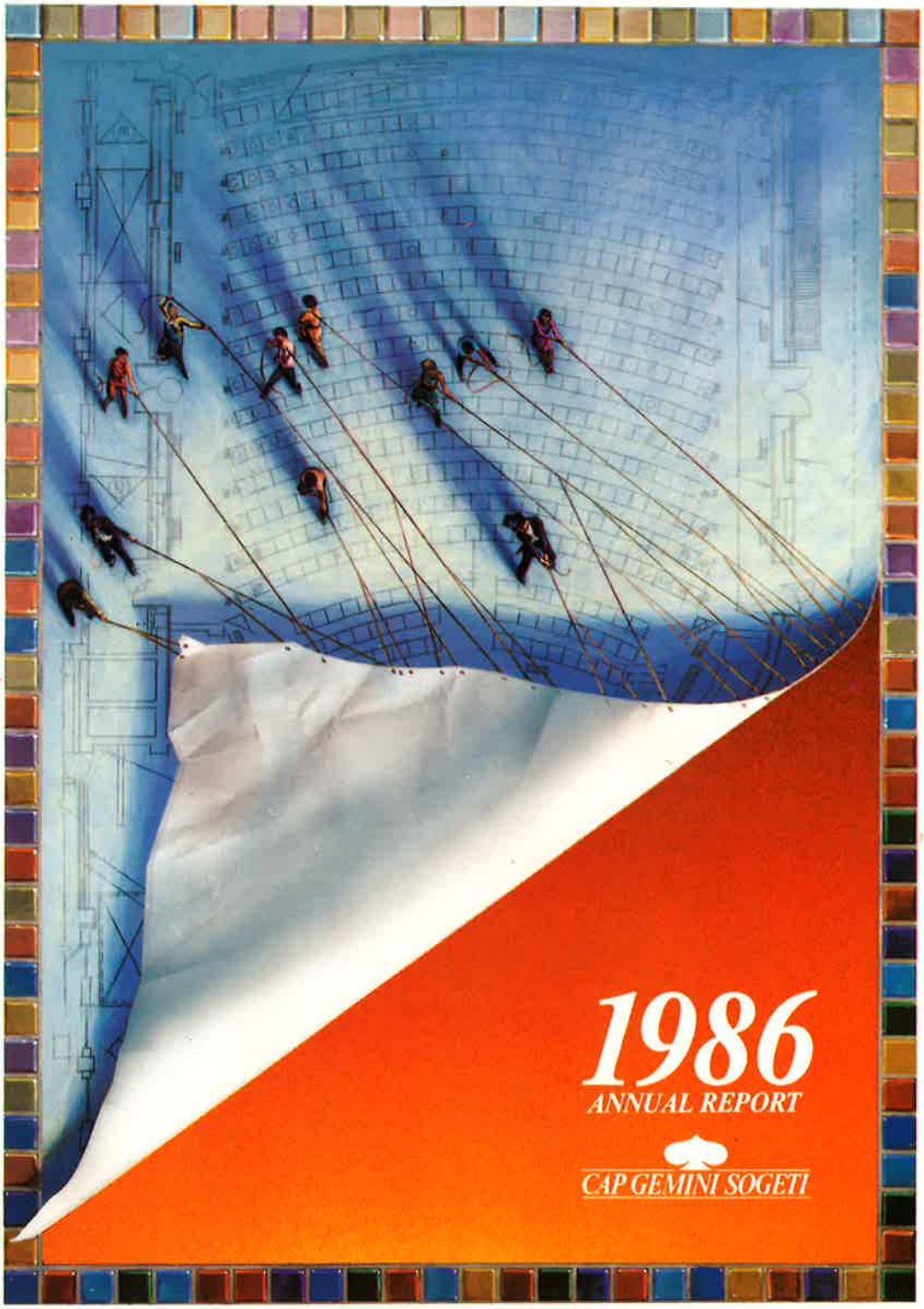
1986
ANNUAL REPORT
CAP GEMINI SOGETI

1986 Annual Report of CAP GEMINI SOGETI

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CAP GEMINI SOGETI

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When I created SOGETI in October 1967, I could hardly find ten people to support me, although there were at least a hundred bent on discouraging me: "It's too late; the slots have already been filled; the pressure in this business is too great..." There was no end to the negative arguments.

I also remember those who were constantly talking about critical mass. They were the ones who explained to me several years later that although it was true I had succeeded in assembling 2 or 3 hundred staff, I had better stop there because if I went beyond a certain threshold, it was no longer services but industry. "And there," they warned me, "you'll find the problems are just not the same"; no doubt implying that the only alternatives are either craftsmanship or mass production.

A few days ago, at a luncheon attended by a number of leading French industrialists, I heard one of them – someone I greatly respect – refer to services as an "incestuous activity." And some months ago, I heard another brilliant Chief Executive, head of a family business, claim that "services do not create any new wealth." (It turns out that he has just doubled the value of his industrial empire by acquiring a company dealing in transportation and international trade!).

Why does all this come to mind as I write these lines? Probably because I sense an economic sea-change taking place – under our very noses, in fact – but one whose real magnitude is neither clearly perceived nor fully accepted.

In their "Economic Table" of 1758, François Quesnay and his fellow physiocrats(*) concluded that agriculture was the only real source of wealth. And it is true that 150 years later, at the beginning of this century, 70% of the working population of the United States was still employed in agriculture. Today, agricultural production in the U.S. has multiplied by 20 or 30, yet it employs only 3% of that working population. Now everyone admits that a nation can be fed without harnessing more than 5% of its workforce.

It is this same "materialistic" reasoning – simply shifted a notch (from agriculture to industry) – which still refuses to label as productive any activity not directly linked to the manufacture of a product, and which, taking its cue from Adam Smith's example of more than 200 years ago, insists on classifying service activities among the non-productive professions.

