecture arises. Although Ireland is revising its approach, developping countries remain and will remain fierce competitors. By modifying space/time relationships, the NICTs give them access to the job market in the tertiary sector. An analysis of all the factors which compose production costs in those countries give affordable labor the upper hand. Advanced countries lose certain activities when a cheaper workforce is available elsewhere. Employees, for their part, will be confronted to growing competition of teleworkers in developing countries. We are forced to recognize, for example, that India, with the third largest pool of computing engineers in the world and salaries seven times less than in the West, is turning into a true competitor in the field of computing services externalization.

From work without frontiers to the frontiers of knowledge

Since they can neither wait nor hope for any significant change in the cost of work, advanced countries will have to build their line of defense on another ground. The

majority of companies have understood the importance of telecommunications in today's international competition: according to a 1989 Ernst and Young report, 60% of all companies included telecommunications in their global strategy. The commercial battles – we hesitate to say " of tomorrow", as they are already taking place – are fought on new frontiers, the frontiers of knowledge, on three simultaneous levels:

- The mastering of the NICTs: the technological know-how has become essential in order to enhance productivity and gain strategic differentiation. For example, thanks to telemaintenance, the cost of computer after-sales services has fallen from 12% to 4% of the purchase value during the 80's. This remote monotoring of computer systems has cut the costs of coordinating a constantly moving team of technicians. Availability has increased with the help of preventive monotoring. Maintenance has improved thanks to the information provided by the "telediagnosis" prior to any intervention. Now the spare parts required to reboot the system are always available for the technicians.

- The mastering of the specialized standards in electronic exchange has become crucial. Firms will build their second line of defense upon their mutual understanding of the standards of electronic data interchange. The formerly merely internal organizational issues are going collective. Professions are uniting around federations of information systems such as the EDI (Electronic Data Interchange). The access to these new private clubs requires mastering languages and standards, such as EDIFACT. Since a message such as a purchase order can include up to 6,000 bits of data, the content and position of the information must be carefully agreed between partners. The members of the EDI "professional club" can, in a way, impose their standards of computerized documents and render access to electronic trade more difficult.

- the third wave of "knowledge frontiers" will come from the privileged links developed between partners who have grown familiar with the exchange of know-how and experience in a sort of club, reserved for members only; knowledge exchange will become as important as the spreading of computers in our society.

Created in 1984, the OREDIC (Organisation de Réseaux d'Echanges d'Informations entre Collectivités - organization of information exchange networks between communities) played such a role of club for large cities. Each member city put in a common pool the outcome of its innovations and experiments: security, energy conservation, recycling, employment... This unexpensive tele-application (only a few thousand francs per city) also benefited from a questions/answers service functionning with the main database.

The stake of today's economic war is the creation of what Jean-Jacques Servan-Schreiber called "les industries du savoir" – "the knowledge industries" – as early as 1984 in his Centre Mondial de l'Informatique, but which we shall refer to as the "knowledge monopolies". The news lines of defense against the international distribution of labor will be drawn around the frontiers of the "homelands of knowledge". Key fields can be controled simply by tapping into the right pool of knowledge, seizing the right brain power. And because this type of activity requires large amounts of human resources, we must make a proper use of the NICTs in order to optimize the efficiency and the productivity of intelligence.

The medical profession gives an example of the process of gathering and sharing knowledge and experience through databases. Remote access to expertise, facilitated by the transfer of medical images through the ISDN network, has opened up interesting

possibilities for expert systems in hospitals. However, interest is now waning since expert systems did not keep their promises. An interview with J.C. Pages, expert system specialist at IBM, in a special issue of *Sciences et Vie* (September 1990) on "electronic workers", summed up the situation: "Diagnosis takes up less than 5% of a doctor's work time. In fact, the decision making process is often much easier than the process of obtaining comprehensive information." The objective becomes to build up the basis of a vast erudition, then transfer it on demand, with the computer acting as an assistant to diagnosis. Mastering knowledge and experience acquisition, communication and interchange is a growing concern. The "knowledge monopolies" may make it possible for advanced countries to resist the relocation of certain activities in developing countries. The necessity to recoup the enormous research, development and training expenses supported by firms, governments and all types of organizations is also at the forefront of preoccupations.

Some believed that preserving energy, saving petrol, was enough to justify the existence of teleworkers, but what really needed saving was time. Some thought that saving time on executives' travels with telecommunications was the solution, but what was needed was to enhance communication as a whole within the company. And now, we are talking about mastering knowledge acquisition and interchange via the NICT's.

Intelligence, "brain power", has become strategic. The stake of the next millennium will be to exchange this power at a lesser cost in order to increase the productivity of huge corpuses of - often poorly exploited - data. Organizations involved in developing expertise networks know how highly strategic this type of exchange has become, while the Baby-Bells of the world are looking into controlling it for political and economic reasons. The NICTs are now serving our brain cells and work is becoming an added value activity.

Since technology allows to call into question the reality of frontiers of many sorts, we find ourselves teleworkers as the spreading of the NICTs is accelerating. *And yet, power will rest with those who will control knowledge*. With the help of networks, knowledge will be part of a new conception of service interchangeability. The new stake will be to master and market brain power. This is miles away from the international labor division so popular in the manufacturing sector in the 60's through the 90's. This is why there is danger, in an advanced nation, in continuing to consider telework in its 20th century incarnation as the exclusive domain of the services industry. The hunt for brain power is now a priority: cities have suddenly realized that students could draw in firms. They try to attract students with brand new campuses and to make use of hubs of excellence in order to widen their influence monopolies. This is reminiscent of the times when corporations, no longer in existence, contributed to their development and their wealth.

The frontiers of tomorrow are truly based on knowledge monopolies: will we be able to feed the new research and development networks which represent another form of national and regional development? This is one of the questions we now face.

The NICTs not only call into question our traditional division of labor; their applications are transforming the very essence of work by offering new possibilities which we, teleworkers, whether we like it or not, cannot afford to ignore.

Part 2

THE TERMINAL MAN

Virtual work: the amount of elementary tasks performed by the forces which are applied to a system of solids subjected to ficticious (or virtual) movements.

Le Petit Larousse (French dictionnary)

Chapter 1

Factors stimulating remote work

The NICTs may be considered favorable to the creation and general operations of many companies. Yet contrary to many theories and statements, telework per se does not create enough jobs to reduce the economic disparities between regions. Telework is but the result of the clever use of the NICTs by some companies in a market-driven economy. And clever they must be, since they are experimenting an alternative organisation of work in an environment which has become global.

Assumed to be freed from ancient reflexes, telework, or work via telecommunications, found himself new technical and economic foundations. Technical and economic arguments will be as many factors in the promotion of remote work within the framework of a new division of labor.

Analysts agree: the burden of wages costs and growing overheads in the tertiary sector, where productivity does not always compensate for investment costs, leads to dire consequences. Jean Voge (1), upon noticing a brutal decrease in productivity in 1973, observed that this trend was due to the growing disparity in productivity between blue collar and white collar workers. The first grew sevenfold since 1900, while the second stagnated despite the billions invested in the development of the NICTs. The blue collar workers' productivity is absorbed by white collar workers into added information costs. And there are more and more of them! Michel Albert, in his book « *Le Pari français »* (The French Gamble), gives the example of a Japanese factory where only 18 out of 600 employees work in the workshops, the remaining 582 being "tertiary" workers.

The betrayal of office workers

OECD experts have witnessed a "relative decrease in the growth rate of the information sector". On the other hand, they have also noticed that consultants, specialists, senior executives and senior administrators are experiencing the most important growth. We can imagine the impact such a phenomenon is having on the growth of the work force in the tertiary sector, and on the expenses generated. These

expenses include movable property and property costs (offices), as well as computer and other variable expenses. These important fixed overheads partly explain the decrease in the growth rate of information professions due to the increasing externalization of activities of low value or simply the disappearance of certain jobs in favor of the NICTs. In London, the new CHAPS electronic check processing system caused the disappearance of 6,000 messengers and the reduction in externalized check processing has engendered a decrease in the number of data-gathering professions from 35% in 1979 to 22% in 1985. (2) The Système Interbancaire par Télétransmission (SIT) currently being tested should have a similar effect in France.

The trend towards converting fixed costs into variable costs (as for above mentionned FIL International) is bound to intensify if we take into account the rigidity of union-management agreements and the inflation in white collar costs. Intermediate solutions can be tried, such as variable work hours, for example, yet the fact remains that the tendency is strong, and will continue to intensify if white collars' productivity remains low. Social partners who wish to curb a company's tendency towards externalization will have to reconsider telework, which lowers some fixed expenses and helps maintain certain full-time jobs.

This phenomenon deserves closer attention: estimates of the German Economic Institute WSI (3) clearly illustrate the transformation of the employment infrastructure. According to the Institut, by the year 2000, the active population will be divided into 25% of qualified permanent workers; 25% of peripheral workers with low qualifications, mostly on short-term contracts; 50% of marginal workers, jobless or only working part-time. This, however, does not mean a decrease in overall employment. The tertiary sector as a whole, especially information-processing jobs, will continue to grow, though less dramatically. We will rather witness a transformation in company structures, giving preference to independent or temporary workers. Temping has grown by 16% during the last six-month period of 1990 in France.

NICTs and the wage-earners/non wage-earners competition

This phenomenon was first brought to attention in 1989 in a study by the European Communities Commission on employment in Europe. Independent workers, mostly in the agricultural sector through the 1960's, are now leading the pack in the services sector, where growth is most significant. They now represent 14% of all workers and the authors predict that the trend towards hiring independent workers will have an increasing impact on the active population in Europe.

Following the trend, more and more qualified executives become independent and create "micro-businesses". The NICTs are one of their greatest allies: a fax machine allows to quickly send an estimate, a Minitel console can handle business transactions, etc. The use of mailing systems contributes to help a single worker to coordinate its activities between several "employers" at minimum operating costs. The concept of time-shared senior executives is also gaining credibility. Some "economic interest groups" bring together complementary individual services such as Eva Rubino's Siticom which provides car rental, messengers, secretaries, interpreters and body guards to visiting foreign customers. In 1986, experts from the Commissariat Général au Plan (French planning agency), in their book entitled "Faire gagner la France de l'an 2005" (Ensuring France's success in 2005), flirted with the same idea when they mentionned

new low value services for families and homes. According to them, this activity is taking on traditional small service companies by accepting much lower fees than them. An article in the Journal du Téléphone (November 1989) on telemarketing illustrates once more this competition. The activity of a teleworker is higly fluctuant in workload and does not adapt very well to traditional organizational models. So much that Stéphane Lumet, the article's author, argues that "the main danger for telemarketing companies lies in temporary work". After a series of tests, firms using these services integrate the function internally in their marketing division, hiring temporary workers only when needed. Once again, the cost price of the temporary telemarketer, 145 Francs per hour, is lower than the 160 Francs per hour the telemarketing agencies ask. These differences in cost are accentuated by fixed expenses in overheads, and are responsible for the increase in outsourced employment – independent workers, experts and temps, called upon as needed. The ultimate aim is flexibility* .

In November 1985, Yves Lasfargue and Eric Verdier of the CEREQ published a report on the "transformation of production methods" at the "*Prospective 2005*" national conference. Speaking of mobility, they declared that: "Imposed precariousness should be replaced by negotiated mobility". Their analysis was based on the idea that companies hold the key to this mobility. This is perhaps a little to quick on the draw. Today, the institutions, the leftists who have been indulging in comfort and the workers themselves are responsible for the rigidity imposed on the organization of work. It has its own logic, commanding when it comes to produce at a lesser cost, without delay, flawlessly, and furthermore, brilliantly. Bosses" are subject to the same rules. The work of sociologist Jocelyne Loos, as quoted in François de Closests' "Tous ensemble" (4), clearly shows how the social forces resist attempts at greater flexibility: "Employers are clearly more comfortable than unions with this issue [...] managerial strategies try to integrate into their social policies some variables relative to the personnel's ways of life." Loos also underlines "the capacity of management to take into consideration and deal with multiple social expectations."

The difficulty truly lies in finding whether, once informed, participants will accept certain changes or experiments rather than oppose them. A strict, to-the-letter approach of the law – always a step behind current realities – can be a threat to employment flexibility. The idea that "the last to be hired is the first to be fired" is contrary to efficiency, as is the idea that flexibility must be internal only. Opposition to newcomers on the job market leads companies to develop cautious hiring policies. As a result, these same companies increasingly resort to peripheral employment, an interesting alternative which increases productivity: less training, fewer taxes.

Should we worry? According to an in-depth study by the OECD on employment flexibility (5), "the importance of expenses related to the cost of work affects the manners in which available human resources are employed." When they realize that overheads are higher with unqualified workers, employers, who must anticipate economic and production inconstency, react to economic fluctuations by keeping their qualified personnel and laying off their unqualified work force. This external flexibility can reach important proportions: 1,000 part-timers out of 6,000 wage-earners at

* Externalizing saves money. In the banking sector, the cost of a wage earner is 89,50 Francs per hour, against 72 Francs for an independant worker. In data capturing, a wage earner in the insurance sector costs 235 Francs per hour (of presence) against 180 Francs per hour (of work) with subcontracting.

Renault-Douai. Yet part-timers only represent 1.4% of total wage-earners (250,000 in 1988). The important increase of other forms of precarious employment (+344% for trainees and +99.6% for short-term contracts) give a clearer picture of how a precarious workforce is competing against a population of "fixed" wage-earners.

Unions have fought hard to shorten the work time and to stabilize salaries. If they wish to survive the competition, small business owners have no other choice but to promote to higher rank employees with long working hours, in order to save on overtime premium... or else, find a cheaper work force instead. Conditioned to the synchronized practices of factory work, stunned by employment insecurity, we lose flexibility and condemn ourselves. The stakes, however, are high: with the help of the NICTs, we must regain our freedom without losing job security. A stimulating goal. While breaking the barriers of the industrial age, we must bring back suppleness in work schemes. Only the cleverest forms of work organization will allow us to push back the precariousness of traditional employement, so penalized by overheads of all sorts.

The limits of mobility

The monthly cost of a wage-earner in Europe* (salary plus social contributions and profit sharing) in the manufacturing industry varies between 2,000 ECU (European Currency Unit) for Germany, 1,900 for the Netherlands, 1,700 for Belgium, France, Luxembourg and Denmark, 1,500 for Italy, 1,400 for England and Ireland and finally, 400 for Portugal who, as we have seen, is interested in Ireland's approach to remote work using telecommunications. Yet, if we set apart the above mentionned risk of social dumping and the market alterations due to subsidies as in Ireland, salary disparities in Europe do not justify in themselves any significant relocation of tertiary employment. In fact many factors are blocking our mobility (which is already much weaker than is generally thought, even for executives and experts of all kinds) and they will justify to use the telework or telepresence applications of NICTs.

First of all, providing firms with services require temporary human resources. Hence the market will be local or regional and ruled by social and professional standards which are themselves governed by supply and demand: independent workers, the wage-earner's competitors, remain close by their target market. As for mobility, social and professional standards play such an important role that they also help to stem the brain-drain even in the more qualified professions. This is why it is difficult to send back to their homeland students who have become doctors or engineers, used as they have become to living and working in ways incompatible to their home culture. Households also suffer from low mobility: the majority of families need a double income. Pressure to own rather than rent and the legitimate concern about the chidren's social and educational environment restrain mobility. In the end, the current state of mobility is at complete odds with the needs outlined in the "Prospective 2005" report.

Europe is not America. However, professional migrations can only be considered when a region has developed enough to attract and convince the head of the household. With the current slow rate of economic expansion, this seems rather left to chance. As a result, the OECD studies on the state of european employment all reach the same

* It is important to note that the ratio of job flexibility over actual wages is negative. This means that when the cost of labour rises,the number of available jobs falls down.
(OECD, *Flexilibilty and the job market*, 1989)

disturbing conclusion: capital mobility on the one hand, work immobility on the other, *although the NICTs do partly compensate for the limitations of work mobility.*

Really there or virtually there?

On the field, agreements, often silent, allow senior executives and specialists (mostly white collars) to bend their schedule by taking days, weeks or months breaks in order to think and work out of the sometimes stressful and inefficient office environment. This formula no doubt explains the report that executives have the lowest official level of absenteeism (3.5 days per year, compared to 16 days and 12.6 days for laborers and employees, respectively). According to the Ministère du Travail, this includes an increase in working hours par week: 51.8 hours in 1982, to 53.1 hours in 1989 for company heads; 43.5 in 1982 to 44.4 hours in 1989 for engineers. And these figures completely ignore true, non-stop workaholics, who bring work home on nights and weekends! In order to fight the international competition to lower work costs, perhaps a more flexible working schedule should be considered. *Making poor use of the presence of white collar workers being the best way to deteriorate their productivity* more importance must be given to the work itself, not on how much time employees spend on it according to punch-clocks. A new approach to time and resource management is needed, such as in job-sharing.

The NICTs, by facilitating job-sharing coordination, allow small businesses to share executives with several other firms. This approach is gaining in popularity. The September 14, 1990 issue of L'Express stated that 65% of company heads surveyed by the Association Promotion & Développement were favorable to sharing an executive with several other companies.

In Lingua, a language school offering courses between 7:30 am and 8:15 pm, has another approach. Its teachers may as well move to the company's offices or host the students at the school according to more familiar schedules. In Lingua also gives courses over the telephone. This last formula, particular to language teaching, optimizes both the teacher and the student's schedules. No fixed decisions are made as to location: clients may ask to receive a call where they wish, according to a previously scheduled appointment. The teacher may call from the school or from any other location, and thus avoids having to run to the office between two classes to give a 20 minute lesson over the phone. In this manner, remote work via telecommunications allows for an original approach to the division and coordination of labor.

Obviously the "always-present, all-the-time" factory scheme is not appropriate for the information sector. Information workers already live according to varying rhythms, sometimes out of sinch. In some way, this "desynchronization", completely side-stepping the traditional industrial scheme, forces us to synchronize our watches. Teleconferencing is a good example: in a virtual meeting room, executives and employees coordinate projects under way. Each company must find its own rhythm and variations in work arrangements which will lead to greater productivity with equal investment. A major argument for telepresence is to balance disorganized and poorly exploited presence against the notion of "productive work" or "useful work". We must explore systematically the ways in which the NICTs can contribute to making us telepresent, even it if means having various work time schemes. Cell phones serve no other purpose than to increase our productive work time, to improve coordination, and

be... telepresent. We have become teleworkers against our will. Meanwhile, we might even be able to improve our Russian or our German in our cars, thanks to cassettes.

Long-distance training is a good illustration of the capacity of the NICTs to help reorganize our working time and space scheme. In 1990, the Direction générale de l'enseignement et de la recherche de l'agriculture (Department of agricultural education and research) launched an experiment in multimedia, long-distance training. This training program was designed for farmers who wished to obtain the professional farming diploma ("Brevet professionnel d'exploitant agricole"). Trainees met regularly in a training center, yet more than half of the 1,200 hours of the program actually were spent in their own residence. VCR's were used to study real or virtual cases, the phone and a telematics system kept trainees and trainers in contact (6). By coordinating private and professional locations, the program touched a greater number of trainees by cutting down classroom time and presence.

The NICTs enable a better management of time and space, individually as well as collectively. This opens up new and original grounds for negociation between social partners. Not to make too much of the phenomenon, many experts, executives, consultants and accountants remain available and accessible wherever they are thanks to the NICTs. They are virtually present, at a lesser cost!

The IBM training center in France gave 4,000 hours of training by teleconference in 1990 alone. They wanted to decentralize continuing on-the-job training without wasting money on personnel going back and forth from training and work places. Around fifteen individual multimedia training workstations will be set up. They will complement the virtual classroom, according to Jean-Louis Delannoy, head of training at IBM France. This planned video-conference network can also help train IBM clients and broadcast on the entire "IBM planet" events of interest to corporate members, whenever needed.

As for executives, telecommunications are redirected, phone calls and faxes transfered to their homes. The unmentioned side-effect of this new comfort is their required, permanent availability on the job. Not all terminal-men will be able to follow this path, but an increasing number of us will. We will not share work, we will share time. Obviously, this type of personalized time management is more favorable to executives who, thanks to this wider availability, work more flexible, though longer hours. Always on the job: should we resist or rather recognize that it is an inevitable trend towards a new form of work? We know that empirical data and in-depth studies all agree: the increasing role of networks in our daily lives and jobs will mark our future.

The almost too well known first experiments in telework practically all bear the imprint of the culture and reflexes of the industrial times. In an information society, the majority of people will be concerned by telework. This point of view is not simply justified by the fact that, according to statistics, a good 70% of active people work in the services sector; as we have seen, since employment externalization creates "services to business", the statistical illusion quickly shifts from one sector to the other; but the explanation rather lies in the increasing dematerialization of all human activities, work included.

Of course, some part of the active population will always live and work in conditions far from those promised by the 21st century society, but in advanced countries,

teleworkers are already the majority. It is obvious if you picture yourself or your acquaintances trying to work without the help of telecommunications!

Chapter 2

Work is deserting the traditional production centers

At the beginning of the second millennium, the relationships between cities and the countryside in Europe was still balanced. But as the rural world was still inorganized, cities undertook to structure themselves. City dwellers understood what could be gained from trade regulation. Supply costs, routes and circulation evolved by the way of edicts and rules benefiting the city. Quality was controlled, market places were taxed. Trade conditions reflected the uneven battle between the individual and the city (7).

During the industrial era, the individual worker suffered from even greater dispossession. Unlike the craftsman, he had no control of his trade. He was enslaved to the machine. In a confined position, he discovered the division of labor and the to-the-minute punctuality necessary for industrial production. He lost control of his own time and space. The factory defined its own frontiers, soon disconnected from the city. The factory operated according to its own logic – it could even define and affect communities by creating an environment which made people even more dependent. Those who were dwelling in council estates and 19th century mining cottages has been chosen by the factory managers. In these uneven battles, the stakes were clear: to pull the maximum amount of energy out of workers. Performance investigations were scientific, mechanical, and no drifting was allowed. "Any form of intellectual work must be removed from the workshop to the planification and organization offices (8)." The city engendered class struggle. The working class continously protested for lower working hours and rates. Then came robotics, especially multi-task machines, bringing about the regression of physical labor.

Progress took the shape of strange sophisticated machines. The only thing requiring negociation was the way they would be implemented. At the end of the 20th century, the condition of the working class is disrupted again, this time because brain and symbols are overriding brawn and matter. Today fatigue is not just physical, but mental too. *Our relationship to productivity seems difficult to maintain; it loses its normative power*.

Then distribution and the need to open a dialogue between consumers and providers became predominant. The NICTs contributed to facilitate communication and work redistribution. As an consequence, space and time constraints concerned a growing number of participants and were changed. People began to leave the company's boundaries and to get freed from the physical limits they used to impose. There are more and more nomadic people, travelling through the markets out of various motivations. Virtual work is everywhere, omnipresent thanks to telecommunication networks. Telework used to be just a choice between working at home or at the office, but today it is adapting to the diffuse relocation of activities stimulated by the growing intricacy of networks. Encouraged by various phenomena, work is deserting the traditional production centers.

The rise of the"local touch"

In the services sector, the reduction of fixed expenses though externalization is limited by the need to keep providing clients with high value quality services in order to remain competitive. These services require and will continue to require proximity to clients and quick reaction to their needs and expectations.

Faced with the erosion of benefit margins as the European market opens up, and with a deep transformation in lifestyles and consumer habits, companies will have to attend more and more on the clientele. As marketing-sales and customer services departments become satellites, jobs too must move to the field, while avoiding the explosion of fixed expenses. For its part IBM in 1980 allocated a part of its staff to sales, in order to improve contact with clientele and at the same time reduce indirect costs.

The concerned jobs deal with advertising and stimulating the sales of the company's goods and services. This is all the more essential as services have become sophisticated and require strong interpersonal ties. Weaving an intricate network through high-consumer areas has become essential for companies intending to maintain their acquired position and influence on traditional markets. Such as the case of the French large bank Crédit Agricole when it launched its "Points Verts" in order to maintain its presence in isolated rural areas. Special agreements were signed with local shopkeepers who then handled transactions. Now more than 10,000 shopkeepers associated with the Crédit Agricole offer basic banking services. Each transaction (checks cashing, deposits, transfers...) yields about three French francs for the shopkeeper. The nearest agency handles management and accounts.

In order to cut down on commercial costs, most notably in the services sector, companies may resort to the still developing field of "business hotels" and time-shared, multi-user (and multimedia) facilities such as the aforementioned Advance of Business Center in Nottingham. A different distribution of work space must also be considered: partly at home, partly in teleoffices or even still in the offices of the firm and by schedules appropriate to the activities. An insurance salesman is his own boss, taking care of customer files and administration from his home; he is available at night to meet his clients returning from work. As the increase in real-estate costs and in rent cuts down on margins and traffic jams hamper certain activities, telework, or virtual work, becomes suddenly more attractive. Wage-earners using either their homes or a multimedia teleoffice are in the position to provide the "local touch". In the world of

mass distribution, the Tupperware formula is practically an icon of this type of direct sales. Alway gathers a team of 500,000 independant distributors.

Very discreetly, so as not to alarm unions, this type of organization is increasingly calling on telework in order to divide tasks and coordinate activities which require regular contact with clients or a third party. This is no news: think about journalists, reporters, messengers, radio-equipped repairmen, truck drivers, private nurses, foremen, land surveyors, quality field inspectors or simply the police! In front of terminals, Parisian police officers receive "17" calls, the French equivalent of 9-1-1, and thanks to radio, they quickly and patiently unravel the thousands of dramas that are weaving out there. They reroute calls to cars and other connected services, dispatching the appropriate assistance according to each case.

In 1982, Kroger Company, a supermarket chain with 1,200 stores and 500 drugstores in 21 US states, signed a strategic alliance with Capital Holding, a $3.8 billion insurance company. Kroger wished to provide a new attractive service, while Capital Holding wanted to modify insurance product distribution. Capital Holding salespeople now go to Kroger stores and, using computers, perform an "on the spot" comparaison between Kroger customers' current automobile insurance policies and Capital Holding policies (9). With the help of their Minitel console, sales representatives for the French banks Caisse d'Epargne of Paris and Crédit Général Industriel have become teleworkers, supplying simulated credit lines for apartments purchasing or monthly car payments from information booths.

The rise of proximity services is a an example of the "one to one" interaction businesses are now developing in order to improve commercial efficiency, while other techniques such as telemarketing are used to identify new potential clients. That leads to differentiate between new markets exploration and sales. La Redoute, one of the first shop-by-mail companies in France, opened small centers with saleswomen equipped with terminals. And in Sweden, the administration decentralized information services throughout the country.

The growth of "local touch" applications is further illustrated by the development of contact points such as vehicles (cars, buses, trucks, mobile-homes, etc.) equipped with NICT devices. This flexible formula cuts down on the enormous fixed expenses normally associated with real-estate investments in a traditional network approach. Buses, cars, or trucks allow companies to locally set up services which were previously unknown or hard to reach. Today we hardly notice mobile Post Offices, mobile tv control rooms or medical emergency antennas. The Conseil Général de l'Hérault had a more original idea: in 1987, it financed an NICT bus which drove around villages and small towns. The bus, a modified Renault, stayed for a day nearby city halls and showed local council members, schools and business managers the characteristics and advantages of telecommunications equipments, such as the Minitel. Connections used the council's telephone lines and demonstrations were displayed on movable tv screens attached to the coach's ceiling.VSD, a company created in 1985, markets sets which dowload information and display it through color video pages. In 1990, for the first time, their "visiobus" system, a video system for urban buses, was exported to Spain. An estimated 418 "visiobuses" are in circulation (10).

Maintenance salesmen or company representatives have become nomads, the company is now some kind of base of operations where people only touch down occasionally.

Multimedia facilities

None of the experiments above should be considered particularly remarkable applications of telework. Nonetheless, they would have been impossible without the use of the NICTs, either as a means to cut down on management expenses or to fulfill the need for on-the-spot representation. By sharing resources, companies can modulate time schedules and make a clever use the NICTs in order to minimize technical investments otherwise inaccessible. The "ideal" multimedia facility is a good example of this emerging approach.

Imagine a craftsman designing the plans for a staircase with the help of a CAD/CAM system that he has discovered, tested and bought at a presentation organized by his professional association in a special office nearby his home. The premises were financed by either the city, a business association, the chamber of commerce or a building and public works company. It is a fully automated office, and comes with its own technician to guide you through procedures. Membership cards are used to control access. Today, in a little room, around 15 people are in a meeting to discuss with a group insurance specialist from the main office. He is using a VCR to display a series of accounts from elderly citizens on life insurance. Yesterday, in the same room, a representative presented an entire line of products in front of his most important clients in the city. The RNIS audio-visual system allowed to illustrate the presentation with images on manufacturing and quality control, as well as a brief intervention by the sales director, speaking from his own office. In another room, travelling trainers are in the process of explaining to bank employees – the local branch does not have the proper facilities – the new applications of credit scoring. Their demonstration is aided by a computer linked to the main office's computer system. The town's high-school also uses the facility for demonstrations and for its annual computer project with a local hospital. Non-profit organization come there for conferences and to make the population aware of environmental issues. One non-profit organization just broadcasted a film towards all identical multimedia facilities thanks to a satellite dish. The multimedia facility is open on a time-share basis (and so at a lesser cost) 24 hours a day. Frequent visitors also include certain small companies and individual workers, who now have access to an e-mail address, a fax machine, and an answering machine (with remote message retrieval), all with possible rerouting if needed. Some of their employees come to learn (another type of remote training) to use electronic office equipment. A showroom for hardware and software is sponsored by the chamber of commerce. A multimedia booth has been installed for carriers at the road junction entering the city. Thank God, now we finally understand that small companies can improve profits with the help of the NICTs, and that new jobs had to be created ... to operate the multimedia facilities!

Large communication companies could play a considerable role in this type of market penetration. Franchising is a good example, especially when it involves promoting know-how and sophisticated new procedures which require "on-the-spot" engineering. As early as 1978, in Europe, ACTE had developed a network of business centers; in 1985, there were 50 of them. Today, they have become true multimedia services centers. National or international representatives have a registrered address in

the business center. They have access on demand to a fully computerized, automated office, meeting rooms, and secretarial services. Members benefit from a flexible structure which prevent start-up companies or firms exploring new markets from overtaxing their budget. The experience of some companies, such as Burroughs, who had eliminated their local branches to cut down on fixed expenses, or Bell Howell, who linked its commercial networks to these centers to locally support their activities, clearly show that large companies too can profit from this approach. It is unfortunate that the government never considered developing such centers in countries where small businesses could export to. Only certain banks with branches already in place in foreign countries have decided to act as occasional (but rare) "baby-sitters" for companies before a less precarious setting up.

The work explosion

"The work explosion goes against universal rights. Though the task may be daunting, we must learn to merge the universality of fundamental rights and the right to difference", Jacques Delors stated in 1983. (11)

But for many, such as journalists, consultants, door-to-door salespeople, telephone surveyors, researchers or teachers, work is not understood as a strictly office-bound task, form of work regarded as sacred in spite of all the generations it has subjugated. The new workers carry work along in their minds, or else they bring it home, thanks in part to the new, nomadic possibilities of the NICTs. And contrary to what many once hoped, free time is not increasing. In fact, it diminished by 30% in the United States in the last 12 years. For the same period, the INSEE (French national statistics institute) claims that French citizens gained 3.28 hours per week in 1985 and 4.04 hours in 1987 but their figures fail to convince. An article in the October, 1990 issue of *Dynasteurs* declares that: "far from diminishing, the average length of the working week has grown once again... from 38.2 hours in 1982 to 38.6 hours in 1988." Today, work often deprives us of our free time for the benefit of a productivity which bears the imprint of the increasingly intensive use of the NICTs. All the while keeping the cost of work even, of course.

A misunderstanding. We thought that the NICTs would turn telework into a tool for greater flexibility. We stressed the emerging awareness of how much companies burdened the community with indirect costs. Unfortunately, the industrial era and its practices die hard. "We are just beginning to re-invent employment in France", says François de Closets in *Tous ensemble*. And Henri Guillaume, Planning Commissioner in 1985, speaking of this modernization, declared: "I'm not sure that the French are ready for it. The ultimate challenge for our society is to find more efficient forms of collective organization, especially in the work sector." End of story. The decrease in working hours was stopped... by traffic jams in large urban centers (90 minutes lost per day, an average which hides considerable disparity).

The French equivalent of the British Country Urban, URBA 2000, which is answerable to the ministry of Equipment, eventually found itself promoting its experiments with an administrative information dispenser, available through Minitel or by phone (in Blagnac or Roubaix), in order to reduce travel time and eliminate access problems for working parents. The institutions' goal is not to make our life easier but to help us carry the burden of work. The average customer-citizen-person is invited to use

telematic services available 24 hours a day. In such a case, the NICTs are flexible enough to reach the individual, but telework had to struggle against forces out of proportion and eventually was unable to revise the traditional organizational schemes. And anyway, why should it be so? The NICTs have become tools for business competitiveness. They interweave the fabric of society, they insidiously infiltrate the teleworker's world, breaking once and for all his personal protective bubble. For better or for worse, according to whether he is a victim or an instigator, to whether he likes or hates his job, the "terminal-man" is caught in the net. Since telework is identified to work-at-home, it definitely breaks the barrier between professional and private life. If some are determined enough to let work take over privacy, as is the case for many executives, the choice is entirely theirs. An excessive invasion of the private life by the employer is certainly the more widely discredited aspect of telework. For that reason, when the DGT (Direction Générale des Télécommunications - General Telecommunications Department), launched its first experiments, they had carefully seen to it that none should take place in the home, but nearby the home. This point is extremely sensitive, because the individual and collective relocation of human resources, whatever the reason, first and foremost jeopardizes each individual's personal professional project.

As was the case at the beginning of office automation, individualized preparation and support actions must be set up. Human resource management must be adapted in order to ensure remote personnel motivation, taking its cue from management by objectives rather than from procedure control. Remote work requires innovations we still are wary of. We have yet to fully integrate the major change which makes it commonplace... and indisputable. This is about organization as an art. And organization again has no idea about on how to make the NICTs profitable.

Yet, an idea is about to emerge: to encourage work-at-home using the NICTs to distract leisure time for training. In 1988-1989, some firms realized how worthwhile it would be if executives and employees had a personal computer at home. Some were bold enough to try the experiment, La Redoute being the most famous; others progressively understood the interest of such an investment, particularly if employees share in the purchasing. It encourages them to practice and train at home, and to bring work home. Executives and certain professions which were already used to forms of work-at-home (publishers, journalists, translators, trainers) found themselves many opportunities for telework. Some cranks started to go about their activities between the company and home, exchanging compatible diskettes: sales and representation, reports, etc. Cases multiplied, leading to the creation of the term "rampant telework" and proving this prediction made by ATT in 1971, much quoted and branded about since, that by 1990, the majority of American executives would work from home. With this nuance, however: in 1990, these executives would have the possibility to work from home.

The "dependant" worker

A Californian subsidiary of CAL Western Insurance Company made a costly mistake. In 1983, it launched a telework-at-home experiment by renting terminals to 22 women with 3 to 11 years of service with the company. The conditions were the following:
- resignation from the company
- independent worker status
- weekly quotas
- terminal rental fee: $50
- independent worker must offer compensation for processing errors
- working for another company is prohibited
- the company reserves the right to end the contract unilaterally and without advanced notice if quotas are not met
Two years later, under protests that the contract was subordinating the independent worker as a regular wage-earner without any rights or protection, the company had to pay the teleworkers 1.2 million in damages after being taken to court (12).

In the final analysis, innovations are few. The information sector, which will increasingly have to resort to remote work, with teams sometimes separated by thousands of miles, is still not calling its organization into question. The productivity expected from the use of the NICTs is still being tabulated in a traditional manner and proof of its efficiency is far from established. Figures such as a 4% increase in productivity in the tertiary sector between 1970 and 1980 against 85% in the industrial sector are thrown about. As always, necessity rules. It appeared that white collar workers made different uses of their working time. They are permanently unsynchronized. This time discrepancy makes as important a division as distance.

Scheduling conflicts in the 20th century...

"The way we are all constantly doing everything at the same time is a tremendous folly: it is expensive and only brings trouble [...] our present synchronism is an anachronism", de Closets harshly claims (13). An interesting expression which justifies the success of the many applications of the NICTs meant to improve the efficiency of tertiary divisions.

Tools such as electronic mail and answering machines were invented on top of valiant secretaries because white collar workers stubbornly resisted synchronization, being constantly on the move, in meetings with clients or in other situations which confer any attempts at face-to-face communication the look and feel of an exercise in zen. *Technical means, in other words, which represent us and allow us to desynchronize our respective time schedules within a collective organization.* Loosening, diversifying, personalizing and optimizing white-collar task division is a logical reaction to the demassification of the "third wave organizations" described by Alvin Tofler. After Henri Guillaume, Plan Commissioner in 1985, had talked of our poor capacity to improve our collective organizations, Jean-Baptiste de Foucauld, the new Plan Commissioner, declared in the October 1990 issue of *Dynasteurs*: "The concept of chosen time has not yet become a French custom". Jean-Paul Camous, general delegate of the Institut du Commerce et de la Consommation, speaks of constrained time. In a foreword to a report on Sunday work entitled *A la recherche du temps choisi* , he wrote: "Queuing at the cash desk at the supermarket is as absurd and costly as traffic jams

during summer or winter holidays." General overcharge is thus engendered by structures of the past which jam and pack tightly people trying to live together. For Jean-Paul Camous, "there is a paradox in that this pursuit of chosen time is stopped by the structured organization of our collective tools for controlling time." This paradox is true, we know it, for work organization. There is thus a contradiction in our society: citizens may choose the people who govern them and the place where they live, but not the hours they work. Fundamentally, time resources are poorly allocated, with consequences on the self-balance of individuals and, by the same token, on business competitiveness. But to make time and work arrangements more flexible, we must get rid of some ideas of the past and see that employment is jeopardized by the discrepancy between the increasing capital mobility and the low human resource mobility and flexibility.

Here and there, client or employee pressure has forced companies to call into question the rigid schedules which husbands were better equipped to sustain in the days when wives were in charge of domestic chores. This, of course, is no longer the case: women are now also part of the work force (50% of them, 96% of which are wage-earners). The family unit has changed, the present status quo cannot be maintained. Our society has now become so complex that everyone sees his or her time confiscated by the simplest of administrative tasks, which often still requires some travel. Meanwhile, company heads record more and more absences. Every disturbing incident in the family unit creates difficulties which affect staff mobilization, and quality* .

At MPSA, a printing company with a staff of 2,000, the arrival of personal computers in the early 1980 led Bernard Merck, head of personnel, to encourage flexibility by authorizing the use of PC's in the home. To realize this project, the company shared in the purchasing of computers and established professional relationships based on objectives rather than means. MPSA took charge of training and launched a debate on why employees should punch in and out at specific times. Experiments were tried: after two consecutive days of work-at-home on their computers, workers lose touch with the team; a better solution is to split the two days. The debate also broached the subject of scheduling work-time according to workload. Secretaries were allowed to work at home with their bosses' approval and on a task-by-task basis, one day a week. (14) The Marbeuf insurance company in Marc-en-Bareul, in France, tried a similar approach: once a week, employees could bring work home. Les Mutuelles de Rouen in Elbeuf also allowed their employees to work at home once a week, Wednesday, day off school for children, being the most popular choice in both cases. Each time social partners are in a position to negotiate working hours, sometimes combined with relocation, flexibility is the ultimate issue. But it is still too early to speak of flexibility: companies and administrations are still discovering these strange machines called the NICTs and have yet to master them, which is far from child's play. Specialists are few and the NICTs evolve very quickly; a product may be obsolete in just a few months. Life is perilous indeed for computer

* By the year 2000, 40% of the French population will live in the countryside, against 27% in 1975 and 29% in 1982. The number of people living alone will rise from 4.8 million to 7.2 million. People living in a two persons family (couples with no child, or singleparent with one child) will rise from 11.2 million to 14.2 million.

Commissariat au Plan, *"Faire gagner la France"*.

departments and company heads who wish to use the NICTs to increase their competitive edge.

During the 80's and 90's, it seems that the NICTs have allowed new (tele)services, commercial or not, to enter the game, more than they have led us to reconsider the traditional office model. As a result, there is a discrepancy between the impressive creativity of companies trying to improve performance and competitiveness through the NICTs and the weakness of social and organizational innovations which the NICTs could facilitate. Telework being one of these innovations. This rather depressing observation could justify the paradox – mentioned by readers of *Force Ouvrière Hebdo* and *Préventique* – that people dread technology and at the same time hope that it leads to major breakthroughs. Demassification has made the individual visible once again, only to isolate him in an increasingly complex society. Salary is not gained according to task, but according to qualifications. This evolution in the division of labor under the influence of the NICTs is recent. After a century of collective organization which has moved the tribe from the village to the factory, we have come to dread marginal workers, those who simply do not work like everyone else.

Yet, do we really have a choice? Modern organisations are fluctuant. They vary more and more according to their specific constraints and goals. And the organization of work may change too because the NICTs are transforming its very essence. Sign is now binary. It symbolizes the power of computers, the power of the virtual world, bestowed to us to help us save time, money, and energy.

An energy engendered by another big-bang: the NICTs, New Technologies of Information and Communication.

Chapter 3

The big-bang of NICTs

Time Magazine's1982 "man of the year" was.. a personal computer.

In a little more than a decade, the NICTs suddenly and disturbingly appeared in our personal and professional lives. Technology, once essentially confined to specialized locations such as workshops, invaded firms, then society in general, truly breaking from the past.

In 1988, Dataquest, a market study specialist, evaluated at 38 million the number of personal computers in the United-States – owned by 15% of the population – compared to 200,000 in the former USSR – 0.7% of the population (15). It was estimated that by 1995, 20% of European households would own PC's, a total of more than 25 million PC's according to the European Communities Commission report *Les Télécommunications et l'Europe* (16). Minitels consoles continue their progression. The number of PC's sold in the United-States in the course of a year is equal to the total number of Minitel consoles in France. This is undoubtedly a massive spreading of the NICTs. Such rates have become indicators of national economic and social breakthrough. In the early 80's, the sales of electronic equipment within the European Community represented $32 per person, compared to $82 in the United States, and $46 in Japan. The Electrics International Corporation (EIC) estimated that the world-wide turnover for the electronics industry for 1995 would reach $1,000 billion. It amounted to $904 billion in 1992. We are experiencing a technological flood caused by a big-bang of the NICTs. It is also the source of many problems: although we sometimes forget it, the post-industrial information society is first and foremost a hypertechnological society. But the problems do not stop there; we also have to adapt ourselves to the spectacular spreading of NICTs applications, which are deeply modifying our relationship to our environment.

The microdetonator

In 1989, the Marketing Associations World Convention in Paris reexamined the term "complexity": complexity linked to the accelerated development of new electronic technology, complexity of a demassifying consumption exploding into micromarket segments over the world.

For that reason, when Claude Andrenzza became President of IBM France in 1986, he made the decision to reassign to sales some 1,700 engineers and technicians. By improving contact with its clientele, IBM hoped to "make it harder for small competitors IBM had allowed to blossom by letting them hold small niches actually amounting to 70% of the market!" (17). Such a market fragmentation in the NICTs sector, a favorite topic for marketing specialists (including at IBM), had been made possible by the advent of personal computers.

A little less than 10 years earlier, on April 16, 1977, at the Brooks Civil Auditorium in San Francisco, a colorful stand, with a large, apple-shaped logo with a bite taken off, displayed a range of computers no bigger than a typewriter: the Apple II, openning Steve Jobs' saga, which made Apple, within a few years, one the most innovative forces in an extremely dynamic field. In fact, personal computers led to frenzied activity: more than 200 enterprising manufacturers broke into the market. In the early 80's, no one actually could be said to dominate this sector (18). At the time, Tandy sold more computers than Apple and Commodore together. Sales were stagnating. Three events opened the door to the massive big-bang in the NICTs sector.

The first event was a technical breakthrough from American companies such as Motorola and Intel. They created fast, powerful microprocessors, the 68000 for Motorola and the 8086 and 8088 for Intel. The latter was chosen by IBM to launch its first PC in 1981. This PC, a project of IBM lab manager William Lowe in Florida, was in fact the second event.

An IBM team led by P. Donald Estridge was responsible for developing the new PC. Its conception and distribution changed every aspect of IBM's usual practices. It was even available in retail stores! It had tremendous success: between 1981 and 1983, PC sales rose from 20,000 units to more than 500,000 units per year. The press wrote: "IBM puts its seal of approval on the personal computer, which makes it a long-lasting product." Nonetheless IBM, although it was manufactoring more than 50,000 PC's each month, did not have a mass production and distribution culture: the company could not satisfy demand. Many manufacturers seized this opportunity and launched their own products, some of which cloned IBM's PC. These compatible clones led to the third event which detonated the big-bang: the appearance and the mass distribution of standardized programs, or package software.

In 1979, Daniel Bricklin and Robert Grankston created Visicalc, the first electronic spreadsheet specially created for Apple. Success was such that it amounted to a fifth of total Apple sales. In 1982, IBM called upon Mitch Kapor to create the famous Lotus 1-2-3, another spreadsheet which could convert numbers to graphs. An army of developers was put to work and created a true software industry for the MS/DOS operating system perfected by William Gates, head of new firm Microsoft. At the same time, the most gifted computer specialists challenged large systems, opening the door to the generalization of NICTs. This spreading was also made possible by a spectacular drop in prices in the computer industry.

Computer technology at a low cost

During the oil crisis, Fish Engineering & Construction, Inc. was hard hit and needed to cut down on expenses. President Jim Boyd and his staff, who had become fans of personal computers, decided to revise their computer system, an IBM 4341 with ten or so terminals amounting to $280,000 in 1985, including dedicated personnel and site.

At the end of 1985, Fish Engineering & Construction, Inc. bought a dozen microcomputers from Compaq Computer Corporation, the Deskpro 286, then in September 1986 shifted to 386's, built using the latest processor. With these new Compaq PC's, work speed was 40 times faster than with previous system. There was no need for a cooling system and maintenance was much cheaper. Moreover, engineers could use cheap software for their tracers. Fish Engineering was able to lower their sales price by 4% (20).

In 1986, the European market for large systems was beginning to slow down, IBM was losing some of its market shares. The period was characterised by both demassification and a spectacular spreading of computers in households and offices due to a fall in the cost of computer technology. The policy of centralized computer "power" was challenged: according to Marc Butlein (Gartners Group) centralized systems fell from 46% in 1984 to 40% in 1985, then to 34% in 1986. It was the beginning of a trend which was called downsizing in 1989: microcomputers taking over from centralized systems. Micro-computers rose from 1.4% of the world market in 1981 to 38.5% in 1986. Prices were cut by half in one year: an IBM AT (256 Ko) sold for 56,000 Francs in 1985, then for 30,000 Francs in 1986. Software sales grew 31% per year between 1983 and 1989. In 1990, a Mac Classic cost less than 10,000 Francs and the up-to-date IBM's PS/1 cost 15,000 Francs. Big Blue revived the home computer market, while executives were fond of lap-tops (+32.4% annual growth until 1993 according to IDC) and microcomputers were getting even smaller with the "mini-desktop".

Computer technology at a good price: the price of Mips (in $)

System type	1986	1991	1995
Large systems	110	25	7
Micro-computers	30	3	0.7
Supercomputers	30	5	1.5
Workstations	15	1	0.15
PC	5	0.5	0.09

Source: Dataquest quoted by 01 Références, October 1991

The goal was then to make computer hardware even smaller. Eventually, the notebook-style lap-top computer would fit in your side pocket. According to IDC predictions, an estimated 14.4 million laptop computers were to be sold between 1988 and 1993 (21). The arrival of electronic notepads in 1991 was expected to make laptops even more practical, yet equivalent in power to a PC. An industry of peripheral micro-devices developed (disk drives, modems, printers, optical readers, pocket

scanners). The office was reduced to a few square inches, right on your lap: the office was also becoming a nomad. It shifted to vehicles; some even talked of "mobile offices" ("bureaumobile"). After a difficult start, at least in France, these vehicles were eventually equipped with radiocommunication: from 2.1 million in 1990, they were expected to reach 6.9 million in Europe in 1996. The development of cellular phones should spread to all Europe before the end of the decade. This new network, still in the works, will allow us to locate and identify vehicles and communicate with the driver, and also to follow their movements. The car will become a mobile terminal, and so will planes and trains. Networks are on the slow course of entirely interlacing society.

Linked... and omnipresent

Technology explored new territories in July of 1989, when Jean-Louis Etienne and his team went to the South Pole. Their trek across the Antarctic covered 3,700 miles through a frozen, desert landscape. Yet, thanks to a satellite link relayed by microcomputer to the Spide central server in France, schoolkids across the world could follow the expedition and exchange messages with the team.

This spreading of computer technology, even in the most remote areas of the globe, had a spectacular impact on telecommunication facilities needs. This is essentially due to the explosion of what we could call "personal connections". Micro-computers everywhere are getting linked at a dazzling rate, a development stimulated in France by videotex applications or large networks users such as banks. The bank-to-bank exchanges of the Belgian SWIFT system include 2,900 financial organizations in 73 countries. 4,500 connection points amount to total of 1,300,000 transactions per day. Yet this is but a tiny part of the total world-wide turnover of telecommunications: according to the Observatoire mondial des systèmes de communications (OMSYC), this market was worth 322 billion in 1991 and doubled in 1995.

Company budgets for computers were still increasing by 15% each year; budgets for telecommunications, however, were growing at a 30% rate. In 1986, the weekly magazine *Le Monde Informatique* pointed out that computer expenses were the fastest growing general expenses in French companies: +68% in 1980 and 1985 (representing 8% of general expenses, expanding from 0.87% to 1.65% of the turnover between 1978 and 1986). After sotware development costs at 22.5%, data transmission is second, with an 18% growth.

Leaving company walls behind, and thanks to powerful digital switches, workstations and microcomputers gained access to international data exchange in increasing numbers. Digitization ruled: 34 million digital lines were up and running in 1990 in the European Community (23). Research on data compression opened the door to multimedia (sound, voice, image, data) leading to the transfer of animated images. Public access to databases on optical disks made possible to visit virtual museums. Both the artistic world and the technical world became available on a tv screen. Video- and visio-conferencing began to improve our working environment.

Local communication networks can also take off to the air to help the spreading of computer technology. High-frequency radio transmission allows for wireless communication between sites (offices, floors, buildings). This cuts down on cabling or wiring expenses, especially in older buildings, or allows companies to consider sharing

links with an existing network. Mostly it eliminates mobility constraints for certain work stations.

This approach could transform laptops into a type of "cellular computer", thus liberating terminal users from various space limitations.

Local networks and multimedia facilities can send data less than 1 mile away using laser technology. This solution was chosen by the Meuse department in France, to avoid wiring and cabling a number of buildings. The system, developed by the British firm Dowty, sends point-to-point data through light signals. Under the impetus of technological development, processors have doubled their power every two years through the use of parallel microprocessors and software processing optimization. As networks' capacity increases, multiple processor connection become possible, satisfying requests for real-time computing power. The network is the computer: workstations cooperate thanks to high-speed specialized networks, and *the computer itself becomes virtual.* Steve Jobs, Apple's founder, really seized this when he created the Next company. The system first integrates a number of communication interfaces, then surrounds them with processing units, the opposite of a traditional PC. Dubbed an interpersonal computer by its creator, the Next computer is remarkable for other reasons. It is the perfect example of the stunning development of computers in the 80's and 90's: computer technology is not satisfied with flooding communications lines, now it is capable of representing reality, of simulating immaterial objects and properties. And Next is an object oriented computer... a virtual object, of course!

Virtual machines

The evolution of visual and graphic quality of high-definition screens follows the huge progress in graphic and design software: what you see is what you get (WYSIWYG). The advent of a new industry in desktop publishing and graphics opens the doors to impressive possibilities: 16 million colors for the Next.

Today, as we know, systems features and commands are represented by software icons. A printer icon will launch, of course, printing, another icon will place a document in a file, which can be locked – another icon representing a safe – etc. These innovations, imagined by Rank Xerox labs in Palo Alto and first implemented by Apple, then by others, can be found on almost all computers today. In other words, your desktop and your common working tools are symbolized on the screen, on the well-known electronic office. What is most remarkable about these icons is that they are seen as virtual objects, each with its own set of properties.