Nevertheless, the shift is taking place right in our midst. Still taking the United States as illustration: has it been forgotten that at the end of World War II, industry employed 50% of the working population of the country? Well, that sector today employs less than 25% of the workforce, and there is general agreement that by the beginning of the next century – with the help of automation and robotics – that figure will have shrunk to no more than 5%! Which means that 20 years from now, 8% of the working population (that's right, barely 1 American in 20) will be enough to produce all the agricultural and industrial goods needed by the United States for its internal consumption as well as its international trade.

So it is also unreasonable to expect industry (taken as a whole) to go on creating jobs when its real problem is to increase productivity. When those in their infancy today reach working age and start looking for employment, they will be offered positions in the service sector (mostly in areas that are not even know to us at the present time!). From now on, that sector will represent more than 70% of the working population of the United States, about 60% in Holland, Scandinavia and France(**); it already represents about 55% in Japan.

But shouldn't we define exactly what we mean by "services"? Most definitions simply oppose services to

(*) Physiocrats were members of a school of political economists founded in 18th century France. Included in their doctrine was the belief that government policy should not interfere with the operation of natural economic laws and that land is the source of all wealth.

(**) According to Le Monde of March 18, 1987, the breakdown of the 21.4 million people employed in France in 1985 was as follows:

- *1.6 million in agriculture (or 7.5% of the total)*
- *6.6 million in industry and construction (30.8%)*
- *13.2 million in the service sector (61.7%).*

everything else: "services refer to whatever is not agriculture, mining or industry." Distinctions are usually made – however approximate or crude – between non-marketable services (national defense, public safety, education, justice, social services, etc.), which generally represent 1/4 of the total, and marketable services, which may be further subdivided into:

- marketable services targeted mainly to individuals (distribution, tourism, public transportation, entertainment, media, restaurants, health care, etc.), which represent roughly 40% of the total, and
- marketable services targeted mainly to businesses (consulting, DP services, financial services, audits, publicity, temporary employment, freight, security, etc.), which represent approximately 1/3 of the total.

This third category is interesting in more than one respect. Not only because it accounts for 20% to 25% of GNP, but also because its very existence and its rapid development suggest that perhaps the product/service differentiation has grown a little too formal. On the one hand, some services compete with industrial products (even in data processing, software products – or "packages" – are replacing custom software in the performance of certain standardized, repetitive tasks).

On the other hand, however, most enterprises nowadays (industrial enterprises included) are basically service companies. While it is true that in industry the end result is a tangible product, what a number of these companies are actually selling is an increasingly "service-enhanced" product: publicity, packaging, transport, market adaptations, assembly, user training, consumer information, after-sales service, credit, leasing, etc. Even within the manufacturing process itself, handling materials or assembling parts (i.e., the really "industrial" aspect of the work) is often less important than the many internal services involved: market studies, research, financial services, acquisitions, production preparation and programming, information management systems, recruiting, accounting, inventory control, public relations, security, etc.

Thus, the industry/service boundary begins to break down as soon as we start talking about the services provided within such companies, which are often only complementary to, or an extension of, the industrial activity per se. Is that boundary even worth mentioning then? I am reminded of the remark of a certain box manufacturer: "We manufacture boxes to package other people's products," he said. "Therefore, we are a 'service' industry"!

The real question arising from the relationship between the industrial and services sectors, is why any firm – industrial or services – decides to call upon an outside specialist to do what it could very well have done itself? The diversity of responses to this question suggests that many motives lead a company toward "externalization": a desire to refocus its activity on what it does best (allowing others to do the same in their own spheres – a "to each his own" philosophy, so to speak); the need to seek special outside skills when confronted with a particularly difficult or urgent problem; the hope of inspiring inventiveness in its own teams; an inclination to try out methods which the service company has used successfully in other contexts; the wish to absorb a temporary peak in the work load; an attempt to avoid expensive duplication of what a service company can provide at reasonable cost; and so on.

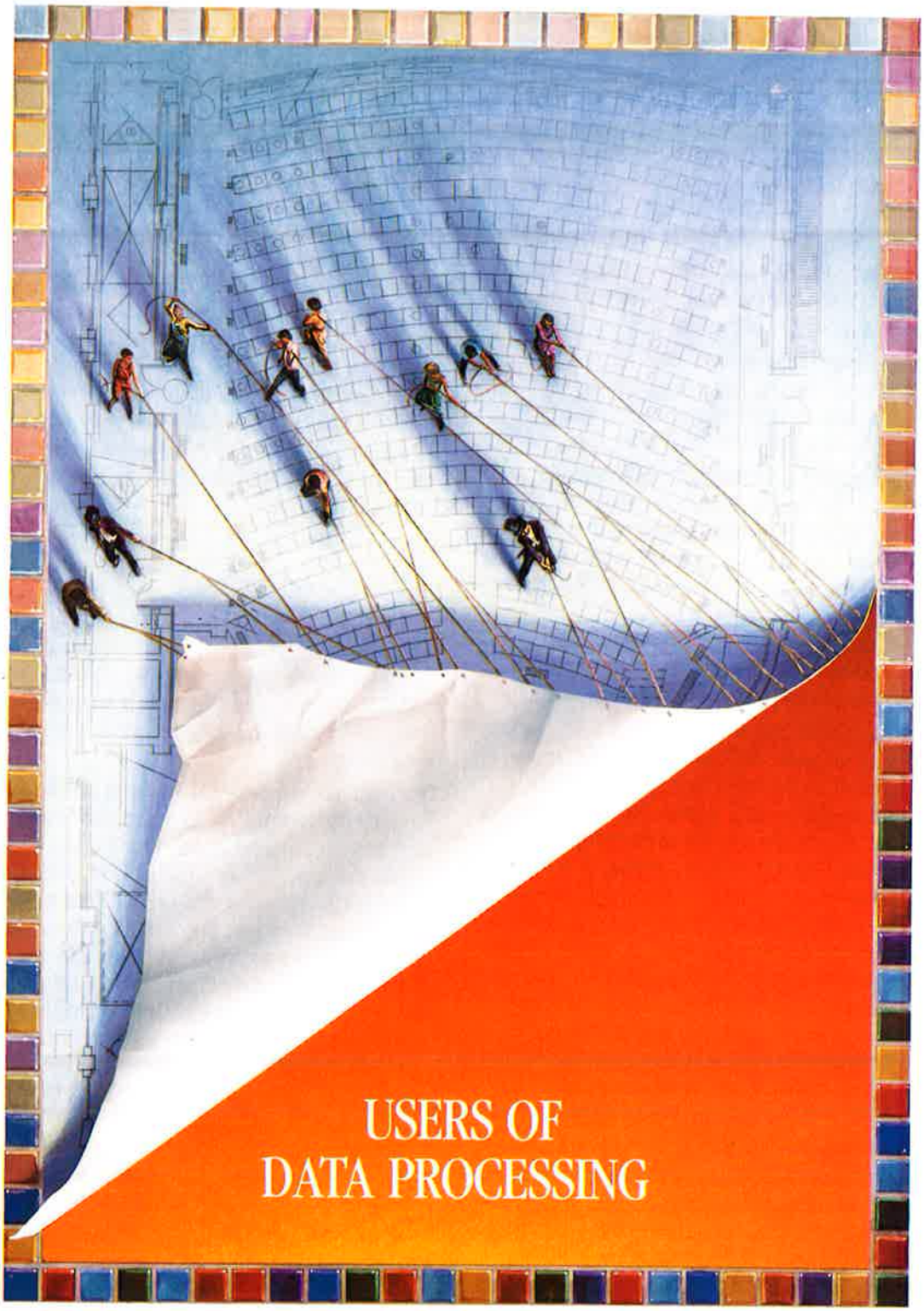
In data processing – where service companies are rightfully viewed as veritable "hotbeds of innovation" – all the above motives (and many others besides) are linked to the incredible rapidity of technological development. These goals justify the existence – and legitimize the success – of companies such as CAP GEMINI SOGETI, companies professionally committed to the two sectors in which they excel; services AND data processing.

Included on the current roster of large DP services and consulting companies are firms that may already number 30 or 40 thousand people, with revenues of 2 or 3 billion dollars. Therefore, CAP GEMINI SOGETI, with its 7,500 employees and its $600 million forecast for 1987, is not one of the giants. But of course it hasn't stopped growing yet, nor does it intend to stop. I predict that in 20 or 30 years, numerous service companies, which are not considered as contenders today, will be among the worldwide corporate leaders. These service companies will be powerful, multinational firms, employing several tens, sometimes even hundreds of thousands of professionals, all conducting business within one or more highly specialized spheres: communications, finance, strategic counseling, corporate organization, CIM. And data processing will be in the middle of it all – omnipresent, if you will.

CAP GEMINI SOGETI's ambition is to take its place among the leaders.

Serge KAMPF

April, 6, 1987


USERS OF
DATA PROCESSING

Up to now, star billing on the data processing stage has gone to the computer: *Time* Magazine went so far as to proclaim it "Man of the Year" for 1982! As if the human mind, proud of having created a machine in its own image, made the first mass-manufactured device of this type - the microcomputer - just about the size of a man's brain.

Admirable as it may be, however, the computer is still so rudimentary that it takes a lot more brains to use one than it does to design and manufacture one! Perhaps that's why the term "user" has come to designate all those people in business and industry taking part in the lengthy process of computerization of applications. And this name has itself grown so vague that it was necessary to coin the expression "end user" to distinguish a person who handles a finished product from one who somehow "finishes" it in the process of implementing a DP application. In any case, there is still plenty of opportunity for coining new expressions, as many end users are themselves now developing applications!

This year, CAP GEMINI SOGETI has decided to dedicate its Annual Report to all those men and women whom the DP industry and its publications call *"USERS."* The following pages introduce those people - divided into four groupings - whose difficult task it is to exploit a fast-moving DP technology for the benefit of organizations which are themselves evolving at a much slower pace.

Reading on, you will find:

An initial section dealing with the organizations bearing overall responsibility for data processing in large and medium-sized companies, staffed by DP professionals who design, develop, operate and maintain the software and hardware which comprises this "central" data processing function.

A second section devoted to department, unit and division managers who, together with their central counterparts, share the task of installing "departmental DP" to meet their users' needs.

A third section which introduces the end users for whom data processing is - in varying degrees of scope and significance - a working tool.

And, in conclusion, a description of the goals sought by users (we call them "integrating users") who incorporate hardware and software into their products.

I - CENTRAL DATA PROCESSING

DP MANAGEMENT: A STRATEGIC ROLE

The role played by corporate DP management has evolved along with technological development. In the early days, its job was to manage, develop and operate a limited hardware inventory. At that time, a DP system was confined to automating the traditional tasks of business management and accounting – although this already yielded a substantial gain in productivity. Consequently, DP Management was subordinated, as a rule, to administrative and financial management. System implementation required solid technical skills (knowledge of programming languages, operating procedures and communications protocols) and a dedicated environment (computer room). At first, then, DP Management was seen as a structure slightly removed from the one to which data-entry forms were delivered, and which churned out results in the form of reports or listings.

With the advent of remote processing, terminals entered the picture. Users could now communicate with the system by directly typing their commands on a keyboard. And they were soon able to receive a virtually instantaneous response, thanks to the system interactiveness developed by their DP departments. Thus, little by little, users came into direct contact with a technology which had theretofore been inaccessible to them. And this new familiarity has been repeatedly confirmed during the intervening years.