Software workshop, virtual workshop

Virtual objects" are the product of a type of designing software which simulates real objects. With their modular quality, these simulated objects become software components of a kind (object databases) which may be linked in complex chains and can have specific properties which gives them a certain operating "autonomy". These simulators are used more and more frequently in computer-assisted design for graphic and scientific projects. They are becoming tools, most notably for software workshops, in a completely dematerialized, digitized world.

The development of object-oriented program libraries led to the development of a new industry: multimedia software. This is a major breakthrough: we can now "mold" computer technology. Virtual objects, with their complex, specific characteristics, interact to simulate reality, complete with sound and image. For example, Next's music software, in order to analyze sounds, can simulate an oscilloscope. Signals are received from the computer itself or from an input connected to a signal processor. All the traditional oscilloscope dials appear on screen in a signal frequency analysis window: the micro-computer has turned into a sound-lab oscilloscope! It is no surprise, then, that the IRCAM (Institute for acoustic and musical research and coordination) in Paris was one of the first Next users in France. The computer could simulate any virtual musical instrument or an electronic circuits drawing board, or a draining board for chemical or biological experiments. After objects, machines are becoming virtual and the computer becomes a universal machine! It was first rudimentary, such as the clocks and small calculators found on all computers now, then it became increasingly sophisticated to the point of replacing traditional equipment. The representation of reality, with the progress in animated image synthesis and computer graphics – a result of the increasing power of processors – not only set in motion the industry of the future, but the makings of a new world.

If the atoms of the big-bang shaped the matter which now surrounds us, virtual machines will shape dematerialized representations of reality, new objects or molecules, and materials with strange properties, used in experiments currently inaccessible to us. Products of our imagination, these objects will remain within computer programs for a while untill they are implemented and marketed at a lesser cost... and at a lesser risk.

Yet the impact of the NICTs on our society and our organizations does not stop there. The most spectacular effects are yet to come. Dematerialization will be characterized by the expansion of the simulated world: work will also become virtual. Which is, of course, our main interest here.

Chapter 4

Symbol over matter

The Hubble space telescope, launched in April 1990, was the biggest scientific satellite ever: it weighed 12 tons. One of its mirrors alone weighed 900 kg. Its polished mirrors were mounted with extreme precision, and it was expected to be 10 times more powerful than any land telescope. It could spot a marble 25 miles away. For astronomers, billions of new stars would suddenly light up the sky. The project monopolized the entire scientific community for seven years. Launched in orbit with the help of a shuttle 300 miles above the atmosphere, it was expected to send pictures of remarkable quality which would help us understand the origins and history of the universe. We can imagine the scandal and the disappointment, then, when it was discovered that the main mirror – 2.66 yards in diameter – had a defective curve. A $3 billion mess for a myopic space telescope not even on par with its earth-based counterparts. (25)

In this case, matter was at fault, a problem in curvature. A special computer program set it right. Part of the image received was blurred; decomposed, it was then analyzed in detail by a grid of photosensitive cells. Each anomalous pixel was processed by the program to correct contrast and brightness according to the accurate, clear part of the image. Using a type of space surveyor rod, an image processing program analyzed convergence errors. By using mathematical laws applied to light, and with the help of statistics, a composite was made, as close as possible to what the original image would have been with a perfect mirror. Of course, the image will never be as neat as was hoped, but the Hubble telescope is now capable of provide with images 2 to 3 times better than any observatory on earth: *sign corrected matter*.

Maybe not as spectacularly, the many applications of the NICTs have led to the growing development of dematerialized activities which integrate intelligence to computer memory and software. These many applications contribute to the generalization of "digititazed" work. Starting from a sketch, a computer optimizes its parameters to create the end product. This product artificially lives for a few hours, a few months perhaps, in the computer. It undergoes simulations in fictional environments, possibly in many places thanks to research networks, before becoming

reel. This is ideal for naval architecture, as Jean-Marie Finot explains (26). "For the past 20 years, ships have become quite large and yet have remained fairly easy to navigate. Sail grows faster than drag: with a computer, we can check the shape of the hull [...] Fifteen years ago, we had to draw it ourselves, but now the computer does it. It is interesting because we can associate many variables into the computerized image. Before, drawing the hull by hand and checking figures using a calculator took a week. Now, a modification in shape and in calculations takes between ten minutes to an hour." The same idea also saved the European aeronautic venture Airbus time and money. Airbus could make use of from millions of hours of simulated flight time in Aérospatiales's labs before the first take-off at Toulouse-Blagnac, France. Computer systems optimized the plane's architecture according to the various phases of simulated flights. The power of this technological aid is such that planes are becoming more versatile: computers can program a plane according to the type of flight. This type of innovation is in fact responsible for making the French plane Rafale one of the most adaptable in the world.

The power of software is a new aspect, quite unusual, of the impact of the NICTs on our relation to the material world. Software will give us access to an artificial world: no longer content with influencing matter, mankind now act on representations of reality thanks to computers; *we create a world of "pseudos"*. We try to obtain from advanced electronics and with the help of computers, an interpretation, an aid to a new comprehension of reality which escapes our common senses – or which escapes our economic means for traditional research, prototype manufactoring or marketing.

Oil prospecting is a good example. Research is costly because it involves digging wells. Geologers now use computers to assist them in their search and avoid unnecessary drilling. Prospectors scan a three-dimensional image of the substratum during sismological tests. A computer system called "Prospector" records the terrain's characteristics. An expert system eliminates conjectures one by one in order to identify what is really present in the soil. Soon, satellite images will further refine this type of research thanks to our knowledge of gravitational fields (27). This remote, virtual prospecting does not eliminate the need to check if oil is actually there, and in large enough quantities, but it saves considerable amounts, each drilling costing anywhere between $1 to 4 million per well. This increase in our capacity to simulate or manipulate reality with computers and electronics unfortunately also proved brilliant achievements during the Gulf war: electronic decoys, computer-aided night vision. For businesses, the simulation capacities of "pseudos" can be applied in at least three areas.

First of all, they will be usefull to the study, research, and development of new products, a result of the exhausting competition between international companies, most notably on the economic front. The furious pace of technological innovation is costly: out of ten new products, only one will really make it on the market. Before reaching the market – and we have already seen its complexity – virtual products will remain for a long time within computers and the interaction of their pseudo-molecules will be simulated and tested millions of times before reaching the customer. Second, to sales. Commercial costs for distribution and marketing have also dramatically affected companies performance, with market presence spreading worldwide. Meanwhile, the market itself is breaking down into consumer groups with extremely specific needs. From now on, companies will be able to "teleport" a virtual product to simulate the actual product or service. And finally, to manufacturing. The enormous modeling,

molding, and prototyping costs will have to be cut down with the help of revolutionary computer-aided design procedures. A new technique, the « stéréolithography »_can automatically produce in three dimensions the product represented on the screen.

For the uninitiated, these prosaic applications of the NICTs seem utter science-fiction. Comapnies are confronted with the pressing obligation to adapt their organizations to the explosion of mass markets. Only simulation and "pseudos" can save resources, first on the research and design stages, then on the marketing stage when a new service or product is introduced to prospective clients. These future battles for productivity in the 21st century will be fought and won on unexplored territories and may, each in its own way, lead to rather unsettling outcome.

Artificial representations: pseudo-worlds

Pseudo-worlds are a product of 3D computer imaging research, much like image synthesis. In the 1970's, the Dysney studios produced Tron using 3D animation, a veritable tour-de-force at the time. Since then, however, animation technique has made enormous progres, including interactive editing of path, movement, texture, and moiré depending on specific lighting effects. Synthetic images of an ant created for Volkswagen Polo commercials were developed on computers by a start-up company named Pixar. They invented Renderman, a stunning synthetic image description and processing language, which could set the standard in imaging. This language was the brainchild of Ed Catmull, once head of computing for George Lucas, and his team (28). In 1981, the team was working on the Reyes project (Renders Everything you ever saw), which produced special effects for movies such as *Star Treck II*. Incidentally, one of the shareholders happens to be the ubiquitous Steve Jobs, father of the famous Macintosh and Next.

The progress of computer-generated special effects using synthetic imaging technology is such that they can now even fool our senses. By modelling particles, computer systems copy nature. They can thus progressively create a series of pseudo-worlds or pseudo-characters, which will constitute as many artificial productions of real life. In this manner, the Ecole Polytechnique of Lausanne was able to recreate the famous sequence with Marilyn Monroe standing on an air vent... The early 90's witnessed a boom of metamorphoses or visual simulations made possible by the NICTs. Using this technology, the European Space Agency developed the cockpit for the future Hermès shuttle. General Dynamics used a hybrid mix of real and virtual images for its Falcon Eye combat simulation system. The University of Hiroshima prospects simulated wet-road driving conditions.

In France, Multimédias Techniques created virtual billboards for use during sports broadcasts. Ads can be electronically edited and displayed depending on the audience and broadcasting time. Real images are partly hidden to make room for the inlayed ads. A new technique for mixing real and synthetic images (used in the film *Total Recall*) can help produce virtual environments already coined "cyberspace". The University of North Carolina at Chapel Hill, specialized in virtual space research, decided to expand its church. For the final blueprints, Professor Frederick Brooks invited the parish – unwitting guinea pigs – to visit the planned building... on his computer. Visitors, all wearing a helmet, a special glove on their right hand, a moving carpet under their feet, were able to walk around – using their hand to change direction, in the simulated

representation of the knave. They marveled at the decoration and were even able to move pews and walls with their gloved hand, which allowed them to interact with virtual space (30).

Computer imaging is revolutionizing our traditional communication tools by playing on our senses. Such is the case in medical investigation. New experiments in computer-assisted "navigation" for brain surgery use lasers and synthetic imaging to represent the affected area, and have often been shown to the public.

In the field of "cyberspace" applications, the Mandala system can create a type of collective remote choreography between people located in different places (31). This if of great interest to the NASA, who is studying the possibility of linking several operators to a single database in a virtual environment. We can easily imagine how companies can make use of this type of collective cooperation in a virtual meeting room. These pseudo-worlds interact with our senses without so much as a computer screen. Images being directly projected on the retina – we might be able one day to use small lasers comparable to those being developed for ophtalmologists – the screen becomes boundless. *Terminal-men of the world, we are now part of the image!*

Virtual surgery

The young boy obviously had a strong limp. He walked back and forth in front of a camera linked to a computer. In front of the terminal, Ali Seireg, professor of biomechanics at the University of Wisconsin, used his optical pen to place markers on an animated image of the patient. A few minutes later, a skeleton faithfully recreating the boy's moves appeared on the screen. The "surgical intervention" then began. An enlarged view of the skeleton's leg appeared. Using the pen as a surgical knife, Ali Seireg started to shorten the leg, simulating the removal of small pieces of bone. Soon, the virtual image of the boy stopped limping. One last simulation and the computer image ran across the screen quite normally. Seireg transmitted the surgeon information concerning the amount of bone removed on the simulated leg. After the real operation, the young boy walked without any noticeable limp. (Source: "Electronic Images", Time Life, 1986)

In France, the Université of Paris VIII, together with the city of Saint-Denis, unveiled the "Legible City" in October 1990. An installation simulated a cyclist moving in space. By pedaling and moving the handlebars on a real bicycle, the spectator was able to visit an imaginary city, virtual of course, shown on a large screen in front of the cyclist. Thanks to the decrease in equipment costs, already foreseen by such specialists as Jaron Lanier of VP Research, companies will have access to virtual space applications by the end of the decade. In such a pseudo-world, equipped with helmets and virtual racket in hand, you will win our first – immaterial – tennis game of the week. Air traffic controllers will see an exact 3D representation of their environment simulated by a series of sensors which record the movements of planes, clouds, and even certain phenomena invisible to the naked eye, such as gusts of wind. Submarine pilots will be given the feeling that their hull no longer exists. And a surgeon will visit his patient's body: one day, controlled by electronic gloves, a robot will perform surgery thousands of kilometers away.

Thanks to a simple micro-computer and a stereoscopic helmet similar to Jonathan Waldern's "virtuality system", we will enter a virtual world, maybe some delirious fifth dimension, controlled by the whims of its inventors. Until then, more down-to-earth

applications will let us visit our future apartment our neighbourhood, all artificial, computer-assisted productions. In the same manner... we will go to the office: Bell laboratories are studying the Virtual Shared Environment. It will allow for shared use of the same virtual space (32). In other words, the future meeting room of international corporations will not even exist! By the end of the century virtual representations will revolutionize teleconferencing, and indeed, all collective activities. We will have the possibility to send off our own image instead of moving. Those who dreaded in the 20th century that telework would cause a decline in communications will have to face a series of rather strange responses to their concerns.

Yet immaterial representations will not only artificially recreate our surroundings, if only that of the office; the NICTs will help us represent humans... and substitute them! We will also have to face pseudo-people.

Only make believe...

Perhaps we should remind the reader that this is not science-fiction! This is no doubt what London's Channel 4 fewers must have thought in april 1989, when Max Headroom broadcast his first talk-show and became a symbol of London hipness. Max Headroom was funny, showed the latest videos, interviewed stars and was submitted to interviews himself. In August 1990, he hosted a music festival entitled "Max Headroom, patron of the arts".

MacLuhan had not foreseen Max Headroom: Max does not exist, you won't meet him when you go shopping. Max is a synthetic image, a virtual Max, a make-believe host: a pseudo. Canal + viewers have seen him in France. He is an android, only his eyes and mouth move, he stutters and sniggers all the time. "Max is the first live Dickian fantasy, purely televisual", journalist Léonce de Portal wrote (33), speaking of a staggering interview with this nonexistent character. This make-believe Max had his own personality, his own personal history. He was the logical result of a new type of research: computer-assisted representation. NASA also coined the term "telepresence".

This use of pseudos will have a profound effect on our social, spiritual, and even emotional life in the next century. So far, we have only discovered fairly rudimentary applications, such as computers substituting men to fly or land planes in any weather conditions. Yet in a hyper-mobile world where time has become desynchronized and people are out of tune, this artificial, machine-operated representation is already familiar to us: an answering machine picks up the phone for us and takes messages. Its job is to represent us; it uses our voice. One day, it will use our image. The work of two Canadians, Naida and Daniel Thalmann, of Mirilab laboratories in Montreal, who have modelled famous faces, is a step in that direction. They have been working since 1986 on a software called Human Factory, which contains rules for animating both face and body. Their short film *Montreal Rendez-vous* shows Marilyn Monroe talking to Humphrey Bogart* .

* France holds 24% of the European market of synthesized images, in second position after UK. There are already many superior training centers, but most of all, the European Union created in Luxembourg, the Cerise project for research and development which aims to become the more modern training and production center in the world (35).

In the afternoon of December 19, 1989, at the Cité des Sciences et de l'Industrie de la Villette in Paris, at an AFCET (French association for economic and technical cybernetics) meeting on talking machines the audience laughed and clapped happily: a talking computer simulated dialogues so well that it even protested when it was – vocally – bullied.

> *Tom Fantjo, billionaire and owner of Livingwell gyms, decided to install "Harry", a robot in charge of creating bodybuilding programs. These gyms teachers measure results and have a vocabulary of 1,000 words to encourage those looking for muscular thrills (34).*

During closing hours, artificial representations (computerized voices, for now) become information desks. Still primitive, these talking machines may in the future fool the unobservant. Banks hoping to improve services without expanding their networks or personnel are more and more turning to the telephone for this type of application. In France, the Compagnie Bancaire was one of the first banks to offer the possibility of making transactions by phone, without human interaction.

The military are already preparing a soldierless war. "Condor", Boeing's new spy plane, has broken two records: it flew up to 60,000 feet and non-stop for two days and a half... without a pilot. The pilot's life is no longer in danger in case of war, and large amounts are saved in survival equipment (36). With this computer-assisted representation or telepresence, we can replace and represent man with a robot. In 1989, the French military launched Dards, a surveillance, reconnaissance, and anti-tank light vehicle with an automatic pilot. The Germans have launched a similar project (37). One day, the army will only be... virtually on the battlefield! It is no coincidence that NASA is increasing its investments in this area while diminishing the importance of traditional space exploration programs. Our future astronauts will sit before screens: robots unabled to work in hostile environments – with just enough artificial intelligence on board – will do the trip for them at a lesser cost, and at a lesser risk. "Astronauts will be telepresent", says NASA's Scott Fisher, whose team has been working for many years now on the VIEW system (Virtual Interface Environment Workstation).

Our capacity to project ourselves mentally to the work place is capital. Robotics create simulacrums, exoskeletons, which faithfully reproduce the operator's movements. Wearing a helmet and a special suit, the operator can see his working environment. The suit, thanks to special sensors, remotely controls the exoskeleton's movements. This is of particular interest to firms working in hostile environments, such as COMEX, a company specialized in off-shore oil rigs. Teleoperators in critical areas are already using robots to clear mines or bombs, or to keep watch inside nuclear plants. Helicopter pilot Anatoly Grichtchenko's sacrifice, who agreed to fly over the wide-open Tchernobyl reactor, led Tecmi to develop a remote-control device that can safely perform this same type of operation. Tecmi also built a miniature helicopter, the Vigilant, first introduced at the security trade-show in Toulouse. At 23 kg, it can fly for 90 minutes and carries a high-definition color camera up to 6,000 feet in the air. The pilot flies the helicopter from an ground-based control board. And as the military can attest, its low radar signature makes it undetectable.

Necessity rules, and so remote work continues to spread: Man is terminal and virtually everywhere networks can take him to. The NICTs facilitate dematerialized

exchanges and are used with increasing frequency as an intermediary in telepiloting or to avoid exacting chores. The giant "Club Med One" sailboat is piloted by only one man, who controls the five-mast sail with a lever and a few function keys. A few years back, a team of 20 would have barely made it. In a lab at Wadesa University in Japan, engineers are testing a robot playing Liszt music. A first model, named Wabot, could read a simple score, which it then loudly banged on a piano. A new model should master difficult fingering exercises from more elaborate scores. These are the forerunners of a new generation of robots capable of complex, service-oriented intervention. But aspiring to a full-time job in the service sector, even for a Japanese robot, is perhaps taking things a bit far. In general, researchers oppose this anthropomorphic approach to robotics which they feel is unrealistic (38). It is a mistake akin to trying to apply telework to the working principles of 20th century factories. As robots have enhanced productivity in the manufacturing industry, *virtual tools and resources will play the same role in the service industry in the 21st century.*

In fact, computer-assisted representation, without seeming to, is forcing us to call into question our continous propensity to build new machines – cyborgs – in our own image. In pseudo-worlds or in cyberspace, our synthetic, animated own image will do, whereas robots must first be designed according to their specific working environment. For now, a more intelligent approach seems to be to improve the man-machine interface. We will lend our cyborg (our robot) – who will telerepresent us at work or in hostile environments – the capacity to learn thanks to special *prothèses* via computers. In exchange, the terminal-man will benefit from new, artificial senses, currently under development: computer-assisted, multi-wave-length artificial vision and special tactile sensors used by air controllers, submarine pilots or doctors for specialized perception.

Even more disconcerting, the NICTs will contribute to the development of artificial senses and – since we have already touched on the concept of artificial production – the transformation of arts, shows, and even theater. Ah, imagine a virtual stage where you could be a pseudo-King Lear! What if*Total Recall*, a film between science-fiction and arcade games, had only been a demonstration of the future collective schizophrenia engendered by pseudo-worlds!?

The development of artificial senses

Telemetry allows to measure distance without actual physical contact. By applying telemetry to power stations, we have opened the door to heightened navigation and perception capabilities, to levels outside the reach of our senses. Today, like Alice in Wonderland, we can enter immaterial pseudo-worlds with almost limitless possibilities.

Jaron Lanier's team at VP Research in Redwood City, responsible for the Dataglove (a sensitive glove which allows to interact with pseudo-worlds), worked on developing a sensory suit which could simulate all our senses within virtual worlds. You slip on the dataglove just like a regular glove. On the surface, electrosensors sent information to a 3D graphics program on a Macintosh through an optical fiber network. The program displays an image of the environment and the operator's hand on a screen – in fact, a dedicated pair of glasses. When the hand moves – the real hand, that is – the environment comes to life accordingly. An illusion of depth can be obtained by contrasting the quality of brightness hitting each eye respectively.

Senses can be manipulated as well as stimulated, for work and for play. For the Japanese firm NTT, the telephone of the future must be sensorial for a total communicative experience. A hedonistic approach shared by the Californian researchers working on the sounds of the body: they have created a veritable one-man band by connecting an individual to a "Biomuse" synthesizer. While results are musically questionable, it is clear that the researchers on man-machine interface are moving in new directions... and having fun along the way. This is just the beginning: even remote sex is being – discretely – explored.

Meanwhile, many little-known "artificial senses" applications are making spectacular strides. Remote medical diagnosis, for example, combines images provided by x-ray, scanning, magnetic resonance, endoscopic, and ultrasound technology. These images can travel on a RNIS-type network. The network thus becomes an invaluable tool for expertise exchange, as well as a means of cutting down on costly, heavy medical equipment. In France, hospitals in Rennes and Lannion such exchanges. Each hospital has a dedicated station equipped with a camera to scan images. Experts on lung disease in both hospitals can quickly compare diagnosis. Jean-Marie Scrarabin, a neurosurgeon at Rennes, remarks (39): "The Lannion Hospital does not have a neurosurgery department. For emergencies, they send us a scanned image we can then use to reach a diagnosis. If an operation is needed, the patient may be operated in Lannion or transfered to Rennes." Doctors also consult reference databanks to help in their diagnosis or to find teaching aids. "We quickly receive expert advice when sending a sample through the mail can take days", pints out Pierre Dussere, Director of the Center for Anatomical Pathology in Dijon. Time is precious when cancer is involved. "Progress is no longer measured by how many more units were produced, but by how much human time was saved" (40), Richta wrote, a statement even more meaningfull here.

All that is still only a teaser: researchers at the University of North Carolina in Chapel Hill are applying virtual reality to 3D ultrasound scan. Thanks to a computer and special glasses, a doctor can "see" the foetus through the mother's skin. The 3D image displayed on the semi-reflecting glasses used as a terminal does not block his vision. Radiologists can then correlate their palpations with his natural vision. Through ultrasound emanating from the ceiling, two cameras fixed on a helmet keep track of his head's (and eyes') position, in order to steady the virtual image being displayed (41).

Better still: we can "enter" matter by artificially projecting ourselves in a system which simulates molecular structure. In Chapel Hill, a chemical reaction simulator has been perfected. Molecules are modelled using CAD, then projected in 3D in a stereoscopic helmet. A robot controlled by the chemical technician simulates the theoretical resistance of molecular components according to their energy levels (42). This is true virtual work. Similar research is being performed by Media Lab: they have created a virtual cadaver to train apprentice surgeons.

When exploring the various applications of virtual reality, we also modify fundamentally the way we conceive terminals. These examples of simulation of reality, such as air combat, or reunion in a virtual office, or travelling through matter, or visiting a nonexistent building, have been made possible by the invention of new man-machine interfaces. The teleworker is plunged into a specially designed world. Using a dataglove, he can see himself moving about, lighting a lamp, placing and manipulating objects. Like the Next oscilloscope, the virtual machine will become part of this

immaterial universe. We will enter pseudo-worlds where our image is cast: we will become virtual beings!

Notwithstanding the many philosophical and sociological issues that these breakthroughs raise up, we must realize that the terminal man can now operate in a virtual-immaterial environment which represents his professional world. "Private Eye" is a 1,2 inches square graphic screen which, fastened to a helmet, projects an image on the user's retina without preventing him from seeing his environment. This system is still being fine-tuned by an American start-up society, the Waltham, Massachusetts-based Technological Reflection. It allows individuals to perform multiple tasks while receiving a non-stop flow of information. It is possible, for example, to perform remote diagnosis or maintenance while keeping hands free. Some companies are also looking for ways to make lap-tops easier to use. Gilberte Haubant, journalist for the French magazine *01 Informatique*, wrote in the December 21, 1990 issue, of a "virtual screen which could do for video what the Sony's walkman did for audio". Specific gestures can dispaly on the screen scroll-down menus, windows, and information needed by the teleworker. It could even be possible to simulate an office and feel like moving about when you move your head.

Of course, simulated sensations are still rudimentary. In 1962, Morton Heilig created Sensorama, the first highly-sophisticated attempt at multiperceptive simulation: stereo, 3D vision, vibrating seat, air ventilation, smells, all to recreate a mad motorcycle ride across New-York city (42). More recently, Universal Studios amusement park introduced the Fantastic World of Hanna Barbera, a showcase for 3D synthetic imaging, in a room equipped with seats that tremble depending on the action on screen, thus amplifying the feeling of speed and acceleration. A new industry has been created – virtual reality – and will shall witness its first achievements before the end of the century. Medical research is but one of them.

The beginnings of CAD

The first drugs were the result of more or less fortuitous clinical and pharmacological observations. At the beginning of the 20th century, we were unable to provide precise physiological and molecular analysis of the chemicals we were using. The keen eye and intuition of a few great researchers led to the discovery of quinine and antibiotics. Later on, we learned to describe molecular chemical actions and interactions by determining the properties of structures, molecules, or viruses* .

Combining our knowledge of these properties with computer technology, we can explore pharmacopoeia even further. Computers can help us to recreate series of tests during "artificial experiments" such as simulating the effects of a drug on certain proteins and on the human body. It is possible to model and store the properties of given chemical components into databases and to confront them in order to predict interaction, thus facilitating the creation of new synthetic molecules according to their simulated effects on the body. Marcel Hibert, a researcher at Marell Dow Research in Strasbourg, says they have created several molecules with an affinity – hence an efficiency – 100 times greater than the molecules traditionally used. Tagamet, an extremely efficient

* The analogy between the computer's virus, as a special virtual object, and a virus injected to a living organism has already been made.

ulcer medication, is a good example (43). One traditional organic synthesis costs around 10,000 French Francs. Groups such as Roussel Uclaf or Rhône Poulenc perform between 5,000 to 10,000 syntheses each year, at an annual cost of at least 50 million French Francs. Theses exemples of CAD/CAM use synthetic images to reduce the cost of molecular research by 5 to 10.

Meanwhile, databanks have increasingly become interesting pools of information about immaterial resources. The NICTs can help companies enhance productivity upstream, in research and development departments – before reaching the manufacturing stage – where products are developed and tested. Digital data can be shared through networks, as is the case with IBM's research and methods departements which are divided into roughly 50 research units around the world (44).Landscape designs, city maps, or computerized mechanical parts can now be drawn on a plotter from a remote location. The aim is to cut down on time and energy spent if workers and research teams have to design models or prototypes.

With this in mind, CAD developers have created a wonderful tool: stereolithography. This technique allows to create large objects shaped by lasers controlled by a 3D CAD program. In a tank, an acrylate resin photopolymerizes layer by layer and hardens while the object is shaped by successive cuttings monitored by the program. This little revolution was engineered in the U.S., but also in France by Olivier de Witte from Spectra-Physics in the early 80's. Plastic models can be created in record time: two days, compared to two months with "traditional" CAD/CAM (45). Complex objects can be modeled without manufacturing or molding, directly from the "mind" of the 3D CAD program. This is a major step forward for research departments and companies such as General Motors, who produce no less then 25,000 models a year using this technique. A veritable stereolithographic service industry is developing. There are already around 30 such facilities in Europe, 7 in France alone. The process takes roughly 10 hours. A client who supplies his CAD diskette has his stereolithographed object within a week. Some users, such as designers, adapt this technique to molding, while others use video equipment to create automatic sculptures, a relatively new use for CAD, yet one that is spreading like wildfire in the U.S. Laser-Vision, who was involved in the development of the process in Saclay, has implemented a technique for pre-production molding. Finaly, laser modelling allows to materialize complex 3D "mathematical" objects – which do not exist in our everyday world – from resin.

All those examples are symbols: symbol has mastered and dominated matter. Digitized signs open up new horizons, however artificial and vertiginous they may be. In a 21st century trying to save fossil fuel and human energy, we will remotely interact with representations of reality, and everyday life will gain a new meaning. At all times, we will be able to materialize our innovations at low cost or to share and communicate – in new ways – our view of the world. The clerk from the age of writing, the age of the scribe, has had its days. Now comes the era of the Terminal Man, bringing along a strange universe whose characteristics we can only glimpse today. As in the parable of the crippled leading the blind, the Terminal Man will soon find himself incapable of working and living if not in perfect symbiosis with the NICTs, linked to this artificial limb called a terminal.

Chapter 5

The advent of the Terminal Man

The Terminal Man belongs to the 60% of *tertiary* executives and employees who – according to Parker – work regularly with symbols and signs via the NICTs. Thanks to major advances in programming, the binary code used for computer languages has progressively evolved into symbols. These symbols, as we have seen, are a digital representation of reality. But the influence of computer applications does not end here: a progressive and beneficial symbiosis between man and computer is taking place. When journalists asked the winner of a boat race who had won, him or his computer, he answered that they were asking the wrong question: he could not have done it alone but neither could the computer. They complemented one another, their collaboration winning them the world championship (46).

Enormous sums are spent on improving user-friendliness, on making terminals more accessible and attractive. Douglas Englebart, founder of the Augmentation Research Center (ARC) in Menlo Park, Cal., was convinced that the computer could adapt itself to the most advanced activities of mankind. He though that it would make it possible for people to communicate quickly and easily. In 1986, after 20 years of unsuccessfully trying to spread his ideas, he decided to prove himself right at an important conference in San Francisco. On that day, all explanations were cast aside to give an all-out show. Sitting at a strange-looking console on the Civic Auditorium stage, Engelbart wore a radio helmet much like a pilot's. He addressed his audience with the help of a wireless high-fidelity microphone that left his hands free to move. An antenna linked the console and screen to a central computer in his laboratory 40 miles away. His face was projected on a large screen behind him and he made sample documents superimpose on it. By manipulating a little box with invisible wheels, the speaker showed how easy it was to manipulate images and files, and to correct text. The device, invented four years earlier by Engelbart himself, cleared the path for a type of man-machine interaction which stupefied the audience and won him a standing ovation (47) .The market caught on later, following work performed by his team in Xerox Palo Alto laboratories. Engelbart did not know it at the time, but he was one of many researchers who instigated a

gigantic upheaval in our culture. Today, these interfaces interact with the ways their users organize their thoughts and work.

Progress in this direction can only intensify as new remote devices eliminate frontiers between mind and matter. New hybrids will be engendered by the mutation of working in a society where information and signs circulate with increasing intensity.Terminals can be found everywhere, everything must go through them, and they even have become a status symbol: certain employees can now feel a sense of belonging by joining a privileged coterie authorized to access confidential information. Are they a future-minded professional caste, or is it just a new form of social or professional cohesion for people who feel conventional space-time losing its structure? The Terminal Man witnesses a fragmentation of his day time into multiple tasks – long-term tasks or reactions to unpredictable events which petition him with increasing frequency now that telecommunications have connected him to the rest of the world. The Terminal Man has become either a receiver, or a privileged transmitter in the social and economic life of the post-industrial age: he is a "commutant".

> *"It takes to have performed what we call the "big jobs" to understand the extent to which they prevent you from thinking. The shredded days, the phone calls, the meetings, the browsing of documents, leave neither time nor – which is worse – energy for putting your mind in order. You acquire the habit of reacting to a remark, a note, an attitude, an event. You forget how to think or integrate in a general perspective what triggered your reflex. You glide more and more rapidly, more and more cleverly, on the surface of things. You don't even scratch the ice. Then one day, facing an unexpected hole in your schedule, you realize you are incapable of using this void, and suddenly you become aware your own emptiness."*
>
> *(Jacques de Bourbon Busset)*

Commuting, or shredded work

"How many phone calls a day do you make to prepare the 10 o'clock news?" - "I have never kept track. But it must be close to a hundred", answered Jean-Claude Bourret, news anchorman for a French TV channel. With five direct and three indirect lines in his office, two cordless phones, eight lines for his assistants, and three lines at home; with an answering machine, a fax machine, a cellular phone and a pager, (48) J.-C. Bourret is the model commuter. He "commutes", that is, he rapidly goes from one topic to another, from one issue to another, by dividing his time between the various tasks and subjects which will occupy his day and allow him to produce his newscast. This phenomenon was first noticed during a series of studies on management performed by Henri Mintzberg, an American management specialist. Mintzberg realized that, contrary to our preconceived notions of management, company heads do not plan, organize, and control. In fact, according to his research, they are involved in a series of urgent, brief, varied, and discontinued activities with no chance to step back and gain a general perspective. There are no routine tasks; a survey of 56 first rank American managers showed they treated an average 583 topics per day, only devoting 48 seconds to each (49). For these "wild zappers", the NICTs are not a hindrance; quite the opposite, they increase their capacity to act and to handle a wide range of activities: they are virtually everywhere. They seem to give priority on oral information, to phone

calls, to meetings and reunions; between 66% and 80% of their time is devoted to verbal communication. An analysis of the agenda of 160 British managers found that they don't work on one topic more than a half an hour every other day (50).

Pandemonium in the workplace: the NICTs are destroying our traditional, e.g. physical, interactions. Such is the case for telemarketing, teletyping or telesales. With every new technical progress in communications, we realize that the NICTs are transforming our relationship with our environment. Tayloristic, routine office work is far removed from what employees and executives deal with today. Formerly insensitive to the outside world, unused to interacting with its clientele and the public it was serving, administrative work had more to do with mastering a group of elementary and only rarely varying tasks. The sudden irruption of telephones in the service sector in the late 1950's destabilized this arrangement. Personnel now had to deal with the new problem of direct connection with the outside world. As inquiries multiplied, they had to learn how to handle and face a multitude of situations in real time. We shall, in a way, commute in synch with phone switches, e.g. equipment which establishes links between many speakers who, travelling across the web of telecommunication networks, either solicit you or are solicited by you. Sometimes work and decisions will gain a personal touch. At the same time, however, a new decrease in efficiency reared its ugly head, leading certain firms to specialize in call management services. With or without the NICTs, our permanent "zapping" is shredding our time into multiple contacts and is changing the way we work.

Amusingly enough, computers also had to adapt. In 1987, IBM invented the "administrative robot". It was in fact an automatic calling program based on the awareness that we regularly consult databases on different computers linked to different networks. This automatic connection process clearly illustrates the importance of multiplying interface modes for "commutants".

The Next computer, as we have seen, taking its cue from the telematic service computer systems so popular, uses its power to ease user interfaces. In fact, the interfaces process data, text, image, and voice indiscriminately. Artificial intelligence has found fertile ground in computer-assisted databank research, allowing us to jump easily from one program to another, from text to sound and image, in hypertext mode. This capacity to navigate databases according to an either organized or deductive model happens unbeknown to the user, who has no idea of the power of the software that made it all possible.

The Terminal Man divides his time over a series of tasks and controls projects from different locations. His constant travelling wastes both time and money. For him, voice mail, electronic mail, and specialized databases have become indispensable tools. They also transform the way in which individuals and teams relate within an organization. It is now possible to produce documents or perform team work – at a distance – on projects coordinated by a team leader. This approach, called groupware (we will come back to that later), refers to the collective use of a computer system. Although physically distant, the group is able to work virtually together and hold meetings or collect advice (Metaplan method), optimize the exchange of expertise (Delphi method) in close to real-time. This application of remote group work born in the U.S. is still only in its infancy. Yet the movement forward is irreversible, in spite of the reluctance of users still not familiar enough with group work or, even worse, remote work. It only takes to observe the latest developments in teletraining and in expert systems associated

with teleconsulting to realize how much the opportunities for group work via the NICTs have multiplied. Commuters are hooked, connected, linked. And the world-wide NICTs industry is beginning to be very attentive to these new consumers of advanced technical resources and increasingly sophisticated teleservices.

The travelling office

Nomadic or sedentary, in the form of on-board equipment or remote services, the NICTs are progressively weaving their web around the Terminal Man. First of all, the NICTs avoid wasting time in trying to establish communication with modern, complex organizations. In a physically discontinuous universe where the traditional division between work and personal life is eliminated, companies wishing to retain efficient collaborators must grant them some autonomy. The world is connected to a web which reaches places once considered inaccessible.

The train, the plane, the car, the country cottage... The cellular phone, at home or in our vehicle, is our only means to stay in touch, whether for professional or personal reasons. The Terminal Man should not to waste his time: his way is dotted with communicating milestones. In fact, the phone is no longer associated with a place or a machine, but with a person.

As a contribution to the professional life of these new nomads, airports now provide them with fully-equipped meeting rooms and supply them with cell phones. Companies, too, must be permanently accessible and available. The TGV has public phones inside its cars. London taxicabs have cell phones; the Dutch airline KLM has satellite phones on its 747 flights: the Terminal Man can plug in wherever he goes. The office, a nomad itself, follows him everywhere.

This would no doubt please Serge Bromberg, an independent film producer who never parts from his cell phone. With good reason! An American distributor was asking $100,000 for the French rights of Frank Capra's beautyfull color movie *It's a Wonderful Life*.... After consulting his database (more than 10,000 titles), he realized that, of course, the film was originally black and white and had been colorized, that it had already been broadcast three times in France, and most of all, that it was now public domain (51).

A study project entitled "Work and business in 2005", launched by the French General Planning Commission predicted that workers using NICTs would rise from 12% in 1986 to 32% in 1990 and that by 2005 there would be one PC or terminal per office worker. With the increasing miniaturization and integration of office automation tools and their decreasing cost, we may to consider portable offices for almost everyone. Canon's Navigator system integrates a compatible PC, a telephone with answering machine, a 21 x 27 cm scanner, a telex, a fax, a modem, and an ink-jet printer. This Japanese system is smaller than a regular PC, with a touch screen and a mouse, a 40 Mo hard drive, basic software such as word and data processors, and an automatic dialer. It also features a speaker for hands-free phone conversations. It weighs 17 kg, and is one of the first fully integrated office automated systems (52) .

At Kenzo, the well-known luxury designer, sales personnel carry laptop computers to the many fashion shows they are constantly travelling to. They can process sales in a matter of hours (53). Out of 2,000 chartered accountants working for KPMG, the Fiduciaire de France, 500 have portables. They are used to finish work at home,

particularly at year end, when everyone is frantically working to meet deadlines (54). They can also be used for real-time work with their clients. As a result KPMG increased its gross sales without increasing staff, as accountants personally took care of memos, mail, and reports.

The weight barrier has also been broken. Compaq launched a laptop that could be literally removed from the office PC, in order to avoid the fastidious coyping of notes and files only too familiar to nomads (55)._ The NICTs are more and more frequently part of the luggage for professionals on the move* . The lap-top office introduced by Ricoh at the 1989 Comdex in Las Vegas only weighs 1.3 kg and costs from $540 to $1,000 according to options.

Since business people are on the move more and more often, an entire "mobile communications" industry is developing. The European Locstar project considered spotting, then exchanging messages with travelling Terminal Men starting in 1993. Some 400,000 mobile workers are expected to join the work force by the year 2,000, essentially long distance truck drivers in constant liaison through a satellite network. The French firms Mannesman and Fapi are already selling mobile systems which help central delivery. In Hong Kong, with its seven day work week, "nomadic objects" are so popular that one citizen in nine has a pager. The point is to be reachable at all times, since quickness is so essential to the service sector (56).

Specialists at Plessy Communications in the United Kingdom, significantly enough, predicted that the cell phone would reach at least a third of all telephone users by 1995. Some were even more optimistic and spoke of 50%, the cell phone being provided by the employer for professional needs.

In Japan, Seiko Epson launched a speaking electronic agenda with pluggable dictionary cards. The word-book or pocket computer is the ideal tool for the professional on the move. A veritable smorgasbord of laptop computers is available to nomadic executives. With communication cards, they can keep in touch with their main office and retrieve any data needed for their work . The NICTs have become embarked resources. Thanks to satellite networks, it is now possible, from regions devoid of any infrastructure and for a mere 400,000 francs, to follow the Gulf War in real-time, just as it is possible to follow a team of geologists in Brazil or a sailboat in its lonely race around the world.

The virtual office

These numerous applications require some adaptation, most notably when coordinating and managing teams on the field. "Salespeople do not see orders anymore,

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* Who are the users of laptops? (Survey sponsored by Toshiba):
- the laptop is the tool of business executives, who often act as technological pionneers.
- 60% of laptops users already have an office PC; for 40% the laptop is the first PC.
- the laptop is a professionnal tool for 97% of users.
- laptops are used in the office (60%) at home (20%) and on the move (20%)
- four main types of software are used: word processors (72%), spreadsheets (69%), database managment (55%), graphics (42%), and accounting (10%), CAD (10%) and software development (2%).
- laptops are twice more connected to networks than office PCs (58%)

According to Toshiba, 70% of all computers will be laptops by the year 2000.
(Source: Le Monde Informatique, may 7, 1990)

they do not know the results of their counterparts; they do not take part in strategic decisions and are rarely kept informed of them", according to a distribution specialist at Gamma International. "As a consequence, the sales team works without a net and quickly loses motivation." This is partly why Génésys, a French company, decided to launch a system which allows groups to hold meetings over the phone – telemeetings. A more sophisticated approach sets up telemeetings by automatically calling each participant. A third party can even be invited to join the meeting in this virtual meeting room.

Thanks to networks, the new nomads, substituting themselves to the "commuters", have become privileged consumers of office and even home automation. White collar workers are deserting offices, which in turn are becoming virtual. For the terminal people, work space has become discontinuous, while work remains permanent. We can now keep track of files from home, the hotel, the client's office, the car... Christian Marchandise, President of Télémarket, a French shop-at-home supermarket, gives the following testimony in the December 1989 issue of *Affaires Economiques*: "We have six different sites. My collaborators and I are constantly on the move. I fail to see how and where I could possibly make a hundred phone calls each day, other than from my car. For me, it is no different than an office phone."

Officeless office services or remote offices are blossoming. It wasn't easy at the start, however: in 1982, Europmicro tried unsuccessfully to launch a portable system in France for wireless teletransmission, "ISF1". It had been designed by Geet in Hampburg, where Customs kept tight control on the movements of transport and containers. This system allowed for radio dialogue with the central computer system. At the same time, Sogelog proposed a software downloading system using a « *logimetry* » process which allowed users to pay per use. It worked much like pay tv: after their initial payment, users received a code corresponding to the desired service. Things have greatly changed since and the most important companies are once again considering charging per connection to make their software accessible to as many people as possible, and the computer chips of the super-commuter have worked wonders. Take this portable data system, for example: a computer/phone with an ultra-light battery, which can send the same information to several people at once, such as keeping delivery men informed of their next destination at a cost of 600 F per month. First used by the general public, it is now distributed by Hutchison Mobile Data and used by the police and firefighters (59). It will be installed in British taxi cabs, the United Kingdom being the only country allowing such systems on its territory.

Many executives and bosses have become obsessed by the desire of being releived from the constraints of space - and time. In 1991, within the huge virtual office which has freed us from the walls of our main office, there were 90,000 pagers, 270,000 car phones, around 100 taxi-planes, 80 visioconference studios, world-wide e-mail, "fax machines and soon, car radio-fax machines." (60)

We can all witness how deeply the NICTs are infiltrating our lives and the increasing role they play on the field, beyond the spaces traditionally dedicated to them in our offices. Lammy Transport links 23.000 drivers and clients with its European freight exchange system accessible by Minitel. Minitel has also become a tool used on building sites, particularly for Building and Public Works. The Alcom telematics service was developed by two companies in Lyons, Algoe and MG2 Télématique. "Am I invited to this meeting? What was discussed at the previous one? Has the production schedule

been changed?" "As soon as we have a piece of information to broadcast, we enter it in our database. It then becomes immediately available. Any of our users can retrieve it by punching a code and a password," a foreman at the Carré d'Art building site in Nîmes explained to a journalist for*01 Informatique* (06-29-90). "Alcom lets us broadcast information on the site to specific players only". This is confirmed by a subcontracted carpenter. "Before Alcom, I could spend two hours in a meeting when only the first fifteen minutes were directly of my concern". A plumber also agrees. From his home, he can "prepare most of my week's work in a few minutes, on Sunday nights, quietly sitting in front of my Minitel," and confirmation is guaranteed. A foreman can thus control activities on a daily basis with an improved coordination, and quickly transmit all decisions made during meetings. This continuity of work independently of traditional work places thanks to the NICTs is but one of the characteristics of virtual enterprises. Terminal people have become the logical product of a transition civilization. Addicted to these electronic media which transform their life and work, they will have to master these machines in order to negotiate with the new office workers. Company heads, more than anyone else, will have to learn. To paraphrase Lévi-Strauss about writing: "the appearance of NICTs will promote the exploitation of man before his illumination." It would be vain to put too much hope in the NICTs. Doomed are the weak, the ones who, facing their terminals, do not know which key to press! And doomed, too, those who will have failed to identify the new technical and economic frame of post-industrial businesses, the singular, mutual relationship between companies and the NICTs.

Part 3

THE VIRTUAL ENTERPRISE

"Furthermore, no one will own slaves, be they men or women."

"But then, the elderly will be forced to attend to themselves?"

"By no means, for I will make all objects able to fly"

"What good will it be to man ?"

"Each utensil will come when called. Table, come, set yourself! Little bag of flour, start to knead! Decanter, pour! Where is the cup? Will you go wash up! Raise, dough! Fish, come forward! I will bring hot baths to my friends' homes with an aqueduct so that in each house water will flow from the sea to the tub. And we will say to the aqueduct: "Stop the water." The soapdish will come by itself, together with the sponge and the sandals."

Cratès (1), Les Animaux sauvages
(The Wild Beasts)

Introduction

Virtual: that which in all possibility could be real, could virtually be, i.e. practically able to...

Sicamob is one of the most important co-op organizations of the Finistère (a department of western France) trading Guerlesquin cattle with 13 billion francs gross sales. In early 1991, it launched a telematic auction service, BOVI 2000.

This Minitel auction service serves as a complement to traditional markets; it saves certain buyers and suppliers from travelling. People on each side of the fence know each others well, trust being essential in this sector (2). Auctions are held once a week. Bidders representing the region's slaughterhouses receive the catalog by fax on the morning of the auction. In the afternoon, when bidding opens (at 2:45 pm), a Sicamob sales manager, facing a dedicated console, lists the characteristics of each lot. Buyers have a Minitel equipped with a special box and a telephone in order to bid. The auctioneer keeps track of bidding, and final offers are confirmed by telex. Pick-up is also scheduled as transactions are completed, so cattle can be delivered to the slaughterhouse. Simacob bills 1% of the amount of the electronic transaction to the buyer, and 1.5% to the supplier. The data processing department at Sicamob records all the transactions related data. It will no doubt be able one day to operate this type of auction non-stop. Already, a telematic catalog is permanently available for institutional buyers who have deposited a security with Sicamob. Sales have increased by 26% since the system was implemented. Of course, Sicamob's auction room is purely virtual. With the help of NICTs, traditional auction techniques were adapted and simulated. The auction hall has now a national audience, which will lead to a mid-term growth in the number of transactions. Simple, ingenious: remote electronic sales! Impatiently, we are all eager to jump on the bandwagon. But let's not be deceived...

The traditional rules do not always apply to the virtual enterprise. A post-industrial product par excellence, the virtual entreprise does not fall under manufacturing production schemes - on the contrary, it transforms them. Therefore its economic and socio-cultural makeup is a break from tradition. More than a half of all French telematics services had to close their doors for failing to adapt to this new challenge. French retailers using Minitel, even the most well-known, such as Caditel, Télémarket, Les Grands Boulevards, and La Voie Express, unable to overcome the difficulties

inherent to a very young market, had to devote time on learning how to ensure reliable payment and delivery and keep their clientele.

NICTs sometimes have unexpected impacts: camping sites in the Provence-Côte-d'Azur region refused to broadcast availability on a telematic server for fear of taxes, according to Dominique Doré, a telematics consultant (3). In another field, although networks have facilitated the implementation of non-stop stock exchange, they also magnified the "speculative spheres" phenomenon in automatic sales activation. The same is aknowledged with the Sicamob's auction system which amplifies up and down trends on an always speculative market. In 1984, a project for a Minitel auction service for a flower market was abandoned in the course of the feasibility study, although it was technically viable. The proposed system fundamentally modified the economic relationship between the flower producers and the wholesale buyers. The farmers sold potted plants and cut flowers. They had to clear their stock in the course the morning auctions otherwise they merchandise would be lost. Certain wholesale buyers, acting on orders, used to buy at the highest price to have priority on the earliest delivery trucks. For ages, supply and demand had played their mutual part. With telematic auctioning, since lots were proposed before their preparation, producers did not have to actually cut all the flowers for the auction. This allowed a better supply control while keeping prices high. Something which buyers, used to rule the market (and discretely surveyed on the subject), would never have accepted.

The virtual enterprise has its distinctive features. The appliances French chain store Darty had to test "sales robots" which were to serve as a complement to their traditional sales personnel. Nothing came of it. A robot does not control the sale, that is, it is unable to encourage consumers to buy high-priced products. In 1988, Darty decided to suspend a first experiment in its stores in Meaux (4). All these examples show that the NICTs can be put to creative use in order to increase productivity in the service industry, but also that pioneers who endeavour to explore new organizational schemes to improve their competitive edge have to face some difficulties.

The virtual enterprise is still in symbiosis with the traditional enterprise, providing it with new possibilities and transforming it at the same time. The NICTs are able to project the shadowy shape of the virtual reprsentation of a person, a place, a function or an action, as they have already done with objects and tools. Thanks to the NICTs, some "artefact" captures and organizes the material and immaterial flow of information, and makes it profitable for the entire organization, at a low cost and, if possible, with minimal investment.

Before speculating on the impacts for companies, we should first examine the distinctive features which the virtual entreprise is gifted with. *"The Multiplied Man"* demonstrates a new capacity for ubiquity, for being virtually and simultaneously "telepresent" in several places. Our example introducing the Multiplied Man clearly shows how ambiguous the notion of symbiosis really is: it could be profitable or, on the contrary, parasitical. For us, the answer is "profitable", since it stimulates traditional organizations much like organic symbiosis: certain bacteria, for example, help in liberating nitrogen, essential to the development of certain trees and crops. *"The never sleepingbusiness"* discusses this other special power of virtuality: omnipresence. Even if the chief is out playing golf, the company can still keep its operations going full-throttle. *"Neuroconnections: knowledge monopolies"* offers a perspective on our ancien dreams of omniscience. Thanks to networks, by dipping into world-wide

knowledge, we can elaborate an economy for the future which our actual economic references are unable to grasp and whose impact we cannot predict.

Finally, *"Welcome to the club, just plug in!"* shows how the vascularization and the structure of telecommunications will have a considerable impact on the organizational and operational schemes of the virtual entreprise. Its development will be volatile, evolving according to local markets, regional advantages, and new profit centers which encourage off-shore work. Certainly disturbing for the avarage 20th-century man, the development of "corporate networks" will contribute to a loss of sovereignty for post-industrial firms trying to connect to the global networks. Entering this very exclusive club leads to the awareness that a true Copernician revolution is shaking organizations to their very traditional, strategic foundations. The virtual entreprise is the network, and this alone changes everything.

Chapter 1

The Multiplied Man

Being a man is feeling... like a multitude of virtual beings, and being an artist is bringing... this virtuality into being.

Thibaudet

Max Headroom, the virtual image on Channel V, may amuse or disturb, but Max will never interest a manager as much as Pierre does. Pierre is the salesman every manager dreams of. He is a multiplied man, famous for launching on October 5, 1987 the first French tv shopping program, entitled *Magazine de l'Objet* and broadcast on TF1 channel. Pierre Bellemare, a popular story-teller on Europe N°1 radio, became a pioneer of direct tv sales in France. From the outset, the show attracted an audience of 1 to 1,5 million viewers (5). Facing his new audience, thanks to sparkling production and a call center that improved with every show, Pierre Bellemare entered homes via the TV screen. He and his team became virtually present in millions of homes, simultaneously, and he turned himself into a first rate salesman.

The show was a success. Christian Loviton, in his book *La Vie à distance*, tells how phone lines were overloaded in the 12th district of Paris, where the Sysmark company was in charge of processing the calls. Neither the network nor the hundred or so tele-sales employees taking the orders could process the 10,000 potential calls, the network being able to handle only 5,000 or so per hour. Teleshopping is a carefully orchestrated impulse-based approach to sales and a French association of consumers (Union Fédérale des Consommateurs) even tried to put a stop to it* .