The onset of decentralization of DP resources came with the **minicomputer**, made available to selected levels of corporate activity.

The **microprocessor** began its business career at the beginning of the '80s, bringing a boost to computing power and independence at the individual level. In only a few years, then, users have taken over functions such as data entry and checking, and even definition of display and output formats. This evolution has been accompanied by growing system complexity, hand in hand with sustained demand for new applications. Data processing has proved to be a powerful communications tool. It has become the technology for implementation of the integrated business information system – and thus an essential instrument of strategy.

Over the years, the DP department has had to keep up with this trend. Exercising its responsibility for "central data processing," it has taken on new missions: assisting end users while assuming a role which – as will be shown – is growing increasingly strategic in nature, while maintaining full control over an increasingly complex technology.

In this section, we will first give a general overview of the function of data processing in the corporation. Then we will examine this function in greater detail:

- first, on the basis of the expense budget that it entails,
- next, from the standpoint of the major forces to which it is subject: decentralization and strategic pressures,
- and, finally, from the standpoint of the day-to-day problems that it must handle and solve.

THE CORPORATE DATA PROCESSING FUNCTION

As a rule, DP management is tasked with designing, implementing, managing and developing the corporate DP system. Its traditional goals are business information processing (accounting, financial management, production management, etc.) and the provision of computing resources to technicians. Putting technological advances to work, DP professionals have made it possible to process every type of information, from business correspondence through warehouse inventory status to the very signal pulses emitted by industrial robots to indicate that they have started and finished a welding operation on a workpiece; whence the term "information system" instead of "data processing system."

With its extensive ability to communicate, the information system is increasingly assuming the appearance of a biological nervous system: it transmits messages instantaneously, it controls memory, it encourages decentralization, etc. It is taking on an increasingly crucial importance. As a result, the role of DP management is becoming daily more complex, its position in corporate line authority is changing and it is being assigned new tasks. With data processing henceforth recognized as a strategic tool, the DP manager is participating more and more in decision-making groups. In this way, he is contributing his skills as an expert in the use of data processing to the definition and execution of corporate strategy.

To fulfill its mission, DP management must carry out a number of precise tasks:

- **it anchors the corporation's entire data processing activity**; it manages the hardware and software teams and resources (computers, networks, databases, programs, etc.) and maintains the information system's coherence as it grows and changes; it plans and monitors installation of the company's DP master plan, and coordinates its fulfillment.

- it assumes responsibility for **the development of new applications**; it collects user requests and takes charge of implementations. To this end, it manages development projects until applications have been accepted and go operational.

- **it maintains existing applications**; this maintenance might consist in debugging a program, improving its performance, revising it to meet a new user requirement or to adapt to a change in its technical environment. Given the volume of existing applications in a large corporation, maintenance often involves a greater workload than software development itself.

- it carries out applications processing, for which purpose **it manages DP system operations**; it acts to ensure that resources used (computers and peripherals, software, networks, etc.) yield the service expected of them by users, particularly from the standpoints of service quality (punctuality, response time, information accuracy) and production cost.

- it is increasingly being called upon **to assume responsibility for other services**, such as telecommunications and office equipment, whose technical resources are themselves becoming increasingly computerized. As telephone switches and word processing systems – to name only two – have become true computers, they can also be integrated into the DP system.

- furthermore, the increasing involvement of users has led DP management to take on the now-crucial problem of applications training, as well as that of the concerted definition of specifications. In order to carry out these new **consulting, assistance and training functions**, DP management has set up structures and procedures for dialogue with its "clients": "infocenters" (also termed "microcenters"), DP committees, networks of contact people in user departments, etc.

All of this has not been without some effect on attitudes: more and more, the DP manager and his team have had to commit themselves to dialogue and concerted action. As a result of the progressive – but rapid – transformation of DP management's role within the corporate structure, this body must today not only maintain existing levels of technical skill, but exhibit the highest managerial qualities as well.

Finally, in order to play his part effectively, the DP manager maintains close and continuing contact with the outside world of data processing: colleagues, manufacturers and software service firms. Only a comprehensive grasp of the possibilities presented by developments in hardware and software technologies enables him to orient his strategic options correctly, to optimize his technical choices, to counsel users efficiently and to make full use of outside resources.

Changes in the operation of DP centers

For the past few years, the range of operating tasks assigned to data processing systems has been undergoing a profound and irreversible change, the result of overall transformation within the data processing industry itself. Among the many factors contributing to this evolution are the growing number of direct users, the appearance of intermediate users equipped with many different kinds of systems, in addition to the development of a wide variety of networks linked to a equally wide variety of equipment.

These developments in operations have led:

- on the one hand, to the opening up of new categories of users, radically different by virtue of their numbers, their demands, their needs, their level of familiarity with data processing, from those who traditionally made up DP operations;
- on the other hand, to the need for mastering an increasingly complex and varied technical environment: supervising access to databases, controlling the availability and performance of networks, monitoring the workload of large systems, etc.

All of this implies the computerization of operations, without which it would be impossible to guarantee the level of services that users are demanding.

The growing automation of DP production takes the form of new structures and new businesses. First of all, the new structures: as manual intervention in the computer room diminishes, operations begin to take on the features of a monitoring and security facility.

Concurrently, logistical tasks become increasingly important and are taken over by new channels: DP production planning and scheduling, the restart of DP centers in case of accidental interruption, database management, network control, etc.

The new skills which are emerging as a result of these changes are designed to ensure that the new tasks are handled properly; at the same time, they offer DP operations staff broad opportunities for professional development.