* The Japanese teleshopping firm Fujisonkei broadcasts sensational shows via satellite. They organized on September 3, 1987 the auction sale of a French 19th century castle with a park. Bids started at 10 million Francs. In March of 1988, 15 gold medals commemorating the French Revolution were sold for 1.427 million Francs. Fujisonkei has more than 1,000 female teleoperators..

A virtual company: PBRK

Sold items are paid cash prior to shipping. On the other hand, suppliers are paid rarely within less than 100 days. Consummers can pay by card, and a CETELEM credit is possible for the 25% highest transactions. Return rate is low: 0.5%. It can reach 15% in the United States. The organization is quickly learning the ropes. PBRK, named after the initials of its founders, Pierre Bellemare and Roger Kluger, neither buys nor stores merchandise. A team of buyers chooses a series of articles which the supplier agrees to set aside up to a certain quantity until the following morning, when the total amount of sales can be confirmed. Orders are then transfered to another company, which handles packing and shipping. Prices vary between 300 and 500 francs, with occasional thrusts of up to 5,000, or even 15,000 francs. Specialists once evaluated the number of daily sales between 4,000 and 5,000 (orders almost reached 100,000 in 1987). When first launched, the show's promoters expected 1,200 sales and a turnover of 186,000 francs. When it started out in 1988, the Boutique of channel Canal+ announced between 650,000 and 700,000 francs per show. No stock, maximum liquidity of capital flow for this virtual company, its existence and success relying entirely on a shrewd exploitation of NICTs in order to control material and financial costs. This French form of telesales quickly proved successfull and telesales programs multiplied rapidly (TF1, then Canal+, Channel 5, RTL, TMC, M6) to finally reach 9 millions francs per week, or 350 million in 1988 alone, according to an evaluation by Facem, who expected 1990 to bring in 800 million francs.

The French company La Lyonnaise des Eaux is a PBRK and channel M6 shareholder. It is also interested in collaborating with SFT (Société Française de Télé-Achat) which was founded by Christian Marchandise. It produces tv shows for a group of distributors, and so has a different approach from PBRK. It creates affordable mini-videos, customized for different advertisers. Once again, subcontractors handle logistics, with more and more of them specialized in this new area.

However, cable applications are still slow coming. Cable companies in France are waiting to pounce, ready to join a market where an intense institutional lobbying is currently limiting the various possibilities of teleshopping. Their objective is to create a new source of revenue. Taking a cue from the Canadian company Rogers Communication, Inc. and their partner CVN (Cable Value Network), they want to expand in the service sector, as they can no longer rely on traditional TV shows to reduce their wide-spread deficit. Already, Canadian telesales programs offer a wide variety of products and services, from housing to personals, weddings, tickets, and auctions. Tele-Travel uses this medium to promote travel packages. A type of videomarket, or televised classified ads, broadcasts non-stop, with pictures and the owner's phone number. In Denver, Colorado, cable telesales company CVN booked in 40,000 orders a day in 1987, and 90,000 a year later.

The virtual salesman is cheap, too! The cost price of a telesales program in France is estimated at anywhere between 70,000 and 120,000 francs, for an audience of at least 1.5 million viewers (at a broadcasting cost of 250,000 francs per hour). A traditional sales representative usually wins you 800 to 1,000 contacts a year at most, each visit costing 200 to 500 francs. In other words, it would take 1,500 years to reach the same number of people, at a cost of 300 million francs. Using telemarketing, where you can expect 12,000 to 15,000 contacts a year, a mere 100 years would do the trick. This is

why shrewd managers are investing in NICTs (automatic canvassing, by fax, by phone, and of course via television or ISDN). In 1987, the Galeries Lafayette (a famous Parisian department store) signed an agreement with Télé-Action for interactive teleshopping on cable television. Their slogan: "Go shopping in Paris without leaving Chicago".

A store in a box

When launching a distribution network today, it's impossible to ignore the powerful fascination that this little store in a box called a tv set exerts on us all. Inside the box, salespeople reign as true entertainment stars: the multiplied man is also a brilliant communicator. In Italy, European leader in teleshopping, Renato Caldera collaborates with sponsors and stores. He is as famous as Maria del Barguan Radice, who created Tele-Globo and broadcasts telesales programs hosting stars 24 hours a day. Giorgio Mendella, Bod Gircosta, Pat Boone, Nancy Nelson and a few dozen others all take after Bonaldi and Bellemare in France. Each has his or her niche and style. Gradually, they all hosted specialized teleboutiques and introduced new forms of shopping on television. The idea of teleboutiques was launched in 1986 by Joseph Siegel, a mail-order specialist. Along with Sears, he launched QVC (Quality Value Convenience). Yves Rocher was one of the first French companies to open a cosmetics teleboutique on the network. The idea is to reserve special time slots to manufacturers or distributors. QVC, reaching a minimum of 15 million homes, broadcasts roughly around 30 constantly changing boutiques. QVC buys products for resale, sells teleshopping time at $100 a minute, and keeps a 18% commission on sales. Products usually come from well-known manufacturers and programs are hosted by celebrities. Some hosts can in fact be quite surprising. For example, Dr. Ronald Lawrence, a consultant to the President of the United States, demonstrated how to use exercise bikes properly. Shows try to outdo each other in originality, making teleboutiques part of viewers' daily lives (7). For example, Shop Chicago opened a teleboutique allowing local storekeepers to drive down stocks or unsold items. Hosted by a former lawyer, Julienna Richardson, who created the show, and by a witty emcee, Pierre Foucher, this telesales program only handles selling. Everything else is outsourced.

There are two main forms of organization in the world of teleshopping: a high integration, such as the Home Shopping Network, or an association with traditional distributors, such as Télé-Action, created by J.C. Penney, an expert in mail-order. By 1987, telesales in the United-States represented 1% of all trade, for a turnover of $1.5 billion. It was expected to reach 15% in 1995. There are 35 home-shopping production. Gary Arlen, President of Arlen Communication Inc., expected a $6 million turnover in 1991. Large operators such as the Home Shopping Network build their networks through purchasing local television stations. At night, programs previously taped in specialized stations are broadcast via satellite. Limited agreements allow independent channels to broadcast HSN productions and receive a 5% commission from . Apparently, this mix of cheap information and entertainment programs is a winning combination, if we believe Geoffroy Saint-Clair at Retail Planning Associates. HSN, which has been using satellite communications since 1985, reaches 15 million homes and gets 60,000 calls an hour. Along with its $160 million turnover, it made a $17 million profit in 1986, for a 10.6% profit margin, three times the average in the distribution sector.

In France, cable still is not very popular: programs and services are few. Since critical mass does not yet come into play, companies met more success developping commercial services on the Minitel. Espalux in Lyon, a company with a staff of 200 specializing in home-assembly kitchen furniture, sells 70% of its production on the Minitel, even in England. After greatly improving its manufacturing performance, Espalux first turned to Minitel to keep in touch with its distribution network: 450 sales outlets, with around 100 under the banner of Mondial Kit. Just-in-time order processing avoided over-stocking by reducing the production-delivery time from 6 weeks to 10 days. A computerized shipping center reduced the delay to 4 days (8). But the "French connection", in spite of a success supported by enormous public investments, will never be more than just another medium in the eyes of the international community, a "cold" medium, specialists would say, as opposed to the "warm" (colors, voice, images, animation) medium known as television, always a preference. As we too often forget, TV services came first, especially in the USA and Canada, making use of a wide-spread media hard to compete with.

Télé-Action, created by J. C. Penney – who refused to try Minitel – is a good illustration of how a chain of virtual stores expands and of how teleshopping will likely develop in France over the next few years. J. C. Penney, Sears' competitor in the mail-order industry, has been interested in electronic sales since 1983. He sent a team around the world to chase NICTs applications of strategic interest for electronic mail-order sales. Videotex has been rejected, but not because of its qualities or cost. It is a cold medium, has no color and only poor, fairly unattractive graphics, a far cry from the excellent photographic images expected and ideally found without intermediate processing. When the project was about to be dropped, a partner in the firm, Stuart MacIntire, discovered an exciting technique, already discretely watched by the J.C. Penney team. Some time later, J.C. Penney bought a small business, Cable Share, and created Télé-Action SA, with 300 million francs in capital.

With the help of NICTs, Télé-Action gained real strategic advantage over its competitors. The principle is simple: you only need a television set connected to standard cable. With a regular telephone, the consumer gets excellent quality fixed images in color on screen. Fine tuning, however, proved tricky; consumers had to be able to move freely in a huge virtual store, and to speak with telesales personnel to ask questions or place an order. Access to images was limited by many constraints. The interactive system is a hybrid: cable-phone. For technical reasons, out of 15 cable users in a selected area, only one can get Télé-Action. When all lines are busy, to avoid long waiting periods, the caller's number is recorded and dialed automatically as soon as a line becomes available. On the other hand, there is no need for the consumers to purchase any extra equipment. Virtual stores can broadcast images on demand in any given geographic zone. It is an impressive organization: hundreds of videodisc players mix images and sound to display Télé-Action products and services (9). Computers analyze consumer behavior (visitors and buyers) in what is essentially a virtual supermarket. Potential teleconsumers are tested in a sort of telecenter; a dematerialized universe is brought to our households to answer our teleshopping needs. We navigate departments and boutiques with our telephone, guided by an artificial voice. We put in our electronic shopping cart the articles we choose, take one last look, and whip out our electronic cash - the credit card!

Could Télé-Action prove to be the perfect showcase for the possibilities of ISDN and cable in France? Undoubtedly. Multimedia is bound to steal away a large number of services now found on Minitel. In fact, marketing studies for cable distributors who face the Cogecom-France Télécom monopoly will reach a golden age. Especially since ISDN has become more affordable.

We can imagine how this could inconvenience large cable and videotex operators. As they are only too well aware, the IBM/Sears Prodigy system, for PS/1 owners, was a great success from the outset: 60 francs for a monthly subscription, 700,000 subscribers in six months. We should remember too that Americans buy 4 million home PCs each year, almost the equivalent of the number of Minitel consoles in French homes over the course of ten years. When the ISDN was launched internationaly in 1990, a computer with a DVI card in France could access Belgian, German, American, Japanese, British, Danish, Spanish, and Italian networks, among others; in short, almost any European multimedia service. Meanwhile, British Sky Channel has been broadcasting since 1987 a telesales program reaching via satellite more than 8 million Europeans, including the French.

However, another type of application is developing: the tele-representation of sales people in the form of automatic tellers or interactive multimedia terminals. They are more or less dependant on networks, as an increasing number of these applications are tele-monitored during the night to update data - prices and availability mostly, since images are rarely, if never, changed.

The electronic peddler: the age of flash

Sales and marketing imply expensive manpower and high operation costs. Distributors find it hard to preserve their margins while providing minimum customer (and network) services and support. Today, distribution is dramatically caught between the fragmentation of markets and purchasing habits, ensuing in greater product diversity and volume, and the pressure of innovation, as materials and products become obsolete with increasing speed. As a result, product value can decrease rapidly. For this type of distribution, options are clear: ensure the return of unsold goods, ruin yourself in service and support, or reduce stock as much as possible and concentrate on mail-order sales. We should not be surprised, then, if companies frantically try to replace white-collar workers with machines to peddle their wares.

This should not turn Post offices, the banks or cornershops into some alien territory. Remember the boat race winner: he could not have won without his computer, but the reverse was also true. In the same manner, many activities made virtual through NICTs would fail if not for the symbiosys with man. As robotics become increasingly sophisticated, they also become less reliable, and malfunctions put industries globally in jeopardy. The automatic production line is extremely costly; we must go back to simplicty in order to reduce costs and increase reliability, not just in manufacturing, but now also in the service sector.

Another discovery: firms expected important productivity gains from the use of automatic tellers, for rather basic operations (deposits, withdrawals, information, requests for documents, tickets, payments, etc.). Ergonomics had attempted to make these machines fun, fast, and easy. Yet, demanding as always, consumers started using these automatic services with increasing frequency, resulting in higher NICT

investments. Productivity simply went out the window. Some customers could reserve seats in planes or trains without previous payment, sometimes without even boarding, leading to further losses, as a representative for Air France once pointed out in 1988. He was, of course, against automatic ticket sales, not to mention the fact that a commission had to be paid for each sale charged to a credit card, something that didn't apply with checks. Goodbye, then, to liquid assets, consumed by progress.

And yet, these automatic tellers have not become part of the private world of consumers as extensively as modern telesales peddlers. Between the multimedia teller and the talented hosts of the boutique of TV channel Canal +, there is a void which video terminals are trying to fill by giving us information, seducing us, attracting us, entertaining us, selling to us. An interactive video terminal, in a travel office for instance, allows you to select a brief sequence about holiday sites or hotel packages. Customers can thus be kept informed while waiting to be attended to, and nobody's time is wasted. The agency owner, for is part, can identify the most appealing destinations, a wonderful marketing tool. But of course, the curious finger happily poking at a new toy does not necessarily lead to purchasing.

The client, however, does not necessarily notice significant advantages from this formula. A case in point: supporters of interactive video terminals for selling jewelry in shopping malls in the United-States argued that they better showcased products, reduced the cost of stocking merchandise in the store, limited theft, and allowed for a precise analysis of shopping behavior. Consumers, however, had to wait for home delivery when the amount or the nature of his purchasing made it necessary to call on a centralized wharehouse. Are we really thinking about the client's best interest? Laurence Weiss, director of development and research for City Bank, made a similar observation at a 1987 conference on the impact of NICTs on distribution. "Throughout the years, we eventually became aware of a fundamental mistake. On the whole, however, responsibility belonged to the entire industry [...] we were more concerned with hardware and software [...] we focused on machines [...] and lost sight of customers." "One of the most important tendencies in the evolution of banking is of course service automation", according to François Seguineau, manager at Hewlett-Packard and quoted in *01 Informatique* in May 1991. Technology is taking the pleasure away from shopping, we lose the fun of choosing as well as the human touch. In order to avoid any such drifting, some American specialists try various approaches: "Here, a videodisk was used to introduce a large hotel in Hawaii, the site itself and certain packages, to travel agents in charge of selling the product", says one. Robert Marmiroli, Director of Marketing at Windsor Total Video, added (11): "A more detailed interactive videodisk will help travel agents to better acquaint themselves with the product before advertising it. Our product is not aimed directly at clients." Computer and salesperson join in a mutual contract in order to make the saleperson more efficient. In 1987, Atari used such a system to catch the eyes of passers-by and attract them to their stand in shopping malls. The prospective customer was then taken over by a salesperson.

Clearly, a buyer does not whip out his or her wallet as easily when there is no sales staff on hand, a lesson learned by Florsheim in the United-States. Failure outside the stores, with sales terminals, success inside the stores, with the help of specially trained salespeople. Do we want to inform, seduce, attract, entertain, or sell? Give the right answer and video terminals will be saved from utter catastrophe. Making people forget technology only to focus on the highlighted product is probably one of the hardest

functions these video terminals are asked to perform. For example, if you are looking for fix-it-yourself tips, the videoclip ends by politely inviting you to enter and find out more. This approach is similar to Muriani's, the distributor of Coca-Cola clothing in New York, who used its system to attract passers-bye, much like a peddler, by inviting them to consult their electronic catalog complete with lavish color and music. This is meant, of course, simply to attract people, particularly in crowded areas where this type of video terminal is usually found. In reality, in the case of Muriani, the terminal works mostly outside of regular working hours; curious passers-by quickly grew tired of consulting this interactive virtual catalog. In 1989, Télémarket abandoned their video terminal experiment in a Parisian suburb after six months. It is interesting to note that the most attractive video programs imitate telesales programs. There is a host on screen, multiplied man once again, catching our eye and attracting yet another, shall we say it, sucker, another teleconsumer, this time in a large shopping mall. Should we be surprised? This is no doubt what has inspired some American mail-order companies to introduce video catalogues: the salesman now comes in the mail!

Those who regularly attend to trade shows have certainly noticed crowds gathering around a giant tv screen showing a little cartoon man with wide, fast moving eyes and mouth, frantically moving about. Complete with a cheeky attitude sometimes bordering on insolence, he addresses whoever walks by, particularly good-looking young women. The public's fascination has much to do with this interactive virtual flirt as well as with what was really happening in front of the stand. This was all made possible, you will have guessed, thanks to an invisible camera which captured the public's reactions. This amused interest, this fascination for such a simple trick shows the capacity and credibility of visiophonics, of visioconferencing, as a means of communication. In fact, it is even more a matter of necessity than mere credibility. Of all the ways to multiply our presence and send our image travelling through the world, teleconferencing will without a doubt be the most important of the next decade.

Electronic nomads

Newspapers and television repeat it endlessly: we have never been so mobile. Yet all this traveling, whether for business or pleasure, comes at a great cost. In 1989, in Europe, travelling expenses amounted to 751.2 billion francs. France is third with 162 billions (21% of the total), with more than 42 billion in business-related leisure trips (trips offered to clients, for example) (12), numbers confirmed by a recent study performed by Bossard Consultants for American Express on 400 businesses. In 1991, professional expenses amounted to 5.2% of operating costs, in third place after salaries and supplies, for a total of 175 billion francs in 1990. Obviously, these promotional or "incentive" trips are not boring little affairs. However, business trips are not, or less and less, what we generally think they are. Businessmen and executives trying to conquer new markets believe these trips to be necessary, sometimes a part of their status, but they mostly consider them a constraint. More and more so.

Think about it: constantly suffering from jet-lag, being cut off from your family, feeling like a ping-pong ball, flying around according to the whims of your superiors and the schedules of managers, factories or distributors, without even seeing the places you are travelling to... There goes the pleasure of traveling! Let us salute the stoicism, then, of these new nomads who circulate the globe, keeping in mind, however, that they will always be a minority.

Turbo-executives: 300 km, back and forth, that means two and a half hours of travel each day for Asea executives and employees, who live in Stockholm and work in Vaesteras, the company's main office. Fatigue, exhaustion, lack of motivation... turbo-executives had enough, forcing their employers to pull out all the stops. Asea bought passenger cars on trains and transformed them into offices. Desks, computers, telephones, even coffee machines and plants. It was then decided that the time spent on the train would be included in the work hours. The series of resignations that had motivated the investment suddenly ceased.

Source: L'Expansion, Paris, November 19 1987)

This minority discovered, quite by chance, and for security reasons, after a decrease in travelling during the Gulf war, the many charms of teleconferencing. A discovery that led to an increase from 75 to 300% in teleconferencing, which was already exploding in the United States (+90% turnover increase in the video transmission industry in 1990). The reasons for this development, strangely enough, have little to do with executives, still rather reluctant, but simply with the fact that, well, there was no choice! In fact, there was no alternative for at least three reasons all related to the difficulties and the inefficiency of traditional travel.

- *Avoiding duplicating expert resources and allowing for faster intervention*.

Much like the TGV did for transport, NICTs allow us to extend the sphere of influence, and therefore the possibility of action of individuals and businesses, while saving on rare or at least expensive resources. Scandinavian Airlines System (SAS) has a technical support staff of 1,800 spread around its principal destinations. It is impossible for them to keep track of every accident, each necessitating a different set of experts, especially when rapid response to international needs is required while ensuring regular – and punctual – flights. The RESAM network (Remote Expert Support for Aircraft Maintenance) used by SAS relies on a large fleet of telemaintenance trucks. Besides electronic diagnosis, the trucks, stationed close to the planes, carry a multimedia center on board, complete with a portable video camera, for various functions. They can literally scan a plane, then establish an international visioconference via satellite. Experts at the main office can get to work right away.

The RESAM system also lets users gain access to databases and technical documents otherwise not available on the spot. When necessary, those who supplied the piece of equipment are invited to join the conference. A video containing any previous conversations can be sent through various channels. Indeed, both plane and satellite links must be blocked for as little time as possible; waiting for specialists to arrive would take hours, and would take them away from various emergencies. Telepresent thanks to teleconference neworks, these "electronically nomadic" experts are a response to the limits of physical travel, always exhausting, costly, and... inefficient!

- *Avoiding the many obstacles and incidents which limit and perturb traffic every day*.

While we spend 50% to 80% of our time in meetings and trips, traffic jams and breakdowns in air or road transport waste so much time that we will eventually have to choose between either meeting... or traveling! Planes are increasingly late: 25% of all flights in 1989 (13). The increase in group or leisure flights – 80% of all flights by the end of the decade – has made flying a victim of its own success. Ground infrastructure

and air traffic control are no longer adapted to the situation. We can even predict, considering how slow we are to adapt, a crisis in air travel by the end of the decade. SRI International, in a report commissioned by the Air Traffic International Association, expects twice as many passengers as in 1988, from 267 million to 500 million, for the year 2000. Breakdowns can of course be expected, affecting all passengers, even in Business Class.

On the ground, transport networks are jammed. In the Paris region alone, traffic jams have increased five times in ten years, for a total loss of 100 million working hours (14). This figure is somewhat less dramatic when we remember that the French, in 1987, spent 20 to 25 billion hours in cars (15). Meanwhile, professional expenses, including travel expenses, are increasing faster than overall expenses, according to a previously quoted study performed by Bossard Consultants: from 4.8% in 1988, to 5% in 1989 and 5.2% in 1990. How many meetings must be botched due to time lost in travelling before we resort to teleconferencing?

> *Dupont DeNemours, France, has 55 teleconference sites in 18 countries. The teleconference manager, Normand Heeney, evaluates costs at $100 per hours in the U.S. and at $400 between the U.S. and the European Community. In 1991, Apple evaluated the cost of its videoconference network at $120 per hour between Paris and Cuppertino (between 20 and 75 hours per month) for international work sessions and customer service for large accounts. In 1989, videoconferencing amounted to $500 per hour in the U.S.; USA-Europe: $1,500 - per hour; USA-Far East: $2,400 per hour.*
> *(Source: Téléconférence, Paris, 1991)*

- *Mastering the "weather effect" caused by the large number of involved parties*.

The term "weather effect" is used to compare the similarities between weather prediction and the large number of sources required for information gathering in market prediction and watch. A situation even more difficult to control as firms are strengthening their international positions, with a view to exchange expertise between countries. Islands of knowledge in an ocean of communication, terminal men will call on each others to enrich their mutual knowledge regardless of borders thanks to teleconferencing. It is unavoidable. If the increasing number of parties involved had to be constantly on the move in order to solve the slightest problem and exchange information, fortunes would be lost in travelling expenses. Furthermore, with executives always on the move, companies suffer from slow response, ensuing in malfucntions.

In brief: white collar workers will have to voluntarily limit their travelling to increase productivity and efficiency. On the other hand, their will become electronic nomads, because there is as yet no other way to be more and more tele-present at a lesser cost. For the virtual entreprise trying to control costs while remaining fully operational, there are two key factors underlying the development of teleconferencing applications: the capacity to effectively control management and remote experts resources and the capacity to access global markets through NICTs. In other words, to be able to be virtually everywhere, when and where necessary.

This will give rise to a new type of television, business television, which attempts to overcome the difficulties inherent to trying to reach simultaneously (and affordably) dozens, even thousands of people spread over the field. Enterpises use this type of

television to broadcast intense communication and training. The organization behind these business television networks is similar to teleshopping: private networks, mostly in the U.S., where more than 40,000 interactive tv stations (up link and down link) can already be found, against 50 in Europe. There are also special programs on specific themes, shared by various companies and broadcast on more or less specialized channels. Bull, Hewlett-Packard, and Renault (most notably when launching their Clio model in France) used this system through France Cable Radio.

The Ibis/Urbis hotel group installed a videotransmission network linking 200 hotels. This European network, named Puissance Satellite, is used for seminars and to ensure proper communication between a staff of 5,000 people. Each installation costs 70,000 francs and includes a satellite dish, and the network head for video and audio equipment installed in the conference room (16).

France discovers teaching via satellite

Why spend time and money sending specialists here and there? Every Thursday morning at 10h30, in Dublin, Helsinki, Sophia-Antipolis, Rome, etc., engineers and researchers can benefit from courses given by the greatest scientific minds in the field. Eurospace, along with Channel E (E is for Education), uses the Astra satellite, already serving 20 million homes in Europe. An American monopoly for too long, this market, according to François Orivel, director at the Institut de Recherche sur l'Economie de l'Education, now represents 7% of the French GDP, the equivalent of the automobile or housing industry.
(Source: Express, Paris, February, 29 1991)

The virtual entreprise has no better choice than to encourage "electronic nomadism" if it hopes to enhance white-collar productivity. While face to face meetings do not require large investments, organizational costs and variable expenses are extremely high, and as time gets wasted in unproductive activities, business opportunities are lost. In the end, we face a paradox: teleconferencing applications can be easily justified economically to executives who are still reluctant because of the difficulties in installing such a system in the first place.

It is true that, limited at first in their development by monopolies and thwarted by national companies, interactive satellite connections, or VSAT's (Very Small Aperture Terminal), are little-known in France. Meanwhile the Production Manager of an electronics firm in Japan regularly contacts his seven factories around the world thanks to bidirectional VSATs. While we are still waiting to take up in Europe, Volskswagen is joining forces with Scientific Atlanta to develop services for its overseas dealers (17). Short-term use of VSATs being an uncertain affair in Europe, the most enterprising firms will no doubt concentrate on national and international digital networks or visiophones for group work via ISDN.

Since 1989, the French bank CIC has been experimenting with visiophone applications to improve productivity (18). First of all, a client will be able to communicate from any branch through a visiophone with any of the bank's experts wherever. This expert will be able to send documents or images. CIC is expecting to save on personnel, since the visiophone will allow them to concentrate their experts in a few, equipped locations. Furthermore, the visiophone will serve to enhance management performance at meetings or conferences. Individual visiophones can be linked to visioconference rooms during a meeting. Branch managers, for instance, can

join a meeting without commuting to the main office. Training will also be improved in the same manner. From the visioconference room, a trainer will be able to address trainees at their workplace, as was done with IBM engineers. At CIC, return on investment is expected nine months after the first 30 installations. Yet, this is the type of investments firms are still reluctant to make. Preferred are new teleservices called "telemeetings" on ISDN, a step towards cooperative telework, or groupware.

Cooperative work or groupware

Wide open spaces stimulate the imagination... particularly if you don't want to loose time covering long distances or wandering in twists and turns. For instance, Scandinavian countries, Canada and the U.S. have quickly and successfully developed telemeeting in order to avoid frequent and long journeys. Thanks to these telemeetings, the management and coordination of executive and sales team can be been dramatically improved. Génésys, a French company, is a good illustration of this virtual market. Created in 1989, in association with France Télécom and the Languedoc-Rousillon district, it offers a range of facilities services, at first limited to telemeetings, then, in 1992, expanded to include two new services using ISDN. "Audionis" audioconferencing and "Visionis" visioconferencing enable users to set up meetings in a virtual room, a space-time unit dedicated to communication, booked with an immaterial key code which opens a virtual door to hold a meeting or a teleconference in a virtual location! Provided you have access to either a phone or an ad hoc terminal, you may host any correspondent you wish without any travelling involved on either side. Remote work, slowly but surely, is becoming group work.

This type of business service will grow rapidly and strongly: firms, particularly small or medium size businesses, lack the necessary skills to master these highly and increasingly technical services. Sharing of NICTs resources also helps to reduce operating investments and expenses. In this context, the success of this type of facilities service, or facilities management, applied to computers but also, more recently, to telecommunications, is hardly surprising. In Puy-en-Velay in the Haute Loire region, Génésys is currently sponsoring a special experiment in remote training in rural areas. Using a local radio, private lessons, cassettes, and a telemeeting service, the program allows trainees to travel as little as possible (19). This cooperative effort between specialized resource centers, grouping individuals around different projects (training, product design, organization, research, etc.), perfectly illustrates how remote work is slowly spreading to reach people often parted by large distances.

The oft-mentioned intelligence revolution will not be possible without a massive use of NICTs... which in turn will have to adapt to new ways of working. Part of the European RACE project, the DIMUN demonstrator (Distributed International Communications Using Networks) was launched in 1990, in association with leading European firms such as Biba Institute and the University of Brême, Kone, AEG, telecom firms in Finland, the Technological University in Helsinki, EB Technology in Norway, HUT in Sweden, etc. RACE is a project aiming to explore the industrial uses of wideband networks. However, DIMUN will be able to work on ISDN, thanks to progress made in the field of image compression.

A DIMUN demonstrator was installed to study how an international groupware between multimedia work stations functioned, as part of a project on the

implementation of a clothes collecting program. The technical installation used a classic network associated to a distinct video system. The multiple-camera video system was fixed. It was used to view the speakers but also their working environment, with wide angles on the rooms, hallways, entrances, and even the coffee machine! The image could be retrieved on demand on a Macintosh PC. The work station screens displayed virtual tools: "public spaces" such as a table or a room, "shared spaces", such as a white board, and "private spaces", such as a briefcase, all having the same names and properties as their real counterparts. Each time a meeting involved a new activity or service, specific virtual items could be created. Each new participants received explanations on the properties of these public, shared, and private objects. The room, thanks to video, appeared in its familiar environment. Once these elements in place, virtual meetings could be organized at will. When needed, they could even be videotaped.

Describing the computer screens which represent a virtual meeting room and its activation system is no easy task. Drawings represent the board, the briefcase, the table, the door, the video-windows where participants' faces and environment will appear, the fax machine, the telephone. The mouse allows you to use each of these objects, but also to work across many simultaneous levels, such as accessing a common database or opening work station windows in visiophone or audiophone modes. Each multimedia station is interactive. The "master of ceremonies" has a control system to regulate access to the meeting so that participants speak in turn from their remote location during work sessions. It is also possible to control video angles from a distance, to facilitate the exchange of ideas, or to focus on objects related to the discussion. Also (a fact many times confirmed), after participants have made a first visual contact, their windows are reduced to allow them to focus on the objects, graphs, data, or images which are central to the work session. In other words, the practical rapidly takes over the personal; individuals quickly become familiar with each other in any case. In the center of the screen, up to 16 video images can be reduced and organized in a matrix.

What makes the DIMUN demonstrator interesting is its capacity to explore the future multimedia environment of the terminal man in its technical, practical, and statutory aspects. For instance, how can we determine wether an image is public or private? The ability to work in different places at the same time is one of the result of groupware applications on ISDN. By cleverly making this privileged environment available to their allies, clients, and sub-contractors, companies will provide consultants and project coordinators with an extraordinary tool for collective productivity and efficiency. Following this trend, it is possible to say that:

- Interactive communication between individuals is an essential and efficient contribution to information and data exchange.

- In the process of designing a new product, small work-groups organized around specialties with a client/supplier attitude independent of any form of traditional hierarchy lead to faster, more useful exchanges.

- By allowing all parts of the chain, from designers to retailers, to participate, involvement in the processes and results is stronger, as a greater number of possibilities are explored before a model is created.

In other words, groupware "forces" everyone to be efficient. When we know that half of all executives spend a minimum of 50% of their time in meetings, that 75% of them

bring work home, according to INSEE (20), we cannot help but think that Computer-Assisted Teleconferencing (CAT) will allow us to fully exploit a considerable pool of potential productivity* .

With the virtual entreprise, the multiplied man will from now on choose to virtually be everywhere, telepresent each time NICTs give him the chance to do it profitably, first within the framework of commercial thrusts, then in trying to increase white-collar production. Tertiary workers will indeed have to learn to communicate efficiently, more than ever, in order to progress and help their company progress as well. This implies opening the doors of meetings to more people other than executives, which is impossible to do with regular, physical traveling. We will have to choose between spending our available time travelling or using it to convince, decide, and act together while beating the clock. This means focusing on this new capacity bestowed on the virtual entreprise: quick response to the demands of an impatient society. Electronic nomads will simply have to learn how friendly teleconference can actually be, contrary to their preconceived notion.

* French firms hold an average 150 million meetings each year. In 1989, 23,000 telemeetings generated 150,000 connection hours, representing from 12 to 25 Francs per minute. Pierre Brabet, president of Genesys, expected 80,000 hours of audioconferencing in 1991, rising to 350,000 in 1995, and 50,000 to 200,000 hours for visionconferencing.

Chapter 2

The never sleeping enterprise

Eliminating distance means increasing time.
From now on, we will not live longer, but faster.

Alexandre Dumas

Along with the multiplied man, enterprises – now virtual – have discovered new pools of white-collar productivity and competitiveness. This, however, is not enough: we now have to "unjam" time. After making us present everywhere, NICTs will make us present al the time The availability and accessibility of business services will be improved because companies will have to be virtually operating round-the-clock, day and night, including Sundays and holidays. NICTs will boost company performance by staying continously active, thus making more intense use of investments in order to enhance capital output, improve service quality and access, and reduce operating costs by eliminating the traditionnal intermediation with clients or suppliers.

"A businessman spends 18 hours per week in his car, which actually turns out to be the ideal place to make a phone call", GEC–Plessey Telecom SA President and General Manager Rupert Soames confided to Philippe Guichardaz, journalist at *01 Informatique* (21). "According to my estimates, using the phone has added at least 24 work hours per week to my schedule." Many company executives are likewise preoccupied with trying to increase "productive" work hours. A survey performed for the purpose of this book revealed that, out of 50 large or medium-sized firms or international companies, 45% considered it important to increase working hours, essentially because of international time zones, in order to better serve their clientele. Moreover, enterprises coming into the 21st century are facing constantly accelerating paces. We live in an impatient, right-this-minute, real-time society, but companies are still trapped in aging organizations which must adapt or die. "Time is money" used to be the familiar refrain of executives and managers but today clients, a new breed of insomniacs, are joining in the chorus.

The impatient society

Peasant society, tied to the land, followed the seasons' tides. Village life was punctuated by the church bells. Then crafstmen were replaced by factories, which drove part of the population away from the villages and enslaved them to the factory clocks. Man was already witnessing an alteration in his relationship to time. After the great wars, the colonialization and military service (all chances to see the world), the rapid expansion of market economy, then of wide distribution turned more than one worker into a traveler. Last came the leisure society. Man had successfully adapted to the redistribution of space, but without ever freeing himself from Chronos, God of Time; quite the contrary, Chronos is more than ever the master of modern times. Time is confiscated, dilapidated, sacrificed to the sake of the community, to the needs of companies which, lacking alternatives, eat away their executives' time, sometimes even stealing what is left of their private lives. Some in turn steal time from the clientele by using NICTs to redirect self-production of self-consumption of goods and services. Why do ourselves what customers can do in our place?

On the other side, clients hear promises of more free time, more time to enjoy life – and its their turn to trap the worker-supplier. Clients also want to save time, they will not wait nor travel. They want to buy more and more customized products and instant services, all available around the clock. Intermediaries want to reduce stock as much as possible at the sales outlet. Companies are getting closer to clients and organize themselves – at a very high cost – in order to master "just-in-time" operations out of the factory as well as inside. Factories must work non-stop and services must be permanently available if we are to meet the demands of the "I want it now" society.

Thanks to NICTs, telelife, teleservices, like telework, are now becoming fairly commonplace. Continous material flows gave way to continous flows of information. And the office can almost be run without paper... when there is an office at all! NICTs are helping us to abolish and even cheat time. By allowing us to create a "virtual layer" around companies, and after making man multiple and ubiquitous, NICTs will make him omnipresent.

The number you have dialed is ALWAYS in service

Even with white-collar workers and executives always away on the move, the virtual entreprise remains virtually at our disposal. Thanks to NICTs, the number you have dialed will always be in service... In the spring of 1991, while French newspapers were discussing the problems of Virgin Megastore trying to stay open on Sundays, the Dial Club records mail-order service had no such difficulties. All clients could call their order 24 hours a day, seven days a week. They could listen to clips before deciding to buy, and a synthetic voice guided them as they made their selection. Permanent Minitel access was also available for orders. NICTs are thus entering the domain of traditional distribution, in a disrupting way. Virtual entreprises can function permanently and make capital work overtime. Will this drive prices down, as they did in Swedish stores now open on Sundays? Well, that's another story...

In 1986, there were only 200 voice mail numbers in France, including 50 corporate ones, roughly as many in classified or personal ad services, and about forty in the news world (22). The Banque de France in Toulouse has linked with France Télécom's Audiphone service to give out economic indicators non-stop. The Agence Nationale

pour l'Emploi (Employement National Agency) permanently broadcast job offers, and movie theaters their programs and schedules. As for billing, France-Télécom is making eyes pop: the more calls you receive, the less is costs.

The French engineering firm Decobecq in Saint-Etienne – a 300 million francs turnover, a staff of 1,100 – uses Minitel to hire personnel. Information on the company and available positions is available on-line. The firm uses this opportunity to advertise its activities, introduce its 22 agencies, results and personnel needs in minute detail. Candidates can manifest their interest and apply at all times (23). The "virtual bookstore" service lets consumers order any book in France by phone, 24 hours a day, and orders are shipped within days. Many professional services have blossomed on Minitel. And here is an added bonus: "Videotex and audiotex orders cost twice as less as phone orders", according to M. Masclet, Mail-Order Manager at La Redoute (24). According to the Syndicat de la Vente par Correspondance (mail-order confederation), videotex and audiotex represented 8% of all mail-order sales in 1989, 30% in 1995.

"Talking machines" found Minitel a fierce competitor for many years. According to Arnaud Henry Labordière, President of Ferma (25), a company specialized in *vocodeurs* (vocal coders), there is only one explanation: contrary to the American people who prefer to leave short voice messages to collaborators or clients, Europeans would rather write letters and file them carefully. The recent development of specialized chips and programs has led to the creation of a new generation of interactive talking machines which react to voices. They can be operated via tree structured choices systems, or can guide themselves using expert systems to answer questions. In France, the Audiotex subsidiary of the news magazine *Le Nouvel Observateur* handles 500 lines and a million calls per month with a staff of five. Its first interactive voice server can process 25,000 calls a day. It recognizes 80 words at each step , representing a total of 7 hours of recorded speech. This market covers permanent consumer information, sponsored advertising, promotional games, and registration (vocal couponning). According to promoters, this formula opens the door to international access: the exchange is "warmer", friendlier, and it can reach a greater audience than Minitel. Many companies have expressed an interest in this type of "vocal telematics" applications. The mail-order firm Les 3 Suisses offers games and contests, Weight Watchers keeps the public informed of upcoming meetings, the City of Sciences and Industry of Paris unveils its activities and programs, Air France has an internal voice journal, Air Canada offers daily flight information.

American banks have been using voice mail systems since 1988. At the time, Wells Fargo was offering the first 24 hour service. The enormous network-related fixed expenses must be brought down, however. This can be done by developing what is already being called "a branchless bank" ("la banque sans agence"). Countries where networks are not as densely developed as in France are prospecting differents ways. Firstdirect, a subsidiary of National Westminster Banks in London, and Bex Directo in Madrid, Spain, offer phone services – for now – to clients unhappy with regular bank hours. As of October 1989, Firstdirect recorded roughly 100,000 clients with an interest bearing account. All transactions are done by phone after i.d. verification. An appropriate customer service had to be set up, with a staff of 400, 60 of whom are operators controlled by an auto switch system, in order to reduce waiting time and to help keep track of calls (26). A clever companies use the NICTs to have the field - i.e. the market - while modifying their fixed cost structure. This seems to be the case for

PanAm and United Airlines, who use the rerouting possibilities of telecommunications to cut down the number of branches. Rather than maintaining a costly phone reservation office in Geneva, PanAm, much like United Airlines, has decided to reroute all the (toll-free) Swiss calls to Paris. French employees make serious efforts to preserve Swiss local color and efficiency. United Airlines, for its part, reroutes all European (including Finnish and Swedish) clients towards its Bagnolet office in the Paris area. Multi-lingual receptionists, facing a switchboard which lets them know where the call originated from, answer accordingly: "Guten Tag", "Buenos dias"...

Invested capital never sleeps

Pairing off telecommunications with human and/or computer resources is a clever way to improve invested capital productivity. Bruner and Jahr, in Itzahoe, is one of the largest German press groups. They publish Stern, weekly with 1.6 million issues and Geo, well known in France. A huge amount of documentation was first reserved for the use of journalists, then open to outside clients. In order to manage it, they have installed three "jukeboxes" with megadoc digital optical disks (Philips). Today, this service files 1,200 new pages daily and works round-the-clock seven days a week (27). Easy access to the tools of the trade – and the full exploitation of equipment – is but one of the key issues discussed in a report by M. Taddei, who also underlines that foreign companies making a proper use of both equipment and personnel would gain competitive advantages: "the markets opened by those who better exploit their equipment can be taken away from French companies ." (28)

This is what Burda (a German printing group in Offenburg) competitors feared. After an important initial investment, Burda increased equipment use from 120 to 136 hours a week, which forced competing printers to do the same. Burda, close to Frankfurt, brought these number up to 140, and thus got its hands on printing Rupert Murdoch's Sunday, issued at 6 million copies weekly (29). "As soon as you start to differentiate working hours and use of investment, the question of salary compensation seems to loose its importance", according to M. Taddei, discussing overtime wages and other forms of compensation. But in order to get the most out of equipment, team work must ensure round-the-clock operation. The factory forces personnel to come and put the machines to work. It does not necessarily have to be so with NICTs: today, tasks are transfered from one location to another, across the world if needed. Here, an IBM executive in France is on duty one day every weekend to tele-monitor an operating unit from home. There, people in Galway, Ireland, process subscriptions for McGraw Hill Inc. The purpose is to lengthen the duration of profitable use of computers. The previously cited examples of New York Life and McGraw Hill Inc. clearly show that enhancing the exploitation of investment is obtained by making people work from different locations. Investment productivity also allows for a reduction in cost price, the difference in labour costs between the U.S. and Ireland compensating for the costs of international telecommunications.

When service must be provided on an extended schedule, telecommunications are at times the only means of ensuring services which would otherwise be too costly, considering manpower costs. For railroad stations, being open almost round-the-clock, maintaining security staff 24 hours a day is much too costly. Thanks to ISDN, the SNCF (French national railroad public company) launched an experiment using safety terminals: a microphone, an earphone, and a video camera are brought together to

reassure... and deter. The telesurveillance center reacts according to the safety problems which occur. Using images was very important in that case, since it deters jokers while lifting the tele-operator's doubt as to the seriousness of the emergency. Permanent availability is essential to the success of databases, as well as to business engineers who can consult their "info-centers" or information service centers at any time. Users can access servers at all times thanks to a laptop computer, or using relay radio, as the mobile police force do night and day, 365 days a year. What are these mobile policemen, if not teleworkers? These new pools of investment profitability and competitiveness that NICTs enable are as many opportunities to realize how traditional work space and time are being destructured. In the beginning, telework was understood as a possible form of substitution following a traditional axiom: if you do not go to work, work will come to you – i.e., at home. Today, as we can see, both work and services have been transformed; they are omnipresent in the immaterial world of networks.

The never-sleeping enterprise is virtually omnipresent in order to guarantee non-stop services and activities without multiplying its workforce needs in direct ratio, particularly the rather costly white-collar workers. Post-industrial companies are on the course of completing their mutation and disrupting the most well-established traditions. With the help of the new possibilities of NICTs, companies are not fortresses any longer, they will open up to their clients. Anywhere connecting to NICTs will be possible, clients will be enable to virtually enter certain key business functions, once fiercely guarded. Clients or partners, thanks to their confidential passwords, will have the virtual enterprise at their finger tips!

The enterprise at your finger tips

Barely perceptible in the 70's, one of the greatest revolutions in post-war organizations took place in the 80's and early 90's. It nonetheless almost went unnoticed.

For a century, capitalist economy has been fueled by the combined development of technological innovation and mass distribution. The continuous process manufacturing is forcing family businesses to concentrate on specialized or highly automated activities. Today, multifunctional firms are grounded on production-commercialization and product and process innovation. They are organized according to a hierarchical model borrowed from the railroad industry. Controlled by rich families or by salaried managers, they are all masters of their own destinies and must find their ways of improving performance. The Tayloristic and hierarchical models have combined to facilitate the scientific approach to work so dear to Marx.

In this type of company, the traditional manager spent much of his energy trying to improve productivity, yet he often hung his head in despair: although he was aware that greater productivity lay in trade with other entreprises, his influence was contained within company walls. Part of this potential was used up by low-performance outside units or poorly organized third-party companies. Managers saw their efforts "confiscated" by indirect costs but also by the poor performance of other participants at either end of the production chain. For example, just-in-time management, when dealing with unreliable suppliers would have implied keeping at least some overflow

stock. In such a context, the revolution we are discussing involves the way NICTs broke down the walls of companies.

Thanks to a new spirit of dialogue, modern organizations are enable to influence inter-business exchanges, thus ignoring the former physical barriers. By applying constant pressure, the impatient society has won the battle. The "black box" opened. The now systemic, post-Tayloristic enterprise, by associating with other companies, are capable of revolutionizing their approach to productivity thanks to NICTs. The consequences of this transformation of corporate organization are hard to evaluate. First (but not least !), it is likely to force a more strategic use of computers. Companies will rather reach agreements to generate production and profit, rather than become the quarry. A type of soft capitalism is developping. Senior management now understands that taking over companies which rely mostly on volatile brain power can leave you with only an empty shell without prior partnership agreements.

In short, companies now consult each other and, thanks to networks, increase mutual productivity. These attempts at enhancing productivity and efficiency, as part of an expanded, multi-partner effort sometimes lead to spectacular results. In 1986, British Petroleum equipped 1,200 French gas stations with Minitel terminals. Their aim was to keep informed by e-mail of competitor's prices and to send instructions to gas station holders on prices to advertise. A problem solved in 43 minutes against 48 hours before. BMW now distributes car parts to its 247 dealers with the use of the Minitel. Orders made before 4 pm are delivered the following day, at least for the most oft-requested parts. "Time is money", we are constantly reminded. The wine dealer Henri Maire did the same, and phone bills went down from 1 million francs... to 270,000 francs. Bosch Tools, with their 1,200 Minitel terminals, reduced their phone staff from 43 to 25 people (30).

Companies are trying to cut down on intermediates, and to decrease delays due to bureaucracy. Previoulsy Tayloristic and mechanical, the enterprise has become a network. Through their exploration of the various uses of NICTs, companies find new ways of communicating with third parties. This can include delegating part of its continuous flow management to a specialized organization. The Plate-Forme Alimentaire du Sud-Est (PASE - South-East Food Platform), with its 24 hours a day schedule, is a good example. This highly original bulk food distribution company services supermarkets. Stock must be shipped as soon as possible. Products arrive in the evening or at night and are kept in cold storage for a few hours before leaving in one of the company's 50 trucks. This rigorous flow control can only be made possible by computers, which keep track of supplies and supply needs for 1,000 regional outlets. Order preparation takes shelf space and organization into account. This highly sophisticated approach has proven so successful that a telesales service is now in place, in order to promote and sell some of the products distributed by PASE (31). NICTs have boosted PASE's performance, and the company has become an interface specialized in flow management.

Second major consequence: a company's entire functions can become directly accessible to clients. While the concept of non-stop production still dominates, a new idea is emerging: the return of made-to-measure, yet applied to functions other than production. For examples, the NMPP, which dispatch 60% to 70% of French newspapers, keep track of unsold goods and control delivery and supplies practically in

real time. Post-Tayloristic companies manage just-in-time, thanks to NICTs – immobilized intermediary stock is non-profitable money.

Certain operations, once fiercely guarded by various intermediaries, are now more easily entrusted to remote third parties. ABB Petercem, a Lyon company and a subsidiary of ABB in Sweden, makes an original use of the Kanban method of just-in-time supply management with some of its suppliers. "Each production line has a Minitel – according to Sales Manager Louis Genin – and each supervisor enters daily supply consumption... It is then up to the suppliers to consult the telematic service and fulfil orders." At ABB Petercem, which controls a third of its supplies in this manner (100 million francs per year), a 3% reduction in warehousing costs paid off for the system within a year (32). Less delays, less stock, less white-collar workers in the offices, too, for the paper-maker Brun Passot. Sometimes the order processing cost can be higher than the price of ordered goods. In order to reduce cost, Brun Passot, in exchange of 48 hour delivery, encourage clients to directly place their orders on Minitel, ensuing in a decrease of stock, usually immobilized 4 months (33).

Unfortunately, quick response is not always enough to satisfy the "I-want-it-now" society. What is the use of having first-class salespeople if the company can only deliver within three weeks, when a competitor does it in 48 hours? Transmissions must be fast, or deadlines will not be met. Well, never mind, clients will take control of the ordering process themselves. They may even virtually and remotely monitor their suppliers' machines. "Straight from the factory" is now a slogan: Vestra, a French clothes manufacturer which sells to both Europe and America, directly tailors suits from orders which their clients entered on a computer terminal. Chain stores buyers select measurements, color, and other options from the catalogues. After the central computer system has checked the order, laser cutting starts in less than 4 minutes. Foreign orders are delivered within two weeks. Programmed terminals let clients order without any assistance. Post-Tayloristic companies have cut down on intermediaries and organizational costs by strongly integrating their operations. These are only examples. We are still a long way from seeing companies operating with both feet firmly planted in the immaterial world. Anyway, most of them today don't even have an answering machine!

It is important to establish that from now on companies have the capacity to be virtually continously available. By minimizing or eliminating intermediaries – i.e. certain human interfaces – we can be virtually able to act from a distance on the specialized flows of post-Tayloristic companies. NICTs, as tools of the virtual trade, grant us with omnipresence, to satisfy the needs of the "I want it now" society at a lesser cost, and at a higher profit. For now, virtual entreprises are still testing their strength and their capacity to function automatically, that is, to let machines perform a maximum of traditionally tertiary, white-collar operations. It's a tantalizing dream: more profit at a lesser cost. Such is the aim of virtual entreprise... on automatic pilot now!

The enterprise on automatic pilot

Eve greets callers, transfers calls and tapes messages, while your receptionist is stuck in traffic. Eve is a machine (34). Quietly, through the back door, NICTs are nibbling away at tasks once performed by employees or executives who are now busy on high added value tasks, or perhaps simply absent. Certain operations are put on hold; others

will be put on "automatic pilot". Virtual representations of these tasks or functions will do the work while their masters are away and will take care of current operations. Interest in these many services, often supplied by micro-businesses – another product of NICTs – stems from three factors, all client-driven:

- the relationship between client and supplier is characterized by commitments on resources and sometimes even results (in telesales, for instance),

- service is non-stop, 24 hours a day, and offers top-notch professional performance which companies often have problems getting from their own services,

- costs are low since services are shared with more than one company/client.

Solutions such as answering services are well-known in the United States. In France, Agaphone found a way to adapt this formula in 1985, spurred on by a young woman named Valentine Lambert. Now, Agaphone offers telephone secretarial services, with a staff of 10 secretaries – all trained by Lambert – shared by roughly 500 clients. Clients simply reroute their calls to Agaphone. There is no discernable difference as employees know who is calling, and appointments, messages, or orders are all scrupulously taken care of. Offices are currently open from 8 am to 8 pm, and prices vary between 750 and 1,400 francs per month. The company is considering extending its hours to provide service around the clock. Thanks to modern automatic switchboard technology, callers are easily identified. Recommendations from each client are displayed on a computer screen. Callers are greeted exactly as with the client's office, even if the caller does not specify the person or service he wants. French car manufacturer Renault was greatly interested in this formula for some executives who do not have a secretary. Other clients are architects, doctors, lawyers and middle-sized businesses wishing to save on secretarial staff (35). It seems to be a complete success for this team of efficient teleworkers, who started out working from the home of company founder Lambert, before finding more comfortable premises in Paris. While virtual entreprises are put on automatic pilot, NICTs, together with human power, are keeping watch.

Rerouting communications is now possible with phones, with Minitel, and with fax machines. Companies can breathe easy when secretarial work can be shifted while the pilot is missing. Also, when important staff members are away, job recruiting can be done through Minitel, using the Jobplus service. Aptitude tests can even be performed, according to positions. In a few minutes, a candidate will know wether he may interest the company and leave a message. When lucky, candidates do not have to wait long before finding out what the company thinks of them.

The French radio station "*Ici et Maintenant*" (Here and Now) once experimented with an electronic disk jockey which worked from a distance, without human intervention. The audience called the station. A computer equipped with a voice card acted as a receptionist. It also recorded requests much like a juke-box: each proposed song was followed by a code which could be punched in using the phone dial. Once the most frequent requests were identified, the computer played the songs.

Telephone sales are also jumping on the electronic bandwagon: Bon voyage, Mr. Salesman! An automatic calling system, or automatic dialer, is being offered to French companies by Cogecom. This tool is reserved to subscribers, in order to avoid excessive use. The system can call up to 500 people in eight hours, as well as print a report on caller response: number of successful calls, number of immediate hang-ups, call length, etc. The computer is equipped with a voice card and a database management of

individuals and companies on the calling list. When a call is unsuccessful – no one is home, the line is busy – the computer tries again. And of course, the user may monitor the computer from his cottage in the countryside.

In a completely different area – legal departments – the French company Infos Conseil has developed Contenciel, a software program with manages acounting files and prints out follow-up letters with updates on interest. With a Telociel voice card, the software monitors an automatic calling system. According to the problems at hand, conversations can be more or less left in the machine's "hands". Using similar systems, it is also possible to perform automatic prospecting, marketing surveys, mailings or even automatic messaging and greetings. This particular service was offered by the talking Minitel in 1989. Users only had to type in a message, the appropriate phone number, and the time the call should be made. Automatic dialing today is common practice for telemarketing or consumer survey firms who use it at least for a first contact; once that is established, an operator or telesalesperson can take over. Once again, symbiosis between the terminal man and the computer is essential.

If, following the footsteps of salespeople and surveyors, the advertising staff leave for seminars, they can use automatic fax machines to send a telematic newsletter or a mailing to clients or prospects. With a microserver, it is possible to draw and memorize a list of fax numbers of prospected firms, and to program transmission time, usually at night in order to benefit from reduced rates. The system ensures its own proper functioning. And when the company does not own such a system, there is always the possibility of contacting specialized companies providing the service (36).

The proliferation of teleservices is quite spectacular; any common function or activity has an equivalent in the teleservice industry. For the modern manager or executive wondering how to handle variations in workload, how to maintain regular operations during holidays, etc. – keeping their address books up-to-date with these services could prove extremely useful. Indeed the virtual omnipresence may very well be partly supplied by a third party. Your secretary is absent, you have difficulties communicating with a foreign caller? Transatel offers an interpreter for 30 francs a minute. And rest easy, a typing service will make sure you can always find a quality typist.

Access to business proposition and sub-contracting exchanges, such as the Bulletin d'Annonces (BOAMP) in the Journal Officiel, was greatly facilitated by Minitel. Chambers of Commerce were able to expand the commercial sphere of activity of firms lacking in representatives. Many of Minitel's applications are in fact rather ingenious, particularly when it comes to communicating with clients and ensuring their continued support, or to managing teams or networks. "Who's who" applications are very successful, especially if they can help saving time and if they allow users to keep track of events and react to these events in real time, or at least in close to real time. While controversial, this method of testing audience reaction through Minitel has been used by more than one television station. This would have been impossible to do with human staff alone.

Only NICTs can lead to such previously unthinkable feats: never sleeping enterprises!

Chapter 3

Neuroconnection: knowledge monopolies

Nothing stems but from the mind. Driven by science and the laws of automation, our civilization is completely changing man's material condition.

Charles de Gaulle, July 16,1965

In 1987, in Cambridge, Massachusetts, Danny Hills, a 29-year-old Ph. D in computer sciences, worked on his doctorate thesis using a machine he had designed himself: the connection machine. He even created his own company in order to put it on the market. The machine is really a special computer with 64,000 microprocessors, each with its own memory. The electronic network linking the processors optimizes each type of connection. The machine can link itself to databases and, in answer to queries, displays the most interesting articles, rating them – specialists named this the relevance score – according to how well they relate to the topic at hand. The most relevant parts can be displayed and tiled on the screen (37). In the ethereal world of signs, the virtual entreprise can be defined by three main characteristics: telepresence, omnipresence, and now, thanks to applications such as this one, omniscience. This last characteristic is at the same time the most accomplished and the most disturbing to the contemporary layman, particularly if he is unaware of the stunning development of NICTs, most notably in the field of "intelligent" networks. A few technical pointers should be enough to help the uninitiated better understand the situation.

In the 1960's, Paul Barran laid the foundation for packet networks. Computers converted analog signals into digital signals, grouped in packets identified by their own "computer address". Let us simplify by saying that all the network junctions cooperate to convey the millions of packets sent through the network to their proper destination. Arpanet, the first packet transmission network was developed in 1969. It first served to link together American research centers, such as the Stanford Research Institute, but eventually expanded to international servers. From now on ideas could circulate much easier and faster. Then the home-computer craze facilitated the access to Transpac-type networks, and led to the creation of computer programs which optimized packet

conveyance and dispatching from junction to junction. The itinerary – a virtual circuit followed by the packet – was attached to the address. The proliferation of terminals led to the multiplication of short, sporadic sessions between systems (Transpac had disastrous results with Minitel in 1985). The problem had to be approached differently: a new type of program had to be devised, called the datagram method (one of the first object oriented programs). Unlike transmission via a virtual circuit, the information packet does not contain an itinerary, but selects the most available route itself according to its destination. Each packet is "conscious" of being a part of an organized sequence, which will have to be reconstituted on arrival, though each packet might have followed a different route. The datagram is let loose on the network and has to adapt its route according to traffic, connection quality, cost and time. The packet erases itself once it has reached its destination and reception has been acknowledged. Except... if its a virus or Trojan Horse launched by a *cracker*, on a mission to clone itself within networks or hide within programs until a clock sends it destroy files. Or if it is in fact an automatic research program from a virtual entreprise at work!

Research hackers: CARP

A Computer-Assisted Research Program (CARP) specialized in tropical pathology was launched one morning in July of 1999. The program is allotted both time and budget for transmission and databases consulting. It knows how to select the most economical routes to reach the desired databanks. A routine explores the servers' address directories in order to identify bridges or other databases of possible interest to the querier. This official market product, based on fuzy logic, is non-aggressive. It abstains from looking for flaws in security systems, take advantage of unprotected computers or lift passwords carelessly abandoned by users.

While reading available files – their access granted by its query program – the CARP defines which structure will be used for the resulting hypermedia documents (voice, text, image, sound...) by taking into account the specific knowledges which are requested (financial, ecological or social angle?). The CARP is self-monitored thanks to supervising networks nodes. It also leaves behind a very visible signature in the computers it chooses to visit and submits itself to all security checks required by the solicited scientific networks and databanks. It is recognized as the CARP from "Hackers Ltd.", a firm specialized in automatic databanks browsing. As morning is waring on, complementary instructions are added to refine the search, and CARP starts to provide and record interesting information, in half the expected time.

Then a more refined selection, assisted by an expert system, focuses the research on African areas where malaria had been endemic in the previous decade. The last forms of treatment, their results, and the protocols customized to specific local situations show the relative success of preventive measures by offering a striking model of the evolution of epidemiological studies. A Hypercard-type multimedia software structures the information into a virtual folder now stored in the tropical pathology lab's work station. The research team notices a similarity between their protocol and a current clinical study. The scientific community specialized in tropical pathology in Marseilles is contacted by e-mail in order to set up an electronic meeting.

The first mission od CARP was over; the case was closed the following morning. Remote research had found ways to enhance productivity. From now on, virtual

entreprises are part of a web of intelligent networks. According to Alvin Tofler, these networks use information and transform it into added value. "In the United States, there is a network which links certain specialists in the clothing industry, keeping fabric manufacturers and clothing stores informed of each other's activities almost instantaneously. As styles rapidly fall out of fashion, such a network has allowed for stocks to be kept to a minimum, while restocking was fine-tuned and the profits of members rose 25%. Now, members refuse to let it go. But this network does more than simply pass the information along: it processes it, sorts it out, and interprets it. In the end, the network holds control. Just like the nervous system of an animal ." (38)

Robert T. Morris launched a virus from Cornell University on November 2, 1988. The virus attaqued and practically put out of service Arpanet, one of the networks of the State Department and research centers, Milnet, a scientific mail system, and NFS, the network of the National Science Foundation. The MIT estimated that, among the 60,000 computers used in research networks in the USA, 6,000 had been contaminated. The damage amounted to $15 million in time and resources lost. This virus did not destroy data, it forced securities and overloaded the systems. Fortunately, it was not meant to read, erase or damage the attaqued programs.

(Source: Science et vie micro magazine, october 1990)

Progress in the fields of storage management and information compression on CD-ROMs, optical digital disks or holographic memory is impressive. In 1992, work stations can store up to 3 billion characters, the equivalent of 5,000 books. Artificial memories open up the boundaries of time and space. However, information storage is secondary: accessing and using information from a distance always comes first. Human knowledge is a fount of science... or rather a deep chasm, where entire national libraries could be buried, where billions of bits of data are lost every year, countless paper or magnetic media, knowledge bound to remain unproductive. An invaluable, gigantic, prodigious universe which we can't explore but by candlelight for want of means to efficiently access information. This a major issue in higher value productivity and future wealth, which comes down to:

- efficiently access all the knowledge in the world,
- master and encourage the exchange of ideas,
- protect sensitive data.

These are the conditions for building the new frontiers of knowledge, and even for creating one or several monopolies, which will fall to companies rather than governments. Companies will in fact strive to become omniscient in their fields of excellence, especially by developing new strategies in order to weave the brain power centers spread around the world. The battle for knowledge monopolies is already on and world-wide NICTs networks are its weapons of choice. The stakes: to make the most profitable use of the corporate intellectual heritage.

From market information to strategic information

Before becoming truly strategic, information first remained a statistic and economic product, at least for a time. In 1979, out of the 360 available databanks around the world, 70% originated from the United States. In fact, the States dominated the market

in economic information on the evolution of industrial and social systems, and the more usefull statistical models came from the States. Then, in 1977/1978, the first European data transmission project was born: Euronet.

In their report on the "computerization of society", Simon Nora and Alain Minc underlined the importance of such databanks. Between 1975 and 1983, the number of databanks was multiplied by 5, with 150 in France for a total of 2,000 world-wide. In 1984, the French association of databank producers counted 3,000 regular users in France: 60% were firms, 40% administrations and universities. However, because of problems in teletransmission networks, research methods or interfaces, they were still mostly used by addicted experts (41%) or by highly specialized documentation centers (59%) (39). In 1986, out of 2,450 world-wide databanks, 1,800 were American, 500 European – 250 of which were French. Let us not be fooled, however: the latter, 90% of which are institutional, only represent 10% of Europe's actual turnover in the field. France still underestimates the strategic potential of these resources.

In the 70's and 80's, implanting a modern, fully equipped, and well-organized documentation department was no easy task. Companies alloted their documentation department a poor budget, when they had one at all. Even then, its very existence could be jeopardized at any time, save perhaps when it could help companies cut on time spent consulting databases or on money spent in purchasing technical litterature thanks to centralization. Firms did not realize the potentially huge losses in "immaterial investments" which could result from their mismanagement of expertise and documentation, whose relevancy they continuouslly disputed. In spite of their ignorance of internal studies or expertise, they reduced documentation staff, preferring to subscribe to databases for each service, which hinders attempts at keeping track of competition and market needs (what we could call "economic intelligence"). But databases themselves were a hard cause to defend: access was unfriendly even for simple queries, fees were too high, and added value relatively poor. In 1986, 50% of the 4,000 French database users worked on foreign servers. Things did not improve, as French databases are still mostly provided by the public sector (63%) and only accounted for 2% of the world-wide turnover in 1989. The European Community accounts for less than 30%. The American market, apparently more sensitive to the strategic value of information, represents more than $6 billion, mostly provided by the private sector (83%) which quickly learned to sell added value. Market size and the tightly woven networks of firms and universities undoubtedly contributed to the success of American databases. Most of all, Americans know how to make a product develop profitably, especially by creating added value. This is exactly what National Decisions System did with the information collected by a survey performed in 1980. Using the raw survey results and an special computer program, they wrote a series of highly successful books for marketing studies. When making strategic decisions, knowing what other companies have done, even in condensed form, is essential knowledge. The same applies to information on the condition of certain markets. In the Unites States, ABI/Inform & Management Contents and Prediscat have filed it. Promt has 1.8 million references from more than 1,300 world-wide publications, starting in 1978. Citicorp, with its own national satellite network called Citisatcom, saw its turnover increase by 134.6% between 1986 and 1987 (40).

The proliferation of on-line services did not make information easier to get, especially on databanks. Supply remained greater than demand, although users began to

use them properly. Knowing which product a competitor is patenting can prevent superfluous investments, or reduce the cost of a research project by 10% to 50%, according to a study performed by Thomson CSF. Terraflex, a French floor-covering company with a staff of 450, came to the same conclusion: the technical department is kept informed of all new patents, thanks to a program which automatically searches a half-dozen databanks around the world (41). Avoiding to purchase an obsolete patent, being aware of technological breakthroughs which could modify production methods, keeping track of a competitor's research projects or of the development of a particular market, none of this is free. In 1987, Elf Aquitaine had a budget of 7 million francs for on-line information alone, representing 6,000 hours of consultation in 600 databanks (42). However, according to François Périgot, president of CNPF (French confederation of business owners and managers) at the time, "the Japanese use 100 times more professional information than the French."

According to the Observatoire Européen du Marché de l'Information (information market European observatory), the market increased fourfold between 1985 and 1989. However, outside of a few leading international firms who signed agreements with specialized network offices (such as Bossard-Siar) on international strategy or patent and exhibition watch services, companies, in France notably, still considered information to be an expense rather than an investment. This attitude dramatically changed in the 80's and 90's.

The increasing interconnection of networks have made it easier to connect to the virtual world. Encouraged by various motives, with financial interests high on the list, a few mischievous hackers, by pillaging or sometimes making a shrewd use of unprotected data, opened the eyes of many an executive. The mafia went as far as to chop off the finger of an executive manager in order to penetrate IBM's research networks. Companies suddenly became aware of the value of their own know-how, then of the strategic value of their competitors' know-how. Information networks became the strategic tools in this search for competitive edge, while the press spread around the new rules of a game which deeply perturbed the Tayloristic model of innovation. Information had become strategic* .

As more and more research centers are created – and spread – worldwide, networks become more and more essential to integrate projects and information exchanges. sometimes industrial units, methods and research labs are dispersed around the world, near by dynamic markets but also by experts equipped with the most advanced research tools. Such is the case for IBM, whose research and development activities are spread world-wide, though mostly concentrated in North America. Research is performed in three labs, two in the United States and one in Switzerland. Development is divided between the other labs: 14 in the United States focus on IBM's key technology, while 8 other – in the Netherlands, the United Kingdom, Germany, Switzerland, Austria, France, Canada – are financed by royalties in each country. Each lab is responsible for the products it develops, on behalf of and with the help of everyone involved. An impressive telecommunications network has been set up, including the Satellite

* The exchange of ideas relies on networks, especially scientific ones. In Europe, the EARN (European Academic and Research Network) links together research centers and universities. Similar networks are building up a veritable global scientific web, which provides with computing power, specialized information and electronic mail systems. Nota: Cornell University, from where Robert T. Morris launched his "worm" virus, is connected too…

Business System (SBS), to connect the various labs to a central databank, a system coveted even by the mafia (43).

The virtual entreprise adapts its traditional operations each it allows a better use of local potential; remote research and development cannot be overlooked. Networks and expertise gradually weave their way around the planet, creating new opportunities for profit... as well as new risks, of course!

Networks and brain power: new centers of profit

Kubota Ltd., the giant Japanese farming equipment firm, invested more than $150 million in the Silicon Valley, part of which went to Ardent Computer, a manufacturer of graphical supercomputers in Sunny Valley. Kubota Ltd. eventually became one of the company's principal shareholders and creditors. It went on to impose a merger with another company, Stella Computer, which according to Ardent's two founders was a way to divert both technology and assets (44). Kubota did build a $200 million supercomputer plant in Japan, while turning its back on Ardent's deteriorating financial situation. An illustration of the cruel realities of business, or all-out Japan bashing?

In 1989, a few well-known Japanese companies – Hitachi, Fujitsu, NEC, Toshiba, Matsushita – invested close to 65 billion francs in research, six times the CNRS (Centre National de Recherche Scientifique) annual budget (45). For want of a strong fundamental research and of researchers, Japan exports very little brain power. 90% of Sony researchers are living in Japan. Out of 9,300 engineers, Matsushita has sent abroad only 115. Hence Japan has made use of its financial power to progressively develop a first-class research and global intelligence network. In a first effort to attract western brains, international invitations to tender were made. However, western experts did not exactly flood to Japan; perhaps life style and the language barrier played their part.

The second step consisted in setting up and financing labs where Japanese and foreign researchers cooperated, near by university campuses. "These installations have been experiencing a veritable explosion (+300%) since 1988, in the United States as well as in Europe" according to François Grout, scientific attaché to the French embassy in Tokyo (46). In June of 1991, L'Express declared that "5,200 Japanese scientists can be found in the United States, while 4,000 Americans live in Japan. French research records 2,000 Japanese scientists among its ranks. Furthermore, the CNRS revealed that its laboratories had signed 2,300 secret agreements ." The reporter did not mention if the firms happened to be Japanese. Not exactly earth-shattering new. After the brain drain to the United States in the 1960's, we are now entering the "fingers in the brain" age: "if you do not want to come and work with me... I'll come and get what I need from you myself!"*

An impressive – rather profitable – established intelligence and "spying" network was set up. It could even be said that the Japanese know more about western research than we do ourselves. As one Casio executive so deftly put it: "You Europeans, you invent what already exists and you pay for what is free" (47). Be informed: such is the

* The Human Frontiers Science Program Organization (HFSPO) in Strasbourg, France, known as "Human Frontiers" is mainly sponsored by Japan and has a Japanese president. It illustrates the interest from Japan towards penetrating international scientific networks by the way of granting scholarships or sponsoring projects. Many Japaneses live abroad, but, on the contrary, very few Americans or Europeans go to Japan, mainly because of language problems.

credo of strategical intelligence, be it commercial, industrial or technical. Information is essential for a company facing with permanent - and efficient- innovation. Only a proper international network can do the job. Just ask Mitsui and Co.

The Japanese firm, founded in 1876, made $127 billion in transactions in 1988 (15,779 million yens) with a staff of 11,000. It has 52 offices in Japan and 162 offices in 88 other countries. Each office is linked to a private telex which processes more than 70,000 messages daily. Western Europe is divided between three subsidiaries, with offices in London (European head office), Stockholm, Düsseldorf, Bruxelles, Amsterdam, Paris, Milan, Lisbon, Madrid, and Athens.

According to Tokeshi Kitano, C.E.O. at Mitsui France, speaking at the World Marketing Convention in 1989, the company owes its success to "its capacity to provide international service". He went on to extol the virtues of his international network, capable of linking sales people and buyers and to assist them in their negotiations anywhere in the world. Capable – if needed – of handling shipping, and even of offering a wide range of financial services ready to satisfy even the most specific requests. However, two other services deserve closer attention, services which, according to Kitano, set his company apart from the rest: it also supplies information services. Every client knows how essential market information is. Mitsui's international staff, composed of sales representatives, negociators, financial analysts, specialists in various technological fields, and product experts, is available to clients, ready to give any information they need in order to perform successful transactions or to seize any opportunity anywhere around the globe.

In order to have such a fast, easy access to all types of information, Mitsui set up an efficient world-wide telecommunications network. This network, composed of satellites, private e-mail channels, and data storage systems, continuously transmits and processes data such as market prices, exchange rates, and world market analysis. Thanks to this omnipresence, Mitsui takes an interest in technology transfer, with an eye on joint ventures. A special technological development department employs 100 specialists, in constant contact with the world's most prestigious research centers. These specialists keep track of the most important technological trends, following their clients' objectives. Business is encouraged by results: in 1988, Mitsui owned at least 20% of 450 companies in Japan,and of more than 250 companies abroad, totalling close to $4 billion - in fields of special interest to Mitsui, such as advanced information systems, aerospace technology, new materials, and biotechnology. The President concluded by saying: "For instance, our subsidiary is the first Japanese company owning privately a telecommunications satellite, built by Hugues Aircraft and recently launched by the European Ariane." (48)

Mitsui is a virtual entreprise for the third millennium. Organized along "trade streams", its networks, contrary to European die-hard views, are considered a profitable, necessary and unavoidable part of business management. Added value and profits lie in the networks. When launching its hertzian telemaintenance network on the market, IBM had also understood.

Its the classical story of the weapon and the shield: research confines itself within the boundaries of international conglomerates, their only possible source of financing. Meanwhile, these same conglomerates are looking for ways to magically produce higher value, using brains for what has been termed "transforming intelligence".

Intelligence which must also operate and organize itself from a distance, without losing sight of a new factor: time.

The exploitation of knowledge: what are the stakes?

Every company is composed of several departments, each department is composed of a specialized "tribe". When some executives insisted that efforts be made for greater productivity, each of these Tayloristic tribes answered the call by working on their own, never really noticing that some of their efforts resulted in global inefficiency. When companies then realized just how much had been invested in technology, the full extent of the damage, wrought by the isolation of these "productivity pockets", became painfully apparent.

It was first attempted to approach the problem as part of a global technological and organizational strategy. This systemic approach led to service automation, automation of factories, and coordinated management of the flow of certain activities. It was also based on industrial data which was gathered among several research, design, and production centers, ensuing in communication requirements.

Thanks to digitalization, some remarkable breakthroughs have been achieved. Computers enable to modify an impressive amount of technical data in a few hours, and thus dramatically accelerate product design. Even better, storage of technical tests and study results represents an invaluable immaterial corporate heritage which is difficult to assess with traditional reference schemes. In the mind of Albert Merlin, director of economic studies at Saint-Gobain (49), in the case of specials glasses, total "immaterial investments" amount to several times the total of fixed assets (buildings and equipment) needed to keep all Groupe Saint-Gobain production lines going. Yet, developing and managing "immaterial" resources is seldom a concern, unless they answer an urgent production requirement, be it industrial (nomenclature) or administrative (file management). In other words, the power of NICTs is applied more to management processes than to enhance knowledge and make corporate brain power profitable. Training is the only exception.

When efficient intellectual group performance is required, the power of NICTs to reduce delays in, say, product design, is quite amazing. Digital's development center in Maynard has managed to accelerate a process which, five years ago, took 24 to 30 months. Designing a new station now takes 6 to 9 months, to be cut to 2 to 3 months only in the future. Speed has become a skill, as well as a competitive advantage. It can be achieved when all operations are processed and managed electronically by each team, each of them benefiting from a global view of the project. The walls that once separated teams involved in a common project are brought down to help accelerate the process.

Once side by side, now facing each other, companies need telecommunications in order to accelerate the exchange of knowledge and reduce the distance between field workers and researchers. Automatic information processing is not enough: we must find ways of mastering knowledge transfers in order to make the most of corporate knowledge resources. This implies having an integrated information system facilitating both internal and external exchanges. As was the case for integrated services exchanges between companies, the concept of internal/external division has been eliminated. As a result, containing expertise within the traditionnal corporate "bosom" is longer possible,

and the risk arises to see research and study activities reproduce the separate production islands of the Tayloristic "tribes".

When looking for new organizational methods, companies focused on three strategical trends. First, to enhance the productivity of the "transforming intelligence", by breaking up, as often as possible, the old Tayloristic tribes and replacing them with project teams, sometimes open to outside partners (clients, consultants, partners). The post-Tayloristic organization is a global, complex patchwork, where everyone both makes use of corporate immaterial resources and contributes to develop them. Liberated from time and space thanks to NICTs, people share a mutual identity within the "project". For the virtual entreprise, white-collar workers can only be efficient if they can access the knowledge fund of the company. "You know well enough to perform your task" is no longer an axiom. Teams are coordinated thanks to groupware or computer-assisted cooperative telework. Virtual meetings prove to be much more productive than the traditional meetings of bureaucratical organisations, where people seemed to more or less consciously try to evade results requirements.

The second trend is to facilitate as much as needed the access to the knowledge of expertise specialized networks. Inter-enterprise integrated flows, such as EDI, apply also to specialized research networks. In this global strategic game, scientific and technological exchange is the domain of specialized communities, more or less in control of their own specific networks, trying to protect their know-how and to benefit from strategic advantages. Many small businesses, however, are not able to capitalize on these immaterial resources. Unable to afford – for example – sophisticated (and costly) computer-assisted manufacturing or design programs, they rely upon NICTs to benefit from this know-how or to connect to expert networks. In this respect, the creation of local infocenters with the help of specialized universities appears an economically sound decision. Knowledge thus exploited and stored becomes available to small businesses, at a reasonable cost, and encourages technological transfers.

Finally, to become directly involved in expertise networks, not only as clients, but also as suppliers and coproducers of programs, databases and databanks. The first step is to participate in tele-teaching network projects – a form of virtual campus – in order to activate brain-power through innovative educational projects that companies would partly provide for. In Canada, Carvet Canada, a division of Allied Signal Aerospace, is experimenting with teletraining systems, as is George Brown College in Toronto. Work stations are equipped with IBM computers and high or medium definition screens, tablets, stylus, scanners, and cameras. Students "talk" to their teachers while exchanging documents, texts, images, or manuscripts. In this particular situation, images are not animated (50).

The second step is to bring together expertise networks or Added Value Networks and Services. The Apex project, part of the European Eureka program, could count from 1988 on the most significant aeronautics and aerospace companies in Europe – Aerospatiale, MBB, British Aerospace, Aeritalia, Casa . Apex is a good example of this new strategy of professional partnership to manage the new knowledge resources, enhance exchanges as well as create "knowledge monopolies". Apex Aerospatiale covers telecommunications architecture, security and e-mail, but also technical litterature, computer-assisted design and manufacturing and Edifact.

With the development of networks dedicated to a whole sector rather than to a particular company, the virtual entreprise develops a personality of its own, typical of the third millennium. Having lost all links to the factories of yesterday, the virtual entreprise is the network - or rather a series of professional NICT networks, through which the latest battles for money and power are fought.

A city of networks: the return of professional guilds

An alliance, while neither easy nor magical, is faster and less traumatizing than all-devouring capitalism, and it makes financial resources available for other battles. All-consuming capitalism, in fact, is dying. For example, Volvo estimated that the alliance with Renault saved two billion crowns per year (2.35 billion francs) and five billion crowns in the long run (51).

Research networks under non-European control?

This question was raised when Fujitsu's took over ICL in July of 1990. Could Fujitsu claim European membership and dip its fingers into European research projects such as ESPRIT and JESSI, which the British ICL was involved in? By partially barring access to JESSI, the European Community sent a clear message that European research projects were open only to firms whose Board would be European and unlikely to threaten European key sectors.

Accessing to expertise is becoming more and more expensive. Sharing common resources – such as telecommunications and computers – requires alliances. Strategic alliances have already been the subject of many books and commentaries and we do not need to discuss them further. Nonetheless, we will give a closer look to two points. First of all, the will to access the most up-to-date and specialized technological resources. Charles Wiseman, author of *Strategy and Computers* (52), studies strategic alliances where NICTs are the lever for new interest groups. He recalls that according to Chandler, companies with higly adaptable resources rely upon technology rather than upon finished products – a statement which sheds new light on the surprising conclusions reached by Coopers & Lybrand (53): "74% of alliances in the 80's took place in sectors where technological advance have a crucial impact: the automobile industry (24%), the aerospace industry (19%), telecommunications (17%), and computers (14%)." Were we to perform this study again today, we would no doubt discover that telecommunications and computers reach even higher scores. In this age of rapid obsolescence, reaching to a technological solution thanks to various alliances has become a key factor. And, need we say it, a good way to find out what competitors are up to.

The agreement between Compaq and Silicon Graphics is a perfect example. Compaq was willing to expand in the very dynamic field of work stations, which required mastering 3D imaging. Silicon Graphics had developed the Iris Graphics Library, a card which could transform a computer into a 3D work station. Compaq, for its part, was considered one of the leading companies in the field of manufacturing and distribution. Their union gave them both greater strength. This technology transfer brought Silicon Graphics 1 billion francs, as well as a research and development agreement in a sector where, for lack of proper means, Silicon Graphics would have easily been outrun (54).

There is another, more collective, type of alliance based on the sharing of NICTs centralized resources: specialized NICTs networks. The emergence of these professional communities outside company walls is a direct consequence of the decreasing role of national frontiers. All use common NICTs resources, yet have various origins. The transportation sector uses a corporate network of international transport; the navigation, brokerage, and banking sectors have been using specialized networks for a long time. Teleport networks open access to specialized software development centers. Oredic, in France, attempted to establish a network to share expertise between cities. Nationality also plays its part here: companies such as Boeing Computer Services and General Electric Information Services, according to their centers' availability, supply 80% to 90% of their data processing services to overseas subsidiaries of American companies! (55)

In every case, a form of virtual condominium is set up, as a specialized network which brings together companies sharing the same trade. This phenomenon will eventually extend to more or less formal specialized networks set up by specialists in order to exchange expertise and know-how. The most innovative scientific communities and schools have been developing informal networks for a long time. The trick is to share this expanding transforming intelligence among many: value added service networks are corporate networks. They are not the private domain of international groups. Brought back from history, professional guilds, after ruling the trades of spices, silk or perfume, will control the world of knowledge. Much to the chagrin of Tayloristic enterprises, professional "tribes" will flourish outside of former boundaries, as a result of the increasing influence of research and development networks on the economic landscape.

In Germany, engineers are members of active, powerful associations. The Association of German Engineers (VDI), the largest in Europe, has 84,000 members (56). Its mandate includes continuous training, standardization, and encouraging research and development projects. Taking its cue from American industry/college partnerships, Germany is multiplying hands-on training and partnership with schools in order to develop specialized networks in various fields. These networks help make NICTs services more accessible for dynamic small and middle-sized businesses. The latter, for their part, set up merchant or crafstmen networks in order to share their resources and expertise. Sous-Traitel, a local subcontractors network established in 1982 by the Chambre de Commerce and Industrie of Strasbourg (CCI) is but one example. Today this association links the entire national CCI network and the professional subcontracting associations. The network was launched in Europe in three languages with the use of Minitel. The support of the European Communities Commission was an important factor here, stimulating exchanges between clients and subcontractors, who have the opportunity to promote their expertise via Sous-Traitel through all Europe.

Networked condominiums

Permanent or temporary concentration of brain-power in a location results in a "condominium" phenomenon: bringing together people sharing a same project or hobby, be it professional or personal. Palo Alto in an electronics condo, Kourou, in Guyana, a space condo, and LEP (Electron Positron Collider) in Grenoble is a particle physics condo where researchers from around the world gather on a scientific campus near by the 16,7 miles long particle accelerator. On the quiet and bucolic setting, the apparently relaxed, jeans and t-shirt atmosphere hides a fierce competitive spirit. The various teams represent some 60 countries. High energy physics is only accessible to a select few; they can all be found here, slaving night and day, preparing the protocol for the next experiment or analyzing the previous one. The atmosphere is highly charged, emulation is permanent; yet collaboration is complete, without a second thought, teams gladly sharing what knowledge they have. In fact, specialization is such that nothing can be done without the skill of others. The vast majority of researchers here live an austere life, dominated by experimental requirements. Every time the particle accelerator is started up, everyone looks on. And as a reward, a joint article ends up published in Physics Letters, the Bible in the eyes of all physicians.

(Source: Geo magazine, mai 1990)

The most representative of these new "virtual communities" was launched in 1989 in Davos, Switzerland. For this prestigious event, executives, decision makers, heads of state and governments, and international economists got together to launch the first international e-mail network reserved for the world elite. In France, the ICTI network (Ingénieurs Consultants et Techniciens Indépendants - Consulting Engineers and Independant Technicians), launched in 1991, was one of the few initiatives in this area. According to its founder, Ammar Lasga, it intends to become a "management and marketing tool, a meeting place, a national structure of technological watch and training." Within two months, ICTI had gathered 250 professionals (57). "3614 Teaser" is another example of this type of specialized network, in this case gaining computing geeks.

These network communities are progressively extending their web around our society, our planet. As the phenomenon increases, our economy might be transformed according to the policies of the privileged users.

Chapter 4

Welcome to the club, just plug yourself in!

With NICTs networks, the virtual enterprise will switch from independence within interdepence to dependence within interdepence.

Your manager of information systems has just linked all your company's offices and branches through a private high-performance network, which brought the cheers of the press. There is already talk of linking this patiently woven network with a related EDI system. You know that there is no alternative, sooner or later you will have to go with the tide and connect to networks in your field... and a few others as well. Yet you are wary: you just learned that a company you know went bankrupt after a competitor plundered their database and shut down their e-mail service.

Your telecommunications expenses are constantly increasing, roughly amounting to the average: 0.70% of all operating expenses, between 0.11% and 3% of actual turnover (58).

Your company externalizes several specialized services: strategical watch, facilities management or computer or telematics development. You know that Motorola's "Iridium" project plans to weave hertzian telecommunications with 77 satellites by the end of the decade, allowing personal communications networks (PCN) and cellular links to reach all parts of the globe. There is a memo on your desk about a bulk purchase of communicating laptops for your itinerant executives. There is also a reminder about a scheduled visio-conference with your representative in Tokyo and one of his clients. You have recently caught up with other companies, such as Motorola, the Compagnie Générale Maritime, IBM, Rank Xerox and Renault, which use e-mail, in order to work with your offices and representatives around the world. And you are getting weary of all these impromptu trips abroad which you and your "never-there-when-they're-needed" collaborators must constantly deal with. Meanwhile,

your MIS suggests a financial feasibility study on the applications of teleconferencing and cooperative work for your various offices and representatives.

From now on, you are aware, together with your Board of Directors, that your business is switching from pure manufacturing performance (diminishing cost price) to higher value performance. It is now taken for granted that the networks that you master or will master will not only generate expenses, they will bring profit.

The ins and outs of mail order, electronic sales and remote management involving fewer intermediaries are now familiar to you. What's more, you are re-organizing the company, shortcutting hierarchical distance, and developing many projects encouraging client/supplier-like internal relationships. The next story may make you smile, though it will not surprise you. Welcome to the club, welcome to Initiates Anonymous!

Initiates Anonymous

His Royal Highness Tupou IV, 72 years old, weighing in at 320 pounds, is quite a character. He wears two watches, one set on Greenwich time, the other on local time. Topou IV reigns over Tonga, a series of islands in the middle of the South Pacific, near by the tropic of Capricorn. Out of 171 islands, 135 are completely unnocupied. The capital of Tonga, Nuku'Alofa, the "city of love", on the island of Tongatapu, looks like a small provincial town. Life there should really be quiet, were it not for High Majesty's impressive head for business. After selling phoney passports to millionaires investing in Tonga, he realized that burning America's used tires could provide Tonga with a cheap source of energy. So far, only the peaceful population of the islands was concerned. But another of the king's schemes is bound to cause a bit of furore in the ordinarily quiet International Telecommunications Union, while ensuring Topou IV with an all topical form of fame: His Majesty is conquering space. In mid 1990, he announced that his country, in accordance with international laws, had reserved the 16 remaining geostationary satellite positions directly above the South Pacific. In one fell swoop, he managed to seize practical monopoly over telecommunications for a large section of the planet. As there are only 180 positions on the transpacific telecommunications market (a market experiencing a 20% yearly growth), the move could very well prove to be a profitable one* .

In 1989, general trade between Asia and America represented $2.5 million. Lacking the means to launch satellites of its own, Tonga, under the guidance of an American businessman specialized in telecommunications, simply rents the precious positions to the highest bidder. At the price of $2 million a position, business is obviously good and Tonga only needs to invest in an army of lawyers to protect its interests. Indeed, all nations are entitled to reserve for free any unused frequencies or positions by applying to the International Committee. This, of course, came as a shock to the international consortium Intelsat, who had so far believed to hold total monopoly on behalf of its 113 member States. Attempts were made to reach a compromise. Suddenly, a small, third-world kingdom, without any resource but the sky above, through an unusual type of speculation, has become an unexpected partner in the development of space telecommunications.

* Northern America represents 52% of the global visioconferencing traffic, Europe 30.4%, the Asian Pacific Zone 17.4% (Source: Téléconférence Magazine, paris, 1991).

Such are the new realities of electronic distribution and exchange of information. The very particular structure of this composite web, the various techniques and protocols used – let's not forget that many international networks will join together – will affect how the flow of information will be polarized and piloted. But who, exactly, is the pilot?

Firms are forming so-called "strategic" alliances in order to share NICTs resources. There are obviously practical reasons for this – the equivalent of car-pooling. For others is a matter of global vision: today our planet is the battleground of a strategical game where initiates fight to control the key connections. The great institutional players such as British Telecom, NTT, Telekom, and France Télécom are joining forces to preserve their ISDN markets. British Rail created a telecommunications subsidiary, and so did Sweden. In France, EDF, the SNCF, the Lyonnaise des Eaux, and the Compagnie Générale des Eaux are widening their influence and expanding their market by offering added value services networks. Meanwhile, industrial consortiums such as NEC, Northern Telecom (now Nortel), and Ericsson are involved in similar operations in order to sell their products world-wide.

It is no longer exceptional to see former competitors strike partnerships. In 1990, for example, AT&T, British Telecom, France Télécom, and the Japanese KDD joined hands to launch private international networks, while France Télécom collaborated with the British GEC-Plessey on the Pointel system, etc. Partnerships between operators and large companies are also signed every day. In this new global game, the majority of small businesses are left in the lurch for lack of assistance. Completely behind-the-times, outsiders in the game, most of them will eventually have to find their place in the existing streams or to go into partnership with professional or institutional "sponsors", or with each others. There is no choice.

This turmoil does not take place only for the profit of the large private or public telecommunications companies. Society as a whole and especially the organization of post-industrial companies are involved in the process. As NICTs networks become more structured and widespread, three major consequences become apparent:

- the profit logic of the large telecommunications providers is causing a shift in economic power,

- the logic of economic development is creating new profit centers,

- as exchanges develop over networks, power is shifted away from company walls.

The profit logic of the large telecommunications providers is causing a shift in economic power

Telecom network operators worldwide are trying to seize ever increasing incomes, and to gain control over business and research telecommunications exchanges. Traditionally monopolistic, protected by political lobbies and their allies - public owned manufacturers - these operators had to change their mentality. They could no longer afford to hold to their simple philosophy that what was good for them was good for everybody - and what was bad for them was equally bad for all.

Those who are careless enough to underestimate how much companies are determined to find integrated solutions to their worldwide telecommunications problems will suffer deeply from competition. Large companies all wish to fight on

equal terms on the global market, and reach international markets as economically as possible. They certainly are more prepared for the situation than small businesses which may be daunted by the difficulties encoutered in benefiting from economies of scale for their telecommunication services, which are as strategic to them as to anyone else. Large companies, for their part, still have the possibility to reroute or relocate their activities if the game is not played according to their interests.

In 1988, Visa, the world's leading banking group, opened a new transaction authorization office in London, which handles all calls from Europe, Africa, and the Middle-East. Visa made London its European head-office by signing a contract with British Telecom which brings half of Visa's yearly 10 million revenue to the telecom operator. British Telecom establishes international links with European capital cities and financial centers between London and the United States (59). The American group chose London rather than Paris because French telecom rates for specialized lines leased by the year were 15% to 20% higher than British ones. In 1991, the AXA insurance group, third in France, also chose British Telecom to develop its international network (Europe, United States, Canada, Singapour). Named Axacom, this network is based on a virtual data transmission network. British Telecom was chosen over its competitors because of certain advantages others simply couldn't match: they offered a package with unlimited traffic and a centralized office which freed AXA from administrative tasks and complex negociations with operators around the world (60).

Renault France almost did the same in 1990: "45% of our production equipment is abroad, 50% of our sales as well. Our production equipment functions on a just-in-time basis, which dramatically increases our need to exchange information, yet we neither benefit from reduced rates, nor from any guaranty as to price policy", according to Bernard Le Bihan, network manager at Renault. His company was ready to sign an agreement with Mercury – British Telecom's competitor in the United Kingdom – to lease a satellite channel when France Télécom, at the last moment, decided to grant Renault one of Télécom 1's satellite channels (61). At the same time, the European Council had decided unanimously to abolish national monopolies on numerical data exchange services. Deregulation in space telecommunications will also put an end to the "natural" monopolies of local operators. Users will be able to access Intelsat satellites. Licenses to access satellite reception systems might also become available.

Up to fairly recently, governments fixed telecommunication rates at will, and clients had no say in the matter (in 1990, Renault still found fairly wide variations in prices ranging from one to seven). This time is over. The high number of speakers, the confusion in rates and in specific access procedures for telecommunications were the last line of resistance for national operators._The diversity in protocols, finally, makes equipment optimization difficult. Satellite networks seem to be an excellent way to bypass these problems. "Especially since international operators will one day "charter" traffic during slow hours", says Bernard Le Bihan, in an interview with 01 Informatique in May of 1989. Both telecommunications and flow are structured differently on either sides of the Atlantic ocean. In Europe, it would be impossible to imagine "list cost routing" customizable programs as a means to get cheaper connections.

Meanwhile, Europe is having a hard time deregulating land stations. Contrary to their American counterparts, European international, multi-establishment companies had chosen to invest in land telecommunications networks using the infrastructure of public operators. Then the effects of deregulation happened to be more beneficial to added

value services networks, such as Giesco, provided by private operators such as IBM, Tymnet, CCMC, GSI, SG2, CISI, etc. In 1987, France Télécom recorded a hundred Value Added Networks. This is definitely a move. Telecommunication rates, especially for specialized networks, are not the only criterium: one needs to be connected to the right global network, together with his markets and clients. Concerted policies will have to be established to make it possible for everyone to "meet on-line". Networks are becoming specialized in a system whose leaders will be, we know it, the corporate networks. This is far from surprising if we remember the progressive shift in economic power towards the busiest, if not the cheapest, international networks.

A new, fiercely disputed, market will open. For example, there is a noticeable – and strategic – shift in the trade of computer manufacturers. The inevitable rise of networks should eventually force them to sell value added computing power. This in turn puts facilities management back in the limelight, along with value added services networks. In France, there is talk of a possible agreement between BULL, a public owned manufacturer, and France Télécom. This type of alliance is a sign of the times: DEC and IBM are both negociating with operators to answer the needs of the companies willing to access world-wide networks rapidly. The banking sector, with its impressive networks (leaders in the field, in fact), may also be tempted to offer value added services networks. With so many firms unable to support world-wide networks (or even European networks) on their own, alliances between users are also likely to become commonplace.

Corporate networks will rule!

Perhaps naively, we believe that the power of a network is measured in the quantity of its investments; in other words, the more money was put it, the more power they have. However, the situation is more complex. Their technological choices and strategy have a major economical impact. They contribute to shaping a region's economy and restructuring communication. In the end, value added service networks bring together companies around a specific corporation or field and, inevitably, we automatically chose a specific one over another.

Mitsui, as we have seen, has chosen London as its European head office. , The French bank Paribas established its world-wide network using specialized digital lines leased from international freighters, linking Paris, New York, Tokyo, Singapour, and Geneva. Market activities are monitored by 450 operators from the London back-office where the bank's computers are found. Paribas claims to save 25% on its telecommunications bill. During the summer of 1990, the French oil company Total transfered its trade activities to London. In other words, one of the foremost trading operators in the world has established its telecommunications center in London. The back-office alone remains in Paris to handle administrative tasks.

Costs of the different communication systems in 1990
(Base index Hertzian TV = 100)

	Equipment costs	Costs depending on channel
Herztian TV	100	100
Cabled network	300	200 (12 to 35 channels)
Propretiary MMDS	30	100 (less than 16 channels)
DBS satellite	50	100
Optical fiber	1100	650

Nota: the cost for a DBS receiver should not be more than $100 in the USA

(Source: Wildburg Pritehard, Video Broadcast, november 1990)

Entire regions around the world will now on rely on the "webbing" strategies of operators – and on competition, the only way to get competitive prices – to avoid further shift in economic power. These examples, such as the transfer of certain international activities from Paris to London, illustrate how this shift is influenced by the spread of international networks, and how certain regional advantages – there are no taxes on the stock exchange in London – are causing a shift in profit centers.

Economic development is creating a shift in profit centers

Reno, Nevada, as we know, benefits from a special type of tourism: love lost, love found. The impatient society has finally found services that allows lovers to join in matrimony as quickly as they may break up. Las Vegas and its casinos, Hollywood, the space centers in Houston or Cape Canaveral nearby Walt Disney's Epcot, are as many examples of "polarization", efforts to attract beneficial economic activities, in these cases dedicated to entertainment.

In the same fashion, other regions around the world, most particularly in developing countries, are financing teleport-type centers while their national or rural equipment remains rudimentary. Their aim is to seize on the most lucrative international telecommunications exchanges which may become tremendously profitable. If this fails to attract services exchanges, they simply follow Ireland's example and offer more advantages, such as low-cost telecommunications, to encourage companies into coming... and staying. If necessary, they will even provide with ways to bypass fiscal constraints or to cut production costs. All this helps developing off-shore industry: in the banking sector, 20% of transactions on the European market are processed by off-shore firms from the United Arab Emirates, the Bahamas, the Caiman Islands, Bahrein, the Dutch Antilles, Panama, Singapour, the Phillipines, and Hong Kong (62), or by telework service centers or software development centers.

New profit centers are thus developing in various parts of the world following client/supliers partnerships or incentive policies. NICTs serve to facilitate the establishment and maintenance of economical local representation. Once this is done, flows can easily be relocated where they can generate a maximum profit at a minimum

cost. NICTs have completely eliminated space and time constraints, and businessmen can ignore borders and time zones. "There are now – says Ricardo Petrella (63) – $120 billion available worldwide on the stock market, which can be managed 24 hours a day, and which can be instantly mobilized for a hostile takeover."

The relationship between financial flow and telecoms is a very interesting case in point. Our "investigation", conducted at first within tax havens, clearly shows how essential telecommunications are to these peculiar sanctuaries. For Edouard Chambost, editor of a fascinating *Guide to Tax Havens* in 1992 (64), they are in fact a key factor in choosing the right Eden. In his book, he mentions a investigation performed by the IRS between 1968 and 1978. The report estimated that "spotted" American investments in tax havens amounted to 23 billion in 1978, almost five times the 1968 4.7 billion total. By comparison, direct investments outside of tax havens only rose 2.5 times during the same period (57.2 billion in 1968, and 145.1 billion in 1978).

We should of course tell apart individuals and companies. What is attractive to the former may not be to the latter, and vice-versa. For example, Monaco is heaven on earth for individuals: there is no income tax. On the other hand, companies must pay a 35% profit tax if more than 25% of their turnover is generated from activities outside the Principality. However, the island of Jersey is a perfect paradise for non-resident trading companies. For 500 pounds a year, they can set up company without having to declare benefits nor provide books for audits. For their part, individuals suffer from a whopping 20% income tax. A paradise... of sorts. Experts specialize in combining these advantages for their clients. Their business will become increasingly profitable as long as certain countries continue to exert an excessive tax burden upon their individual or corporate residents. An easy thing to do, too: you only need to concentrate on areas with advanced telecommunications, part and parcel of these fiscal havens.

An analysis of international traffic and network density (number of lines and telephones) in various areas has been performed (based on 1988 statistics in The World's Telephones by AT&T, 1989 edition).

Most islands or peninsulas have the best calling rates per line. This is far from surprising when we realize that the majority of calls are international. Hardly a coincidence, then, that most of them can be found in Edouard Chambost's *Guide to Tax Havens*. Leading are the Pitcairn Islands, free of any form of income tax. Next comes Gibraltar, nicknamed "a mountain of gold on a pile of rocks", followed by Monaco, Wallis and Fortuna, Bermuda, Trinidad and Tobago, and the Bahamas, quite familiar to specialists.

Countries with intensive export activities are instantly identifiable. While the United States and Canada fare poorly compared to Taiwan and the United Kingdom, for instance, West Germany (this is in the late 80's) has 50% more calls per line than the United Kingdom, 6 times more than the United States and 9 times more than Japan. Outside of islands, such as Honk Kong, we find Belgium, Singapour, then Denmark and the Netherlands, or course, whose fruitful relationship with the Dutch Antilles – thanks to financial holdings – are common knowledge.

If we now look at this international traffic – leaving out the islands – from the point of view of transactions intensity (connection time per line), the leaders are Monaco, followed by Luxembourg, Liechtenstein, and finally, Switzerland. All are important financial centers. A coincidence? Lets notice by the way that Germany has 35% more

traffic than France. If we give a look at international business traffic by number of calls per line, the leader is Hong Kong, followed by the Netherlands, the United Kingdom, Spain, and Italy, almost on equal footing with Taiwan. They are all far ahead of the United States, Japan, and Canada. The intensity of business traffic alone (minutes per line) puts Switzerland in the lead, totally overwhelming France, then South Africa, Mexico, and Colombia. These results, however, should be taken with a grain of salt, as World's Telephones mentions the number of lines per company in only 24 of the 117 countries studied. For example, there is no mention of the Caiman Islands, where line density is the highest in the world, with more companies than coconut trees, according to Edouard Chambost. Sometimes, relative volume is hard to compare, as volumes are either expressed in number of calls or in connection time, but rarely in both.

Anyway the "Triad" counties interested in international business traffic can't ensure their dominance on equipment volume alone.There is a causal relationship between the intensity of economic exchange, the volume of equipment, and the intensity of telecommunications linking certain regions of the world. As we were well aware, telecoms go where business is, and not the opposite. They ensure victory when time comes to develop new profit centers on grounds other than fiscal advantages.

A gigantic virtual network of international "inter-prizes" is progressively webbing the globe. Service exchanges and off-shore activities are both facilitated. In the field of tourism, Galileo links British Airways', KLM's, Alitalia's, and Swissair's reservations systems, for a total of 20,000 terminals. These airline companies have chosen to use United Airlines' Apollo system, the power behind Galileo. Their computer center is in Wales (65).

American companies have transfered a substantial part of their data capture activities to developing countries. From these new relocated service centers, the United-States reimport from the Carribean, one of their principal off-shore centers, along with Korea and the Philippines (66). In order to develop the data processing industry, the Caribbean have created a joint firm between the Jamaican government and American and Japanese companies to set up a teleport in Jamaica.

The government of India helped establish a teleport for software companies in Santa Cruz, specialized in electronic services export. Texas Instruments and other, similar companies develop their software programs in India and "export" them to the United States or elsewhere through a satellite connection run by the government. Success is such that software exports increase 40% each year (67). Predictably, facilities management centers providing computer power and remote added value services are also relocating to countries where the maximum profit can be yielded. As a result, "circulating incomes" are flowing and growing, due to the increase in exchanges of telecommunication networks based international services. The services can either be charged where the contract was drawn, in an office abroad, or considered an export revenue because the contract was signed between a representative from the off-shore office and the local company. Again, profit centers can easily be moved depending on changes in international policies.

For instance, developing countries where capital is low are interested in world networks for their reinsurance needs, as well as for expertise and services in engineering, accounting, etc. However, NICT-based business networks could contribute to the success of competing foreign firms in the position to easily establish and maintain

profit centers in their midst at a lesser cost, where in the past local expertise would have been solicited at a greater cost (68).

As there will be more multinationals companies, they will all the more contribute to international traffic and the success of telecoms companies

Distribution of traffic from the world capital cities

(Source: Logica VK Ltd. Tarifica, July 1987)

	Multinational firm in the capital city	National firm in the capital city	National firm out of town
Local calls	30%	60%	20%
Long-distance calls (6 m.)	10%	25%	75%
Calls to bordering countries	10%	10%	5%
Overseas calls	50%	5%	0%

These networks, by facilitating off-shore activities, also support the transfer and decentralize certain skills or activities which allow to accede to difficult markets. An increasing number of Japanese firms are striking partnerships with South Korea, Taiwan, and China where software production is cheap, as in India.

In the 21st century, international trade will be invisible and difficult to assess. A study by the OECD estimates that computing services represent between 15% and 25% of all exchanges between the world's most important companies. Pressured by multinationals companies who understand the real stakes, new countries will progressively get connected. A rude awakening for many of them, who will find it hard to access data and information exchanges, now vital to their economy. Indeed, countries with a high concentration of know-how and making a proper use of NICTs can seriously harm their lesser competitors.