Cap Sogeti Exploitation, a specialized subsidiary of Cap Gemini Sogeti, counsels and assists its clients in preparing and implementing the indispensable changes taking place in their operations services. Such expertise in the computerization of DP production is of vast benefit to the Group's European and American subsidiaries, which have themselves developed services adapted to their own individual markets.

THE DP BUDGET

On the average, a corporation budgets slightly over 1% of its revenue for data processing. Naturally, this percentage varies widely between individual companies and sectors of the economy. It is known that dynamic companies spend more on data processing than their slower-moving counterparts. It is also fairly obvious that distribution companies – whose ratio of added value to sales is relatively low – and the chemical, petroleum and steel industries – in which investment levels are high – allocate low percentages of gross income to data processing. On the other hand, it is only normal to encounter higher levels of spending on data processing in the service sector, where this tool is often an essential component of business activity (banking, brokerage, insurance, transportation).

Let us mention two examples of order of magnitude: the DP manager of a very large corporation finds himself in charge of a budget on the order of a hundred million dollars or so, while his counterpart in a 1,000-employee pharmaceutical laboratory has around one million dollars with which to meet his company's data processing needs.

An "average" DP budget is distributed as follows, by expense category:

- personnel: 35% (25% to 45%)
- hardware and program products: 43% (40% to 50%)
- outside DP services: 10% (5% to 15%)
- telecommunications and miscellaneous: 12% (10% to 15%)

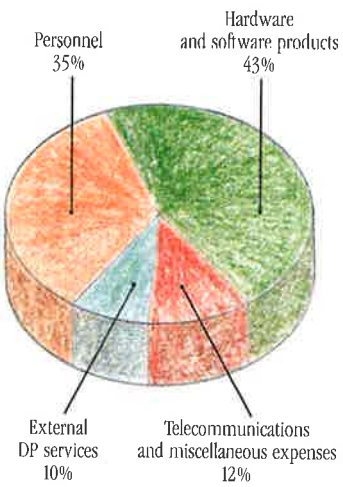
The ranges shown in parentheses give an idea of the possible variations in expense distribution, depending on sector of activity and country.

This distribution illustrates the significance of the DP manager's **purchasing function**: about 60% of his budget goes for goods and services bought from outside suppliers such as hardware manufacturers and service firms. Although certain acquisitions are made directly by individual departments in large corporations (dedicated computers, microcomputers), DP managements maintain an undisputed responsibility for overall spending levels and purchasing policy, particularly from the viewpoint of standards and relations with suppliers.

An examination of a DP budget by activity shows a distribution which varies with company size and economic sector. According to a study published by M.K. Rau (Winchester Consulting Group), the average distribution calculated on the basis of a representative sampling of American companies would look like this:

- production (or "operations"): 54%
- new applications development: 21.5%
- existing applications maintenance: 21.5%
- administration: 3%

DISTRIBUTION OF EXPENSES IN A DP BUDGET



It may be seen that development and maintenance costs are identical, reflecting the fact that we are dealing with an "average" case of a company whose data processing has reached a stable point. It should be noted, however, that it is not unusual for maintenance costs to be much greater than development costs. Unless this situation can be explained by special circumstances, it is to be feared that such companies are not replacing their oldest applications and that their failure to invest in new DP applications could cause them to lose competitiveness.

The proportion of expenditures on maintenance vs. operations, estimated here at 40%, is also significant. Too great a deviation from this mean could be a sign of either inadequate maintenance (generally leading to a degradation of service to users) or aging of applications, some of which are doubtless overdue for renovation.

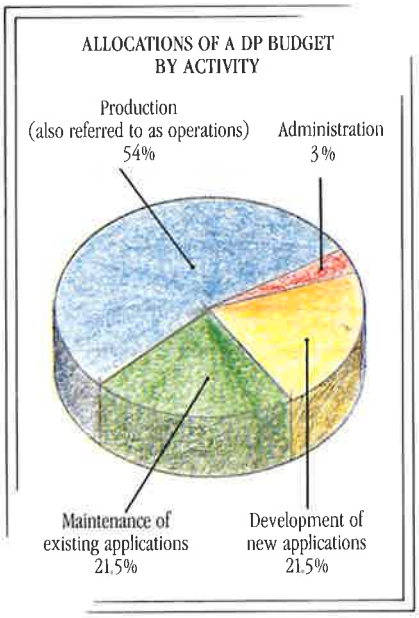
There is also a linkage between development and operations activities, characterized by a time lag, since new applications are made to be operated....and maintained! As a very rough estimate, a development costing $100 entails an annual operating cost of $25 and an annual maintenance cost of $10.

DP managements perform many other analyses of their expenditures for purposes of budget control and, in a

broader framework, budget management and forecasting. In this way, they know exactly what their costs are, not only by individual user department, but by individual application and transaction as well. And they arrive at this knowledge through the use of measurement software which is now written into standard operating systems.

Nonetheless, management of major budgetary categories and options is becoming increasingly difficult, for the following reasons:

- users are demanding more and more applications offering higher performance levels, and they are in a hurry. In particular, because they have gotten better at formulating their needs, and because the drop in hardware costs makes a growing number of applications economically feasible.
- corporate managements are balking at increased spending and fail to understand that maintenance is costly.
- as manufacturers have virtually given up renting their hardware, they are no longer afraid of inventory returns and are unveiling new models at a rapid clip. The residual value of purchased or leased machines falls very rapidly, and the problems of inventory management have been shifted onto DP managements.



TWO MAJOR FORCES

For all kinds of reasons – including the advent of microcomputers, telecommunications, increased competition, etc. – DP management is subject to forces emanating from two major sources: end users and corporate strategy.