Software production units established abroad by Japanese firms
From 1985 to July 1986

Source: The Japan Economic Journal, July 1986)

Japanese firms	Partners
Teikoku Databand Ltd.	Samsung group (South Korea)
Cosmo 80 Co.	New Asia Computer (China)
IBS	Daemin (South Korea)
Uchida Yoko Co.	Computer Center of the Chinese Academy of Sciences (China)
Century Research Center Corp.	Advanced Institute of Science and Technology (South Korea)
Nippon Computer Systems Corp	Shangai Science andTechnology Association (China)
Sanko Co.	North Ocean Industrial Co.(China)
Fujitsu Ltd.	University of China in Quinghua (China)
NEC Corp. (Japan-China software center)	Chinese authorities
Toshiba Corp.	Computer Technical Service Corp. (China)
Toshiba Corp.	Lucky Engineering Co. (South Korea)
Toshiba Corp.	China Management Systems Corp. (Taiwan)

With the development of exchanges, power is no longer within company walls

It is often believed that telecommunications, as opposed to roads, electricity, and water, could be controlled by private owned companies. Indeed, certain companies are developing – and successfully so – value added services networks for strategic reasons, in order to create obstacles for their competitors and design new products that capture their clientele. This is no doubt one of the greatest forces behind the creation of monopolies. Itt increases each partner's dependence on NICTs networks. This is true for both the supplier... and the clients!

NICTs now slowly contribute to making companies loose freedom and control, in the guise of just-in-time management, through corporate or un-corporate networks. The invisible hand of the market has infiltrated networks and has caught companies in its net. Businesses have become another link in the strange virtual net which is spinning around the earth, with maybe sometimes a stitch dropping for momentarily loosing touch with the global net. In this sea of communications, no one, truly, can afford to be just an island.

We are entering a very sensitive area. As we have already seen, Lamy Transport helps control the flow of trucks travelling about Europe. Lamy's server, adapting its system to transnational flow, became Telefret International in 1989, now recording over

100,000 connection hours each month. Their success is impressive, and its impact on the collective and economic organization of transport is astounding. In March of 1988, an article in *Telecoms International* numbered 48,000 calls a day, and 23,000 users, including many family businesses whose trucks now leave with a full load. Any breakdown in the Lamy network would cause a disaster. In fact, Lamy no longer controls its own power and must make sure that the service is maintained unfailingly otherwise the whole trade would be devastated. Power is now within the network, a phenomenon predicted by Alvin Tofler in his book « *Les nouveaux pouvoirs* » (69).

As strategic computing networks develop, their hold on whole sections of business increases, wrenching control away from once sovereign firms. As borders vanish away, so do company walls. Value added services networks capture clients more easily, leading to global integration. In other words, entire sectors affecting both suppliers and clients become so intertwined that they begin to shape into a common economic entity. *Many businesses, under the influence of strategic networks, have retroceded added value in exchange for productivity gains and short term economic gains.* Any brutal and untimely move would injure the whole edifice. American computer strategy specialist Charles Wiseman gives us a perfect example of this in his description of the McKesson story, though we would like to propose here a somewhat different reading (70).

Wiseman does offer a very complete description of this rather complex case. He perfectly shows how added value networks can help to link multiple economic activities closely. As early as 1984, McKesson Corp. was one of the largest independent American distributors. They had three basic product lines:

- drugs and pharmaceuticals (toiletries, perfume, etc.) distributed in 14,000 drugstores and 2,000 hospitals in 35 states. They owned 50 warehouses, with more than 50,000 articles from 2,500 suppliers.

- wine and spirits, in 36 distribution centers, destined to bars and restaurants.

- industrial and chemical specialties. These products were spread over 60 warehouses and were destined to various companies dealing in pharmaceuticals, cosmetics, food, and automobiles.

In its 1983 annual report, McKesson talked of "shifting the center of gravity (of our activities), making added value distribution our principal axis, with a secondary axis in certain specialized markets". A remarkable strategy which first required the development of merchandising software designed for drugstore managers and wide distribution. These applications, which first optimize shelf space management, eventually covered more and more products and departments. McKesson was also clever enough to provide its clients with an Econoscan scanner which gathers information on current stocks right from the shelves and processes restocking orders. Less work, less stock, better product rotation, and everyone is happy. Restocking was prepared in the warehouses during the night and delivered the next morning. Clients improved their productivity – one client claimed to gain 8 hours per week – and were quite satisfied. This formula was then expanded to include all McKesson products. The company introduced a real-time ordering program which optimized stock (and by the same token, investment and capital assets) and closely complied with client – and market – needs.

McKesson's second step was to develop a prescription refunding system using a first-class NICTs network. A special card (PCS: *pharmaceutical card system*) was

issued to workers by their employer. 2.3 million people benefit from this considerable advantage in kind. More than 45,000 drug stores (more than 80%) process 27 million prescriptions in this manner. Refunding is payed by 155 companies across North America. Each order is transmitted to McKesson's main computer. Amounts are calculated automatically and the data tapes are sent to the companies in charge of refunding, also glad to be a part of the system. A specialized division, Pharmaceutical Data Services, analyses information gathered by the system in order to further refine the management of the pharmaceuticals and parapharmaceuticals product. This allows Mc Kesson to provide the entire health industry and government agencies with strategic information, such as prescription practices per health sector, product type, State, etc., thus becoming an official driving force in the market.

Thanks to strategic computing, McKesson progressively integrated various organizations into its value added services and networks. These organizations have accepted to lose some of their sovereignty in exchange for unquestionable benefits. Neither McKesson nor drug stores would benefit from cutting the tie that now binds them. Indeed, they could only do it... by getting linked elsewhere. Once again, power has moved to the networks.

A new form of sovereignty for the enterprises of the 21st century?

Technical breakdowns like the one described in the first part of this book often make the news. On June 21, 1991, the entire Washington area became a black hole – no communications, even radiotelephones were out of order – because of a malfunction of the networks dispatching central system. The area, suddenly thrust a century back in time, panicked. "No emergency measures could be taken since there was no way to communicate", one journalist later commented on the radio. These technical breakdowns, however, are minor nuisances compared to the damage a breakdown in NICTs networks would wreak on a region's economy. They would be jeopardized by both technical obstacles and cultural handicaps – i.e. difficulties in accessing information. Developing countries fear, for example, that multinational banks with their head office abroad would benefit from exorbitant competitive advantages to the point of dominating the native national banking activities and, by the same token, important sectors of their economical policy. Foreign banks can indeed recruit high-level personnel, consult their own data banks, and use local know-how at a low cost, all thanks to NICTs. Developing countries are thus quite wary of any obstacle which could suddenly arise; such as being denied access to data or expertise by whoever runs the networks. The risk is real: in the 80's, Dresser-France, a subsidiary of an American company, was suddenly cut off from any form of expertise, in order to prevent them from selling gas pipeline equipment to the Soviet Union.

Specialists agree that there should be a clear distinction between access to markets and access to resources, the latter being considered fundamental to ensure equal chances to all. Some regions could suffer for want of available, not goods, but know-how. Public-owned telecoms operators will no doubt play a strategic role in this matter, but they will only do so properly if they can be freed of traditional market economy. If our prognosis is exact, the 21st century will see the rise of a new sovereignty, a return to the "nationalization of networks" which have become international, in order to somewhat control and regulate the monopolistic excesses of certain international networks. This is a direct consequence of the increasing importance of a phenomenon known as

"*atmospheric economy*" (we'll return to this later), a result of the massive spread of NICTs.

Through the development of networked "condominiums" and the undermined role of borders, a new form of sovereignty is emerging, shaking the Nation-State to its foundations. There is a striking analogy between these various phenomena and a particular reading to be made of Jacques Delors' book *"Le Défi"*, ("*the challenge*") in 1992 (71). The book discusses the formidable economic and organizational impact due to the loss of national sovereignty experienced by European Community member countries. While perhaps surprising, our reading sheds new light on new pools of productivity and profit centers which the virtual entreprise will discover when it joins in the networks. The networks will continue to spin around the planet and will revolve around main axes running along cities and regions whose high concentration of knowledge puts them in the lead.

Ricardo Petrella, director of the FAST program for the European Community Commission, fears that the triumph of market economy may jeopardize democracy. According to him, in the future, a world-wide network of companies could rule the world. "The Nation-State is no longer apt to grasp the global society, today, and tomorrow even less. On the other hand, companies and business networks are becoming international and in the position to set the rules for the global economy, for the simple reason that they are efficient." After mentionning some of these large world-wide groups, he adds: "They are now best suited to exploit – according to their own logic and their best interests – natural, immaterial, and human resources to their fullest."

"What's the world coming to!", our grand-parents used to say. National-patriotism is losing ground when head-offices are relocated to benefit from international networks, national-capitalism is undermined by anti-trust laws, unions are besieged by teleworkers from foreign teleports, the over-protective systems provide people with jobs without work. They all are collapsing to be replaced by corporate organizations, professional guilds, mafia-type organizations, the end result of the exchange of services between the "new families".

Will the virtual entreprises, structured in professional networked "condominiums", take control? Only the 21st century will tell. Meanwhile, rather than oppose, we will have to learn to compromise and infiltrate the new empires. In other words, learn to understand each other... or be left to die as outcastes.

Part 4

ENTERPRISES AND THE COPERNICIAN REVOLUTION

Worshipping the past results in a groundless pessimistic vision of the present and prevents from understanding that "the future is not what it used to be".

Paul Valéry

Introduction

The possible, the probable and the virtual...
Virtual: that which holds within itself all the necessary conditions to become real.

Enterprises and the Copernician revolution

We enter the 21st century with a promise that the way we relate to the world and to work will be changed under the influence of NICTs and virtuality. Companies experience an alteration of their traditionnal standards which forces them to gradually call into question their archaic, 19th century organizations.

In our post-industrial economy, manufacturing costs represent only 19% of total costs for television sets, 27% for cars, and even 16% for pasta! A major part of costs now cover research and development, technical documentation, methods and planification, publicity, marketing, distribution, finance, and administration. All these are tertiary activities requiring massive and costly infrastructure, even more if the firm has an international network.

The post-industrial enterprise has to multiply its exchanges with an increasing number of partners in order to insure self-management and self-regulation. And this covers a wide range of varied and sophisticated skills and fields, resulting in more coordination requirements. It is impossible to approach this situation in a traditional manner, especially when dealing with major issues such as productivity in post-Tayloristic virtual enterprises.

According to the French national statistical institute INSEE, one hour of industrial work produced 25 times more in 1989 than it did back in 1830. The INSEE also believes that the rise in productivity recorded after the oil crisis, from 1983 on, is mainly due to a new faith in investments and a gradual increase in working hours (+3.6% per year), thanks notably to team work. This return to productivity, however, is

part illusion: a decrease of productivity in the services sector was also registered, in spite of the spreading of NICTs which were actually poorly used by reluctant workers. INSEE uses the banking sector (apart from financial services) as an example (1). Philippe Lemoine, then working for the Ministère de l'Industrie, had made the same observation in the early eighties. In an OECD-sponsored study on the subject, he wrote (2): "in France, the most heavily computerized sectors in the past 15 years have created the greatest number of jobs". He also takes the banking and insurance sector as examples. In reality, the theory that the growth of investments in the services sector has helped to create a global "manpower" economy has yet to be proven. A 1983 study by Booz Allen & Hamilton chose another track, focusing on the poor productivity of executives. After pointing out that salaries had more than doubled in the previous ten years, BA&H explained that executives represented 37% of the workforce while generating 49% of all indirect costs. On the other hand, they represented only 16% of the total NICTs investments. Without jumping to conclusions, lets consider that while executives are paid handsomely in a high-cost environment, they seem to have very little means of increasing their productivity (3). Immaterial and technological investments are falling because their use requires expert knowledge. Hence the sudden multiplication of expensive, sometimes rare specialists. Then our question becomes all the more important: it is possible - and how - to improve productivity in the tertiary sector?

There is another reason for the poor productivity in the services sector, as Matsushita President Konosuke Matsushita pointed out in 1985 (4). According to him, Western organizations remain deeply Tayloristic and are unable to elaborate other models. Our lack of imagination has led us to copy imported models, especially from Japan, just as we had previously (and religiously) copied the Tayloristic approach. Our offices, however modern they may look, still operate following 19th century rules; our only move was to separate offices from factories, not always a happy one. A 1986 MIT (Massachusetts Institute of Technology) study on American production methods stated that the American industry needed a true cultural revolution in order to free itself from the constraints imposed by Taylor and Ford. To join in the post-Tayloristic age, neo-Tayloristic enterprises have many handicaps to overcome:

- rigid production methods, economic and technological parochialism,
- a need for fast, short-term profit,
- inadequate management of innovation (both development and production),
- poor human resource management, resulting in an under-qualified and non-committed work force,
- lack of cooperation between co-workers, between departments, and between companies,
- lack of communication between the industry and the government. (5)

This applies to both sides of the Atlantic. Firms are still under the influence of a rational organization of work and workplaces dedicated to mass-production. They have been trying to simplify, but only managed to be simplistic. Their information systems, too centralized, are now jammed and increasingly inefficient.

Finally, many executives are clearly technologically illiterate, and sometimes even boast about it. This lack of technological know-how is a major setback for companies in

a time where controlling technology, including NICT's, is the key to success. In other words, they are entering the 21st century unaware of the problems ahead, while technology keeps developing at an increasing rate, leaving them far behind.

In the virtual world, where NICTs are omnipresent, organisations can no longer be conceived of as centers and satellites. While it could once be expected to manage and rule from a hypothetical center, modern organizations, especially in the services sector, are too complex and structured in interconnected networks to fit this gravitational model. Today the networks federate a new form of professional communities, sometimes hundreds or even thousands miles apart. It is no longer necessary to work for the same company to form a team and work on a common project. Coproduction is now the code word, and collective know-how as well as collective commitment have become key factors for success. This is the first requirement for virtual enterprises to truly become post-Tayloristic.

Since resources and expertise must be in some way scattered; remote management becomes a necessity. The transition does not go without difficulties: remote management means abandoning the hierarchical model for a grid-like model, which may result in a crisis in internal communication. Neo-Tayloristic philosophy, always putting production before market, is not suitable for delegating and making a strategic use of networks. Self-centered by definition, neo-Tayloristic companies just wait for competitors and the market to come to them. This is particularly dangerous when applied to innovation and to added value coming from outside the company.

Virtual enterprises must develop a philosophy of networks, not only in terms of technology, but in terms of people joining in a corporate "sound system" to increase value added productivity and to ensure remote management. Coproduction must facilitate the exchanges as well as the contributions of individual or collective know-how. Networks must also be used to federate the cultural differences between relocated research, manufacturing, marketing, and sales teams.

There is a fourth requirement for those who wish to reach the power and the faculties of virtuality. As companies are more and more market-driven, they must learn to communicate with the market, as well as with their partners. For this, they must learn to master NICTs in order to catch up to the 21st century technical standards. Becoming a member of the "network community" is not the main motive for joining in the bandwagon; that can always be purchased in the form of connections or value added services. Above all companies will have to break the paper barrier, for while there may never true paperless offices, there will be an increasing number of virtual files to manage. Those who can't handle electronic documents management and databases consulting won't be able to compete successfully in the 21st century. Post-Tayloristic enterprises are facing a new challenge in culture and know-how, though some fail to take notice: they have to master technology.

The message from the MIT is clear: Tayloristic enterprises must change their practices and, above all, their culture. There is a lot of work to be done, but it is a true revival which is lying ahead of us, a "Copernician revolution".

Chapter 1

The virtual enterprise is post-Tayloristic

"You will perform your work in the light of your intelligence" has replaced "in the sweat of thy face shall thou eat your bread".

Michel Albert, "Le Pari Français"

Here's a riddle for you: which is the naturally post-Tayloristic organization? Look no further: it's the hospital. The reason is simple: hospitals are focused on their patients - their clients. And they have to, since losing sight of them means losing them, period.

In a hospital, each service is specialized, independent, and operational. Each has its own information system keeping it abreast of the latest developments in its fields. Each unit works independently. There can be anywhere from 20 to 50 such units, all sharing common logistics and resources, whether related to the medical or surgical professions or the hotel industry. Teams use these shared resources much like a client would order a specialized service. The entire operation is controlled by two key persons: the medical secretary, in charge of admissions and releases, appointments, tests ordering, patients file management , and the head nurse, who keeps track of treatment and surgery. The hierarchical structure is not of the classical, pyramidal type. Each service is headed by a recognized specialist who also contributes to his team's training. Several meetings are held weekly between head specialists in order to keep improving the coordination and organization of teams and services. Administration is reduced to a minimum, everyone handing over their reports to the secretary or the head nurse.

Hospitals are true post-Tayloristic organizations because of their cellular structure. The organization of each cell is rendered as simple as possible; it whether operates on its own or collaborates with others when needed. Intervention kits are ready for whatever emergency may occur. In each cell, everyone one involved from the department head to the intern knows what needs to be done without having to refer. Everyone is aware of the organization and the resources of the hospital. Like musicians in an orchestra, each member knows both its personal score and the whole symphony.

Its a remarquable "holomorphous" quality: each single part share the awareness and the knowledge of the whole system. Hospitals are thus able to meet widely different needs. The shared information system, though not necessarily involving state-of-the-art technology, is grounded on a solid base of common knowledge. Each service is both client and supplier: the majority of internal queries are made for the sake of patients. Of course, any situation must be answered both quickly and profitiently, according to diagnostic and available resources.

Traditional administrative functions such as management, accounting, personnel, etc., are secondary. This very tribal little world, dominated by a few all powerful figures, is far from perfect, but its post-Tayloristic approach makes for remarkable efficiency. In fact, any attempt to introduce a Tayloristic approach leads to malfunctions, much to the chagrin of those responsible for explaining the situation to an all-powerful, highly Tayloristic, mechanistic administration.

NICTs have had a major impact on the medical world. Some medical research systems are regularly featured in the media. However, doctors still dream of being able to obtain their patients' complete medical file on demand, a difficult thing to do as competition between specialties can be quite intense. Still, there are interesting examples. For example, in the city of Nantes, nine hospital labs share the same computer system. As a result, each patient has a single file, no matter which tests have been performed. This new interdisciplinary approach allows doctors to have complete access to a patient's full medical history.

This type of cooperation is the first example we have of an NICTs-driven, collective added value. As management catches on, the phenomenon is bound to spread, since managers are in charge of getting the best out of human ressources: i.e. transforming intelligence into energy and success.

Coproduction, or managing the transforming power of intelligence

Far from convinced that separate, isolated offices were such a good idea, Michel Quillet, director of the Valéo plant in Laval, France, decided to try see-through paneling. The research and development department, formerly rather withdrawn unto itself, now had to share the same space with the laboratory and the CAD computers' room. After bringing down hierarchical structure from eight levels to three, the Cellulose du Rhône et d'Aquitaine decided to rather trust in their production teams to take initiatives and self-evaluate results. Productivity and atmosphere improved substantially, boosting what we could call the "collective intelligence" of each team. This is the factory of tomorrow, such as defined by a workshop set up by the French national planning agency (Commissariat Général au Plan): interdisciplinary approach, decompartmentalization, reduction of hierarchical levels, openmindness, and above all, communication. Specialists, engineers, finances or sales people string-pulling to favour their own field against the consensual objectives: that is over.

Jean Fourastié. used to say: "People prevail". Michel Crozier would agree, noting that it would be protitable to invest in brain power what was once invested in structures and procedures (7). A noble idea, of course, but not so easy to put into practice. As Jacques Paitra, director of Cofremca, pointed out in a related study, the values favored by two thirds of the French during the eighties were "the research for self-differenciation, innovation, independence, improvisation and personal

accomplishment." And companies also still value individual performance rather than team efficiency.

Of course, as industry and services were being automated, personnel qualifications kept continously improving. Of course the archaic large industrial and bureaucratic infrastructures are collapsing under market pressures. Of course again, intermediate hierarchy, once grounded on corporate experience and history, is jeopardized by the accelerating changes. Of course, finally, intelligence is no longer the domain of executives alone, it has become collective and effective thanks to the Copernician revolution. However, experience has proven that it takes more than brilliant minds alone to make a winning team:, especially in a society still heavily marked by the superiority complex of an elite patiently builded up in prestigious colleges.

For this reason, many executives will have a hard time relinquishing their ideas about control and management of procedures and men. Just consider how some of them hamper quality control or their reluctance to cease keeping constant watch on workers. The myth of enterprise as the domain of rationality is outdated, however social and behavioural sciences have only recently made their presence felt. They encourage management to listen, to take in the human factor, rather than concentrate on technology, in an effort to reach "zero contempt", as Hervé Serieyx, president of Eurequip, once put it.

However, improving relationships and general atmosphere to enhance collective commitment is not so easily done. Raymond Lévy, president of Renault, questionned about product development in Europe and Japan, fairly summed up the problem: "You know very well that the French are not used to team work. What we need is a revolution changing the way intermediate management relates to workers and the way senior management feels about what it believes to be its own property. This is extremely hard to do." (9)

In a traditional, 19th century factory	**In today's automated companies**
0% to 15% of employees were laborers	0% to 10% of employees are specialized workers
20% to 60% were specialized workers	20% to 60% are specialists with basic professional training
33% to 60% are qualified workers	7% to 34% are highly trained executives
4% to 8% were executives with basic professional training	
1% to 2% were highly trained executives	*Source: Encyclopédia Universalis*

For companies willing to exploit available brain power to its full potential, the first step is to form strong, dynamic teams. The idea is to create units assigned to a project whose results will be measurable.

Work has become a collective process, a "coproduction" where brain power is almost everything, not unlike films, cars, trains or boats projects. Take MacLaren, whose two

MP 4/6 brand new racing cars amazingly won the Phoenix Grand Prix in March of 1991 even though they had actually never driven but one mile before. Specialists stated that MacLaren was "over-computerized". For Ron Dennis, director of MacLaren, in fact, "a company's future should never rely on one man alone". When a project is being developed, all results are systematically stored in a database, the "Car Management System", so nothing is ever forgotten. The outcome is a car that wins a race on its very first drive, even though specialists claimed that is was only the sum of many innovations, all meticulously tested in order to complete the database (11).

Millions of dollars are invested to develop software programs, requiring years of work and huge amounts of brain-power. The outcome, stored on a small disk, will be one of the many candidates for the title of "users' standard" and may be lucky enough to hit the kind of commercial success with makes billionnaires. As with MacLaren, designing is adapted to incorporate re-usable modules in order to cut on development, marketing and maintenance costs.

Developing a new model in the automobile industry
Statistics for 1988, according to MIT (Machassetts Institut of Technology)

	Japan	**Europe**
Engineering per new model, average million hours	1.7 million	2.9 millions
Fine-tuning	46.2 months	57.3 months
Percentage of externalized engineering	51%	37%
Number of employees per project team	485	904

Source: Capital (French business magazine)

As more and more brain power is required to develop a product, supply a service, or run always more complex organizations, the very cost of intelligence increases dramatically. Modern executives and managers must now focus on getting the most out of coproduction (or added value) through team work. This implies developing the structures and procedures allowing to create and coordinate efficient computer-assisted projects. Teams will be project-oriented, maybe structured as matrices so that white-collars take an interest in operational and functional work. Most of all, a team spirit has to be instilled to reach understanding and effectiveness of the collective game.

Each link must be aware of the chain

In a communicative enterprise, intelligence management and collective efficiency means a commitment of all individuals to the corporate objectives. Everyone must be able to make decisions which benefit the entire team. Keeping company values in mind, aware of the professional network it belongs to, each individual cell develops through the exchange of ideas, information, and services with other specialized cells.

In a disruptive environment, the determined collectivity uses its own culture both as an inspiration and as a depository of knowledge and information exchanges. In order to encourage innovation, Tandem sees to it that everyone is fully aware of company objectives, expending on huge efforts of information and explanation and thus allowing

each member to submit ideas in due course. In other words, in order to fully capitalize on the collective intelligence available to a company in a post-Tayloristic environment, everyone must share corporate line and objectives. The organization then becomes holomorphic (each single part of a hologram can reproduce the whole image). Holomorphism means that self-management ans self-gouvernance is possible at any level of the organization, be it the whole corporate group, teams or each individual. In short, in a complex, intricate post-Tayloristic organization, each link must be aware of the entire chain. What was true for "datagram transmission" in research networks (see Part 3, chapter 3); it is also true in the world of computers.

"Hitech" was created by professor Hans Berliner and his team at Carnegie-Mellon. "Cray Blitz" was the product of the American super-computer firm Cray Research. In 1987, the outcome of the american computer chess championship was incertain. Which of these two radically different computers would win?

The strong point of Cray Blitz was fast processing which allowed to choose the next move after testing all possibilities during the 3 allotted minutes. Four supercomputers were linked together to analyse all anticipated moves. Hitech, however, was designed quite differently. It contained 64 chips, a microprocessor for each square on the chessboard. Each chip was in charge of one square, identifying all the moves which could bring a piece on to it, and evaluating them according to its knowledge of the game. The results were fed into the main processor, which chose between the 64 options given. On that day, the "holomorphic chip" won against Cray Blitz. Some time later, Hitech became the first machine to be confered the title of Chess Master during a man/computer competition (12).

When a company is structured in the same manner, at least in theory, everyone acts at his own level in concord with the whole group: each service, each function is aware of the others. At each level, everyone is self-sufficient and self-governed, yet keeps a watchful eye on the entire organization. This is what is meant by holomorphic (13). This quality is essential to remote management, where resources are spread over wide distances. This model was described by Jacques Jochem and Jean-Christian Fauvet at Bossard Consultants, who called it *Global Management*. Now a well-proven technique, it allows for a full capitalization of collective intelligence, once considered to complex to manage. Company heads, still stuck in their pyramidal hierarchy, would have hampered any attempts at a positive change.

The situation is further complicated since the virtual enterprise has to relinquish its original national references and integrate several different cultures. This can create considerable conflicts, as demonstrated by Jacques Jochem, Peter Breuer, and Pierre de Bartha in their study on French-German management, which underlined the "tension created by the differences in the ways of looking at hierarchical power, German managers being much more willing to delegate than their French counterparts, for example."

Cultural values compared

Anglo-saxons	Asians	Latins
How they view the world		
Fight, freedom, and victory	Virtue, rites, and durability	Justice, rigths, and free-will
Individual values		
Success and money	Duty and wisdom	Self-fulfillment and prestige
The ideal form of organization		
Democracy, market, and competition. The State never intervenes but makes the rules.	Paternalistic and consensual despotism.The State rules and controls collective action.	State interventionism and balanced re-distribution. The State intervenes to enforce equality
How organization is conceived		
Order and disorder are contradictory. Disorder must be eliminated and order reinforced if productivity and organization are to be improved.	Order and disorder are complimentary. Without order, one cannot survive. Without disorder, there is no evolution. Both are necessary to social cohesion.	Order and disorder are separate. Order has its written laws, disorder has an unwritten law. One shifts from one to the other to preserve its own autonomy.
The global project		
Specialization and optimization of economic tasks	Integration through an intensive networking of social interaction.	Identification, differentiation, and political globalization of social interaction.

Source: France Management, April 1990, n°73

This concerns the different cultures and values of the personnel now become international and also those of partners up and down the trade line. So many different protagonists would be impossible to manage and motivate - furthermore, remotely - without a strong feeling of belonging to, and a capacity to share in, a common project.

Just as hospitals did, and to further follow an open policy, post-Tayloristic enterprises will definitely pull down most compartments and structure themselves around integrated projects and their network system, both nationaly and internationally. Only in this way will they be able to incorporate at no extra cost a growing number of participants. All of these, although sometimes strangers to each others, will collaborate on a common project, sometimes calling on various consultants, suppliers, and specialists from the outside.

Rather ordering than commanding

In such a context, the Tayloristic model must be forgotten. We are no longer giving orders, we place orders. Commanding is replaced by agreement and commitment in an interactive client/supplier relationship. This is the only way to manage the relationships between teams and their resources, each team being both client and supplier of the other teams, each on its turn*. This forces everyone to express their needs clearly and completely transforms the way people relate to each others.

Michael Maccoloy, an American consultant, speaks of a "technoservice" structure as opposed to bureaucracy and production-line: products or services are made-to-measure according to the needs of clients or users. Operators are free and responsable to choose how to answer the clients requests and the situations (14). This approach is similar to the Japanese "Jigiobu-sei", where teams are structured in a federation of autonomous departments whose production is controled by several team members. Control is never the cause of shock or humiliation; indeed, the aim is to improve results for the benefit of the entire team (15).

Trust between "suppliers" will play a major role. As specialists are well aware, such an organization can easily develop a mercenary mentality, always a risk when dealing with rare, highly-solicited human resources. To prevent this, certain companies are careful to promote their values world-wide and to reinforce their corporate spirit throughout their networks. Michel Bon (16), president of Carrefour, confirmed this in an interview for the French weekly *L'Express*. According to him, the company has a strong culture: "consistent through the whole group. From Taiwan to Brazil, our model is more easily exportable. The group is fast expanding abroad by encouraging a mix of nationalities and experiences, and "exports" very few people from France. Less than 50 for a population of 4,000 executives". This can no doubt be explained by the level of confidence that has been put in the hands of local management: "The real bosses at Carrefour are the department heads, all 3,000 of them. Each is in responsible for his own operations accounts". IBM, for its part has sometimes been compared to a militant organization. And Microsoft France went as far as to publish ads in *Le Monde* to hire "system evangelists " and "applications evangelists", religious connotations for "missionaries spreading the Gospel according to Microsoft", to quote Seymour Dinnematin in *Sciences et Vie Micro* in November 1990.

A spirit shared by the 3,000 "pastors" of the 27 Pasteur Institutes in the world whose missionary zeal was praised (17). In other words, what is most interesting with post-Tayloristic enterprises, more open, and thus more exposed, is the need to reinforce its values, its ego, in order to attract and motivate talent. A company mobilizing people around constantly renewed projects is condemned to dynamism: it must never run out of ideas.

* Coproduction in the mass marketing sector: 82% of new products lauching are done through a cooperation between suppliers and stores. Forms of coproduction: 55% through a commercial partnership (discount on new products), 25% through a common project, 2% through costs sharing. (Mercatel 1990, Isabelle Pierre, Mood media)

Chapter 2

Remote work and management

The value or people or objects does not lie in their exchange value, nor in the work they produce, but in their capacity to participate in the circulation of messages which give a meaning to the organization .

Jacques Attali, *"Les Trois Mondes"*.

Sometimes rational management methods are displayed just to conceal the actual empiricism lying underneath. Today, enterprises are facing an extremely complex problem: the traditional division of labor, which does not favor communication, has to deal now with enormous needs for interchange and coordination. No matter what the project, information must be exchanged between members of the group and with its environment as well. However, the modern industry and services sector have experienced an explosion of organizational costs. Ways had to be found in order to reduce not only direct costs, but also indirect costs caused by intermediaries which also tend to slow down projects. A need was raised to optimize the size of units. Contrary to common belief, NICTs are not responsible for the development of a more human, team-work mentality. The need for it was there before: other alternatives, such as flexible workshops, were investigated. However, NICTs played their part in the necessary restructuring by helping to intensify the use of communication networks. At first considered a simple means of communication between the company and the outside world, networks became a tool for the management of remote, relocated (though not decentralized) units. The use of networks has an altering effect on the business and commercial rules which had been established since the Second World War. This results, according to Jacques Jochem from Bossard Consultants, in a crisis of "organizational misunderstanding".

This crisis occurs just as hierarchical, neo-Tayloristic companies are shifting to the networked, post-Tayloristic model. It is often difficult to tell exactly when a company

has moved from one to the other, and both models will probably coexist for some time. But the crisis is focused on remote management .

Remote management is the new rule for the many broken up and "stateless" companies linked to electronic networks. The National Economic Development Office in the United Kingdom has performed many studies on telework since 1986. In their eyes, and those of other observers, management has always been the main obstacle to telework (18). To understand this, it must be remembered that in Ford's view of mass production, market demand converged towards companies, themselves being ruled by a distribution oriented management . The company was at he heart of all concerns. When the 70's and 80's witnessed a reversal of polarities due to overproduction and to the fragmentation of markets and demand, certain established positions had to be called into question. Competition was everywhere, even in the service sector. Even if banks, insurance companies, institutions - all forms of distribution and services - are tempted to play overtime as the European common market was being builded up.

The neo-Tayloristic organization is unsuitable for remote work

Hierarchical bureaucracy, the end result of Taylorism, is totally unsuitable to telework and remote management. Jack Nilles (19) writes:"telework makes good management even more efficient and demonstrates the limits of poor management". Neo-Tayloristic companies are over-centralized, indulge in large projects, and are reluctant to entrust work units with the independence they need. Teams require more autonomy in order to deal with intrecate exchanges while cutting on bureaucratic intermediaries which hamper efficiency. Even if upper management is willing to increase productivity by reducing middle management, most executives still remain basically Tayloristic. Entrusting field workers with decision making, be they just around the corner or halfway around the world, is still difficult. Of course this would require confidence to rule throughout the whole company. In 1980, Lesieur & Cotelle, manufacturers and distributors of vegetable oils and herbs and spices, were almost considered revolutionaries when they allotted production units their own budget as part of a "progress and quality" program. In fact, the neo-Tayloristic company is unsuitable to remote work because it lacks confidence in its members. NICTs may not be essential to a company's success; confidence is.

Lets move to the early 15th century, in the aftermath of the Hundred Years War: France was ruined. A 20-year old shopkeeper from Bourges by the name of Jacques Coeur, became within a few years the richest man in France. By trading in fur and silk, and some smuggling, he became familiar with international trade and met other merchants who, like him, attended the court of the *dauphin* in Bourges, who was to reign as Charles VII. At the age of 32, he started trade with Egypt and Palestine. Studying his competitors' behavior, particularly Genoese and Venetian merchants, he realized that the Venetians, who held a type of monopoly on the Mediterranean trade, did not hesitate to swindle their Oriental partners.

After a prolonged study of Mediterranean trade practices, he returned to France and called upon Italian merchants to act as intermediaries between him and the Orient. This allowed him to copy Genoese ships and build his own fleet. Later, he developed his own land-based transport system. Within a few years, Jacques Coeur controlled more than 300 establishments, from Scotland to Egypt, all from his home in Bourges. At the

time, of course, much travelling was needed, but he was never afraid to delegate: each branch, each captain was autonomous. At the age of 45, he was the richest man in France, but also the most envied; when the King withdrew his protection, he was driven to ruin by his adversaries.

Answering "post mortem" questions from journalists, when asked "How is it that your employees were faithful to you to the end", Bernard Kapp said: "I understood that a man's word was a good trading weapon. I transposed this principle to my own company. I had a moral contract with each of my employees, setting duties and rights... Thanks to this system, everyone prospered. My employees had become my allies and supported me to the end." (20) How many executives could say that?

Such a confidence-based agreement is rare. We may wish to institute a more congenial climate, a contract consistent with a client/supplier relationship, between partners separated by distance, but centralizing, Tayloristic attitudes prevail. People and activities are dragged back to a single, central unit on the pretext of large-scale savings. Companies wait for the world to come to them, rather than seeking it out. Hierarchical communication channels are quickly overloaded, inefficiency prevails, expertise is wasted, and it becomes all but impossible to act in a variety of sectors. We could say that Tayloristic culture is "economically focused" on cost price rather than added value and does not respond to the general trend towards deployment. It is too much self-centered to take any offensive. It fails to delegate and to judge by results rather than supervise. Remote management, regional and international deployment through telework never enter the frame.

In this context, NICTs are used to enforce supervision, rather than to release energy and knowledge.

NICTs have not been incorporated into the value-added chain

From design to development, through purchase, manufacturing, and assembly, and all the way to customer service, the value-added chain between partners must be optimized, according to R. Johnson and P.R. Lawrence (21). This means setting a rule and asking plain but painfull questions: does this partner supply added value? What do you supply?

"What do you need?", we keep asking our clients, especially when they have become partners in a client/supplier relationship. We try to meet their needs and we are kept well informed of them. This information, the result of much observation, circulates throughout the company's various networks, becoming a competitive advantage. Brain-power is made productive as suppliers submit their input from design right on through, producers are invited to find new ways to improve manufacturing and finally, clients are asked to contribute in judging the outcome. As all these people cannot be found in the same place, NICTs will have to play their part in the coordination of expertise and knowledge. Companies are communicating more and more with the outside world: 85% of connections in small businesses are for outside communications, against 15% in large companies, where communication is mostly internal (22).

Team work and meetings are a rising trend. According to a study performed by Apple Computer France, most projects (80%) are run by teams of 4 to 25 people. As a result, groupware applications will quickly become essential: they allow expertise to be consulted as needed without requiring permanent involvement on a project.

Applications range from e-mail or sharing of diaries, files or documents within a closed circle of users, to visioconferencing or telemeetings on demand, on a more or less regular basis. Expertise can then be easily accessed, even between countries where labor costs differ widely. Previously, benefiting from expertise required prohibitive travelling and delays. However, although NICTs are drastically changing the production chain, applications in the service sector for the exchange of expertise are still rare. The French bank Crédit Mutuel Méditerranéen has a federative structure requiring that executives in Marseille, Nice and Montpellier consult each other on a regular basis. They have recently installed a visiophonic network allowing meetings and coordination from a distance. Sixteen people can communicate at the same time and whoever is talking automatically appears on the screen, from his work station which controls sound, image, and data (23).

NICTs are not considered tools for conquest

PARIDOC is a purchasing group serving the French supermarket chain Mammouth. They have installed a system known as the Système International de Télévision Interactif (Interactive International Television System). For the benefit of decision makers of the group's 20 sites, two or three monthly shows broadcast information on products and partners. Internal teleshopping programming can also be produced thanks the network's interactive possibilities. Stores have thus been able to order directly from Chinese manufacturers during a telesales show broadcast from Hong Kong. "In this particular case, we saved a good two months" according to Xavier Guérin, the network's manager (24).

This case also illustrates an interesting point: teleconferencing has been used to import, not to export. The main reason why enterprises chose to invest in NICTs is costs reducing, "to make scale economies" as we often hear. Then investing in teleports would be the best way to facilitate import activities or to share telecom fees thanks to Advanced Telecommunications Areas. But aren't these neo-Tayloristic impulses?

When Shosharna Cardin, president of the American Conference of Presidents of Jewish Organizations, wanted to react to the blocking of funds for Israel by President Bush, she invited her counterparts to a teleconference in order to discuss the issue. When Sybase, a Californian company which supplies database management systems, was performing poorly in the US, they could have simply chosen to withdraw on the domestic market. On the contrary, they decided to reinforce their international strategy by breaking into the expanding European market. The first case demonstrates an recognition of the new possibilities of NICT's, and in the second case an open attitude and a knowledge of the world. All around the world, thousands of users are connecting daily to their corporate networks and from there, to the world, listening, trading, developing business. At the time of Jacques Coeur, the councilors, the first bourgeois and the bankers used to share resources and to finance expeditions to establish trading posts in foreign lands. Why are these same people satisfied today with investing in electronic trading posts installed right on their doorstep? Why not in Cairo or Instanbul? From now on, the influence of nations and companies lies in their capacity to cover new territories thanks to electronic trading posts and alliances with partners beyond space.

Of course, not all trading posts are equal. In May of 1990, in Lisbon, Portugal, during a STAR conference on regional development through telecommunications, a

representative of the SEMAIR (Société d'Economie Mixte Locale Artisanale et Industrielle du Robert) from the French island Martinique in the West Indies described various NICT projects and applications. After a brief explanation of Martinique's situation in the Caribbean, the representative focused of the technical organization of the teleport telecommunication system. He never mentioned that the prices for software are 30% to 40% less in Martinique than in continental France. Dublin's teleport, for its part, nevers fails to mention that it now competes with Luxemburg on fiscal advantages, highlighting its specialization in banking services and inciting insurance companies to profit from the tax exemptions.

These new electronic trading posts and lines will not be initiated by cautious technocrats, or even less by neo-Taylorists reluctant to break down their own protective walls. Speaking of the "crisis in American technology", J.C. Derian coined the expression "exposed culture" to define firms who are open to competition, as opposed to "protected culture" for companies who stay away from technological development, the latter trying to survive through strategies inspired by the former (25). Jacques Coeur did not have any model to imitate. He drew his own conclusions from field observation, both on the technical level - the ships - or on the management level, and did not fear to open or expose his business with his networked organization.

In the 21st century, Jacques Coeur would still need a networked organization. Alvin Toffler well understood the stakes facing companies in the next millennium. He professed to Dominique Hoelgen of the *Journal du Téléphone*: "I once found myself explaining to some Japanese executives that they should start a communications crusade to link all the countries in the world. They listened carefully and I was immediately invited for breakfast by the Minister of Telecommunications. When I say the same thing in the United States, everybody yawns. (...) Countries willing to finance telecommunications infrastructures (...) will have a considerable influence and will benefit from true advantages in terms of trade relations."

Chapter 3

Post-Tayloristic enterprises and the network culture

An increasing number of individuals and organizations are joining forces to create new forms of trades or associations, be they clubs, gangs or mafia-style groups, under the most diverse pretexts. Yvon Chouinard, 51 years old, is the American President of Patagonia, a prosperous firm (20% growth, 10% profits) specializing in outdoor ware and equipment. When purchasing recycled paper and "everlasting" environmental goods, you join the "pro-nature gang", as coined by Renaud Leblond of *L'Express* (26). Patagonia neither advertises nor promotes, they lobby. Through militant activities on behalf of forests and endangered species, Protagonia has become a member of a network of some 250 environmental associations, some of them very active, who help keep their 350 sales outlets alive and kicking.

This network approach is not new. Its spread, however, is striking: readers' networks, users' networks, television networks, distribution networks, research networks, university networks, banking, business, support, and influence networks, etc. The desire to belong to a network has been on a major trend since the mid 80's and usually means taking part in a large number of interactive groups. According to Cofremca (a market behaviour survey institute), this phenomenon is grounded on needs to find solutions to concrete problems. It is a pragmatic response to an increasingly complex, uncertain, more open, always changing and internationalizing society. For Cofremca, this also calls into question the durability and the adaptability of our basic established structures such as unions, traditional organizations, political parties or the State (27). France is doing comparatively well, and networks develop more vigorously here than anywhere else in Europe. This is all the more interesting since post-Tayloristic culture is a network culture.

We are witnessing the development of communities of network users, scattered around the world. A characteristic network culture is being worked out, without its members, the terminal people, fully realizing it. Within a few years, everybody will be

expected to know how to navigate these networks for work as expertly as documentation specialists* .

Many experts and consultants will use networks to answer questions or spot interesting projects and keep up with them from a distance. Networks will become a type of knowledge exchange pools where everybody will be able to advertise his/her needs** .

The celular Post-Tayloristic organizations are structured around networks, sometimes around profit centers, up and down the value added chain. Their members have access to all the expertise the company has to offer. Their sense of belonging to an international community grows stronger, as does their realization that they represent a culture, a local added value. Professional "tribes" seek each others out through the networks which serve as a catalyst for original organizations. People who work abroad, meeting in airports or in the most cosmopolitan places, already know this feeling. Far from their mother country and community, their tie with their counterparts only grows stronger.

It is not always easy to fathom the global dimension and organization of the special culture that the use of large networks generates. For a better understanding, let us make a detailed analysis of Digital Equipment's Easynet network.

Digital Equipment's world-wide network

DEC has been developing its Eaysnet network for more than ten years. For the company, computers must communicate as easily as possible to allow people to work together. Any information should be available to everyone who needs it without duplication. Now one of the largest private networks in the world, Easynet has 50,000 systems linking 120,000 users, 4,000 in France alone, spread over 1,100 sites in 85 countries. Each month, 53 billions words travel through the network. Close to 1,600 connections are added each month and over 3,500 applications are available. Every company member has access to the network, no matter their importance or function, in order to communicate and share information instantanously (28).

Whether in Paris, Geneva, Tokyo, Sydney or Boston, everyone is kept informed of what is happening in the merry world of DEC. "Digital is working on high-definition TV. with Thomson", "Tokyo hit 39 degrees Celsius yesterday", "the Canberra olympic team uses a VAX", "Why Digital is interested in Philips information systems subsidiary", "Manchester has won the national cricket championship"... In a few seconds, you have travelled around the world without ever leaving your office. This service has become as commonplace as the telephone, to the point that nobodies sees anymore what a luxury it is to benefit from a widow opened on the company worldwide. "A comfort that has deeply changed the way people work", according to Didier Lambert, information systems manager at Digital France.

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* Usenet is a worldwide users' network composed of 37,000 connections nodes. To access its mail and database services one needs to find a convenient node. All information on available databases and services is provided by users on a non-lucrative basis.("*Pour la Science*", november 1991)

** City Messagerie Internationale (International Mail City): New York, San Francisco, Toronto, Montréal, Bruxelles, Milan, and Paris, Rennes, Marseilles. To join in, open a mailbox on the international Minitel: friends, exchanges, ideas, news of the global networked world.

Digital's virtual office favours relocated development. Every office is equipped with a phone and an Easynet connection: no matter where you are, you only need to punch in your password and your home-site's name. Your files, your mail, your agenda, everything you need is there for you. The network also automatically reroutes all calls between sites, thus reducing the need for phone operators. Phone numbers are no longer assigned to a particular site, but to individuals. We are in Sophia Antipolis in France. The Arturus project reunion is about to begin. Hans Gehrmert left Karlsruhe, Germany, two days ago to visit his European co-workers for a week. He takes the time to check his messages and mail. There is a free terminal: site's name, user's name, password, then appears the group logo and All-in-1 menu in German: "Sie haben 5 Mails bekommen"... He is home again.

While some continue to work in their country, others can work in just any location they may choose, all thanks to the network Patrick Scherrer is a good example. Originally from Switzerland, he has chosen to live in Paris. "Where I am, physically, is absolutely unimportant, as long as I'm in Western Europe. I decided I preferred France." In a traditional structure, Scherrer would no doubt be the head of a large sterilized lab. Instead, he runs a kind of scattered lab that conducts a hundred different projects. His role is to develop outside research project financed by Digital throughout Europe in some of the most prestigious universities and research centers. "These projects will lead to prototypes, ideas and are also a wonderful way to select future employees." He receives countless offers from European researchers, and admits to reading them sooner and faster when sent as e-mail, especially since paper entails a series of tasks he could well do without (photocopying, writing and sending letters, etc.). After selecting the projects most likely to interest the company, he forwards them to whoever might concerned. When a team is interested, a 30-member electronic "jury" chosen by Digital Corporation takes a vote. "Without this remote, electronic voting procedure", says Patrick, *"it would be impossible to bring 30 people together in the same room every two months"** .

Once selected, the project literally lives on the internal network (separated from Easynet for security reasons by a series of gateways), as is the case for a research project on medical imaging run by the Grenoble University Hospital and Digital engineers in Colorado Springs. "It is very important for a scientist to be able to continue his research in his own environment, with his own people. With its network, Digital lets researchers chose the environment best suited for their work."

Networks contribute to the productivity of the value added chain

For Digital's collaborators, product designing benefits from using Easynet in many ways. All the company's resources are at their fingertips, without having to centralize them. "Digital's next platforms are being designed on the network by decentralized know-how, especially software development, which is grounded on networked expertise and resources, mostly European", according to Patrick Grogniet, who has been part of

* Digital's tools for electronic meeting: Almost any topic may be the occasion to open a NOTES forum. Available to all, NOTES forums are a place for free expression and a working tool, especiazlly in technical matters, where a question seldom remains unanswered. According to many, forums represents the true culture of the company. Another tool is PHONE, a real time mail system.

various development teams for a year and a half - most notably VMS and VAX 9000 projects - while still working in engineering.

Another of the network's advantages: direct and interactive contact between designers and manufacturers. This synergy reduces both costs and production delays. Dec-router 2000, designed in Reading, U.K., and assembled in Clonmel, Ireland and Augusta, Maine, is a good example. Normally, Digital would start manufacturing a product in a single plant before moving on to mass production in a second plant, which usually takes six months. In this case, manufacturing was launched simultaneously in both plants. Thanks to the network, the same parts list, the same instructions for assembly were used, and start-up problems were shared in real time. The result: the product hit the market six months earlier than usual.

Easynet: 53 billion words per month

The impressive amount of information which circulates on the network requires some discipline, according to Geneviève Houdent, Internal Communications Manager at DEC France. New employees receive a book containing the 10 commandments chart. At the same time, parties and meetings are organized regularly to ensure that everyone occasionally "disconnects" and socializes rather than stay permanently hooked to their computers: .
The network still remains the most cost-efficient way to avoid the burden of constant travel. It is the perfect democratic communication tool. However, arriving at the office one morning to find 150 pending messages in your mail box is disheartening, a clear indication of the limits - and problems - of an open teleconference system. Structure and discipline have become indispensable and, adds Didier Lambert: "In the world of Easynet, man will be judged on his capacity to ask questions and the system, on its ability to answer them.""

Digital's network involves electronic nomads: Digital France's 64 technical support "superdoctors" are found at the Bois-Briard site, in Evry. Highly-specialized, they know everything there is to know about the possible glitches a VAX computer can run into. They are forwarded the electronic files of cases which the "integrated service center", where customers call with their complaints, failed to solve. They are the ultimate recourse... and they must not be stumped, whatever it takes. The corporate network also summons up outside specialists; whenever a problem arises that even these "superdoctors" cannot solve, they can use Mail (Digital's e-mail system) to contact whoever is most intimately acquainted with the product outside the company. The solution usually is sent via e-mail again, within a few minutes if time-zones allow. Finally, if Bernard and Patrick, electronic nomads, spend most of their time in Evry - though electronically, 30% of that time is actually spent in the United States -, they are, along with 11 other European specialists, regularly assigned to VAX 9000 technical support. VAX 9000 is Digital's largest system, involved in strategic applications in the banking sector or in phone distribution and it requires total availability. During those periods of assignment, a home-terminal connects them to Easynet. When a call comes through, they are immediately "beeped", contact the clients and connect to their systems. If their remote exploration of the system yields nothing after four hours, another, even more qualified expert in another part of the world will take over, from another part of the network. Those in charge of the express shipping of spare parts, as well as maintenance technicians (who do house calls) are similarly equipped with home terminals.

The network also controls the company's relationship with its clients. Information is rerouted towards specialized sites in Ireland, France or elsewhere, and travels along the chain, from ordering to billing to accounting, without ever being captured twice. This resulted in a development of telesales: it now represents 18% of Digital's turnover. A team of 13 telesales representatives settled in Evry processed more than 15,000 orders in the year 1990-1991 alone. Out of 45,000 calls, 65% are requests for information or technical advice, but the sales staff must try to convert these into orders. Telesales representatives can also use a special application that keeps track of clients' files. It can be opened at any time by any representative and provides with client information, as well as a history of calls and transactions. Conversations can be picked up from where they were once left off, even by someone else!

Individual input and the network

Electronic nomadism, allowing to communicate with colleagues just as easily be they located in the next office or halfway around the world, changes drastically our organizations just as it does our working relationships. Electronic nomads, released from the pressures of hierarchy and social conformity, talk much more freely on a network than face to face. From this point of view, very different behaviours can be witnessed in groupwares, according to company policy. In the 1960's, when Arpanet was made available to American researchers and labs, e-mail, at first considered secondary, became the favorite application* . Informal exchanges took place between students, researchers and teachers regardless of status or origin. The Defense Administration tried to limit the exchanges, but to no avail. Users had already understood the advantages of the network. It not only improved productivity on the value added chain, it also modified the way individuals relate to the group.

The influence of NICTs on the behavior of groupware participants was the subject of studies performed by Harvard and Carnegie-Mellon University. In the November 1991 issue of *Pour la Science*, Lee Sptoull and Sara Kiesler confirmed what these studies had proven: electronic meetings are devoid of any etiquette. The studies performed at Carnegie-Mellon showed that since an electronic message generally bears no indicator of social status, e-mail discussions are more direct, and propositions and ideas more plentiful, as it is impossible for an individual to monopolize speech in a virtual reunion. Everyone is more at ease, more dynamic, and team work becomes more efficient. Hewlett-Packard, for example, has made sure that its ergonomists, who work all over the world and rarely get to meet, could still manage to cooperate.

However, according to Sptoull and Kiesler, the abundance of contributions complicate decision making and delays. Bringing to a conclusion is more difficult, sometimes resulting in behaviours and disagreements even more conflictual than in traditionnal meetings. Hierarchical regulation does play its part anymore: in fact groupware works better when only suggestions and advice are needed. When experts need to communicate and decisions must be made, traditional, face-to-face meetings still are more efficient.