As noted in the introduction, pressure from end users is nothing new. But the massive installation of micro-computers in business has accelerated the phenomenon of decentralization of applications development. Results of recent surveys conducted among large American users confirm this state of affairs:

- only 58% of DP managers (as compared to 100% five years ago) say that the major applications should be centrally developed.
- in 80% of companies, microprocessor-equipped end users are themselves developing applications.

In point of fact, the old debate over centralization vs. decentralization of DP resources has been buried in the United States, and is beginning to fade away in Western Europe. There was a difficult period during which DP experts were sometimes looked upon as being intransigent or arrogant, and end users as being presumptuous and unaware of what the true difficulties were. This chapter has been closed, because a necessary transfer of technology brought the two players closer together: on the one hand, end users asked the DP professionals to modify the program products they had bought, and then demanded access to existing central applications files; on the other, some tools developed by end users have been adopted by DP managements.

Today, three levels of data processing are recognized:

- corporate (or central) data processing;
- "departmental" data processing, by definition including all aspects characteristic of the department level: portfolio management or currency-exchange management in banks, shipping, marketing, manufacturing, research and development, etc.;
- end-user data processing, performed at individual terminals or microprocessor workstations.

There also appears to be a consensus of principle to endow users with autonomy thanks to decentralized, department-level resources, on the one hand, and to the integration of these resources into a central DP system on the other. Naturally, it is the function of DP managements, working in harmony with other corporate managements, to define and set up the policy most appropriate to each situation.

Specifically, it is a matter of minimizing the risks inherent in user pressure: risks arising from excessive centralization (poorly-matched functions, slow development pace, etc.) as well as risks arising from an overly emphatic separation of resources and responsibilities (diversity leading to higher costs, organizational immobility, difficulties in

communication, etc.). As an example, it is clear that the decentralization of applications development work prevents the exchange of corporate data unless there is a single, shared system architecture.

It is also the DP management's function to assist end users in becoming the crafters of their personal data processing, by distributing computing power (in the form of hardware, software and access to data) to match individual needs. This is the reason behind the creation of infocenters, presently installed in 82% of large US corporations.

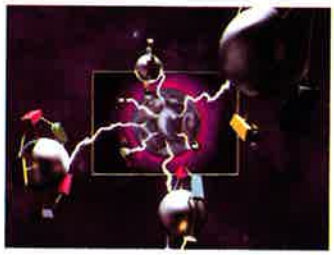
The inset (opposite) describes microcenter services in a large corporation and as provided by CAP GEMINI SOGETI to medium-sized businesses.

While it would seem that problems posed by user pressure are on their way to satisfactory solutions, the same cannot be said for the second major lever acting on DP departments: corporate strategy. The literature – particularly where American authorship is concerned – reveals a plethora of formulations describing this phenomenon:

- DP management's horizon is shifting from technical management toward the fulfillment of corporate goals.
- Data processing is no longer merely an expense item: it must contribute to revenues and profits.
- DP managers "look for ways to harness the power of new information technologies to slash costs, boost productivity, create new products, improve sales and marketing and help set a company's strategic direction." (*)
- The DP manager must spur on change.

Something that was heretofore uncommon – that is, use of the DP tool for strategic purposes – is going to spread significantly. Two examples of this are worth pointing out. The first is that of American Airlines, whose reservation system – "SABRE" – was a decisive factor in that company's successes of ten years ago. Why? Because SABRE, unlike the competing systems, provided travel agencies with the flight schedules of all the airlines.

(*) *Business Week, "Special Report, Management's Newest Star," October 13, 1986, p. 160.*



Under the control and supervision of the DP management department, the job of the MICRO-CENTER is to develop uses of the micro-computer.
It provides users with the following services:
- analyzes the needs and choices leading to the selection of hardware and software products;
- studies the way micro-computers communicate with each other and with the central location;
- assists in the implementation, use and maintenance of hardware and software products;
- supervises training;
- monitors, controls and evaluates new resources.

Our second example is that of a large French mail-order firm, La Redoute. Automation of order-taking and deliveries gave La Redoute a substantial competitive advantage in terms of service quality and especially speed. We might add that the company's DP manager went on to become its chief executive officer!

A recent survey of 600 large and medium-sized American companies clearly indicated that the prime concern of DP managements is to respond rapidly to their firms' vital needs. Contrary to what might be believed, this concern is paramount not only in activities which depend directly upon information, such as banking or air transportation, but is rather quite widespread. Mention is often made of the support that applications provide in other sectors such as telemarketing, competition analysis, automated order-taking, direct (and often priority or exclusive) computer links with suppliers and dealers, automatic documentation printout, etc.

New assignment? Well then, a new title! In the United States, the DP manager whose horizons have been expanded in this way is now the "Chief Information Officer (CIO)." Studies indicate that this change of title has been adopted in 40% to 50% of large American corporations. While an identical evolution in responsibilities is taking place in Europe, it is happening without a change of title, as far as we can determine.

The CIO's new role might be characterized as follows:
- "He oversees all the company's technology, including data processing, office systems and telecommunications.
- He reports directly to a high-ranking executive such as the chief executive officer or chairman.
- He concentrates on long-term strategy and planning while leaving the day-to-day operations of the computer room to subordinates." (*)

These two forces, and the changes they bring about, once again show how the user's imagination and effort open new fields to the application of data processing

(*) *Ibid.*

techniques. Here we are speaking about two paths which can indeed be termed "new": expansion of developmental potential to a large number of people, and the use of corporate data processing for strategic ends.

EVERYDAY LIFE

If certain problems – such as those discussed in the preceding section – seem crucial at certain times, others – such as the development of application software – always rank high in the surveys. Changes do take place, of course, but the everyday life of the DP department is made up of all the activities which contribute to user service and place needed resources to work; all things without which change would be senseless, if not downright impossible.
Obviously, just a few pages are inadequate for describing this day-to-day existence. So we have selected three areas of daily concern to DP managers: applications development, DP personnel management and dealings with service companies (problems surrounding maintenance are also discussed: see page 19).