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* IBM's VNET networks connect 355,000 terminals worldwide. They are said to have processed 5,000 billion characters in 1987. According to IBM, the corporate network PROFS allowed to spare 40,000 jobs and 7,5 million enveloppes.

In the United States, an informal network of 37,000 companies hosts more than 1,500 newsgroups, some numbering more than 100 members. It is estimated that 1.4 million people participate in at least one discussion each month (30).

The flow of information should be made even more efficient thanks to these applications. When companies are lacking in electronic connections, expertise is passed along through personal contacts, as opportunities or emergencies arise, with no pre-set pattern or plan, not even in information and documentation departments. At Tandem Computers, the network, linking more than 10,000 people, transmits at least six times a day the following question: "Does anybody know...?" Lee Sptoull and Sara Kiesler, who studied the network, have said that less than 15% of the people who answer know the people who asked, or even work in the same city. Employees give information more readily through the network, even if they do not know the people they are sending the message to. This seems to be, first of all, because employees, especially those working away from the main office, suddenly feel that by entering the network, they are joining the company's culture, but also because writing down answers and sending them has become so much faster and easier. Tandem has decided to capitalize on the company's expertise, expressed through questions and answers, gathered in a single server accessible to all. This is impossible for companies who fail to connect.

An unconnected company not only cuts itself from its market and from the world networks, but also loses the accumulated expertise and knowledge it has paid for. It fails to take contol of its own know-how. While teams are moving more and more, networks respond to a need for durable relationships and compensate for time and distance which prevent actual physical reunions. For a particular test, teams were asked to analyze retirement settlements. The teams were made up of both active employees and recently retired personnel. One of the teams met in special rooms, the other used a computer network. The retired personnel integrated more easily to the team that used a network. This team also performed better, according to the sociologists who performed the test (31).

We can easily understand the limits severely imposed at times on networks by certain executives fearing for their authority and reluctant to enter the new age of cooperation. Others choose to go along, of course, ready to establish a charter for their "proper use", if need be.

However, the majority of companies are never confronted with these transformations. They still live in the 19th century and, for want of a network culture, they aren't even aware of it. Perhaps they are still facing the many problems arising from the sometimes complex installation of NICTs. Network culture is, after all, grounded on another culture, technology, essential to master the NICT's.

Chapter 4

Meeting the 21st century technical standards

I have the world at my finger tips! Now, if I only knew which button to press...

"We must move from a gunboat strategy to a network strategy" (32). These words by Zbigniew Brzejinski, former American Secretary of State, perfectly illustrate that as the balance of economic forces is deeply changing, NICTs offer new possiblities for strategic domination, and that networks have become essential to business. In March 1990, at the Mercatel trade show in Paris, François Henrot, Assistant General Manager at the Compagnie Bancaire, presented his assessment of Minitel applications. He highlighted Cetelem's mastery in the field of credit distribution (80% of all files). Cetelem, a subsidiary, was a serious advantage when working in association with a more powerful foreign partner. According to François Henrot, this technical know-how was the ticket to new markets. For him, mastering networks became part and parcel of the company's business strategy.

Mastering NICT's, or simply understanding their power, means the ability to be virtually telepresent and to act wherever in the world. It is also a definite advantage over competitors, at a reasonable cost.

Louisiana Oil & Tire first decided to transform its ten sales representatives into telesales staff. This cut sales costs down by 10% while sales volume was increased twofold and the management decided to expand the telesales staff's range from regional to national. In another field, International Transportation Services in Cincinatti changed its pricing procedure. Previously, each local office had its own schedule of prices. Now, a network links all offices to a central unit which fixes prices according to which client places the order (33).

In yet another field, Dow Jones, publisher of the *Wall Street Journal*, first linked 17 regional printing houses by setting-up a system for teletransmitting pages. In this way, it

was able to publish a national paper that still covered local events. This same strategy was later expanded to Europe and Asia thanks to printing houses all around the world.

Goods and services travel through various distribution channels. They are many such channels, and they keep being invented... and improved. It is essential to know them if you wish to participate in modern trade. Each company, according to its size, products and resources, has its own marketing policy, and may use one or more of these channels. They all have their advantages and their drawbacks. The same thing is true of the distribution of electronic information. Each firm must choose its networks. This choice is even more complex since it involves many technical aspects: the problems of digitalizing multimedia documents, the establishment of standards specific to certain fields, and the many networks to choose from. Bringing companies to the 21st century standards is never easy. And the problems may occur where and when you don't expect them.

Advantages here, majors risks there... The *Wall Street Journal* finally blew the whistle on the computer crackers specializing in intercepting e-mail messages. According to Earl Devaney, in charge of prosecuting fraud cases for the US Treasury, this type of espionage affects hundreds of administrations and firms and costs tens of millions of dollars. Crackers break the - often deficient - code and access e-mail boxes to read messages or even take up permanent residence. From there, it becomes just as easy to tap into phone lines and make free calls (34). Some supermarkets were even invaded by unscrupulous competitors who penetrated their networks and made phony orders, changed existing ones or altered client or stock files.

In 1990, an American company redefined piracy. Logisticon was in litigation against Revlon, one of its clients. Revlon had suspended a payment and stopped a computer aided logistics management project, which they claimed to be unsatisfactory. At night, Logisticon decided to fight back and sent orders to Revlon's database system, paralyzing their two largest warehouses for three days. (35) Which caused, needless to say, quite a commotion in Californiа...

Yet, for all these examples familiar to media watchers, how many catastrophes are unknown of, so as not to scare clients away and lose the trust of market, shareholders, and even company executives? We cannot win at every turn, as we all know. Information must be controlled, or risks can be enormous. Who remembers today that, on January 16, 1988, the New York Stock Exchange limited automatic transactions between computers? Or that the Brady report recommended a limitation in market transparency and in the number of terminals on the network (to 300,000), otherwise the stock exchange would be impossible to control?

In regard to NICTs, modern enterprises are constantly torn between a minimalist, sometimes too cautious, approach, and enthusiastic infatuation. Increased decentralization and relocation are forcing companies to rely more and more on NICT's. At first used as production tools, computer centers, the equivalent of the plant for the white-collar worker, are also becoming communication centers. The computer specialists of the neo-Tayloristic age are not happy with this situation: telecommunications lie outside their usual expertise. To add insult to injury, computer resources are being relocated too, and centralized power along with them. As a result, both management and computer executives, ironically enough, refuse to join in the

network culture. They dangerously pretend to be sceptical about the importance of reaching the 21st century technical standards.

The most determined executives know, if at times vaguely, that the problem needs to be addressed. They understand the importance of gaining access to expertise if they are to survive the technical and economical obstacle course on the way to joining in world-wide networks. They are in fact facing three challenges: they must diversify and multiply access to the global networks, get freed of paper as they learn to master electronic information exchange, and learn to manage the boom of virtual files. They must also realize that productivity means partnerships. Everything will depend on the company's capacity to adapt to new technical standards: mastering NICTs has become a key to success.

Diversifying and multiplying access to the global networks

A company' should never rely on a single communications system. Many executives know that they too will become increasingly dependent on the network policies of their suppliers. Most of them realize that the technical expertise and the cost of launching their own network is beyond their reach. They will then join in corporate networks and value added services networks. Their network strategy will be to diversify and multiply their access to the global networks and in order to be less technically vulnerable.

When a building team accidentally cut an AT&T optical fiber cable in January 1991, communications between banks in the New York city region were suddenly interrupted. The more heavily harmed were the smallest banks, because AT&T was their only link. Some of the larger banks were able to continue sending data over MCI or Sprint networks. However, as one spokesperson for the New York Telephone Company pointed out, there were still problems because these other services could not handle the sudden overload. Four of the World Trade Center's raw material markets had to suspend their activities temporarily. Certain systems on the New York Cash Exchange based on talking machines were out of service for the morning before being taken over by MCI and Sprint. Three New York airports were closed for 90 minutes, all lines dead. (36) This breakdown of the AT&T network interrupted many vital activities, such as air traffic control, banking, and phone communications for many hours, much to the delight of AT&T's competitors - AT&T has an exclusive hold on more than 60% of all long-distance communications. It matters little how much AT&T invests in modernizing and duplicating its network, this simple accident demonstrates that a one-supplier approach to telecommunications leaves one open to disaster (37).

Companies are more concerned with integrating telecommunications.

Companies, worried about rapid change, are more concerned with technological evolution, or at least 47% of them, according to a survey sponsored by Le Monde Informatique (April 1990). It has become a priority for 55% of French firms with a turnover between 200 and 500 million francs and for 57% of businesses with a turnover between 500 million and 1 billion francs. Integrating telecommunications has in fact become their third priority.

It may be technically possible to structure telecommunications through a single, universal network, but it would be a strategic and economic mistake. From the point of view of the telecom operator, integrating all services on the same network may have its

advantages: infrastructure is more profitable, the cost price of traffic is reduced, and in a best-case scenario, new services can be tested at a minimal cost. Unfortunately, these large scale savings rarely result in real advantages for the clients (at least, as far as rates go), but rather into improved stock market performance for the operator, who may be in no hurry to invest. This has been the source of much trouble for AT&T, who failed to invest according to market needs.

Furthermore, in a so-called integrated network, clients have to pay for linking up. The more technically complex, the more expensive equipment and services are. Towards the end of the 1980's, a period marked by relative deregulation, firms were attempting to become more independent by developing private, specialized networks. In 1988, 52% of American companies had between 4 and 6 networks and 14% used more than 7 networks. According to a IDC study (38), the Bank of America had 20 networks of its own, none of them being linked to the others. Chevron Oil used one private network for voice, one for IBM SNA, one for DEC, and a general data network and several X25 networks. This boom of heterogeneous networks certainly contented specialized engineers who had to build bridges between them. Competition is no longer lies between private and public operators, but between intricate networks, sometimes incompatible with each others, each with captive prices, to the detriment of a global optimization of flow and security - no specialized network is safe from malfunction. Companies have to pay the price for the successive generations of always improved equipement and connection services.

The difficulties encountered in optimizing and managing heterogeneous networks is not the burden of businesses alone. Network inter-operability is an objective shared also by public or independent operators as well as international standards organisations. As networks become interdependent, operators will realize that the very nature of competition has suddenly changed. Considering the huge investments already commited by both companies and operators, the solution will lie in "re-insurance" agreements allowing parties to trade virtual traffic ability on demand. In this respect, AT&T's paralysis in January 1990 seems a remnant from another time.

For now, clients are benefiting from deregulation

Anik E1 is doing well. Its solar panels unfolded successfully on October 2, 1991. However, Astra 1b is experiencing tracing problems and images regularly disappear. Superbird B exploded in February, 1990. Marees A is dying of old age. Solidaridad will be put into orbit by Ariane. Intelsat VI F1, Telecom II A, Immersat 2F3, Superbid B, Arabsat, Entalsat II F4, Satcom, Galaxy, Hispasat, Stcom Panamsat, DFS Kopernikus, Columbia TDRS, Astra 1A, Stationar 4, Marisot, Asiasat, and others are all waiting their turn to find their place in the sky. (39) Traffic demands, obviously, are quite high. Each satellite has its specialty (data transmission, telecommunications, television, etc.), its operator, its clientele, and its applications and its competitors. However, new digitalization techniques are disrupting the market. In other words, new networks, more efficient and versatile, are able to steal from more than one type of traffic. Telephone system operators, for example, are greatly worried, since voice can now be digitalized. This is already a problem in the United States and could very well become one in Europe.

Hugues Networks Systems has installed TV Answer, a private data transmission network via satellite. The main station is in Reston, Virginia, with another 1,000 Vsat stations to begin with. TV Answer is in fact getting ready to launch its Interactive Video Data Service. Two-way data transmission will be available to radiocasters and to service firms who do not have their own network. Clientele will be divided into four-mile areas with an assigned frequence. Orders or information requests from viewers will be centralized in Reston, then rerouted to suppliers and radiocasters. This type of network is of particular interest to those who wish to process transactions while bypassing the traditional phone network. Eventually, 10,000 specialized stations will be found all across the United States. By 1992, licensees will pay $5,000 and some royalties to sell terminals and services to the public (40).

Any company wishing to diversify its network resources can benefit from the current restructuring of telecommunication space. World-wide competition is forcing companies on the international market to meet technical standards to expand their influence. However, severe regulation can prevent a company from establishing precious links, as was the case with Varig Airlines in Brazil. In 1981, Brazil's Special Computers Commission (SEI) forced Varig to bring its data processing systems back from Atlanta to Rio. The move cost Varig $23 million. Costs rose and efficiency decreased since brazilian telecommunications infrastructures are simply unadequate to meet the needs and requirements of international business (41).

The cost of telecommunications (between 1% and 3% of turnover) is of great concern to the majority of firms. A recent study performed by AT&T France demonstrated that the 100 most important French companies are more concerned by costs than by technical reliability and network compatibility. As a paradox, if a telecom operator, such as French Télécom, was jeopardized by competitors cutting on prices, according to the laws of the market, clients would answer by diversifying even more their network resources supply.

Professional networks still rule

For whom whishes to join in the initiates club, the large international groups are the source of inspiration, showing the extent of technical know-how and investments required. Otherwise, the most dynamic small businesses could find themselves cut off from the community of networks, and lose the benefits of the value added chain which they have builded up with their suppliers and clients. This will only widen the existing gap between them and larger companies: in 1989, less than 1 French small business in 6 (out of 850,000) used computers (42). They have no other choice but to connect in order to keep in touch with their market. A good compromise would be to let an external service manage their network, a type of "technical mentor", recognized for his knowledge and expertise in value added services networks. The idea is to bring together small companies who wish to share Electronic Data Interchange (EDI) with their clients; they would become guests of a large company which would lease computer resources and access to specialized networks. Later, they would always have the possibility to bring home the necessary applications and the know-how, when possible and convenient. Such a service would give them access to international networks, but they would have to surrender to the power of professional networks.

The cost of a network breakdown

A company network is down 23 times a year, for around 5 hours each time. In a study performed by Infonetics, a large American company commented that close to $3.5 million are lost each year, with another $600,000 in loss of profit. This represents 68 times more than the average $60,000 a year spent on network maintenance. According to this study, as networks develop, so does the number of breakdowns....
(Source: 01 Informatique, October 19, 1990)

Electre is a commercial network for publishing houses and bookstores. The server "Electre Transmission" is a catalogue of constantly updated 300,000 titles. Any bookstore equipped with a Minitel terminal or a personal computer can connect, retrieve information on past orders and availabilities, and place orders at a minimum cost.. Seven hundred publishing houses are linked to the system, bearing 90% of total costs. The system is able to process rapidly an impressive amount of orders without any mistakes and as a result, orders have risen considerably, from 6,000 to 180,000 per month in 1990 alone, 70% of the total book market. A tour de force, as the world of literature is a particularly hard one to convince.

Value added services networks have become affordable even for smaller clients, sometimes spread over wide territories. Geisco Easy Claim in the United States is a perfect example. Easy Claim is a system which processes reimbursement requests for doctors. It uses Mark III, the largest teleprocessing network in the world (750 cities, 24 countries, 23 time zones, 24 hours a day, 365 days a year, with 6,000 Geisco users). It lets doctors, now teleworkers, automatically fill reimbursement requests from their office, thus eliminating errors and delays (43).

As value added services networks become more easily available, enterprises are learning how to use networks without having specialized teams, always hard to find and keep. From now on, a small business can access the global networks at a minimum cost. Operators, for their part, have to follow recommandations to ensure that business networks are able to communicate with each others. Leaving nework management to outside parties is a recent phenomenon. It means, among other things, that the relationship between companies and operators must be carefully monitored. The type of activities you will chose to give over to networks will have to be selected with great care. Dozens of value added services networks are available to small businesses, who can thus benefit from international networks, as well as the expertise of a "mentor", always ready to win extra revenue by leasing network connections or services. The Société Internationale de Télécommunications Aéronautique (SITA) has a world-wide network connecting 187 countries: over 100,000 terminals and one million indirectly, via the information centers of airline companies. In this particular case, it is hardly a question of choice: when plane accidents occur, countless messages have to be dispatched immediately, around the world. SITA also leases its formidable capacities for EDI at a very competitive price in 40 countries (44). Charles Wiseman, in his book *Strategic Computing* tells the story of Japan Airlines who, finding their automatic reservation system underused, decided to offer other reservation services: concerts, theater, and sport events, all to make their programs more profitable.

Telecommunication equipment manufacturers are trying to enter this particular market by offering integrated professional services. Using telemaintenance and

telesurveillance, Alcatel Business Systems (ABS) has created a facilities management service. Autoswitches have become very sophisticated, with software now playing an essential part. This creates two problems: traditional distribution has difficulty adapting to constantly evolving products, and clients are confronted with increasingly complex software. To rise to the challenge - and the growing number of calls for help! - Alcatel has decided to use its network to handle clients and distributors. Otherwise, the task would have proved impossible (45).

However, creating more and more versatile networks to cover larger territory is not enough. The packets that will navigate the networks still have to be standardized, in order to eventually truly eliminate paper. This means having to master the standards of electronic exchange.

Through the paper glass

Professional tribes tend to develop a technical jargon of their own, often making it difficult to share information between partners or coproducers along the value added chain. In this context, mastering the standards of electronic data exchange actually becomes a competitive advantage.

On December 30, 1990, France symbolically entered the third millennium. On that day, a new law authorized the computerization of bills. In other words, a paper bill or invoice could be replaced by an electronic one. This was a significant advance in the application of NICTs to electronic data interchange (EDI), and another step towards a new society where sign will take over matter in every sphere of economic activity.

Of course, this is still a long way ahead, and many problems mostly technical still need to be solved. The US State Department is well on its way to achievement. A study performed by the Gartner Group and sponsored by the U.S. Navy had reported that 25% of technical documents were either not up to date or inaccurate. This is literally a heavy problem: the U.S. Navy processes up to 26 tons of documents for a cruiser alone. A B1 bomber represents some 1.4 million pages. The on-board documentation for a C17 weighs 750 kg. Technical documents require 270 days on average to be fully updated, for a total annual cost of $3.5 million. White-collar workers, lacking the means or the standards for transfering data between partners (for equipment maintenance, for example), waste hours, irreparably lost, manually updating what could have been done by machine. Consequences can be dramatic: 5% to 8% of fatal accidents in the U.S Army are caused by faulty documentation (46). This is why, in 1989, the State Department decided to standardize data exchange techniques in the military, using a standard similar to EDI (EDIFACT for billing).

The Direction Générale de l'Armement, in France, has recently launched a similar program, with a view to decrease the global cost of arms systems by 20 to 40% over the next 30 to 40 years. This standardization is based on international cooperation. Breaks in the value added chain can thus be prevented. In other words, there will be no more "technological islands" unable to communicate and eventually, paper will be banished. This will allow for more flexible processing and considerable savings in maintenance and operation since equipment can vary considerably from one version to the next. This is a great competitive advantage, as the entire life of a product is suddenly made easier, from design to user's assistance. Thomson's Radar Division experienced a living hell in the 1970's in France. Among their many products sold all over the world not two were

alike! Keeping technical documents up to date without the right technology was a sheer nightmare.

In virtual enterprises, the value added chain now includes suppliers and sub-contractors. Think of the complexity in managing the 300,000 parts and plans that go into an Airbus, as well as the thousands of participants involved, with each model different from the next. Today, investing in standardized electronic data exchange has become imperative in order to make full use of expertise, knowledge, know-how, innovations and experience accumulated by a company. This plays a decisive role in cutting down production costs. Any loss of information, any coordination problem would have a considerable impact on Aérospatiale's competitive edge. Bernard Vergne explained this situation clearly in an interview with *01 Informatique*: "In a single decade, we have learned to design a plane in half the time: by 1988, we could do it in only four years." (47) To be able to dominate the competition, research and develoment need to master CAD databases. As Bernard Vergne concluded: "We are seven years ahead of the Americans".

After spending close to 20 years emphasizing office organization, specialists are finally looking at file management: an average 3% to 8% of annual turnover goes into paper (48). After many disappointing years spent in office automation, Rank Xerox changed tack in 1989, as later confirmed by general manager Bernard Fournier in 1991. For him, attempts at a paperless office have failed. We still use paper documents for 90% of our information needs. "Everyday, in Europe, workers produce a total of 4.7 billion paper documents". That's 170 billion documents in France alone, with a 10% annual growth rate. Rank Xerox France president Olivier Grouès underlined for his part the growing need for color documents and reprography, which he had expected to grow from 1.2 billion documents in 1991 to 4 billion in 1995.

The Mornay group in Paris decided to study this problem further. Mornay is a group of 13 institutions, professional or interprofessional pension funds sharing administrative tools. With 370,000 companies, 1,900,000 workers, and 720,000 retired workers, 11 billion receipts in 1989, 75% of personnel expenses came from file administration. To create a paperless office meant eliminating the cost of documents storing (4% to 7% of total management expenses) but also, and mostly, to reduce document circulation. The Mornay group receives an average10,000 letters each day. According to Pascale Buon, responsible for a project called Gestion Electronique des Dossiers (electronic filing), "an average of 15 days is needed when using the traditional route; with the new system, it will take only a day." Furthermore: "a 30% productivity gain is expected" (49). AGF, Assurances Générales de France, is fighting the same battle against paper. Using IBM's Image Plus system, the company has launched a similar experiment in electronic document management. The service keeps track of 3.5 million individuals or companies who have contracted loans from 250 different establishments. In both cases, files are scanned then indexed, and documents of no legal importance are eventually destroyed. These operations are done on local terminals linked to a central server. Only text and data are transfered, as images require a considerable investment. Heavy operations, such as scanning mail, at a rate of 1.25 pages every 30 second, require over 80 hours of work per day. Certain operations also require costly equipment, memory, networks, and structural changes: bringing together a case file made of tens of documents that have been spread around several services, sometimes originally processed by an unavailable application, adding photographs or graphs, then accessing hard-to-reach general

documentation banks... These operations limit the company's capacity to free itself from paper. Images, even virtual ones, can be extremely costly. This is why multimedia, with its brilliant future, is still a slow developing market. According to New Media Research and the Information Wordstation Group (51), multimedia is still mostly of interest to the greater public ($6.3 billion sales in 1994), who just wants to play games. Next come commercial uses, such as sales, product demonstration, and information terminals, at $4.4 billion. Documentation is right up there with commercial uses, followed by computer-assisted teaching. This, of course, is only a sketchy outlook on the world market. But even more important than the paperless office, we are reaching a transition period characterized by the impressive rise of hybrid applications: the boom of virtual documents.

The boom of virtual documents.

Virtual enterprises have to eliminate paper. This is still a long way off. Paper, in fact, will disappear only to create a new problem: the boom of virtual documents, be they multimedia or not. As companies progressively learn to master electronic file management, they will have to face costs and technical traps they had never suspected before._

As many others, the French firm Brun Passot, after deciding to fully exploit the possibilities of electronic data interchange (EDI), has found a special niche where image is still a good compromise between state-of-the-art and required investments. After Transpac, a specialized network which opened the doors of EDI, they now use ISDN to make their catalogue available for download on their clients's terminals. A good 1,000 references spread over roughly 100 pages: placing an order was never this easy (52).

Service SA, a French subsidiary of Philips, had chosen not to use EDI at first. The company sells spare parts, provides costumer service and technical advice, and takes care of all technical documents for over 20,000 distributors. In 1986, a Minitel service was installed and orders could be placed on-line. As a result, parts moved more rapidly and both stock and current assets were cut down, regional wharehouses were closed, and local distributors were served directly from a central unit. In 1990, Service SA went even further and developed a more global NICTs strategy, using the image downloading possibilities of ISDN. With more than 10,000 clients and 25 million pages sent out each day, ISDN allowed the company to cut document distribution procedures down by two months, and to multiply document production by five. ISDN can transmit text, voice, data, and images and is also used to train technical personnel and to update all the documents. Whenever a product is modified, so is the documentation. "Before ISDN, it took two months for repairmen to be notified of a modification; now it takes only a few days", according to Serge Jourdain, project manager at Service SA. Repairmen receive technical training from nine teachers who work outside Paris. They write their courses on their computers and send documents via ISDN to the main office, which forwards them after final formatting. Soon, it will be possible to consult text, images, and technical diagrams. This implies to create multimedia files stored on optical disks monitored by a central server and accessible from computers equipped with a special card (53). This type of project is quite different from those of insurance companies, who must process as fast as possible thousands of constantly rotating files. This is "fragmented" work, requiring a costly infrastructure, a problem certain companies decided to solve by creating a mixed system, using computers for current files, and

optical support systems for documentation and archives. However, files are rarely created using multimedia technology. Eram, France's foremost shoe manufacturer, offers its 6,000 products at its 14,000 sales outlets by downloading its catalogue on ISDN, complete with sound and pictures. This particular application was designed by Cap Sesa in France, who was rewarded in 1991 for this very project. Computer stations used in travel agencies in France are another example. They are currently testing the PARS system, which combines a CD-ROM on site with a software program connected with a reservation network which displays a virtual visit of the facilities. These examples represent but a fraction of the many possibilities of multimedia.

The boom of electronic files and documents, virtually available and materialized on demand, will make it harder to process them and keep track of their circulation. Only think of the number of people who will see these files pass through their... virtual hands. Certain users, still unfamiliar with databases and willing to have a file "in their image", will help in the development of a new concept, still unfamiliar to most: virtuality incarnate .

Virtuality incarnate: intelligent objects

The concept of intelligent objects came from the need to make the omnipresent and overpowering technology disappear behind new objects, discretely small but with enough "intelligence" to reduce the need for human - unqualified - intervention. The idea behind intelligent objects first arose in 1988, when Ken Sakamura officially launched a project called TRON.

"Intelligent objects have a master/slave relationship with each others and with other equipment... Each object has its own status within the communication network... There is no central authority... A pre-established program lets the device choose whether; for instance, to heat or cool down a room... Electronic controls supervise these devices... They exchange data to create a welcoming physical environment. They cooperate with each others." For example, the system controls temperature according to where lamps are placed (or moved) or lowers the t.v. or radio volume when someone is on the phone, according to the volume, the distance between the t.v. set and the phone, etc. This control of locations and distances applies to intelligent objects as well as to humans. Humans have their own idea of comfort, and specific relationships (virtual addresses) with the objects. At times, various possibilities for action are pre-programmed and classified, such as bath or room temperature for one or several people. In the eyes of its creator, TRON personalizes the environment at home or at work in an intelligent building. Every intelligent object is programmed and works in real time, without users ever having to step in, or only exceptionally. TRON renders technology as intelligent as possible, to make it as invisible as possible (54).

This type of development will lead to the incorporation of programs into virtual objects. The idea is to associate a drawing, for example, with the program that was used to create it. The drawing, a virtual object, is available anywhere on the network. When called to display on screen, it also carries along the application allowing to modify or correct it. Any change to the drawing will automatically change all its manifestations on the network. The advantages of such a system for managing files shared by multiple services is obvious. The virtual file will be reconfigured in the network at every step.

Virtuality incarnate: the electronic book

Thanks to Sony researchers, a plain 19.5 oz CD-Rom player is able to display 100,000 multimedia pages. Other attemps at "smart books" had already been made. In 1987 the Australian publisher Tom Kressider proposed a bible the size of a credit card for $50. The player and the screen were available for $250. In 1988, Scenario from Somnerville, Massachusetts, launched the Dynabook, an interactive virtual book. Such products are really an opportunity for training programs. Georges Lucas, in partnership with Apple Computer and the National Geographic have a project for historical and geographic clips available on multimedia computers.

In the United States, researchers at Xerox Parc in Palo Alto are working along these lines. They are responsible for coining the phrase "virtuality incarnate" to designate objects made intelligent by computers. First of all, they are trying to saturate the workplace with invisible (and cheap) computer power, incarnated in a series of interconnected utilities controlled by invisible infrared networks. A special i.d. badge,for example, could be used to locate employees anywhere in the company, transfer them calls, authorize access to information systems by automatically reconfiguring their work stations, check their schedules for appointments, etc. Electronic notepads could be specialized in a particular topic, storing all the information needed for a particular project. Both these ideas can be extended to create personal information charts. Thanks to the active personal badge, information on the badge wearer and the projects he or she is currently working on could be accessible.

Of course, personal environments like TRON would have to be adapted to the whims and needs of users. They could even go as far as simulating office noises, if not their occupants... Embodying an individual's personality to an object which could virtually represent him as a hologram, for example, is far from mad vision. We only need to wait a few years, a few decades.

Part five

TERTIUS ORDO: THE THIRD ORDER

"Ordinateur", the French word for "computer", invented in 1955 by Professor J. Perret of the Faculté des Lettres de Paris, comes form the words "ordination, ordiner", used in theology to refer to the pastoral duty to put the world in order.

Introduction

As technical progress accelerates, so does its spread within society. The markets are demassifying and the marketing experts have to readjust the niche concept to a global market. Productivity has moved further up the chain, away from production, a second wave industry. High value conception allows to multiply innovative products with similar production means. Markets are won by the capacity to innovate and rapidly diversify manufacturing, but only if costs can be cut down by investing in NICTs. Provided that one invests in manpower, trains employees, makes them feel a part of the whole, trusts them, makes them work together, it is the NICTs that make it all possible... and affordable. The third wave industry so dear to Alvin Tofler could never have been developed or managed without computers. Today, they give mankind the capacity and power to manage tight schedules, master a complex world, the infinitely small or the infinitely large. Ultimately, they allow us to manipulate at a low cost the essential material of the third wave: virtuality, or symbols representing reality.

NICTs are the instruments that order, structure, and give shape to the third wave. They participate in the creation of the Tertius Ordo: the Third Order. Traditions and religion were the First Order, in the age of clans, then villages, hunting and agriculture. The laws and international treaties of the Second Order have embodied the - quite relative - wisdom of industrialized nations in an effort to develop respect between individuals and nations. NICTs will be the instruments of the Third Order.

The neo-Tayloristic model is under pressure to change, while a certain type of economic growth typical of a particular stage of our evolution has reached its culmination and its limits by the end of this century. Here and there, the intellectual community, just after counting out communism, simmers with new theories on capitalism, on how to manage world resources. The considerable growth in immaterial investments over the past ten years, for example, is changing our old notions of capital performance and productivity. We are moving from a second-wave economy based on production and the accumulation of material capital, to a third-wave economy based on coproduction and the accumulation of intelligence, expertise, immaterial capital. A great upheaval in the way we act and think accompanies the progressive advent of the Tertius Ordo.

When planes broke the sound barrier, they experienced new aerodynamic forces. Design as well as controls had to be adapted. Likewise, in the world of virtual enterprises, a new way must be found to assess productivity and to organize resources. Yet the most important impact of the Third Order is found in the role of networks to

make symbols increasingly rule matter. They come with NICTs in our enterprises; to resist them is tantamount to suicide. At the same time, they upset the traditional capitalist structure and the ideas we first entertained on energy savings or national and regional development when telework first made its appearance. All these ideas finally led to the misunderstanding we referred to at the beginning of the book.

Chapter 1

Thanks to the networks, signs rule the economy

Economies which chose to invest in the immaterial, in expertise, clearly have the upper hand. The nature of investments is shifting and inverting itself, towards lighter, immaterial capital representing a total of 65% of raw capital in the United States in 1988.

Amount of immaterial investments in France

	1974	1983
Immaterial invest. / added value	3.8%	5%
Total invest. / added value	21.9%	20.3%
Immaterial invest. / physical invest.	21.2%	32.2%

Source: Crédit national

The obsolete Soviet economy, which failed to realize the crucial importance of networks to encourage immaterial capital and the exchange of expertise, imploded because it was unable to adapt to an economy controlled by signs and symbols. This does not mean that capitalism is free from criticism. The accumulation of immaterial capital does not necessarily save manpower, as expected, but it saves "heavy capital". Also, immaterial capital is still found mostly in the manufacturing sector, whereas large scale savings and added value are now the domain of marketing and trading networks. It is impossible to escape the importance of distribution channels, whether electronic or not.

Capital is supposed to be profitable. But which capital? Training? Design? Production? For many years, quite a few sectors made more money through speculating and through industrial restructuring, both sources of short-term appreciation, rather than through developing. Also, many believe that telecommunications are more benificial to the community than profitable for the operators. Is Third Order economy, or network,

virtual economy, different from second wave economy? Apparently, yes. We call it "économie d'atmosphère", "atmospheric economy", because of our incapacity to measure it with traditional accounting tools. But it certainly profits more to those who have been wise enough to develop the full potential of NICTs.

As virtual enterprises increase the number of their electronic transactions, they also save energy. After the first oil crisis, the Japanese doubled their GNP, while diminishing their energy import. Fifteen years later, Japanese production required half the energy. (1) The same has happened in France, where relative consumption of primary energy sources in agriculture experienced an 11% decrease between 1973 and 1990, while production increased by 26.7%. Thanks to NICTs, the tertiary sector will also curb its energy spendings while improving productivity.

_Without networks, "the Red Army always loses"

"The Red Army Always Loses" was the title of an article published in Saga (2) in May of 1989. A Polish General complained that the Western creators of adventure games were anticommunists. A game called "Raid over Moscow", very popular in Poland, was for him "particularly biased because it made sure that the communists could never win under any circumstance."

This simply points to the failure of Soviet economy. It has always favored hardware, or equipment, over software. The former Soviet Union did not invest in computer programs. There were no compatible NICT systems and because of their self-imposed isolation, few mastered English sufficiently to benefit from Western know-how. They did what they could, and the service sector, which could have helped reach a certain balance in this area, simply did not exist. In his book: URSS, le défi technologique, Yves Logé discusses the obstacles preventing the development of information technology and goes so far as to use the term "prohibition". (3) The technology crisis in the former USSR stemmed from three areas of interdiction.

First, there was a ban on anything which might favor social communication. To prevent information from circulating, photocopiers and computer printers were severely limited. Communication between institutions was difficult, as each one was controlled and supervised by its own authority. Exchanges were few, and rivalry intense between technical networks or channels. (4) The official stance to justify theses restrictions was that "the flow of information might be diverted". As a result, barriers never eroded and trade slowed down by lack, e.g., of efficient electronic money transfers.

Second, only a few NICT applications were selected, which limited trade and the economic factors needed for the development of the tertiary sector (banks, insurance, education, office automation, etc.).Third, the ban on free enterprise since 1928 discouraged the development of NICT applications because it effectively prevented the service sector from existing at all. Any attempt at demassification was absorbed by and rerouted to the gigantic industrial complexes of the Eastern European countries, where the collectivization of capital so dear to Stalin accumulated. Production structures were overblown in an nonexistent market. Alvin Tofler's third wave broke on the lack of structures which encourage small businesses to blossom. Planification still came before innovation. Organizations were barely able to reach any kind of independence or self-management .

Eventually, the Soviets had to turn to networks and international scientific and technical databases: the need for innovation was too great. Reaching for Western expertise, they tried to import advanced technology. This created a veritable electronic black market, reaching its climax in France in August of 1987 with the Ratier Forest affair: special equipment with extremely sophisticated software capable of reducing the radar signature of submarine propellers was diverted. However, importing innovations in no way reduces the need to revise an over-centralized industrial and economic structure. "Authorities failed to recognize to power of technology to improve communication and favor decentralization and initiative; they only saw it as a tool to improve production in a heavily centralized system", Yves Logé adds. (5)

On a more individual level, users themselves feared these instruments that could "indentify those less productive". (6) Devices which limit corruption do not necessarily please everyone... Dematerialization was neither understood nor assimilated. In one particular Soviet plant, the computer system had to be modified: each terminal was equipped with a small printer which produced a receipt for each message sent in order to ease the users' minds, according to Yves Logé.

This series of events pleased a small circle of political and economic leaders because it stopped them from having to invest in demassifying Soviet industry. In 1980, the former Soviet Union had half the computers found in Europe and, in 1982, there were 2,000 personal computers against 200,000 in France. As a result, Soviet products simple could not compete on international markets, and living standards went down.

Today, in the country of Stakhanovism, while a link has been established between innovation and NICTs, the delays and costs of change have yet to decrease. Also, the lack of communication between research, application, and production organizations seriously hinders the transfer of technology and, by the same token, the development of innovation everyone still expects. Because the spread of NICTs remained limited, as did information-related activities and services, the former USSR, lacking the right communication, coordination, and regulatory tools, wasted its resources and effectively prevented the creation of added value (0% between 1970 and 1985, less than 15% now). (7)

A dogma has fallen in socialists countries. It is now the turn of the Western economy to be caught between an impatient market looking for the immediate and constant availability of products and services, and shareholders who want fast, profitable financial cycles. It will also to have to review a few of its tenets. Networks will also modify the structure, and uses, of capital.

The future of capitalism lies in networks

In Western capitalistic economy, the extensive production of the post-war era (jobs were created with minimal investment) was encouraged by increasing demand. Large companies made better profits by large scale savings in standardized manufacturing. To save capital and improve investment profitability, days were stretched so equipment could be used for the longest possible number of hours. This helped to reduce costs per unit while increasing quantity and, by the same token, the capacity to increase sales as well.

The growing importance of information activities (50% of America's GNP at the end of the 70's according to U. Porat (8)) changed the economic landscape. The information

sector (white-collar workers) soon represented 60% of workers, "consuming", so to say, productivity from the industrial sector. As a result, since the 70's, there has been a growing tendency to save on man-power by resorting more and more to technology, which in turn requires more capital.

The ensuing economic scenario is directly related to the spread of NICTs. We can now manufacture products to order in small batches, lending greater flexibility to the entire manufacturing process. Production reaches faster profitability, particularly since more expertise has gone into creating the tools of the trade. "To build the front-wheel axle on a Renault 12, says Michel Albert, an enormous transfer machine was created ten years ago. To go from a R12 to a R18, it had to be stopped completely for three months. For the R9, however, the machine was replaced by a single robot. We simply need to change its program, saved on a cassette, to create another type of axle. This no longer takes three months, but three minutes." (9)

This situation concerns companies who had at first relocated production to cut down on man-power costs, as in the French and German textile industry, while others tried to resist by choosing added value right from the start, as with shoemakers Etablissements Bidegain. This French company, with its staff of 400 established in Pau, creates 300 new models every year, for a total of 1.6 million pairs of shoes. Rather than relocating production abroad, they decided to automate it as much as possible. In 1983, Bidegain was the first company in the world to use Microdynamics' CAD/CAP system. In 1991, they inaugurated the first integrated high-precision water-jet cutting worskhop in the world, for mass production. By eliminating the bottlenecks of the old manufacturing processes, the company also registered a 4% gain in raw material, since the system also optimizes the disposition of the pieces to be cut. In this case, NICTs were used mostly to improve manufacturing efficiency. The accumulation of hard (material) and soft (immaterial) capital was concentrated locally.

There are two consequences to this search for added value. The first, apparently well-known, has to do with the increase in immaterial investments, mostly software, needed to design and manufacture new products. These immaterial investments will lead to capital savings. The second, perhaps less obvious, had to do with the synergy between networks and investment profitability, like ensuring that a computer or fax network reaches its critical mass. This must be understood if we are to appreciate just how profitable computers are to virtual, "network" enterprises.

Traditionally, immaterial investments are still in the shadow of hard, material investments. Sometimes referred to as "intellectual investments", since they include training, research and development, studies, engineering, publicity, software, marketing, and distribution, they are generally considered a current expense. These cumulated expenses can at times be higher than immaterial investments. According to the center for statistical studies of the Ministère de l'Industrie, in a 1991 study (10), expenses are shifting world-wide towards greater immaterial investments. Japan has the highest growth rate, while France is still performing poorly, except in the software sector. Still, the trend is irresistible: in 1974, for each franc invested, 82.5 centimes were assigned to material investments and 17.5 centimes to immaterial investments. In 1988, for each franc, material investments represented 71.1 centimes while immaterial investments had risen to 28.39 centimes, a 62% increase. Immaterial economy is taking the lead.

In France, the rate of physical investments decreased from 18% of added value in 1974 to roughly 15% between 1984 and 1986, then rose again to 15.9% in 1987 and 16.7% in 1988. At the same time, immaterial investments rose from 21.1% of fixed capital to close to 40% in 1987. Immaterial investments continue to grow faster than material investments, except for 1988. Yet while growing steadily, immaterial investments still only represent 31% in France against 65% in the United States. At first, these investments were expected to translate as man-power savings only. This led to important investments in computers, in France and elsewhere (for example, between 1980 and 1985, the most important variation in fixed costs was in computer expenses, at +67.8%, rising from 0.87% to 1.65% of turnover between 1978 and 1986). Yet these purported man-power savings have yet to be proved: along with technology came a growing need for highly-skilled and knowledgeable workers. The job market is indeed changing, but by shifting towards more qualified and more costly man-power, and progessively "saving" low-skilled jobs. Gunnar Eliason, of the Industrial Institute for Economic & Social Research in Stockholm, (11) has in this respect a very interesting theory.

For him, the technical shift towards NICTs was at first not an attempt to save, not man-power, but rather "hard" capital: machines, buildings, stock. We can easily see the advantages of such an analysis: "extra-soft" capital, thanks to networks, saves capital. After reminding us that our industry, based on manufacturing performance, has become an industrial organization based on the increase of added value through lower costs, he goes on to illustrate another of his highly original ideas: the importance of large scale savings in the manufacturing process is decreasing; rather, we are looking for large scale savings in the marketing, distribution, and financial sectors. Gunnar Eliason makes a distinction between immaterial investments in localized manufacturing and research and development, and in externalized or outsourced activities, "outside the world of manufacturing and far from plants and industrial equipment." (12)

To summarize, we could say that companies with a high density of material (and now, immaterial) capital survive thanks to their effective control of manufacturing costs, though they risk to be easily imitated, especially by newly industrialized countries. G. Eliason reminds us that Swedish manufacturing industries who relied mostly on manufacturing greatly suffered during the oil crisis in the 70's. According to his study, only the companies which invested in research and development and new products, as well as in marketing and distribution channels, were able to survive the 70's relatively unscathed. Immaterial investments in the manufacturing sector helped to create better products but also to restructure the economy around marketing and trading activities, around foreign networks. According to a report by the Industrial Institute for Economic & Social Research in 1984, of the 37 largest Swedish groups, listed according to their numbers abroad, the percentage of investments made in 1978, for their foreign subsidiaries alone, was divided as such: 6% in research and development, 42% in machines and real-estate, and 52% for marketing and distribution. This sector represents 40% of the workers, with 58% of salaries assigned to transformation and 2% to research and development.

When we also include Swedish establishments, the numbers for these same 37 groups change to 21% for research and development, 52% for machines and real-estate, and 27% for marketing and distribution. Improving general productivity is dependent on

how NICTs are used to coordinate research and development and distribution channels, which accelerate product flow and thus help to save further capital.

From this point of view, it would be interesting to study the division of immaterial investments in Japan. There is a strong chance that investments in foreign distribution networks are considerably higher than in many European countries, including France.

The evolutions of immaterial investments in France (%)

	1974	1988
R&D/Material investment	8	12.1
Patents and permits/Mat. inv.	1	2
Training/Mat. inv.	2.5	4
Publicity/Mat. inv.	5.8	9.1
Software/Mat. inv.	3.2	11
Foreign trade/Mat. inv.	0.5	0.5

Source: Chiffres Clés de l'industrie, Dunod, 1991

The success of an enterprise now depends largely on its capacity to reach international markets through networks and to avoid isolating itself in a plant filled with white-collar workers, no matter the cost of immaterial investments. As we reach the end of a century, added value, not work, is delocalized. If investments are obstinately centered on a company's production equipment, any neo-Tayloristic protectionist move will simply nullify them. Added value is also found in networks. We live with an almost exagerated example of this every day: simply think of how immaterial investments can give a brand its market value. A brand can become so prestigious, its value so high, that manufacturing productivity is almost secondary. Distribution and communication networks further help in its commercial success.

By concentrating itself on networks, immaterial capital makes knowledge more profitable, and makes access to knowledge cheaper, thus increasing clientele, especially when it is possible to pay per use. We are still talking about large scale savings, though no longer in manufacturing, but in distribution, and the electronic exchange of knowledge Gunnar Eliason described. Immaterial capital can also be disorienting: it works like a "tontine"* . Why? Because an information system is fed by the initiative of individuals working for the good of the whole. The priceless accumulation of experience and expertise creates a new kind of capital in the value added chain. Every company member can connect to the network and take his or her share of the "pension" the group has helped create. This is why so many feel that it is impossible to realize just how profitable computers really are based on tenets of the second wave, capitalistic economy. "It is impossible to calculate return on investment for a terminal", says Gérard Ducoulombier, computer department manager at la Redoute. "The only thing I can say is that, if we didn't have this information, our competitors could wipe us out" (13).

* Tontine: Association of persons who set their capital (here, knowledge) in common in order to benefit from its profits. When a member dies, his share of the profits is split among the survivors.

The Union Européenne of Radio-diffusion (UER) is a good example of this capacity to organize a "tontine" through NICTs. They have created a virtual network well-known to the general public, Eurovison, which adapts according to circumstance. The UER has created a news program and image exchange in Geneva. A service called EVN (Echange Video News) stores images from editorial offices around the world and is available to t.v. stations 24 hours a day. Early each the morning, preliminary radio exchanges identify which news programs need which images for the day's broadcast. As soon as production meetings have been held, journalists know which images they will need from the service, and which one they will be able to supply to EVN. Everyday, at 11 a.m., an audioconference meeting is held between international members of the UER network (around 30 in all). Each in turn will place an order with the editorial staff and offer the topics is has available for others. By noon, the subjects selected by the various partners will be sent as is in the EVN offices found around the world. Another visioconference is held at 4 pm for the evening broadcasts. And so on, every day, every night...

Networks improve capital profitability i

In 1982, Gretel, a Strasburg firm, Télem in Nantes, and Claire in Grenoble grouped different services: press, associations, administration, mail-order sales, etc. In other words, though NICTs can be used to make the work day longer and thus fully exploit company equipment, they can also be used to split expenses by shared ownership.AGAT, Administration et Gestion des Agents Territoriaux, is a databank which serves employees in the personnel department of local administrations. They offer administrative assistance, job exchange, legal information related to personnel, and job postings, but also individualized employee management, to the départements of Essone, Val-d'Oise, and Yvelines. This sharing of resources to create a pool of expertise is a form of economic telemanagement which improves investment profitability.

Networks create an "atmospheric economy"

Networks create "atmospheric economy"Liberal economics, with its grounding in well-ordered accounts from another era, fails to grasp the profound economic mutations our world is undergoing under the influence of NICTs, of networks. Nevertheless, we can still expect that the Third Order will eventually lead to the creation of practical business models that will allow us to evaluate return on immaterial investments. For this, they will have to consider "atmospheric economy".

In a hard-line liberal economy, railway company executives would never hesitate to interrupt service on an unprofitable line by arguing that shareholders would be unable to support a loss. The possible catastrophic consequences on local economy, particulary if the region is already experiencing difficulties, would matter little. When communication networks are concerned, be they physical or not, two economic laws come into play, confronting each other: the law of private carriers, who refuses to continue operations, using cost and a weak local market as arguments, and another law which, politically, recognizes communication channels to be a good way to develop a region's economic potential. In the "liberal" system, the "capitalist" controlling the network, and by the same token, the local economy, is most likely to win the battle. This "capitalist" will

easily forget that companies tend to thrive when the entire community takes charge of its infrastructure, training the elite, and the services essential to its success.

What happens when this dangerous economic philosophy takes a hold of government employees? When they question the very profitability of important telematics programs, such as Télétel in France? Of course, both investments and stakes are considerable, and we could understand concern over irregular accounting, for example, or how markets are transfered, but profitability? Renault and EDF lost $3.4 billion between 1983 and 1984, (14) considerably more than the entire Télétel program. Did they worry? Télétel only reached operational balance in 1989; return on investment was expected by 1995, that is 15 years after its launch. But this is actually besides the point. How could we ignore the economic potential of the project simply because the operator was not yet profitable under the tenets of anglo-saxon "liberal orthodoxy"?

In 1986, Videotex Magazine evaluated the economic fallout of activities directly related to Minitel* at 700 to $900 million, no to mention 12,000 jobs (15). In 1987, Médias, a French monthly, counted 2,700 service editors and "service centers". That same year, the Office d'Annonce (ODA) made $21 million with their publicity on the electronic phonebook (16) and Le Parisien Libéré and Le Nouvel Observateur split $30 million in profits from their Minitel issues. This is only a very small, tiny in fact, survey of the economic effects of Minitel. What would the 12,660 teleservice promoters surveyed in 1990 by France-Télécom say? "That Minitel helped us multiply our clientele by three, if not four", says Irene Savignon, telematics service manager at INPI (Institut National de la Propriété Industrielle). (17) A recent study by Tersud and sponsored by the CNET (Centre National d'Etudes des Télécommunications) established that 65% of small businesses surveyed considered telematics profitable, while only 7% disagreed. (18)

Liberal economy is essentially concerned with profit gains from the sale and maintenance of products or services. Nevertheless, economists hesitate to quantify the economic impact of certain services or information. We know, for example, that using the telephone generates globally more indirect profit for the community than its commercialization. As this impact is difficult to define and quantify, especially when NICTs are involved, they have been named "atmospheric economy". As we have already seen, this type of economy is most profitable when a community is well-connected to various networks.

There is a constant debate to find out if networks carry the economy forward, or if the economy is in fact carrying the networks. We know that the second proposition is more easily proven than the first, especially when critical mass comes into play. The centripetal effect is once again at work (see chart below). This means communication channels between important economic centers are multiplied, as was the case in the transport sector. This is what most operators strive for.

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* The turnover of videotex activities:
- Hardware sales: 23%
- Software sales: 20%
- Services, consultancy, training, development: 40%
- Traffic managment: 17%

Source: (France Télécom, *La Lettre de Télétel*, 2nd quarter of1990)

Furthermore, thanks to the structure of networks, we can attract new economic activities, but only by offering special advantages, as with off-shore.

Private firms are always on the lookout for easy profit, but will the community also be ready to invest in atmospheric economy, when its representatives, like private companies, dream of profitability? This is a difficult question, particularly as attempts at an answer frequently forget to take into account a curious phenomenon. As we resort to telecommunications, the interdependence of economic factors becomes apparent: the lesser the supply (in telecommunications, that is), the lesser the demand; in other words, supply creates demand. At first, there is no aggregate effect and social and economic players do not reach critical mass. The accumulation of individual transactions brings this phenomenon to its climax, the "avalanche effect", at which point it simply feeds off of itself and becomes, finally, profitable!Some people are becoming aware of this economic phenomenon. In order to reach this level of profitability sooner, communication systems will have to cooperate rather than compete; they must interconnect in order to offer greater versatility, rather than specialize.

The spatial structure of the network society reinforces the dominant positions of the world's largest metropolis, our greates economic centers

While telecommunications might not generate profit directly, they are still a necessary factor. Not enough in themselves, but necessary. Structuring a territory around networks is still a poorly understood form of urban development. "A shopping center can literally die two hundred meters from where pedestrians are walking", says a shopping-mall specialist. Forty percent of computers in France are found in the Ile-de-France region, as well as 26% of Transpac connections, and 45% of Transfix connections, according to the April 1990 issue of Le Monde Informatique, who also sees a relationship between equipment density and economic activity. Ile-de-France represents 2.2% of French territory, 18.5% of population (20.3% of France-Télécom clients, 86.5% of which are residential), 27% of the economy (26.7% of trade consumption, 49.7% by professionals), 80% of head-offices for large companies (50% of telex traffic), 40% of banking jobs, 60% of research and development, and 38% of French executives.

But in Europe, the situation is similar

The chart below outlines the proportion of terminals for national networks in the most important economic region in 1989: only Germany, at 10%, is still showing its great capacity to regionalize its economy, while Dublin attracts almost 3/4 of the country's economy.

	Region with the highest percentage of terminals	Percentage of national total
France	Ile-de-France	43%
Belgium	Brussells	48%
Denmark	Copenhagen	37%
Germany	Dusseldorf	10%
Ireland	Dublin	79%
United Kingdom	London	43%
The Netherlands	Amsterdam	25%
Italy	Lombardy	30%
Greece	Attica (Athens)	93%

Source: Eurodata. Data Communication in Western Europe in the 1980's, as quoted in STI, April 5 1989, OECD

Cooperation first. Speaking of public transport, in the Parisian area for example, everyone agrees that services must complement each other (bus, subway, etc.). Each transportation mode must interconnect with the others to form a network, after years of working side by side. There are projects to connect the TGV (Train Grande Vitesse) with the Réseaux Express Régionaux (RER, a train service between the city and the suburbs), but also with air transport, as is the case with the TGV Est and Roissy-Charles-de-Gaulle airport north of Paris. "It is no longer a question of competition, but rather of synergy between various high-speed transportation modes", according to Jean-Pierre Beysson, general manager for Paris Airports. (19) Even the most important telecommunication networks, such as the American EMS and the French Chronopost, experiment with interconnection. (20) In time, mail will be shipped to its destination thanks to the collaborative efforts of postal networks around the world.

Who could possibly refuse to use these networks? Who also could use poor performance as an excuse to cut off a particular region from the world of networks, thus running the risk of ruining the region's economy? Unless perhaps they then leave room for other adapted means, as was the case with railway: feeling more and more like a private service due to the constraints imposed by public service obligations, railway is giving way to road transportation. This interconnection has made French railway the first national road carrier, a little known fact, through various subsidiaries such as Sernam, Stva, Sceta, and Calberson. (21) Once again, we must learn to interconnect networks well-adapted to a region's economic development.

We also have to encourage versatility. For example, little post offices in rural areas can cost postal services a great deal of money. Should they be closed? No, according to senator Delfau in France, who wants to stop the population drain in rural areas. In his 1990 report, he concludes by saying that rather, we must try to develop their versatility. Without this, regions most deprived of services will find their economy literally leaving them. On top of their regular services, these post offices could offer various administrative services (car registration, fiscal stamps, etc.) as well as some home services, with more hands-on activities in the region, thus avoiding the monotony often associated with postal work. "Will the post office become the anti-SNCF by preserving its invaluable network?" asks François Vayse, journalist for Le Monde. (22)

Senator Delfau's idea has been put to good use in the "telecottages" of Norway, Sweden, and Finland, and DATAR in France is trying to develop this further with multimedia centers. Will the "electronic trade posts" of the third order, the creators of "atmospheric economy", be financed by public authorities, thus bringing cities and villages up to 21st century technical (and economic) standards? Or will they remain, as was written in a 1978 Unesco report, places where: "Man today is, and will probably remain for years to come, not the controlling force behind communications, but a passive target for messages, an object for communications and a simple consumer of information products he never helped to create"? (23)

Another hope raised by our reflections on the impact of telework at the beginning of the 1970's: NICTs will play an increasing role in energy consumption.

"Virtual slaves" will save energy

"We must stop having to move 80 kg every time we move a single datum", Dr. Paul Pilichowski complains. According to this heart and chest surgeon, "developing home care through telematics means saving hospital beds". Rather than forcing a patient to come to a rehabilitation center everyday for a simple check-up, he suggests we could link the patient to a Physio-tel telematics system. (24). Physio-tel lets physicians create, adapt, and control remotely a personalized cardiac rehabilitation program, complete with an exercise bike and sensors attached to the patient as he gets ready for his workout. The patient can see his heart rate on a screen, and adjust his pace according to his program. This system could save both energy and money, but is still not recognized by medical insurance.

Contrary to most suggestions to improve the flow of traffic on our roads, we now simply transport sign rather than matter, whenever possible. Sign is pushing its advantages over the machines of the industrial age.Machines have always been used to expand our limited physical possibilities. Mechanical devices filled with energy were

our first means to help us survive and defend ourselves, and eventually to facilitate production.

These machines helped us save our human energy, just about the equivalent of a 75 watt light-bulb. In reality, says Alain Cotta in his book: *"L'Homme au travail"* (25), "the human body simply contains the brain, but the brain protects a body with very limited possibilities". Our brains continued to invent and, thanks to technology, maximize the roughly 95% of human energy we spend in our normal physical activities. Laziness makes you smart, our elders believed: this power of invention created a mass of progressive energy available through machines. Since the start of the industrial revolution, this accumulated stock, quantified as energy, grew an average 2% per year. Still according to Alain Cotta, with references to H. Angles d'Auriac and P. Verhoye on the one hand and to Fristh on the other (26), this stock "doubles every 36 years, so that today, we each have access to 35 times our energy through artificial means." According to the level of this accumulation, "the American citizen has 100 to 110 slaves [...] while a Central African only has 2 or 3."

For Ivan Illich, this "accumulation of energy" is a scandal. In his book *"Energie et Equité",* he explains that rich countries are harming poor countries by selling them their products, thus destroying the local economy, and are also causing a rise in energy costs that is reaching uncomfortable heights. In fact, energy resources are becoming even less accessible to poorer countries, not to mention the fact that these countries also end up with imported industrial waste. For Ivan Illich, the growth in energy consumption is harming developing countries, who are penalized to ensure their goods and personnel circulate properly. Americans, who use close to 25% of world energy, have more energy available to them than India or China together. Increased mobility and a wider range of influence come only with a costly accumulation of mechanical, material energy available to only 0.5% of the American population. He goes on to say that this new inequality eventually backfires, when circulation becomes so intense that is slows down to a walking pace.

Alain Cotta, however, writes that, while we are in fact in the information age, 90% of these "slaves" are only mechanical extensions, aimed at making up for our physical weakness, and only 10% are used for the senses and for information processing. Yet this distinction between energy used for physical or information purposes should also take into account the human energy we save when we step from the material into the immaterial world. If we could study the power of this virtual world, manipulated by our fingertips, the 10% in question should lead to a considerable amount of immaterial energy, very different from the accumulation of material energy, which it also happens to save. Sending your image in space in one second through NICTs saves time, energy, and money.

In France, in 1978, total energy consumption for telecommunications amounted to 0.2% of national consumption. (27) In 1973, transport (both goods and people) represented 21.3% of total energy consumption. For all that, the West could never have continued to grow without somewhat limiting its basic energy consumption. Energy performance has become a significant economic index for the Third Order. For example, Poland is among the first 18 producers of electricity, yet only ranks 28th in GNP, its industry being rather outdated and not competitive enough. France, however, produces 1.32 times more electricity, while its GNP is 13 times greater than that of

Poland. Eastern European countries have also produced 1.33 more electricity than the 12 countries of the European Economic Community. (28)

All sectors are reducing their energy consumption somewhat while production remains progressive. For example, production increased by 84% between 1980 and 1989, while energy consumption did not even grow 10% between 1985 and 1990, according to the Observatoire de l'Energie. Of course, for lack of proper statistics, we can only call this a trend. However, we can say that the major part of energy consumption is in the transport and the tertiary/residentials sectors. It rose from 59.8% to 68.8% of total consumption between 1973 and 1990.

Energy consumption in the tertiary and transport sectors should be further affected noticeably by the spread of NICTs. However, it is still difficult to isolate the effects of NICTs on production according to each sector. While the price of oil can double, costing transport more than 15%, telecommunications only have to deal with a 1.2% growth. Michel Albert goes on to say that: "While the price of oil was multiplied by 15 between 19870 and 1980, computer memory was divided by a thousand". (29) In the war between oil and brain power, "virtual slaves" have already won. Developing countries can encourage the circulation of ideas, of teaching, of services at a lesser cost, with less capital, while rich countries consume relatively less basic energy thanks to NICT applications which limit the rise of energy costs.

For Ivan Illitch, "speed only concentrated energy on people's butt". By travelling differently, white-collar workers, now electronic nomads, contribute to improving how energy is exploited in the tertiary sector. We are miles away from the time when telework was vainly thought of as a solution to energy consumption because it could help cut down on traffic. The increase in production (added value) and the decrease in the relative consumption of energy should in all probability continue to intensify in all sectors, and NICT applications have modified our demand for more energy in the tertiary sector. This is less the result of eliminating the need for physically moving people from one place to another, than a way to respond to new needs, as was pointed out by the Université du Quèbec in a now fairly old study on teleconferencing. (30) Our growing mastery of interdependent economic factors, the networks of the Third Order, in cooperation with the simulation tools of virtual enterprises, will mean that the 21st century will waste less energy, less raw material, less capital... and less human resources.

The costs of physical transport and telepresence (in Francs)

	France		Europe		USA
	Lyon	Marseilles	London	Barcelona	New York
One hour in two locations, whatever the number of people					
VISIOCONFERENCING					
128 Kbits					
120 hours/month	3,000	3,000	3,300	3,300	4,200
240 hours/month	1,800	1,800	2,100	2,100	3,000
2 Mbits					
120 hours/month	3,000	3,000	6,500	6,500	10,400
240 hours/month	2,500	2,500	5,900	5,900	9,800
One hour in one location for one person					
LOCOMOTION (Go and back)					
Trip by train	700	1,100			
Including time spent	2,700	5,000			
Trip by plane		1,500	2,300	3,700	14,450
Including time spent		3,500	4,300	5,700	18,200
One hour spread in the world, whatever the number of locations and people, per person					
AUDIOCONFERENCING					
120 hours/month	1,100	1,100	1,200		1,500

Remarks:

- Analyse performed in august of 1990. A future fall in telecommunications prices and electronic investments must be considered.
- Malfunctions caused by the weather or by strikes are not taken into account, nor the fatigue due to traveling.
- In visioconferencing, 2Mbits speed seems to be more interesting, but the longer the distance, the more profitable, compared to plane.
- The high, injustified, prices of France-Europe, France-USA communications hamper the global integration of Europe.

Abouts costs:

- The three tools surveyed don't answer the same situations, and are therefore more complementary than rivals
- Train fast becomes more expensive than the plane because of the time lost. But lets consider that modern trains, such as the TGV, are becoming more and more comfortable as work-places.
- The daily individual cost is set at 4000 Francs for an executive

By Bernard Corbineau, consultant

Chapter two

Future productivity: John Von Neumann meets Norbert Wiener

In 1945, John Neumann became known as the inventor of the modern computer. A models specialist, Von Neumann simulated and calculated physical phenomena thanks to super-fast calculators. He also worked on creating models for nuclear explosions. A true trend-setter, he was to be a major influence on how we design machines, and most particularly on mathematical formulas about the rational treatment of information.

In 1936, a young and talented American mathematician, Claude Shannon, developed the binary code. By 1938, John Atanasoff had put it to good use by applying it to a prototype computer, following the Boolean theory which had originally inspired the binary code. At the same time, at the other end of the United States, Stibitz was creating the first teleprinter for the Bell Company. Norbert Wiener, meanwhile, was studying the workings of the nervous system, applying his findings to his theory on feedback and reflexes.

Everything separated Von Neumann and Wiener: their political ideas, their views on the influence of science, and even their approach to what would become computer sciences. For John Von Neumann, computer sciences were the key to faster calculations, and he concentrated his efforts on breaking the speed limit, so to speak. Norbert Wiener, his ardent adversary, the father of the cybernetics, felt for his part that the power to calculate would become useful only if machines could be made to communicate. Von Neumann wanted to build a model for an artificial mind, while the father of cybernetics wanted to develop the computer's capacity to communicate and interact. For him, as for Shannon, humans are a complete information and communication system. They have the highly-developed faculty to create abstract images of the real world and to organize their actions around these images. (31) We could say that, in a way, Norbert Wiener is the father of virtuality. Machines simply do not have these faculties. Von Neumann expected machines involved in predictive calculation - he invented game theory - to be fully-grown "adults" once they are programmed, the program giving them an "innate" sense of how to perform their tasks. For Wiener, machines are ignorant and must learn through experience, through trial and error. This is how they gather knowledge. (32)

For example, on the subject of weather predictions, while the one feels we must go beyond the limits of our usual equations to describe the dynamics of air displacement, the other would attempt rather to work with those equations by adding the statistical data of past meteorological events. Von Neumann favors speed and power, but Wiener analyses the action or the retroaction (the feedback) between two or more phenomena. This conflict between scientific, economic, and even social ideas never dies. Physicists were once divided between Cartesians who observed and broke down the infinitely small or infinitely large by searching for the logical cause behind their structure, and those, still only a few at the beginning of the century, who were interested in interaction, and who acted on and around matter.

We have only recently realized that we have been unable to give robots a sufficient "innate" sense of what they were to do. Robots need to process their environment before every action; this requires heavy equipment, which considerably slows them down. One researcher decided to make robots which somewhat behaved like insects, not very intelligent but able to perceive their immediate surroundings and acquire reflexes, enabling them to effectively move about. The result? The robots go forward, meet obstacles, and circumvent them, as easily as an insect. However, they are incapable of imagining their environment and to interpret it correctly in order to give their actions clearer purpose.

A car or bus driver, an airplane pilot, use their senses and the processsing in their brains of hundres of informations to imagine the situation of their vehicle in space with respect to their expected trajectories. When we look at how smoothly a bus driver navigates through heavy traffic, we also witness how we use a representation of our environment in our mind's eye in order to select our actions.

Consequently, a computer's processing speed is of real interest only when associated with an ability to perceive changes in the environment, first close at hand, then, through the help of networks, anywhere in the world. In other words, intelligence, so dear to Von Neumann, is not be enough if not complemented by an ability to learn, to communicate, and to exchange... which is what Norbert Wiener was looking for. Virtual enterprises, by tapping into the immense power of networks to calculate and communicate, particularly value-added networks, will contribute to the elaboration of a gigantic, cybernetic artefact*, a cortex around our planet, to quote Alvin Tofler, who managed to reconcile the two scientists years after their deaths. This is the same virtual layer we have previously discussed, to illustrate the symbiotic effects of the dematerialization of human activities

This immaterial structure weaving its way around our organizations will help us redefine how we share and divide our common resources, particularly between businesses. The Third Order will hit apparently disorganized, dispersed systems, who in fact will increasingly be dependent on each others.

Mastering complexity: a sign of performance.

The demassification that came with the Third Wave only restored the visibility of Man to lose him again in a world of complexity. Since our time has become fragmented and is no longer synchronised with that of our partners, mastering complexity and

* Artefact or artifact (virtual), artis factum - the fact of art - an artificial man-made phenomenon.

coordination have become major priorities, the key for performance in our modern, Third Order organizations. When personnel and resources are poorly managed in the course of a project or economic activity, intermittent, at times even haphazard interventions start to increase, causing costs to skyrocket, a sure sign that all control has been lost.

Without NICTs, an organization would rapidly become saturated, incapable of reactivity, in other words productivity in an impatient market. Mastering time in an economic way becomes a competitive advantage. When Sari, after moving to the Quartier de la Défense in Paris, began building a new CNIT, completion was planned for the following year. Back at company headquaters, two IBM computers processed all data from the CAD Cadam system in order to keep the proposed blueprints up to date. Around one hundred and fifty companies participated in the project, each using a work station connected via ISDN, in order to keep track of all modifications in real time. Computers were used on the construction site to register changes or to update the technical data. This approach facilitated communication between offices and building site, and the official deadline was met. (33)

As companies are forced to perform at increasing speeds, keeping control manually could become impossible for certain companies, or at least could penalize those whose market demands immediate reaction. The Nouvelles Messageries de la Presse Parisienne (NMPP), the most important press distribution company in France, was particularly preoccupied by this situation. In 1989, they distributed 27 million newspapers; hardly surprising, then, to find some errors. Reimbursement requests from suppliers amounted to about 60 million francs a year. NMPP used to hire a host of people to process these requests, which sometimes measured to dozens of meters in computers listings. An intelligent software, Megara, was installed. This software now controls and coordinates both reimbursement requests and errors in fifteen minutes, with more effective results than the manual control formerly imposed on NMPP agents (34).

Mastering complex operations means optimizing the human and material resources available in a given organization. Coordinating isolated workers or groups is really the most common task of our professional life. Today, however, even organizing a simple meeting requires nerves of steel. Never have people moved so much, been so busy, absent, not ready, not sure, pressed for time... It is estimated that one out of ten phone calls is actually productive. In our increasingly complex organizations, the time we take for coordination alone is enormous. Some secretaries are no longer involved in productive tasks such as shorthand and typing; they spend their time coordinating people, scheduling meetings, preparing them, checking who can be present, choosing a room, planning trips, organizing transportation, preparing material for the meeting, typing up the agenda and the minutes, making confirmation calls, handling call-backs, etc. This phenomenon will continue to expand as companies resort more and more to team work.

There are still no specialized studies on coordination tasks and costs. Planning a meeting: finding a room and the right equipment, calling and trying to find a date to fit everyone's schedule, etc. This process has become so drawn out, so complex that it is now an argument for setting up telemeetings or teleconferences. By cutting down on the travelling expenses needed to physically bring together executives spread all over the

globe, we can set up urgent telemeetings at lunch or at diner, thus increasing our reaction time. Failing this, planning a meeting can take anywhere from 10 to 15 days.

Computer-assisted planning

On Technology's Meeting Maker software can be used to automatically set up meetings. Someone gives instructions to the computer to set up a meeting; the computer will then consult the participants' electronic agendas to confirm or propose a date according to availability.
(Source: Pour la Science no. 169-nov. 1991).

Coordinating resources is now a strategy for profit: Hertz France experienced various difficulties when trying to optimize vehicle use. Cars must reach maximum use before being sold, six months after their purchase. Making dozens of calls in order to locate a particular vehicle, out of the company's 1500, simply made no sense. A database was created. Updated at each step of the way, it allows Hertz to control allotment and use. All Hertz agencies and car dealers in France can keep track of each and every one of their wehicles at all times. This application, which has now spread all across France, prevents cars from being left unused.

Mastering complex procedures was traditionally left to junior management. With NICTs, we can cut management costs while improving reaction time. These same NICTs will also have other consequences. For example, the reduction of operation costs gives room for smaller structures to become profitable. Large scale savings... are changing their scale, much like international radio or press correspondent networks, who divide their costs between several operators - one alone would be unable to absorb the enormous fixed costs associated with these networks. Today, a local radio station can even benefit from a reporter on the other side of the world at very little cost.

We know that coordination costs and system breakdowns increase each time activities are outsourced or decentralized - even more so when participants are many and spread world-wide. This is a problem familiar to transport, particularly mass transport, where a deficit soon occurs if clientele is too sparse. A headache, to be sure, but one that can be cured. Taxitub, a French firm, installed a voice mail reservation system. It works like a type of collective taxi, following a regular route, stopping on request. The firm can thus service neighborhoods where demand is too low for regular bus services. Clients phone in their reservations and Taxitub sends one or more cars to the appropriate stops, according to need. Saint-Brieuc experimented with 15 different routes. This service could never have existed without the coordination possibilities of NICTs. The BHV in Paris, for their part, tried installing radio-phones in their vehicles. Drivers could phone clients and let them know they were coming, thus adapting to their schedules and helping to cut down the number of returns and unnecessary trips.

Another consequence of complexity mastered through NICTs: we can react faster by automating services, in a sense creating a company that never sleeps. Proper reaction time is the key to an efficient system. In the world of networks, excessive reactivity can cause damage equal to the crash of the Fall of 1989, when world trade dropped by 12 billions francs within a few days.

We can easily imagine the consequences a similar incident could have in a highly stratified structure, even one with a high-performance communication system.

Interventions of all types would eventually accumulate, soon creating a veritable avalanche that would saturate ordinary networks, slowing the decision process down to a halt. *Risk management* is particularly interested in preventing this kind of catastrophe, often the result of apparently minor problems left to accumulate. System reliability, of course, is always a priority, but the capacity to react to incidents is just as vital. EDF was careful to address this question by joining forces with TIS, a voice-mail service run by company president Bruno Leclerc du Sablon. TIS helped EDF install an automatic emergency calling device which never saturates personnel or the telecommunications system in place. France Télécom has a similar service for network surveillance, combining Minitel, telex, and telephone lines. The system can identify multiple incidents as well as major malfunctions in any telecommunications network.

This type of device, and this type of teleservice - surveillance, tracing stolen cards or checks - are typically Third Order, made possible only with the help of NICTs. In fact, NICTs give even the most modest of consumers at least a feeling of real economic power. Consumers are once again visible and profitable, thanks to this virtual brain communication networks have helped to build.

> *Alpha Taxi in Paris has installed a small computer in each of its cars in order to help drivers reach their clients as fast as possible. A central computer keeps track of everyone's position and dispatches whoever is closest to a particular caller. Specific requests can also be processed in this way. Work is thus better distributed among the drivers, and coordination is much improved.*

High-tech strategy

During the Gulf war a few years ago, electronic war made its memorable appearance, clearly showing how superior it could be. The entire press, written, televised, or on radio, cheered on as invisible planes, electronic decoys, night vision, and high-precision laser weapons proved their mettle. Yet, while General Schwarzkopf was generously congratulated for his expert strategic efforts throughout the war, something was left unsaid: entire days were spent simulating possible scenarios on NORAD computers in Colorado Springs and in other sites (NATO, for example). In order to elaborate a strategy, simulating battles, "high-tech strategy", no matter how experienced or shrewd the General, has become a necessity. Modern engines are too fast, units too mobile, and battles shift too quickly for a single human brain, no matter how brilliant, to process it all and react accordingly. Extremely powerful machines are asked to interpret various scenarios in order to prepare for any outcome. NATO uses ROSS, an object-oriented language. Each piece of equipment, each site, each mobile unit, each tank, all artillery, each plane, helicopter or infantry troup virtually exists with all its characteristics within the computer. As in reality, the "objects" interact and exchange messages. The Rand Strategy Assessment (RSAD) simulators even consider electronic countermeasures, as well as particular aspects of the terrain which could help the pseudo-equipment or pseudo-battalions find cover. American officers who train with the RSAD can control up to 400 individual ground-air-sea elements thanks to the computer. The RASD is so complete that all it needs is a scenario or a decision in order to display how events would unfold on the battlefield. (35) Controlling multiple events and remote management is now a reality for AT&T, EDS, or even EDF-type network operators. All

must dream of one day owning the giant screens used for war games to stay informed of the state of their networks in real time. These examples of the possibilities of high-tech strategy are still rare, but they show promise. The ultimate goal is to find a way to continuously process a rapid flow of information and quickly adapt our course of action as situations evolve and strategic and tactical modifications are required. Management reports are certainly strategic, but can they be considered high-tech? The military, it seems, understand strategic control, which necessitates split-second reaction time - if we only could predict events better than our industries.

With the right power and speed, computers outside the military can simulate car crashes or tension on a plane's wings, but fall short of evaluating how changes to a particular model will perform on the market. Management reports are resolutely focused on yesterday's performance, and management still tries to rationalize the perennial uncertainty that rears its ugly head at every year-end budget.

To spin a military metaphor, we could say that sentinels can only see what is directly in front of them: they have no radar. Even if, by chance, they happen to see an obstacle or a new opportunity, because the company generally has no central remote control system, each cell or unit, controlling the company according to its own principals and criteria, fights to be first, leading the company towards a catastrophe or at least preventing even the simplest strategic move. This, of course, is an oversimplification. In reality, in most circumstances, we manage to get by, human intelligence compensating for any weakness in our system. Eventually, however, the economic battle-fields of the world will show no mercy if executives, no matter how brilliant, fail to get the most up-to-date equipment high-tech strategy can supply.

Information systems must adapt to cyclic changes because our I-needed-this-yesterday society has transformed our relationship to time. This phenomenon is still recent. As we learn to deal with overcrowding in public transport or in shopping malls on week-ends, so must we learn to deal with time constraints, with prescribed cycles in manufacturing or management. In attempts to reduce the cost of these cycles in manufacturing, some have tried to cut down on warehousing space, now a common practice. Similarly, others have tried to shorten the manufacturing cycle, but even the smallest competitors manage to do this today, little by little, effectively eliminating any advantage such an approach might have had. Has anything really been gained?

Today, we are beginning to question the idea of preordained cycles, preferring the concept of rapid cycles. In order to cut down on retail prices, stock and product rotation has become essential to profit, as is the case in department stores. Industrial productivity is judged by a plant's capacity to produce small batches at very high speeds, by how teams are able to accelerate the process by eliminating any disruptions or unnecessary interventions, and, following the example set by Toyota, by making incessant offers from the main manufacturing lines. Joseph L. Bower, Professor at Harvard, and Thomas H. Hout, President of the Boston Consultant Group, describe how mastering rapid cycles can suddenly make competitors react much more defensively: "By constantly offering a new line of products and by studying what consumers actually buy or don't buy, Toyota is permanently keep informed of how consumer needs evolve, which gives product developers the kind of lead market studies simply cannot match." (36)

This means that sophisticated, costly market predictions are actually unnecessary, but that a first-rate information network must be in place on the field, to ensure local touch. Johh F. Rockart, Director of MIT's Research Center on information systems, in an article entitled "Networks are taking over" (37), tells how OTIS, an elevator company, uses telecom networks to automatically trace incidents anywhere. A computer, in charge of maintenance, identifies the failure and automatically launches the appropriate intervention. As a result, a product profile emerges which can lead to certain technical improvements. OTIS now seeks to prevent rather than cure, modifying installations or field teams in order to cut down on the number of incidents. As in the army, the company's networks are used to keep permanent watch on products and markets, everyone ready to change or adapt any product or service according to the information received.

This, of course, is all but impossible for neo-Tayloristic management systems, who still function according to pre-ordained cycles, a beat behind the rhythm imposed by the real economic battles.

In order for executives to anticipate market activity, rapid cycles strategy is essential. However, general inertia and the company's internal culture prevent any such change from happening. Forecasting is all but impossible, caught as it is in the rigid framework imposed by planification. When we manage to avoid the ridiculous, institutional-type annual budget debates, it is only to make predictions based on past product performance. This works and even then only if product management is highly structured: you ask stores to make sales predictions, you negotiate, you compare with global trends and past results, you see if your system is adapted to the task at hand and you set your goals according to how things are usually run. All significant levels of intermediate management or profit centers have worked overtime, running simulations on spreadsheets, each with their own personal criteria, without so much as a nod to global repercussions or a thought to how their scenario might affect global strategy. In any case, upper management and administration have the final say; their power is such that they even act as umpires. However, their decisions can only be based on past financial data. In a highly competitive market, this is far from enough.

In 1982, J.F. Rockart published a long article on the first Executive Information Systems for business management entitled "A General Manager in Real Time"; in 1983, another article stressed how organizations had to become interdependent, in our mind the starting point for high-tech strategy, particularly in international companies with highly-diversified activities - in other words, decentralized trade associations and often heterogenous products and markets. In 1989, following a 14-month study on 16 top companies, J.F. Rockart predicted a break from past strategies based on optimizing operations within functional departments, production lines or geographical areas. According to Rockart, the successful company will have to learn how to manage interdependence, thanks notably to networks and NICTs. (38) Managing organizational interdependence means handing power back to general management, now able, thanks to NICTs, to direct and coordinate the sometimes concurrent actions between profit centers and the business' main operations.

When we change from a hierarchical structure to a network structure, notions of center and periphery no longer apply. How management teams succeed in holding the reins will depend on their capacity to master simulation and high-tech strategy equipment, and to manage the possible feedback caused by the interdependence Wiener

spoke so fondly of. Efforts are directed towards gaining wider access to information and towards expanding to reach markets on an entire continent, or even the whole world. Sun Refining and Marketing Company is a case in point. This international trading company developed an integrated negotiation software which receives market information in real time from Reuter and other, similar firms. This was a determining factor in their success, an essential investment for any company striving for high performance in such a risky, volatile, capricious market. (39) Other efforts are made to improve the adjustment mechanisms once mentioned by Minzberg, an important move in the case of Kodak, who developed (no pun intended) a system designed to help executives plan world-wide production by calculating the costs, transport included, and the feasibility of using other plants as replacements or back-ups.

For Digital Equipment, the recent demassification of operational units into profit centers was the last step in a reinforced integration of functional units. Everyone has now become aware of the key role of interdependence in reaching the company's strategic goals. With its world-wide information system, Rank Xerox can keep a global view of how various profit centers affect a particular market segment or clientele, according to Rockart, who laments the too rare existence of what he calls "vertical networks" capable of providing efficient strategic control

Real time strategic control is far from simple. Attempts at interdependence are quickly stifled in many companies who simply carry on as usual once the big to-do surrounding budget estimates and predictions is over. Bossard Consultants has been working on this question for the past few years. According to François-Xavier Etchegaray, Senior Manager: "We have to put an end to management autarcy; it can only lead to compartmentalization, which in turn leads to errors." Also, an internal language, common to all staff members, has to be developed. This is no doubt the most significant step, as it implies chosing the right indices to reflect the effect of our strategic choices. We must then gather and structure intelligible data in order to work on scenarios, on simulations. This would never be possible if certain key functions were unable to communicate and interact without causing the whole strucure to fall apart. The credibility of control instruments and equipment and the capacity of NICTs networks is seriously undermined here. They are all heavily solicited by a now decentralized organization to supply useful information... at a reasonable cost. In other words, everything must be carefully planned. The type of "holomorphism" necessary to efficient global management is also needed here: each member must be made to understand the company's general objectives and his or her respective place within the whole. Efforts in this matter are fully justified: we have to avoid, first of all, a "gas plant", a move that would quickly prove unpopular, as well as trying to prevent high-tech control equipment from being used as simple management tools, albeit more sophisticated ones, during the sacrosanct annual budget. In a rapid cycle situation, however speculative, we can easily imagine rooms similar to the ones used for war games, where projections and high-tech strategy simulations could be performed continuously, a true collaboration between networks and computers. By matching the military in power, our enterprises would also win the trade wars of the 21st century!

Third Order productivity is still lacking a theoretical model

In 1989, MIT asked various Harvard and MIT scientists to join Robert Solow, Nobel prize winner in economics, to answer the following question: "What does productivity

mean today?" Jonathan Schlefer, chief editor of MIT's journal, wrote that apparently, no new theoretical position was proposed during the debate. It was only concluded that after considerable growth, global productivity was decreasing from 3% to 1% per year, while studies on productivity were positively blooming. (41) Was this a matter for concern?

The question asked by MIT, while interesting in its own right, might not have been the right one, according to a Columbia University-trained Nigerian manager at the Banque Africaine de Développement (BAD). Should we buy an envelope machine in Central Africa, at the risk of having to lay off a large part of our employees, simply in order to make our company more profitable? According to him, the answer is self-evident. Productivity cannot, should not be a source of social depreciation, always a traumatizing experience. It must be useful. If not, governments would be forced to add global fiscal pressure on firms to compensate for social depreciation, the result of a predatory form of productivity. In 1988, a very provocative debate on robotization was held in Japan. The idea behind the debate was to decide who would pay retirement and health insurance fees after total robotization. A proposition was made to create a tax on robots. While NICTs show how economic agents have become dependent in an interdependent world, for lack of a proper feel for modern economy, our efforts to increase productivity are likely to cause - elsewhere - social mayhem.

This was aptly demonstrated by Renaud de Maricourt, who discussed distribution by quoting to a study by Turcq and Usunier on the service industry in Japan entitled "Efficiency through non-productivity". (42) According to this study, the Japanese distribution revolution evolved differently than in France. The sector has remained very traditional, with a large number of intermediaries, yet retailers offer extremely high-quality service. As a result, Japanese distribution requires considerable manpower, 19.5% of the active population as opposed to 11.9% in France (2.53 million people in 1985). If France had failed to sterilize these positions, according to Renaud de Maricourt, using a comparable structure, 4.15 million people would be employed in this sector, or 1.14 million more. At the time, in France, 2.3 million people were unemployed. Modern distribution, where goods are bought at the cheapest possible price at one end and where customers are encouraged to put it all together at the other (IKEA...), reduces costs by improving investment productivity. De Maricourt concluded that the consumer, in fact, pays twice for what he thinks he has saved: once by providing for himself the service he did not get (putting the furniture together, for example), and another time through income tax used to finance social programs to help the very people whose jobs he has helped to take away.

NITC networks are similar to distribution networks in that, while they are an indispensable economic force, they are not directly productive. They help in the exchange of goods and services, and thus play a considerable role in how profit, productivity, and work distribution are organized. Speaking of profit, for example, because of the now "tight" flow of money, banks are on their way to losing benefit from value days and current assets. As a result, they are looking towards other sources for revenue which only the strategically planned use of NICTs can offer. These assets, driven away by productivity, are transformed, thanks to NICTs, into modern tools for profit: speculative bubbles, which act in split-second time on variations of interntional currency. Certain firms are similarly playing with the rate of meat, metal, or raw material, each one trying to pass on to the next the curse of depreciation.

World-wide firms, who control entire networks thanks to NICTs, choose for themselves where profit will be made. Others still, within the framework of our new "dependence within interdependence", negotiate where productivity will be gained, in exchange for added value, as was the case for McKesson and his pharmaceuticals network.

Choosing where to gain productivity through NICTs is made even easier when a company is already involved in externalizing or outsourcing jobs, on the lookout for new pools of productivity. Some, to avoid salary expenses, externalize to foreign countries - the software workshops of India, for example. Others cut costs by concentrating their most qualified resources, as is the case with the SAS maintenance experts network. There are also those for whom gaining productivity through coproduction, in the value added chain, is not only a matter of manpower costs, but also of other costs, such as overhead. W. Bruce Chew, professor at Harvard Business School, discusses the case of a particular company where 40% of efforts were directed towards manpower productivity while in reality, manpower represented only 10% of production costs and 30% of expenses was really overheads. For W. Bruce Chew, this exclusive attention given to manpower costs, while making it easy to elaborate a productivity index, also opens the door to all forms of manipulation, the result of misguided management.

The modernization of production, characterized by the increasing interdependence of economic factors, forces us to change how we keep track of indices, much as we had to find ways to keep track of immaterial investments. For W. Bruce Chew, certain performances indices are ambiguous. (44)

For the curse of modern productivity, current assets are speculative

"Tightening" the flow while reducing current assests is not without its problems: as with immobilized stock, the assets are "immaterial time bubbles" and mean money.
The increase in immaterial exchange has contributed to the development of interbanking through networks. The aim is to guarantee transfer delays and to reduce immobilization between value days by speeding up interbanking compensation. This search for real time management has a tendency to minimize the need for intermediates, even the Banque de France. This is not without its problems. Among others, flow most be controlled between banks, according to their wishes, and the assets, or float, must be reduced. These assets represents in fact an indirect payment for services supplied by the bank, the imbalance between float days for the bank at the receiving end, more important than for the bank doing the shooting, hinder the development of systems such as SWIFT and SIT.
The capacity to transmit transaction messages at electronic speeds has led to a growing interdependence between financial establishments, who now fear one or more participants could fail to fulfill their part, thus endangering the entire network.

A division which manufactures mechanical components decides to outsource. To do this, it will now buy more expensive products but will compensate through cheaper manpower and lower equipment needs. Manpower and machine productivity (capital) will be improved while the productivity of purchased material will diminish. The speed at which a worker can tighten three bolts will be a good index to measure productivity by. The fact that a white-collar researcher has been able to find a way to ensure the worker need only tighten two will prove the significance of his contribution to global productivity, but will not serve to evaluate his or her own productivity. In other words,

added value cannot be evaluated according the performance criteria applied to productivity. If we could, certain white-collar-based economies would seem completely anachronistic. By looking for ways to preserve added value while increasing productivity, the next decade will see senior management interest in expensive white-collar expertise rise considerably. In fact, there is a good chance they will even choose absorb manpower costs as overheads. Theoretical model or not, how can we fail to consider the potential of overheads within the framework of tertiary productivity, characterized by a clearing of both time and space? As a consequence, we will increasingly look to improve productivity through externalization, because externalizing white-collar workers means lesser overheads and immobilization costs, with a somewhat similar effect on productivity... while added value can remain the same!

In 1959, E. Lee Talman, Vice-President at Lever Brothers, giving a speech for the American Management Association on the theme "How to increase benefit", opened with the idea that from top to bottom, everyone had to find ways to save. (45)

Here again, NICTs will help ease the cost of operations. thanks to telework and the now telepresent white-collar workers.

Chapter 3

Do we still need the office?

According to an IBM report on task distribution, executives spend 78% of their time on communications (59% for planned meetings, 10% for unplanned meetings, 3% for visits and trips, and 6% for phone calls); this leaves 22% for office work. It is no surprise, then, that we in fact spend much less time travelling than we do attending meetings. All the more reason for these meetings to be productive. But then meetings are generally held in specialized rooms, and as a results, executives only spend only 38% of their working hours in their costly offices (a total representing the sum of unplanned meetings and time spent in the office, including time spent on the phone). Now, can you name one executive who would actually consider investing in a plant which only used 38% of its production potential? If we applied the same criteria for productivity to offices, how would we react when realizing that the production rates decrease even more when we add week-ends and holidays, about 130 days per year*? Would a serious industrial manager let his investments remain unproductive for 4 to 6 months out of every year? Well, all of us do, it seems... when it comes to our own offices.

Costly offices are everywhere, and in France, particularly in the Ile-de-France region. In early 1990, they represented 32 million square meters, or 45% of total French office space. According to the Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France, between 13,000 and 23,000 office jobs were created in the Ile-de-France region in 1992, for a total of 300,000 to 500,000 square meters of new offices, and 200,000 square meters in added annex space. (46) In other words, if we evaluate the

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* *"French businesses are not in want of captial, they just don't make a good use of it"*

An OFCE study comes to the conclusion that the investment rate in manufacturing firms over the past 20 years has been higher in France than in the USA, Japan, and Germany. In the other side, capital productivity (added value over capital stock) is lower. In other words, the high French investments are not a competitive advantage. According to OFCE, a study on flebility on the assembly line (machines working around the clock being more productive) would explain the phenomenon.

We prefer to explain this hiatus with the concentration of immaterial capital over production rather than over distribution or R&D.

basic need for one individual at 30 square meters, and the average price per square meter at 20,000 francs, this translates as 600,000 francs per person. This does not include equipment and maintenance fees, more expensive here than elsewhere.

Offices have become a source of prestige for multinationals - one office out of five in France is occupied by a foreign firm - (47) and for a majority of multi-establishment firms. The very speculative nature of the phenomenon further stimulates this development. Companies with a clientele located in the Paris region can only manage to hang on to their local market and are faced with higher fixed expenses than anywhere else, hence an abnormal increase in service fees. Individuals at first, but eventually some companies became unable to afford the now outlandish cost of real-estate. For these reasons, Carrefour has abandoned its Fitt shoe store chain, unable as it was to ensure profitability. In reality, many executives feel this is only a minor debate. Hard capital is full property, a good thing for assets mentioned in the report. This strategy is best examplified by McDonald's. Every year, the company opens 300 new counters outside the United States, each one with full ownership, bringing their total value at an estimated $7.75 billion in 1989. (48) This gives solidity, should the Big Mac suddenly loses steam.

After a century of development interrupted by periods of relative lethargy, offices have replaced the plant to become an essential element of the urban landscape and of local economic development. However, this does cause a few problems for the city, the community... and for businesses.

Too many offices, too little air

As with all the great cities that will form the core of the network society, smaller cities will also generate their own metastasis. According to specialists, third and fourth world demographics are increasing the rate of homelessness as well as creating wild urbanization schemes. New York is imploding, head offices are leaving the city for the suburbs. In Europe, in the United States, in Canada, in Japan, and in New-Zealand, more than 1 person in 4 are city dwellers. In those parts of the world, people are fleeing city centers to seek a better life, while remaining connected to services, leisure, and work through telecommunications and transport networks. This proliferation of suburban centers is slowly creating huge mega-cities. Individual transport needs are sky-rocketing, as public transportation can no longer meet the demand. In Los Angeles - a highly polluted city - the budget for transport per individual is 8 times that of Paris, but as in Denver, Houston, Dallas or Miami, for example, 90% of daily commuting is done by car. This led George Bush, then President, to declare that Los Angeles could eliminate 205 billion miles of travel and 47,000 tons of pollutants per week if only 5% of commuters worked at home one day a week. (49) According to a study by Alan E. Pesarishi, the number of commuters who drive a car has risen from 30% to 35% between 1980 and 1990. Cars are destroying our cities. This require roads, and our city and suburban centers are basically being structured around them. But this is only for lack of a better solution.

The idea of multimedia service centers has been abandoned, and exists only in the minds of a few utopians or in the files of the Délégation à l'Aménagement du Territoire en France (DATAR). Teledistribution (cable, still not very popular in France) is considred superior to telework. Meanwhile, a high-definition cable network has been

launched in Japan, HI-Vision Cities, to encourage the development of teledistribution and teleservices in city centers. In France, public services such as tele-alarm, telesurveillance, tele-teaching, and telework on cable networks were only recently made possible, though ministerial agreement is necessary, thanks to a new law on teleservices (December 19, 1990). However, fear that these networks could be put to uses other than distribution is such that J.M. Rauch, PTT Minister, declared that: "cable is first and foremost a tool for television broadcasting". When promoting NICTs in government services, the same arguments keep coming back: if there is an industrial stake, it is always related to equipment such as television cable. Many members of Parliament are still fascinated by the magic lantern. They fight tooth and nail to get their high-speed train or to stop it from coming to their region, without ever showing concrete interest in the fallout from value added networks on our environment. They are more interested in technology itself than in advanced telecommunications areas or multimedia centers, telesites or cummunication centers... Yet these are essential investments; we must learn to use those services, which in 20 years will form an integral part of our 21st century culture, and more specifically those related to the "Intelligent City" under development by the Japanese as part of the TRON project since 1988.

The dematerialization of economic activities is an insidious process, and only seems spectacular to those who actually take notice. The French Housing and Public Works Administration and Civil Engineering have witnessed a decrease in material investments, from 30% in 1970 to 24% in 1983, while investments in electronic equipment rose from 12% to 23%. (50) However, Public Works has never been known for progressive thinking and still has considerable pull in certain markets, and so in local or national lobbies as well. Thousands of square meters of office space each year, in the Ile-de-France region alone, carries a lot of weight indeed. The consequences could prove explosive: the region's constant traffic jams and poor quality of life are starting to tarnish Paris' reputation in the international business community. Office and particularly building management is increasingly costly. Expenses (maintenance, general services, technical centers) have risen by 16% between 1980 and 1985 (from 4.55% to 5.28% of overheads). (51) Certain buildings are so complex that you can actually get lost trying to understand how they work, much to the delight of British firm Officar, which sells a management application containing all the necessary parameters for maintenance, operations, and even the eventual transformation of office space. Offices, even more then cars (offices are, in way, responsible for those, too!), are choking the city. They have taken over our streets. Buildings, deserted at night, have destroyed our communities by tearing apart the social fabric and pushing towards the suburbs those who once had been asked to stay near the factories where they worked. What real neighborhoods we have left are inhabited by the bourgeoisie, who fearfully watch as their streets fill by noisy, at times dangerous night visitors. New York, Washington, and Los Angeles are far from exceptional in this matter. According to a study performed by the United Nations, in the year 2000, Paris will be the only European city to be among the 25 largest cities in the world (in population). (52) People are leaving Paris for the suburbs. Population growth is not responsible for the demand for transport: the concentration of offices is the real culprit here. Paris and its suburbs are attracting the largest number of office jobs, on top of a myriad of business services. All this office-related activity is responsible for endless commuting. More than 50% of jobs in Paris and the Hauts-de-Seine are held by people living in other regions. As a result, the cost of housing has risen to new heights, inaccessible for the majority of the

population, who now wish even more to leave the city center, causing even further commuting. This is also encouraged by the development of leisure activities and network saturation. The resulting lack of balance is impossible to sustain, costs considerable amounts, and generates absolutely no profit.

Small communities far from large city centers are particularly desperate to find the magic formula that could bring them the kinds of jobs our feverish trend to concentrate offices in the downtown core of large cities has taken away from them. Studies on communications sometimes fail to analyze the causes behind this polarization of resources and its disadvantages, and as a result are far from credible. Some suffer from the delusion that it is possible to control the flow without first adressing its causes. This is a wonderful example of the weakness of a neo-Tayloristic view: if roads could be made more profitable, we could build more of them... thus ruining public transport, already hard-hit. Or we could limit parking on important streets, thus further jamming relief roads and increasing the need for policing, etc. This all brings us to a rather joyless conclusion: the all-powerful attraction force of the city creates an unreasonable, extreme concentration of office space, which in turns leads to a collective breakdown in organization, with considerable costs. As professional taxes are sometimes levied on the richest local communities, the institutional blockage is further impounded. Jacques Voisard, in a study sponsored by the Comitè de dècentralisation, says it best: "The more offices are opened in Western Paris, the more firms it hosts, the more its revenue increases, the more it can afford to decrease local taxes and particularly the professional tax, and the more attractive it becomes to businesses." (54)

Nurmerous studies tried to find solutions to these difficulties. Telework, or remote work, has often been the choice alternative, as it seems most feasible. However, from the point of view of companies, a simple mistake led to ask the wrong question: all propositions and recommendations implied that companies went along with the idea. As a result, studies delt mostly with feasibility. Could Telework decrease or eliminate the need for commuting, decrease pollution, wasted time, constant and exhausting travelling? They also wondered under which conditions workers would accept the idea of telework. No one, however, bothered to find out if companies, the first concerned, were interested or motivated to try a new approach. We now know that non-commmuting travel will always be a minority and that commuting is going to be little affected by telework. In reality, we are changing the way we move. As for finding out how workers would agree to becoming teleworkers, we already know that we already have become just that, to varying degrees. The question, in fact, always had a singular connotation: "Would you try telework... from your home?" Or: "With the help of NICTs, would you work at home for part of your regular schedule?" According to a 1984 survey performed in Germany by Empirika and sponsored by FAST, people were most interested when living in small cities (up to 20,000 inhabitants) with very few jobs, or when living in the suburbs. The study concluded by saying that travelling and distances had a definite influence on people's opinion of telework. Necessity rules. Period.

In fact, the main problem is knowing why a company would even ask itself the question. What consequences or advantages could lead to consider telework? This, for us, is the crux of the matter. According to a study by Empirika, performed some time in the mid-80's, employers had five main reasons for considering telework: improved (more flexible) work-load management, keeping qualified employees normally unable

to work in a conventional office on the payroll, cost reduction (fixed or personal expenses), employees who wished to take control of their schedules, and the possibility of recruiting urgently needed expertise, otherwise unavailable, an opportunity for starting a new activity. (55)

In order to contribute to the debate, we performed a little survey on this very theme in 1990. While it has no real statistical value, it does serve to highlight some important ideas.

The executives surveyed, whose telecommunications expenses rise between +5% and +20% per year, feel highly dependent on telecommunications (77% of answers), even when personnel moves very little. The three sectors most affected by a breakdown in telecommunications are, in order, sales, finances, and coordination between staff and clients - no surprise here. For 48% of them, breakdowns are considered dramatic because they effectively stop key operations. Telecommunication are definitely a keystone in the organization of the firms surveyed: 87% of them have at least a local network (73% have more than one), 86% have specialized lines (mostly analog), and 55% have international connections. Telecommunications represent between 0.5% and 2% of their turnover. For these companies, as with a majority of executives, investing in NICTs quickly proves profitable.

The majority of executives surveyed feel that working space should be rethought every 5 to 10 years. For 45% of them, this reorganization should be made every 2 to 4 years. A third (32%) are interested in telework if it means saving on office space, as opposed to other possibilities, such as reducing telecom costs or the professional tax, or even transport expenses. Also, and this is interesting for what is to follow, the idea of sharing productivity gains with other employees does not exactly bring them to their feet (18%)...

Finally, the executive surveyed are not easily separated into camps: more than 50% did not answer the questions on telework, perhaps simply because they failed to understand them. "The concept isn't clear", someone wrote. Others were ready to "try, just to see" (25%), their personnel being more open (or neutral) to the idea, according to them (62%), even though nothing significant was ever done in this direction, save perhaps experiments in telecommunication groups (64%), which 43% found disappointing. For half of respondents, telework is perceived more as an organizational tool than a way to delocalize work.

As for knowing under which conditions workers would accept telework, usually from the home, well... Much as economic forces forced the peasant to leave his home and the tradesman his workshop and, within less than a century, opened the first plants, the economy will bring workers back home if need be. Everything will depend on how the various protagonists decide to negotiate, as was the case when plants were first being automated. In the post-Tayloristic organization, the collective and the individual no longer clash. Satisfying personal aspirations is now an objective which can form part of an economic policy. Rather than force an unproductive presence, we will learn not to reward employees simply by counting hours spent on machines or working hours. Time does not hold the same value for everyone concerned. A mother who has to pay for someone to bring her kids to school, to get to the office on time or to take care of their children on certain days certainly feels this time is costing her money. For the employer, short on staff for the early morning shift when clients are practically beating down the

doors, this same time means a potential loss. When surveillance activities to be performed from a home terminal via NICTs, costs are brought down. Credito Emilio, an Italian bank, did just that: it can now keep an eye on its computer system at night and on week-ends.

Rather than analyzing how telework should be organized, let us try to identify the economic reasons, and particularly the accumulation of unforeseen problems, which will bring enterprises to reconsider their traditional work arrangements.

The "office of the future" has a very recent past

"The office of the future does not exist!" A provoking headline, to say the least, which appeared in Bureau et Informatique, just in time for the SICOB in 1980. The long editorial which followed still stands today, with the office of the future now... a thing of the past!

"The office of the future" does not exist!

"If we consider today that office automation opens up new perspectives for office work, our image of the latter is still traditional, and neither encourages nor prepares us for the profound mutations future generations will witness (...). Our current social structures will be unable to sustain Tayloristic excesses in the tertiary sector. However, as is the case in many other areas, far too many of us rely first and foremost on technology. A particular, current view seems unable to realize how its stereotypical images of the future can easily be questioned. (...) Let's not forget that technology is the basis for the new "knowledge society". In this society, instability and precarity will lead to an increasing amount of decentralized decisions. These decisions will be made by well-informed, empowered workers, free from the shackles of "routine computing" thanks to self-regulating systems. This new vision, where information is organized according to content, sources, and processing technology, implies traditional office tasks must be distributed differently. (...)

If we think of (...) how companies need to share knowledge and services from numerous specialists too costly to hire full-time, of the pressing need to save energy wasted in "routine" trips to go "to the office", and finally, that daily transactions and management will no longer rely upon people, how can we still speak of the "office" of the future? If we are to have a true futuristic vision, let's go all the way: let machines take care of themselves, and let employees dream and create! By denouncing technocratic conformism, we allow our preconceived ideas to come into question, giving truth to the saying "Nothing is as constant as change". This is why the "office" of the future does not exist."

The stereotypical images of the office "of the future", once frenetically invoked by the creators and distributors of office automation, can easily make us forget how recent it actually is. The office as workspace came to be only at the beginning of the century. In order to organize their affairs under colonial expansion, large merchant companies and large banking or industrial families gathered in various capital cities, according to certain affinities. Religion was certainly a factor: Huguenots, Protestants, Calvinisits, and Jews divided themselves in Alsace-Lorraine, in Switzerland, in northern, north-western, and eastern Europe, and on the other side of the Atlantic, regions more tolerant of industry and commerce. During World War II, women also started working in offices. Secretaries and accountants were replaced by suffragettes fighting for

women's vote. The office was one of the first victories of women's lib. Quite a symbol, which probably partly explains why secretaries, typists and other female employees were so adamantly opposed to work-at-home.

Research, method, and design offices moved away from noisy, cold, or impractical workshops to settle closer to factories and plants. White-collar workers were born in research and method offices. The growth of middle management, sales staff, accounting and legal services, general and personnel services, health services, etc., rounded out the specific needs of office workers: the employee was born. Caught in a series of rules and procedures, controlled by junior executives who alone make the rules, the employee became a mere performer in the administrative machinery: offices were organized exactly like factories. Each employee had his or her instructions and was as isolated, had as little opportunity for initiative as the factory worker. Partisans of Taylorism left all thinking to a small elite. Much like secretaries and office workers, sales staff was considered in charge of "supply" activities. In this highly hierarchical world, organized by functions, closed in on itself, only the invisible hand of the market could bring the increasing role of external, then internal communications to light. The excessive division of labor, as it destroyed social cohesion, led to counterperformance. Professional tribes were divided into office "zones", little fiefdoms protected by their bosses. In this context, normally complementary functions became almost separated by competition, and office floor plans often revealed the hidden tug-of-war between each division. Progressively, the preeminent role played by employees, qualified office workers, and executives in information activities, considered the most noble functions, accentuated the separation between factory and office. This sometimes led to appalling results: when a radio and television plant in the Ile-de-France region was rebuilt, prototype and design activities were separated and moved to a new building, thus breaking the team spirit (and the spirit of innovation) that once existed between them. Eventually, an opposition between intellectual and communication activities, and activities considered of low content in the working sector, was created.