AMERICAN AIRLINES' SABRE RESERVATION SYSTEM was a decisive factor in its success ten years ago, due primarily to the fact that, in contrast with competing systems, SABRE provided travel agencies with the flight schedules of all the airline companies.

APPLICATIONS DEVELOPMENT

This activity is very clearly the predominant continuing concern of DP managements. There are two reasons for this: the workload involved never grows smaller – quite the contrary – and the resources mobilized to decrease this workload barely manage to offset the substantial increase in complexity of the task to be accomplished.
In most corporations, the waiting-list of pending developments corresponds to two or three years of work... and this refers to expressed user needs alone. DP managements are quite aware that many needs go unspoken, if only because users know that quick satisfaction is unlikely. In point of fact, they do not expect the amount of pending work to decrease, particularly since the implementation of new applications must share time with the overhaul of applications grown obsolete and too expensive to maintain.

Development of any relatively sizeable application is becoming an increasingly complex matter. We will note only three of the many reasons for this state of affairs:

- The **human factors** specific to users must be taken into account, and with increasing finesse. Advances in ease of use are not attained without cost in terms of development. For example, the provision of "menus"* (and their characteristics) will depend on factors such as frequency of use of the application, user sophistication, acceptable response time, consequences of input error, etc. Technicians in charge of developments will call upon human engineering specialists for assistance. Continuing this example: a given menu should not include more than seven choices, as immediate visual comprehension is impossible if a substantially greater number of options is displayed.
- The integration of applications and the proliferation of end users bestows a new dimension on corporate **data**. Data is viewed as a corporate asset. In the simplified, conventional outline of an isolated application, an input data item is entered, stored and manipulated for the sole purpose of producing an output result, depedent on the application in question; but it is quite unusual for a data item to belong exclusively to a single application.
- All applications involve hardware which must intercommunicate. Each program thus includes a "**communications component.**" Without exception, DP professionals must familiarize themselves with telecommunications techniques in addition to their basic specialties, which are themselves evolving rapidly.

As an example, let's take a subassembly on the production line. Obviously, the data item representing this subassembly is of concern to work in progress accounting management and production control as well as to production scheduling. It is no longer possible to manage information as though it were dedicated to a single application. In the future, corporate

** Menu: Screen display of choices available to the user at a given stage in the application.*


BANK
BANK

STRATEGIC DATA PROCESSING: ANOTHER VIEW OF THE BUSINESS ENTERPRISE

Until now, used solely as a means of reliably performing repetitive tasks, data processing is arriving at a new stage in its development. No longer confined to the small areas of automation to which it was formerly relegated, it is now spreading out to encompass all activities within a company. Henceforth, data processing need not be considered simply a way of increasing productivity here and there, but rather as an important contributor to an enterprise's overall ability to compete, and to the formation of an appropriate basic strategy.

This is a serious challenge. Many business sectors – banking, distribution – are currently integrating this new approach into their strategic lines of development. They are using data processing as a strategic weapon to gain a decisive competitive edge. In an attempt to identify possible new areas of application, these users are implementing tools for sales management, for refining marketing strategy (analyzing the market and the competition, pinpointing new markets), for improving client service, developing new products and services, gaining clients' confidence, developing economies of scale, gathering, handling and producing strategic information to help in the decision-making process.

The evolution of strategic data processing is a far-reaching project which requires careful preparation and planning. It passes through:

• A phase for determining the information needed for efficient performance, which includes:
– isolating the key factors for a company's success, its major strengths, its levers of action;
– defining the role of data processing in its sectors of activity;
– identifying those lines of development in which data processing can supply lasting, competitive advantages;
– looking for new activities which might be generated by data processing;
– evaluating the wealth of information on products and methods gathered at all levels.

• A phase for drawing up plans, with the aim of winning strategic advantages through the use of appropriate DP systems. This includes:
– evaluating DP applications in terms of their value (product differentiation, productivity gains, quality improvement), cost, risk, priorities and profitability;
– determining opportunities for organizational changes;
– comparing telecommunications options;
– planning installations;
– identifying opportunities for integrating "islands of automation" and studying the possibilities for maximum overall synergy;
– evaluating new technological potential and making the corresponding technological choices.

• The commitment of general management to the most efficient possible use of data processing within the organization means:
– evaluating the current situation, and making recommendations for performance improvement;
– determining the rate of obsolescence of systems and projects;
– looking for productivity gains in application development;
– micro-computer distribution policy with regard to end users;
– security procedures for safeguarding information.

These are proven methods, which Cap Gemini Sogeti has already implemented for a number of its clients.

databases must be developed with reference to all possible applications and with attention to corporate goals (customer account management, production development, cost reduction, etc.). This is precisely why relational databases have been developed.
Application development aids, designed to reduce this heavy workload, are growing increasingly numerous. With some rare exceptions, DP managements have equipped themselves with general-purpose or dedicated tools, such as complete software engineering systems, analysis methodologies, project management methods, high-level languages, prototyping tools, code generators, etc.
Today, it may be affirmed that methodologies have proved their worth (on condition that they are used by competent professionals). In contrast, where relatively major applications developments have been attempted without a methodology, results have been poor: substantial time lags, low-quality code, virtually non-existent documentation, difficult maintenance, and so on.
As most of the remaining tools are intended for only a single phase of the development cycle, the notion of a complete software engineering system embracing automated methodologies and an arsenal of tools is making headway. We should point out the cases of "fourth-generation languages" and code generators, designed to cover multiple development phases, which have been a disappointment to their users: while there have been real gains in analysis and programming times, training costs (due to difficulties in their use) and falloffs in performance levels have also been very significant. Although available tooling is being continuously improved, it must be acknowledged that software implementation is more of an art than a science. Furthermore, if we consider the fact that DP managers have to supervise 50 to 500 development projects simultaneously and are held accountable for the end result, while a major portion of this work is being carried out in a decentralized manner, we can understand why applications development is their chief continuing concern.