In this desert landscape of the 60's and 70's, only the appearance of office technology managed to unsettle the rigid bureaucracy now in place. A little bit of chaos, as American managers would put it, now convinced of its virtues, its power to shake us out of the rut of conformism. The era was still influenced by Fordism, and machines in the tertiary sector were still rudimentary, often designed only for repetitive tasks. We had to wait for the 70's and 80's and office automation before a little "intelligence" was given to computers, thus leading us to finally question our traditional office organization. Progress, then quality groups were formed, making the exchange of information in collective tasks a determining factor. This led in turn to the development of new modes of management and animation, a complete break form the past. Ironically, this also gave rise the a new disease, "meetingitis". However, the office was allowed to modify its architecture, in order to improve transactions between professional groups within company walls. People were finally recognized as information systems in their own right, individual "cells" which organize themselves according to collective objectives and which feed off the company's collective knowledge. They are an interactive part of the whole, of the entire cyber-organization. In turn, both blue-collar and white-collar workers join exchange networks developing inside and outside the company. Everyone must know how to interpret data from their professional environment and share the

results with collaborators in other work units, thus deepening their personal relationships.

Office work, perhaps partly because of the high number of female employees, eventually became more intimate, with a warmer atmosphere sometimes surprising veterans and companies began looking for a common goal for the group. Failing that, general atmosphere can be deadly. In any case, NICTs have eliminated the space-time barriers for our office workers. As our great-grandfather before us, we feel the wall between private and professional life is disappearing. Our home, whether electronic or not, does not deserve to be rejected as a possible workplace. But, needless to say, it will have to adapt.

The "offisaurus": unadequate and too costly

Offices are also a place for social gatherings, of course. However, no matter how hip and modern, no matter how well equipped with NICTs, they still follow the basic pattern of the plant office of the beginning of the century: nobody mingles. More often then not, offices have deserted production units to gain prestige, bringing all expertise along with them. The centralization of services at company headquarters indirectly hinders regional development: brain-power is concentrated at the main office. We are still bent on separating where we think from where we build.

At the French Ministère de l'Equipement, each Centre d'Etudes Techniques de l'Equipement (Center for the technical study of equipment) in each region has developed a specific expertise made available to all. One region will thus strengthen its expertise in artificial intelligence, another in road safety software development, yet another in desktop publishing, etc. The entire territory can benefit from this, on request. Save for a few exceptions, such as Air Liquide, who reduced its overhead by decentralizing accounting, computing, and finances to its subsidiaries in order to give people on the field more responsibility, many companies keep their expertise centralized at head-office - usually in Paris - where most meetings are held. This eventually had a curious consequence: regional managers at a large food company complained that personnel representatives in their plants were better informed, and faster, than they were.

"French small industry is too isolated"

The French Ministère de l'Industrie asked the BIPE to perform studies to compare French small industry with its foreign counterparts. The results show that small industries are spread in clumps over the territory, often based on proximity to an important client. Their turnover by machine-tool is lower than on the other side of the Rhine, and their immaterial investments are too small. Yet how could it be otherwise, when there are so few services outside the capital?

Even in the service sector, past traditions still weigh heavily, and a host of functions are still centralized at head-office. This demands a lifestyle in accordance with location, and also affects performance. The impact is even more considerable on successful companies. As hundreds of new employees get hired each year, even the most modern of office towers begins to feel cramped. This no doubt explains why in our survey, 45% of people polled said office organization had to be rethought every four years.

Offices only appear to be packed. In reality, they are filled with... ghosts. A recent study performed in a service company showed that white-collar workers were really present for 28% to 81% of their time, according to departments. The most zealous are young executives on the one hand, and the most senior employees on the other (46.7% et 44.5 %). On the field, it is mostly project managers and client engineers (38% and 40%). The only exception is found in those who perform studies, more sedentary, and present 76% to 81% of the time.

Antoine Benoit, an architect and specialist in space design, has a team of 20 with no office to speak of. Everyone works on a study site, with size varying according to employee experience and progress. Administrative functions have been eliminated and are directly controlled by site teams. Typing, accounting, and non-essential additional fees have also been eliminated. The central computer, the CAD applications, and the databases are linked to a Novell network, and each engineer has access to a powerful computer. This formula costs little: there is no computer department. In four years, turnover has doubled, while staff has increased by a third (especially business engineers) without ever needing to reorganize the office.

Average area covered in offices

	United States	A French oil company
Office worker	6 to 7.5 m2	4 m2
Office manager	9 to 11 m2	6 m2
Secretary	14 m2	4 m2
Executive	28 m2	8 m2

(Add 5 to 10 m2 per office in an annexe)

Leasing an office in California costs about $2,000 to $6,000 per year per worker. (David Nye, Alternatives Staffings Strategies)

To circumvent these problems, certain establishments simply find ways to drastically reduce personal space. Five or six people get crammed into an office, thanks to new office systems which offer some salvation. Sardines, perhaps, but why not, especially if these offices connect to collective spaces and if the average occupancy rate is low. Aside from problems in managing office space sparingly, the "offisaurus-type" organization concentrates important human resources, sometimes coming from far away. This increases the number of commuters and can make it more difficult to hire qualified personnel* .

In a study on telework and habitat (1987), Anne de Beer and Gérard Blanc observed the consequences of this concentration: office workers, bank employees, and employees in insurance companies travel the longest distances to get to work. The Crédit Lyonnais built a tower at the Défense, a suburb west of Paris; once finished, everyone noticed that most employees lived in an eastern suburb. Recruiting, and keeping exceptional

* Hiring personnel is expensive too. According to a study performed by Costello, Erdlen & co., a recruitment cabinet in Massachusetts, hiring a new worker costs $8,580, amouting to $10,000 for a qualified technician.

employees or specific expertise unable to function in a conventional environment, were important factors which led companies such as Crédit Suisse to partly decentralize activities over 6 regional centers, in order to make up for the lack of qualified computer specialists in Zurich. The University of Wisconsin, Pacific Bell, and the U.S. Government all favor using telework in order to hang on to specific expertise. (58) Another example is the Technological University in Helsinki interested in the aforementioned DIMUN groupware project which created a telecottage in a wild region of Finland in order to keep in touch with a team of specialists.

This delocalization sometimes externalization is accentuated by the cost of office space, often prohibitive, especially in certain large urban center. In London, Rank Xerox estimated that the global cost of an employee rose from £10,000 to £27,000 when direct and indirect costs from the head-office were added. In other words, office expenses were superior to salary. An important French monthly also noted that eliminating an executive with a 30,000 francs a year salary, when salary and general expenses (representation, secretarial work, equipment) are compounded, saved roughly 1 million francs per year. (59)

The "offisaurus" is borne of the absurd idea of large scale savings. An insurance company bought an office tower at the Défense for over 500 million francs, in order to house 600 employees taken from staff once divided among five Parisian buildings. In this vertical city, the vast majority of people will remain anonymous. However, operation expenses were multiplied by at least two, and even more so if we consider the Arche de la Défense, a situation the Ministère de l'Equipement was quite sorry to admit to when it was installed. A Parisian firm located in a so-called "intelligent" building noted that, first of all, the building in question did not communicate better with its clients and that new operation costs rose by 50%, thus costing the firm 5% of its benefit.

An absurd idea, again, which forced these establishments to close their doors, and their counters, when clients were most likely to need them. Rather than creating double shifts in order to increase the productivity of these enormous investments, NICTs, once again, will save the day (and operations accounts!) by ensuring permanent, 24-hours-a-day service, even remotely.

When thought is given to human resource management and the organization and cost of offices space, it sometimes leads to some striking initiatives. In 2986, NEC, a Japanese hardware manufacturer, built a satellite office in Kichijoji, a suburb of Tokyo, about 20 minutes away from the down-town core. A dozen white-collar workers live in the area and meet at work. However, no particular function or task has been decentralized in this case: everyone in the satellite office works on different projects. In fact, they each work with other colleagues in other offices. Contact is kept almost exclusively through telecommunications, most notably by videoconferencing. (60)

Through NICTs, virtual enterprises are infiltrating new territory. They open telesites (or telecenters) according to their own interests. It must be remembered here that while NICTs are not in themselves reason enough to delocalize, they are greatly useful to overcome spatial constraints, especially when offices become too costly and whatever space is available must be fully exploited. Considerable savings can be made, as was the case with Axa, the French insurance group, now a classic example. With a staff of 18,000 and a turnover of 58 billion francs, the firm literally exploded between April 30 and May 13 1991. Central services moved to seven different sites spread around the

Paris region, thus reducing personnel transport costs by 70%. Further restructuring divided staff between ten different regions in France. As a consequence, the company saved up to 70 million francs. (61) Axa already had some previous, though indirect, experience with work-at-home through the Mutuelles Unies in Elbeuf near Rouen. Company president Claude Bebear had in fact shown considerable interest in PBS's efforts in telework. He had previously met Pierre Bertaud, responsible for the project. PBS had reduced its Paris office to a simple sales office. In the case of Axa, the restructuration and delocalization of resources were based on the Axanet network.

Decentralizing can have a positive effect on overhead

In 1990, Jean Waniowski, an architect for the Télémaque group, evaluated loss in the productivity of leasing expenses. For this study, he based himself on the average leasing price before taxes per square meter, in Paris and in the rest of France, taking a 62% occupancy rate as a yardstick, or 228 working days out of 365. His results underlined the low productivity of investments, a result of their underuse. It clearly appears, however, that capitalizing on regional offices could solve many problems.

Numbers are based on a 1,000 m2 area. Prices are in French Francs.

	Annual rent	Cost of occupancy	Annual loss in investment productivity
Paris 19e/20e - 1,500 /m2	1.5 M	0.937 M	0.563 M
Paris 15e Gare de Lyon - 3,000 /m2	3 M	1.873 M	1.126 M
Triangle d'Or - 4,500 /m2	4.5 M	2.810 M	1.689 M
Lyon centre- 1,100 /m2	1,1 M	0.687 M	0.413 M
Sopha Antipolis - 1,100 /m2	1.1 M	0.687 M	0.413 M
Lille centre - 680 /m2	0.680 M	0.425 M	0.255 M
Bordeaux - 700 /m2	0.700 M	0.437 M	0.263 M
Nancy - 500 /m2	0.500 M	0.312 M	0.188 M

Annual occupancy rate is 62%. With equal or inferior occupancy rates, it would be possible to do the same comparison with different organizations and other expenses

When large scale savings linked to regrouping no longer come into play, firms can progressively adopt a new strategy based on proximity: proximity to expertise or clients, to affordable manpower or important education centers, to specialized subcontractors, to sophisticated equipment and research resources available only locally, etc. This has led to a type of "scattered" organization, characterized by a multiplication of telesites, or telecenters, structured along new communications networks, sometimes in association with more traditional transport networks such as the TGV.

The appearance of the TGV on the scene, and of what has been termed the "TGV effect", could have beneficial repercussions on the delocalization of the economy. Veritable white-collar production centers were created along the tracks of the

high-speed train. Company headquarters are a few minutes away, two hours at worst, from station to station, from the decentralized work units. Following the success of a program launched by the Centre d'affaires of La Part Dieu in Lyon, another, similar program was developed in le Mans, the Navaxis center; Lille is building a group of business hotels around its TGV station, as are Paris/Montparnasse and Rennes. Local communities are forming associations with real-estate groups in order to attract new types of activity to their region. As early as 1982, Vendùme started on a quest to prove the feasibility of a TGV station. An intercommunal structure was established in 1985 in order to mobilize everyone and to prepare a series of activities to attract clientele. Interconnections with the freeway system were planned, in order to handle greater traffic and, by the same token, more intensive trade, thanks to a new communication center in the Bois de l'Oratoire region. The aim was to offer Parisian head offices the chance to decentralize white-collar work around the station. We can easily imagine how profitable this could be for the community. And so, as NICTs created a network society, cities will in turn strike alliances, the TGV, together with NICTs, making this renaissance possible. In brief, the key words remain modularity, flexibility, delocalization through proximity, in other words, savings. And it is possible to make savings in an office, especially with a little bit of imagination.

The development of service centers or shared offices

In 1989, the French group Bossard Consultants made roughly the following observation: the variation in permanent expenses for the group's various activities did not allow anyone to adapt rapidly and efficiently to demands in documentation production. As with everywhere else, it had become difficult to ask one secretarial department to support another. In spite of the growing autonomy of engineers, each department was almost constantly dependent on temp workers, and investments in office automation equipment increased as demands for image quality in communications became more pressing. Also, the problem of space became more acute. Under these conditions, a word-processing department was opened, "Images et Caractères". With first-rate equipment, most particularly for desktop publishing and color editing, this center was now capable of working much longer hours than secretaries and offered an invaluable proof-reading service. And what do you think happened then? Bossard Consultants went from a cost-driven to a profit-driven enterprise. Images et Caractères regularly extended its clientele, and found other offices close by, which stopped the need to hire typists, much to the benefit of secretaries, while concentrating the formerly scattered investments in specialized office automation. Finally, the company now has a simple tool for distributing publishing expenses, with a bill to prove it!

Network communities for business centers

The world's main business centers are linked through Global Digital Highway. Made available in France through British Cable and Wireless, this service offers personalized sites, virtual private networks, etc. (Source: Entreprises et Télécommunications, november 1991)

Following the same logic, while new offices were being built, a center for facilities services was opened in the building and made available to all occupants, not just the group. It included telecommunications, security, desktop publishing, photocopying, food... David Nye (62) once spoke of how companies now look at office space in a new way. They have even started to view it as profit centers like any other, by leasing any resource not permanently needed, thus creating a shared resource or service center which happens to generate new profit. This approach is gaining ground. The service centers at ABS France, club SARI-affaires at Défense, and many others, offer this type or temporary or shared office. It is an interesting solution for those wishing to start a business yet who prefer to wait before selecting more permanent offices. Appointments can be made there, meetings held. What would otherwise be fixed expenses become variable expenses, with no investment involved. All automation, assistance, and reception tasks or services normally part and parcel of a business are in fact subcontracted. Still according to Anne de Beer and Gérard Blanc, these savings are linked to offices being shared by many employees who occupy the premises each in turn, part time. One employer admitted to having cut down by half the office surface needed per person. (63)

We have yet to find studies on the subject which could help us form a solid opinion. It does seem, however, that French firms are still fairly unfamiliar with the concept of subcontracting from service centers and facilities services, who happen to offer better and better services. Business hotels, like the aforementioned Atria, are carefully entering the field. In France, multimedia booths are being installed here and there. Total (gas stations), after signing an exclusive contract with LBM, tried this approach in their service stations. In a temporary "office" named "octophone", a teleservice center is made available to truck drivers. These octophones are also installed in hotel chains. A special telematics server allows access to a series of services such as a messaging service for people on the road. The Japanese, who spend considerable time travelling - up to four hours a day - have developed a project for multimedia, multi-business service centers, very ambitious tele-offices. These centers would be installed between Tokyo and Yokoama, and would become neighborhood service centers of a sort, linking various companies. (64) These time-shared, versatile service centers are developing within the framework of traditional trade. The teleoffice, Neighbourhood Work Centers or Telecottages are more specific examples. In these cases, firms share space and technical resources they have helped finance jointly. This is a still controversial option, a type of economic interest group which seems unable to resist the passage of time and everyday management problems. In an industrial Tokyo suburb, five firms have opened an experimental service center from May 1988 to April 1989. Everything went well; it was simply noted that here, too, new methods for motivation and remote management had to be found. (65)

Speaking of telework, trying to show how little impact it actually had on office space, one manager confided: "Mrs C. comes back once a week, and so we must keep her office.""

(Source: R. Clavaud, Le Monde, August 9 1981)

Time-shared service centers, generally speaking, are still rare. "Business hotels" use them on a temporary basis, often while waiting for more permanent installations. In the tertiary sector, where assets are mostly "immaterial", buying into real-estate is a safe investment, an understandable, traditional objective. However, demassification and the spread of less traditional office space, such as villas or satellite business telesites, now follow the progress of remote work and virtual groupware techniques. From now on, electronic nomads will click from place to place. Electronic navigation will become the latest trend for the hip executive.

We predict that this "electronic counter" approach will become unavoidable in time, even if only to be used occasionally or partially. It is a perfect solution for many problems, with interesting consequences:

- it helps to reduce installation and operation fees, especially in foreign countries where these "electronic counters" would become modern trading posts,

- it makes value-added services more widely available, and gives access to specialists paid according to consultation time and not time spent in an office,

- it creates a meeting place that eventually feeds off itself, in the form of business hotels next to the "greenhouses" where knowledge and expertise are fostered,

- it eases human resource management, either intermittently, with sudden, strong sales campaigns, or more permanently, with the opening of an economic post to help reduce travelling and unnecessary overhead.

Finally, we should remember that the "offisaurus", with its low investment productivity, can still make its offices available to others and offer facilities services, thus shifting from a cost-driven to a profit-driven approach. The very idea of an integrated service center besides forcing us to rethink our traditional office organization, always a good thing - has a beneficial effect on "real costs". Revenues from this approach can include selling services shared by everyone in the building. In a building where each story is occupied by various companies using meeting rooms, general services, and occasional offices, it would hardly be surprising if everyone decided to share and thus optimize their respective resources. Some are still hesitant, however, and are afraid to appear to be in financial straights should they consider this option. The managing agent can play an important role here, helping to create a new type of economic union within the building.

A new economic logic is developing, and evidence abounds that soft capital (immaterial) is helping to save on hard capital (material). The relationship between companies and their white-collar workers is changing. It is most notably characterized by a new type of partnership which modifies economy and trade. The Third Order society is starting to create new competition for the second wave employee, a new type of white-collar worker: the partner.

The new white-collar: a partner

In 1982, when Rank Xerox noted that in Great-Britain, 31% of its London offices' expenses were dirtected towards infrastructure, 30% towards personnel, and 24% towards overheads, they decided to give telework a new twist: they scattered.

According to a 1990 Geneva BIT (Bureau International du Travail) report on telework, this "scattering" process implied that all executives concerned were considered independent. They were asked to voluntarily hand in their resignation, and were paid according to their previous salary. In 1985, their ranks reached 54, including 6 women. They represented a wide variety of functions: marketing, planification, research, financial analysis, operational research, public relations, training, health, security, etc. Most of them were specialists and managers, who all signed a partnership contract.

The "partners" made their own arrangements with "their" clients. Payment was made according to results, to performance, rather than time. Rank Xerox guaranteed 100 working days per year for an initial period of a year, based on previous salary. A training session - usually four weeks - on independent management was given to all. In order to avoid physical, and psychological isolation, the teleworkers were associated with other partners in the same sector. Most go to the office for at least one half day a week for meetings or brain-storming sessions. They even founded an association, Xanadu: Xerox Association of Networkers and Distributed Utilities; in order to avoid becoming too dependent only 50% of benefits can be sold to the company. Equipment (computers linked to a network) is supplied by Rank Xerox and certain expenses are paid for. For the company, this partnership system, which guanrantees resources and offers support to everyone involved, also creates jobs, though now delocalized thanks to work-at-home. In many cases, the company itself could not delocalize, but its "partners" certainly could. Interestingly enough, the most highly-trained employees are also the most favorable to this type of arrangement, conscious as they are of their own market value. This was confirmed by the aforementioned Empirika study. Rank Xerox reduced its need for office space and the corresponding operating fees. It now has access to a pool of expertise ready to be used on demand and at a low cost. Partners, for their part, spend less time (and money) travelling from home to office and back, and in the end feel more efficient and flexible, with a healthier bank account to boot. However, the relationship between company and partners was not always so easy* . Rank Xerox managers were not prepared to deal with this new type of relationship. (67)

Fintech, in the UK, understands this type of relationship quite well. The company, specialized in publicity journals, signs long-term contracts with freelance journalists. The journalists are extremely independent. As partners, they have the right to subcontract certain aspects of the work. This independence must coexist with a high lever of technological and organizational integration within the company. (68)

Choosing time between partners modifies our rapport to collective time, which breaks down into a multitude of services in order to help us better organize professional and personal time. The Copernician revolution gives partnership a new credibility. Of

* A 1985 West German survey reveals that 19% of teleworkers visited their office once a month, 19% twice a month, and 24% several times per week. Most visits (89%) lasted more than one hour. (Source: Bureau International du Travail)

course, this is in the best interest of all concerned. An employer wishing to improve time management understands that the company could ask for the occasional extra effort in return, at various times of the year, month, or even week. Companies nevertheless keep privileged links with highly-qualified employees and executives. This approach can be applied to a part-time mobile unit or to set up progressive retirement while maintaining the company's intellectual resources. IBM is a good example: they have authorized a pre-retirement plan which can last up to three years. IBM has long understood the importance of developing career plans for non-hierarchized specialists, baptized "professionals"* .

More than 2,000 such agreements are signed each year. (71) They contribute to stabilize company staff and to reduce overheads. It is less a matter of salary reduction than somewhat slowing their progression down thanks to partnership agreements (where telework does not always play a central role). In 1985, SPAR reduced its data gathering costs from $14.13 an hour to $6.70 an hour. In 1985, one month of data gathering meant $7,500; in 1986, it only meant $4,000. Only 20% of this saving is imputable to salary; the rest is more a question of operations (electricity, space rental and charges, subcontracting during periods of overload, etc.). A German printer made the same discovery when they sent part of their imaging and layout staff home to work: global costs went from 100 DM to 24 DM per day. (72) Economic pressure between competitors in certain sectors is such that only those who manage to reduce fixed assets and operation expenses through telework manage to survive. Generally speaking, reducing overhead while increasing variable expenses is a shrewd approach to sail through rapidly changing economic circumstances. However, this flexibility can sometimes be detrimental to suppliers: in unfavorable economic circumstances, companies no longer wish to outsource.

This situation creates a new type of competition for established workers, and unions will be the first to try and fight back. Yet it also encourages the creation of partnerships which reduce the risk inherent to independent work and are best equipped to adapt to the fluctuating demands of business partners. Virtual enterprises now have access to a wealth of resources at a reduced global cost, on the one hand, and answering immediate needs, on the other.

Finally, NICT's open the door to new ways of reducing costs. A clear consensus appears: productivity stemming from work and personnel redistribution through telework always represent an interesting share of profit, from 10% to 40%, according to the situation. Experiences are so varied that we recommend a look at our bibliography in order to find out more. Attempts at reducing expenses related to fixed assets and overheads and to elaborate scenarios based on this new flexibility always yield positive results. Today, in IBM Germany in Stuggart, 450 white-collar workers work home part-time. The office has been reinvented, so to speak, the result of a 1991 agreement on "work areas outside the company".

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* A 1987 British survey performed by Empirica on wage earners who work partly at home reveals their motivations: a desire of flexibilty for 91%, then the need to take care of children or dependant relatives (88%), then the desire to answer the demands of their family (72%) (69). Another 1987 study, performed by Britsh Telecom, stated that 50% of wage earners were ready to work part-time at home. The British Industry Confederation estimates that the gain of productivity caused by this new flexibility and the savings on costs amounts to 30%.

We will let Peter Townsed, former Avis President, have the final word. In an humourus little book on management, he sums it all up: "This will help you avoid creating an inactive population which would spend some of their time wondering who to bother, in order to occupy the rest of their time..."

Chapter 4

The home office: why all the fuss?

Man's conscience does not determine his being; it is his social being which determines his conscience.

Karl Marx

When we look at various parts of the world, it is difficult not to notice the vastly different roles the home plays from culture to culture. The Japanese easily work and live as men together, sleep where they work or close by, sometimes in special hotels built for this very purpose. Australian bushmen, Canadians or Norwegians have made their home a privileged area for their professional, social, and family life, as is the case for many families who live in isolation. This situation evolves gradually as we move further south, where life is led in public, in the open air, and the home is a refuge from heat. The gyneaceum isolates women and children and divides space along sex lines as opposed to functions, as is the case is Europe. We know that meals are a special time for binding family ties; in Italy, in France, mostly outside of city centers, lunch is usually eaten in the home, rather than at a restaurant. Obviously, the role of the home has an influence on attitudes to telework in general and to work-at-home in particular, especially along the North/South divide.

This said, we should remember that the idea of work-at-home considered a temporary step in the development of virtual business has often been the target of useless, unjustified attacks. We in fact seem to have forgotten how socially and economically useful the home is compared to the office. Firms, particularly in the tertiary office sector, cannot continue to ignore their environment. Neither was it possible to avoid, when office automation came along, investing even minimally in this new technology. We shall have to invest in order to reduce the fear of being left out of professional circles as soon as the concept of work-at-home, even part-time, is mentioned. But first of all, we will have to replace the current, dominant technocratic discourse.

We need no longer ask whether or not we will one day put into practice the virtual enterprise, of which work-at-home is only one aspect. The real question is, when?

Home automation and office automation: two aspects of the same battle

"Tele-teaching via satellite, at home... Minitel, used both for personal and professional needs... Telesales or telemarketing for the home... A Japanese laptop computer to work at home... Soon, our office will be in our very home... Home automation is revolutionizing our daily life..." Images, ideas, catch-phrases with the promise of a better, hypertechnological tomorrow. Yet studies performed by CERN, EMPIRIKA, and FAST all seem to confirm observations made by certain managers regarding office automation: because of our lack of familiarity with NICT's, the spread of office automation failed miserably. In the same way, if technology does not disappear behind the actual services needed to be performed, house automation will also fail. Or at least, it will only be the exclusive domain of the initiated few. This was confirmed by a FAST survey on remote work in urban and rural centers in Europe. (73) Generally, Europe is interested in the home office, especially employees who use their own computers for their work (this is not evenly spread, however: in Germany, 26.3% of computer owners are interested in telework, as opposed to 60.4% in the U.K.). We now feel that as we grow increasingly familiar with computers and as they make further inroads, they should play a decisive role in the development of work-at-home* . According to Electronics Industry Association in the United States, a third of new firms created in 1987 and 1988 were home-based. This revolution was made possible by a reduction in equipment costs. "For $3,000, a businessman can open an office in his home with all the equipment and services a company should offer", according to EIA Vice-President Thomas Friel. (74)

In reality, aside from a few fanatics and the most enterprising of the new tradespeople, the intrusion and ensuing generalization of NICT's in our homes is still very slow. In 1989, the Institut Français du Batiment performed an international survey on home automation which included France, Germany, and the U.K. (75) Five general expectations were outlined:

- technical management, then mastering risks, for 56%
- security and protection for 48%
- assistance for 38%
- information for 35%

These answers clearly show our era's preoccupation for safety, without a thought given to specific home automation needs. On the other hand, according to the Director of Domoconcept, a home automation system should never be confusing to the user and should always be discreetly integrated to the home. In Japan, 62% of the population is wary of the intrusion of computers in the home.

This means that by maintaining a technocratic discourse on telework, we end up instilling more fear than anything else. In reality, there is no need for ultra-sophisticated equipment in order to have a home office. It this were true, who, indeed, would want a

* More than 50% of new French firms are in the service sector. 90% have less than 10 employees, and among those 50% don't have any employee.

home office? A fax, a scanner, and a DVI card for images in a computer cannot be sconsidered a technological invasion of the home. "Telework is not essentially a technical problem", François de Lavergne of the CESTA concluded in 1984, at a Milan conference on telework. It is part of an organization project and should be treated as such. As for NICT design and operations applied to home automation, they are intimately linked to our need to make technology disappear behind the "intelligent objects" mentioned in a previous chapter. No one has as yet thought of applying virtuality to group work, and even less so from the home. This is also true for the possible role of NICT's in supporting at-home training or simply in interactive games, applications still absent from the debate.

The office has become indispensable, no doubt because it is the only place where we feel we are, ourselves, exactly that. This dependent attitude makes us see the home office as only a temporary stop, or step. For white-collar workers who do non-repetitive work, we could imagine an arrangement for those who move around the most, where office work would alternate with work-at-home in order to find... some peace and quiet! The majority of studies on the subject, such as a GRETS (Groupe de Recherche et d'E∑tude sur la Technologie et la Société) study performed in Canada, agree that what is termed "computerized work-at-home" is a temporary, even incidental event. (76) We prefer the term "Home office", to others such as "work-at-home" or "remote work".

This debate on the technical complexity of automation equipment which in fact only serves to hide social complexity extends to the home in general. It is true that certain white-collar workers with average or high income can chose where they wish to live. Yet do they really need the "special apartments" every good sci-fi author promises them, and are they that indispensable to teleworkers? Need we remind readers that we are possessed of a stunning ingenuity when it comes to arranging our homes if we feel like it? ISDN, a small satellite dish, cable, and voilà. For the rest, we'll do just fine and the market will supply the rest.

However, the home office is not available to everyone. Users will be among the privileged few, and not second class workers - ∫sorry, teleworkers. Leaving the traditional office for the home will remain a luxury for a long time to come.

When Henri Mintzberg, a sociologist, declares that Senior executives spend 80% of their time communicating with their colleagues, (77) not all these conversations can be useful or productive. As a result, NICT's will allow executives to escape to their home office, and to put an end to "shredded" work without disconnecting from the office network. Executives and white collars know they are more productive when they are asked to stay after hours to work in their office, alone, peacefully...

The 21st century teleworker is characterized by an increase in global qualifications, responsibility, and adaptability.

There will be a rise in:
- engineers, technicians, and computer specialists (9% in the year 2,000 as opposed to 4.9% in 1982)
- white collar senior and junior executives (12% against 9.5%)
- teachers, trainers, educators (7% against 5.2%)

The same applies to health and social work... A world away from the 0.24% of "home teleworkers" found by the Ministère du Travail in the active population.

(Source: Commissariat général au Plan, *Faire gagner la France*, March 1985)

The social and economic importance of the home

The line between private and professional life has been erased for many white collars. The usual alternative, work at the office, sleep at home - and the means of transportation of your choice between the two - is disappearing under the influence of NICT's, which offer the possibility of working virtually anywhere. Still, the office has the advantage. It generates a massive population movement everyday, emptying entire buildings and residences, practically leaving them abandoned, not to mention hordes of noisy children and old or disabled people left at home. In 1985, in the U.S., only 30% of women stayed home. (78) Offices are gradually absorbing the effects they have had on social organization. The development of industrial societies may be beneficial, but it leads to various problems waiting to develop into disasters, like pollution. The rise in white collars concentrated in office buildings sprouting left and right in our urban centers could potentially be responsible for other such negative consequences. The most well-know are related to the high cost of commuting: pollution, stress, and fatigue. There are others, however, quite formidable, arising from perverse social phenomena (and their cost) created by the interdependence of economic factors. Hence our interest in the social and economic importance of the home against that of the office, less as a way of opposing them, really, than of highlighting their complementary nature.

When cities become strongly urbanized, as service companies and offices develop, home infrastructure slowly erodes, and our living and meeting places disappears. Work no longer leaves us enough time to organize our personal life, our life at home, even our cultural life. We socialize less, and what free time we have becomes more expensive, as our family turns to market substitutes. We turn our backs on our neighbors, plugging into teleservices at the office or late at night, in our homes. Our children, who missed us all day, are already in bed. As with factories, the development of white-collar office jobs has created unquestionable wealth. However, it has also contributed to social problems different from the alienation once imputed to our factories: families... have left the building. Our apartments, our homes have been abandoned, as once was our countryside. Have our living and working quarters become lost in a now wild social landscape? Should we question the value of certain buildings twenty years down the road, as has happened with certain real-estate ghettos now being sold at rock-bottom prices in our large cities?

Brooklyn, one subway station away from Wall Street, has become an economic wasteland of 2.2 million inhabitants. People are so afraid that the City of New York

decided to organize bus tours to tempt businessmen more interested in moving to New Jersey, and to offer various benefits, most notably fiscal ones, to attract them to what is considered a high-risk neighborhood. In St-Paul, Minnesota, only the suicidal still dared to walk around the down-town core after 6 pm, filled as it was with office towers and parking lots. The city was so completely thrown off balance that all highways converged right in the down-town core. Consequently, everyone moved to the suburbs. Eventually, the founders of 3M created a business association that led to a reorganization of the urban landscape. (79) Marseilles, in France, is experiencing the same problem: there is a drain towards the more welcoming surrounding communities. The new rules of the Third Order have led enterprises to multiply their efforts in managing the city's resources. Their success is somewhat lost in the bitter competition between various regions of the world. While the home is at the center of socialization, the spiral of inflation has forced families to go to work and abandon their homes. It now seems necessary to have a double income, partly to cover the cost of our absence from the home... The community also has to pay. In the end, work and commuting leave very little time for running errands and taking care of administration.

More and more, we are substituting our personal relationships with other alternatives. NICT's, meanwhile, are beginning to be seen as potential competitors to the media. "Today, 7 French people out of 10 have no way to keep informed of events in the outside world besides radio and television". (80) However, children are already finding computers a more reliable source of information than the media favored by their parents. They play with arcade games, then study for school thanks to their computers: the home is also one of the key places for education. Should we abandon it completely, especially when we are given the opportunity to return to it - at least a little -ʃ in today's vastly different economic and organizational context, a complete break from our neo-Tayloristic past?

Should we still view the home as separated from the world, and especially the business world, which is now losing its old frame of references and is looking for a new one? We are sitting on a time bomb. We are being led to believe that we can only find misery and servitude if we decide to work at home. Yet our home could offer us new economic and social vitality, necessary to collective balance. Failing this, our large urban centers, like our smaller communities, will gradually become poorer and the victim of rampant homelessness.

We must learn to live in a society that divides its time between economically useful, and socially enriching ways... for lack of our ability to do it all at once. In other words, people first produce the goods and services we need to function properly as a society. Realistically, we must admit that our work is not always interesting or even gratifying. However, we can give each other enough freedom, either as individuals or as a group, to supply or exchange services which allow us to lead more fulfilling lives. Companies are no longer the center of gravity, attracting all social and economic life in their pull; they are now one more piece of the puzzle, part of the mosaic that is our life. Suddenly, the home office seems less archaic.

A. Ruisseau is secretary for a consulting firm. In her 26-hour-a-week working schedule, she would come to her office five times a week. Typing, proofreading, page layout for a specialized monthly newsletter on management and social context. On a particular day, she performed part of her proofreading at home. After buying a home computer, she could do it all from her home. Her relationship with her employer

changed completely. Today, her boss considers her more an "outsourced partner than a paid employee". (81) A. Ruisseau says she wins on all counts: she saves on transport (45 minutes a day), other clients help her amortize her equipment, she better manages her time and can go horseback riding. A. Ruisseau, and many others like her, could have completed her economic analysis, had she wished to: savings in food expenses (no more restaurants!), car-related expenses, babysitting, no more late nights to help the kids with their homework and take care of emergencies that had to be postponed during the day, etc. Having a home office is not such a bad thing, especially when we can keep our social life active.

There are other examples. Some have chosen to try an "associative" lifestyle, quite useful socially, though requiring some free time. When Europe Assistance moves executives, it links them to someone who will help them set-up. This type of service, very popular in the States, is a good illustration of how sophisticated personalized services are becoming. The assistant contacts the landlord or owner of the new home, sometimes even looks for an apartment or home, helps with the kids' new school, gathers information on neighborhood services and facilities, finds out about associations the newcomers might be interested in, looks into insurance needs, guides the newcomers around their new neighborhood, etc. Multiple tasks, obviously, which are not compatible with a conventional office. There is always a free office at company headquarters, however, should it prove necessary. Thousands of people perform these tasks, without asking themselves if they are performing "remote work" or "work-at-home", or even telework! Many of them have an office or desk space in their home. We could conclude by saying that this hidden flexibility helps to reestablish the economic and social importance of the home.

Michel Heurteaux, journalist for Le Monde, well described this new balance between the economic needs created by competition between companies, and individual needs in a 1983 article on "workers of the third kind". He interviewed two employees of Axa's Mutuelles Unies in Elbeuf. One of them, a writer for the "damaged goods" department, said: "I bring my Fridays home".

In this way, he becomes more productive (no one bothers him) and more flexible at the same time, and he can organize his schedule according to family demands, "as long as everything is handed in on Monday". The other takes care of his kids on Wednesdays (a day off in French schools). The "homecoming" does not worry her at all. Far from it: she quite happily reconciles her family life with her work, which her family can now see up close. It is rare, in fact, to see this type of shared time between home and office so specifically written in a contract. Usually, it is a tolerated practice, tolerated because required by this hidden flexibility we wrote of earlier. It is in fact so discreet that no one really notices it, though it helps to reduce our offices' occupancy rate.

As far as we know, people never ask each other: "Do you have an office at home? How much time do you spend there per week, per month?" Why?! Because the office is still the official place of work. Yet we do work at home, even though marginally at times. This shift from office to home, constantly on the rise by all accounts, clearly shows that the home is not only a key place for socializing, but that it is also becoming a place for reflection and professional activity. This is a logical step forward. As we no longer need to all be in one place at the same time, the home, thanks to NICT's, can join the virtual network that links all social and professional players. This duality, this indispensable mix, is indirectly reflected in the development of technological centers.

Specialists in technological centers point out that these are still mostly organized as 1960-style industrial areas, cut off from where people actually live, isolated, ignored, abandoned outside working hours. To counter this, they increasingly suggest the creation of habitat and training programs, business centers, and leisure centers close by. We are reinventing the city. In the world-famous Silicon Valley in California, the prevalent spirit of innovation has led living and working quarters to join in new ways. In other words, our social life, its innovative intensity, has had a positive effect on everyone. This indirectly benefited white-collar... office workers. This approach is slowly gaining ground in France, mostly around specialized university campuses, where our future innovators are to be found. In this perspective, it should be noted that multimedia telesites are becoming open places, where people can meet and learn, whether as members or guests. The telecottages or electronic town halls of Sweden and Scotland are good examples of this.

The fear to be excluded from the professional tribe

The home office, at least part-time, is a good alternative in an over-mediatized society. In all the hubbub, it has been accused of simply being a way of throwing people aside, of leaving them out of the professional loop, and a possible threat to relationships between employees. This type of twaddle only serves maintain our view of the office as tribe, and is successfully brandied about by lovers of sensationalistic theories who know when they have hit a nerve. They affect our view of the employer-employee relationship whenever telework is invoked, even as an experimental approach. These fears are remnants from another age, when we still lived in tribes. At the time, speech and body language were the main tools of communication and social cohesion, and both required proximity. In traditional communities, oral communication was the bond that ensured the community would survive. Even when their role carried symbolic value, the initiated few only had very practical knowledge. We were still a long way from the abstractions the written word finally permitted.

In later years, living and working together, under the same roof, created at times stronger links than even our family ties. We should not forget, however, that "in traditional civilizations, communities are never founded on the explicit and rational understanding of human solidarity". (83) Our relationship to others is total, emotional, and is part of the unwritten obligations we have towards the collective - and vice-versa. As a result, according to Jean Lohisse in Communication et Société (84): "ancient, traditional societies show (...) how hesitant they are to see man as an individual, considered separately from everyone else. Eventually, we end up with a poor social life, and a wariness of individualistic behavior, considered socially deviant." In other words, the employer is not responsible from cutting off whoever leaves or moves away: the professional group is. Whoever is cast off is considered as deviant from the community and is punished accordingly.

Later in history, the emergence of writing fought and won against the old "emotional" forms of communication and became the preferred vehicle of the "learned" society, now capable of abstraction. It gave our tribes who saw it used by authority figures the confused feeling of being caught in an "obscure imperialism". (85)

In today's world of NICT's, two means of communication coexist. One, the most common, is based on the spoken word, self-centeredness, and group values. The other,

less common, is more individualistic and based on the written word and highly-mediatized communications, the domain of a small controlling, learned minority. The ideal scenario, of course, would be to master both these means of communication, to the greater benefit of both, particularly with the growing electronic mediatization which allows us speak to either the individual or the group. The emotional power of the spoken word and of gestures, which ensure cohesion and recognition within a professional group, once united us for common goals... and wars. It has now been cast aside for the power of written information, falsely rationalized and controlled, a power now even more important in an increasingly complex society. All this with, in the background, a growing sense of uneasiness cased by the increasing mobility of working individuals. This mobility is affecting the social and professional cohesion of our now constantly shifting groups. As if the union crisis were not enough, a management crisis is also in the works; managers simply do not know how to understand, guide, and govern entire generations of scattered, extremely mobile employees and executives waiting for their jobs to give them back the emotional impact collective projects used to afford them, the only way to make their work more rewarding and meaningful.

Still, an independent attitude is considered suspect, deviant. Fearing marginality, we end up fearing freedom. We also fear the emergence of a new type of professional, the "partner", considered a type of mercenary, because he threatens to redistribute power. J.B. de Foucault, as quoted by Michel Albert in Le Pari français (83), feels that this new division of power is possible in chosen time (which means, indirectly, that we still buy time and not added value). He stresses the new-found independence of the individual, and the fear this instills in others. "Free time is a threat to power", he writes. "It allows everyone to better control their life, to choose how much time will be devoted to work and making money, and how much time will be devoted to more creative, responsible life." As a result, in order to avoid any form of radicalism, companies who divide their resources differently, thus gaining greater flexibility, will have to take certain precautions. British Telecom wrote a little booklet on the prerequisites for a successful telework program. In all cases, a breakdown in communications must be averted: thanks to networks - which structure groups differently - companies can reach anyone, anywhere, and at anytime, and vice-versa. Projects are controlled more carefully and with more regularity. Ironically, this type of temporary move away from the office leads to formal project meetings, a rare thing in traditional enterprises, since everyone simply meets in the halls...

It is clear also that personal motivation plays a part. Well before the Nora-Minc report on the computerization of France was published in 1978, Jacudi, a Japanese firm, took some time in 1971 to study the development of computerization. Interestingly enough, their analysis showed the 70's and 90's to be oriented towards Society and collective well-being, and the 80's and the year 2000 to be oriented towards Individuals and Personal satisfaction (see below). Aspirations complete each other, become enmeshed, rather than opposed. This analysis shows us that we must accept a dual society and learn to control it in the best interest of our cities.

The computerized society
Source: Jacudi Report, 1971

	1st period 1945/1970	2nd period 1955/1980	3rd period 1970/1990	4th period 1980/2000
Orientation	Information sciences	Management	Society	The individual
Objectives	Military Space	GNP	Well-being	Satisfaction
Values	Prestige	Growth	Well-being	Self-fulfillment
Subjects	Country	Businesses	Nations	Individuals
Objects	Nature	Organization	Society	Individual behavior
Basic sciences	Natural sciences	Management	Social sciences	Behavioral sciences
Information model	Reaching goals	Profitability	Problem solving	Intellectual creativity

By multiplying their production and intervention sites, virtual enterprises have become an open space, and will remain so under the laws of productivity. Telepresence can be ensured from a wide variety of places, the office at company headquarters being only one of the possible "moorings posts". The need for efficiency will decide. The main objective is to stay hooked to the network and the expertise the company offers through NICT's.

Glaxo, in France, chose this very option: in order to improve its profile in the medical profession, the pharmaceutical company decided to create special teams of "Clinical Research Attaches" in various university towns. These CRA teams have no office, and work either at home on in hospitals. They send the Paris office, almost in real time, the characteristics of each new patient in their study projects; results are analyzed by night by Glaxo computers, an operation controlled by the CRA manager, who gives instructions according to how the studies evolve. This approach has allowed the company to perform more studies, and more regional studies in particular, in the same amount of time, and to follow their evolution almost in real time, without having to build new offices in order to house the new staff. According to the company's Data Processing Manager, Marc Elbet, the idea is to give each executive working outside the main office, including employees or executives who wish to work at home, a way to connect to the network, even if certain links between ISDN and the company's private network are still somewhat problematic. (87) In a network culture, becoming conscious of not only serving our company, but also society allows us to extend our reach in new ways, a characteristic inherent to our condition as terminal-men. Remote management of company resources is necessary in our 21st century virtual enterprises. We can no longer accept the old arguments against work-at-home, relics from a former era.

Arguments against work-at-home are far from convincing

Work-at-home is something of an outlaw, rejected by traditional enterprises, the victim of numerous criticisms and reservations. Essentially, there are four basic arguments against telework, in the minds of its critics at least. Let us now have a look at them, before we conclude. We should keep in mind, however, that we are dealing with the tertiary sector in general, but also, and mostly, highly-qualified white-collars of superior rank, who happen to be the most costly.

The home is not a proper work environment? Well, now! What about children, or anyone pursuing their studies, anyone already working there everyday? There are thousands of people doing associative work, managing their personal affairs, and using a host of services from their homes, with the help of NICT's. They are also responsible, need we remind everyone, for the majority of car traffic. This occasional work-at-home should be considered as a normal kind of social and economic breather. Our idea of the home is expanding, as is our idea of enterprises, and the emergence of multimedia centers in our communities will soon be as commonplace as public baths in other times.

There is no need to once again discuss how the home must adapt; everyone can decide for themselves what their home should look like. However, it should be noted that thousands of craftsmen, tradesmen, even teachers, are quite happy with this new type of osmosis between work and home. The physical and psychological health in these professions does not seem to suffer, as there certainly is no incompatibility between worker and working space!

People will become prisoners of their own enclaves, and their personal relationships will suffer. In reality, events are consistently proving this wrong. When J.C. Penney starting using phone sales, they allowed some 8,000 employees to work part-time for their homes. These employees were able to find some sense of economic purpose in a job that would have otherwise been inaccessible to most of them. It is a type of social reinsertion program - contrary to popular belief - which has already found work for convicts before their liberation, as was the case with Best Western in Arizona, who simply rerouted their reservation calls. In France, in 1984, Control Data hired two disabled workers, one who could only move around in a wheelchair, the other using canes. Yet both were fully autonomous, one a programmer-analyst, the other a translator. After a few years of working at home, they would come to the office regularly. As their fellow workers grew to appreciate them and forget their handicap, they came to work permanently at the office, thus going through the mill of daily commuting, the symbol of their complete reinsertion. Other forms of flexibility allow for more hybrid work and preserve our social lives. Another employee of Data General France, for example, during her pregnancy leave, decided to remain available on call to the technical and sales team. Thanks to telework, the company was able to use her know-how in a rapidly evolving field. With this system, a career can be stretched, a good thing for retirement funds, and "old" executives are not so costly. When an executive retires, he or she could work part-time, without having to come to the office everyday. However, we cannot ask companies to supply a solution to solitude; that is not within their mandate. When cut off from the company's communications system, we can suddenly see how much empty space it actually filled. The mythic importance of "place" the main office, headquarters, the product of rare meetings with upper management, strangely familiar, must not make us lose sight of reality.

Our social life is determined specifically by various cultural and environmental factors. In France, the pioneers of telematics were not executives, workers, or firms, but farmers. They used Minitel as a way to escape from their professional isolation. In advanced countries, the growth of formal and informal trade is directly linked to NICT's, a type of peripheral of our social life.

This said, we should try to avoid viewing the office, even in the tertiary sector, as a Barbara Cartland-style paradise. It will always remain a place where ambition and self-affirmation rule.

The law has yet to adapt and experiences are limited. No need to bother the reader with the countless catastrophes imagined by critics regarding law and insurance. By overdoing it, they only justify apathy. The law has never preceded events, and there is no reason for this to change. As far as we know, no one has managed to mobilize anyone in this matter, save negatively. It is usually impossible to act on such precise phonemena. The individual disappears in a complex web which our traditional systems are unable unravel.

The growth of outsourcing forces us to look at the status of the "partner", said to be independent. The loss of a regular, secure income, of possible social benefits are a major impediment to the flexibility our communities have come to expect. We now know that the productivity of telework is not the result of savings made on the direct cost of work but on other types of overheads. Work-at-home, or telework, should not be considered a cure-all. However, for those imaginative few brave enough to leave the Tayloristic model behind, it is a wonderful organizational tool which requires no less discipline than any other form of change. It also requires the right support investments, and properly defined rules for a moral "contract" between partners, in the absence of law.

There is also the matter of confidentiality, when so much information is sent through networks. This is outside our mandate, especially since it deals with a general problem which concerns "open" enterprises, always at the mercy of any fault in their information system. As for the alleged limited experiences in telework, we hope this book has shown there are other types of work arrangements. Fierce, world-wide competition leaves us no other choice; imagination and innovation cannot be only left to product design. Companies must be capable of the same creativity when dealing with their organization and with networks, rather then imitating, and poorly, at that, models imported from other cultures.

Remote management is not adapted to our current approach to supervision. Formal or informal exchanges in the post-Tayloristic enterprise is changing the way we communicate, used as we are to a trade culture. Social cohesion within a company is no longer hierarchical, it is more the result of shared values and objectives. Relationships between company members and outside partners is based on an implicit or explicit partnership agreement. In fact, relationships become "order-driven", everyone in turn being either supplier or client. This is important if the right balance is to be struck between rigid and archaic (though at times necessary) control, and a laisser-faire policy, mostly the result of the saturation of a small circle of decision makers reluctant to delegate. This type of relationship must progressively expand to include all workers in all fields of work.

This change in management practices is all the more useful in this era of "hybrid jobs", some of which may include a part-time work-at-home policy. This could serve executives who wish to lead their careers off the beaten path (partners, professional mercenaries, time-sharing with other companies, etc.), in agreement with their company, who also benefits from the approach. It could also help in surveillance, as rotation cycles could be set up, to the greater benefit of the company. There are other applications, which could serve to stretch equipment use from various locations, as Time Life did in Galway.

These criticisms only instill fear in the most fainthearted. Mostly, however, they have created a type of self-censorship which prevents us from rationally and pragmatically exploring other possibilities. The Third Order, responsible for making NICT's and networks the pillar of our economy and of virtual work, will no doubt force companies reaching for 21st century standards to review the question. We can only hope that the many examples in this book will serve as a guiding light.

Epilogue

Who is the master?
The one who does not know
Who is the companion?
The one who does not say
Who is the apprentice?
Everyone.

Raoul Vergez, dit le Béarnais,
L'ami du Tour de France

It is impossible to conclude a book that announces a birth, the birth of the virtual enterprise. Our exploration of the events which initiated it and a few theories on its possible role in the 21st century economy can only lead to more questions on its future and its inner-workings. Other minds will bring their views, and make their contribution to this process. For my part, I would like to leave the reader with a few remarks which should, I hope, now appear self-evident.

Economic activity, power, the productivity of work and capital, the keys to competitive edge not just for companies, but also for nations, now rely on networks and computers. New strategic battles are to be expected. Companies who lack the latest in strategic tools - i.e. unable to simulate events - and who still believe in fortresses in a world without frontiers, will regret it.

Will there be life after white-collar workers? Computers have transformed the very essence of work. Intelligence is now externalized and coproduced in value-added chains where more and more participants join in thanks to networks. The "workerism" mentality which still underlies the relationships within enterprises will be deeply changed. After the traditional white-collar, a new type of worker will emerge, halfway between an employee and an independent worker: a partner. The law will simply have to adapt.

In the Third Order, telework will no more be a goal than presence used to be; yet in a complex work environment, optimizing resources directed towards developing business

will depend on a successful symbiosis with NICT's. This will only be possible if we accept to call into question certain neo-Tayloristic ideas. From this point of view, it is unfortunate that some companies have often cast aside the people in charge of thinking the organization, under the pretext of pressing computerization. Their role is now played by managers who do not have time to further explore the subject.

Also, many executives, technically backward, have forgotten or have failed to understand that NICT's (and not only in workshops or offices) are essential to transforming our enterprises and making them more competitive. The Japanese happily criticize us in this matter: "American managers are technologically illiterate", writes Professor Yoshi Tsurumi, adding that two thirds of the managers of the top-24 japanese companies have scientific or technical diplomas while only a third of their American counterparts do so. Still according to Professor Yoshi Tsurumi, American managers "look for legal and financial solutions rather than technological and human ones". (1)

The lack of curiosity, and also of technological and economical knowledge exhibited by our managers and politicians regarding NICT's is, to me, a dangerous thing, particularly when Third Wave economy is still controlled by neo-Tayloristic, second wave minds.

NICT's are revolutionizing the world of education, the training processes, and the way our children see the world. They open the possibilities of virtuality to the Terminal Man, to enterprises, and can make us ubiquitous, omnipresent, omniscient. They alter the rules of business competition.

At the same time, less than one French company out of ten is able to receive an impatient client outside business hours, even with a simple answering machine! Is anybody there? Well, welcome to the club. Everything is possible... but we must invent it first!