DP PERSONNEL MANAGEMENT

The number of DP professionals in a corporation varies from a few dozen to a few thousand. Management of this force can thus range from captaining a single team to true generalship over battalions of experts, roughly composed of two-thirds design staff and one-third operations personnel. In any case, however, the technical pressures to which the profession is subjected have stamped it with characteristics which are, on the whole, quite unique.

First characteristic: Keeping abreast of developments in the profession is an absolute necessity and requires unceasing effort. According to a recent U.S. study, a technician needs 8 to 9 hours' reading time per week to stay informed. The figure for an executive: 20 hours. This is hardly astonishing in a field as fast-moving as data processing (which now embraces telecommunications as well). At this moment, there are more than 3,000 technical books on data processing in print in the United States! Obviously, no one can read them all, so the choice will fall on the few "indispensable" ones. But even this is far from sufficient. The DP expert will also be encouraged to attend courses and seminars organized by his company (some DP industry companies spend a great deal of money each year for employee training: $900 million for IBM, $20 million for CAP GEMINI SOGETI). DP technicians must also stay informed on the business and industrial fields for which their applications are developed. And the same is true for service companies like CAP GEMINI SOGETI, whose branches are specialized by economic sector.

Second characteristic, more specific to design professionals: their individual performance levels are hard to measure objectively. As their main "products" are programs, it is tempting to evaluate the quantity and quality of their work on the basis of number of lines of code written and debugged and the cost of repairing defects (or "corrective maintenance"). But certain determinants are capable of causing productivity to fluctuate by a factor ranging from one to ten: choice of development assistance tools, familiarity with specific techniques employed. Finally, project characteristics have a substantial influence on the duration of various development phases. Code-writing time, for example, which on average accounts for 15% to 30% of total development time, can vary from 10% in the case of a large project to 80% for an application implemented on a PC with a spreadsheet! Another example: the documentation for a large telecommunications system might amount to 60,000 pages, making 30 million words (or about 120 words per line of source code). And the documentation for a major military system is even more voluminous: 250,000 pages, 200 words of documentation per line of source code.

Third characteristic: DP experts find that the exercise of their craft is their chief means of achieving professional

fulfillment. They work hard, they enjoy improving their skills and, more than other people, they tend to sacrifice stability in favor of a project's technical attractiveness. The DP manager devotes a substantial share of his attention to team formation, to individual assignments and, generally speaking, to advancing his people's careers. For DP professionals, like everyone else, are career-oriented. DP managements offer them three main career channels: management of projects of increasing size or complexity, conventional line-of-command responsibility for a DP department, and sensitive operational functions such as relations with a user department, coordination of current methods and projects, supervision of beginning technicians or training.

CALLING IN THE SOFTWARE SERVICE FIRM

A study by Pierre Audoin Conseil has indicated that 34% of French DP managements implement formal policies for calling upon service firms, while another 26% subcontract significant volumes of work, although without the guidance of any "conscious" or deliberate policy. According to an article in the October 1986 issue of *Datamation,* American DP managers look upon a 10% to 15% mix of service-firm technicians working with their in-house professionals as an ideal proportion. These reports confirm that the practice of using service firms is now considered absolutely indispensable. The operations most frequently carried out - in whole or in part - by service companies are: applications development and maintenance, adaptation and installation of application program products (with the actual cost of such packages ranging from 2 to 20 times their purchase price), technical studies, strategic studies, development of DP plans.

In France, only 8% of DP managements systematically subcontract on a fixed-price basis, in contrast to 62% which follow the time-and-materials approach.

The fact is that the fixed-price contract has generally had unhappy results, due to the conflicts of interest that it encourages. For example: the precise specifications of an application must be frozen throughout the implementation of an application, in order to adhere to a given fixed price. But it is to the user's advantage that these specifications be able to change as required at least until the end of the technical design phase.

Why have outside services become a necessity? According to surveys carried out in a number of countries, the three chief roles played by software services firms are the following:

- an **innovative role,** in which the service company, at its customers' request, injects modern methods, tools and technologies with which it has already successfully experimented.
- a **cost effective accelerating role,** in which the service firm's speedy mobilization of implementing teams or out-of-the-ordinary skills enables DP managements to respond rapidly to user needs without incurring additional fixed costs.
- a **motivating** role for the client's DP teams, to which outside experts bring new and complementary know-how, viewpoints and experience.

DP managements are increasingly seeking to establish lasting ties with service firms demonstrating acknowledged capability and solidity. Experience has shown that a proliferation of suppliers is expensive - in terms of both money and management time - and is incapable of yielding service suited to the evolving state of corporate data processing.

DP managements are kept busy from day to day with many other problems, such as security or DP planning follow-up. But we cannot deal adequately with every question making up the DP manager's massive workload in the short space available here. An article in the November 1986 issue of *Datamation* provides us with a fitting conclusion to this section: "In 1986, MIS(*) managers are seeking to align MIS with corporate strategic plans and objectives. To suceed, they must both educate senior management and manage data utilization as effectively as possible. In addition, they must perform MIS's traditional mission of software development to the satisfaction of users, ideally with increased productivity." ■

According to the findings of a recent American study, the reading time needed to stay up to date is 8 to 9 hours a week for a technician and 20 hours for an upper-level executive.

(*) MIS: Management Information Systems is the departmental term most often used in the U.S.

SOFTWARE DEVELOPMENT AND EVOLUTION

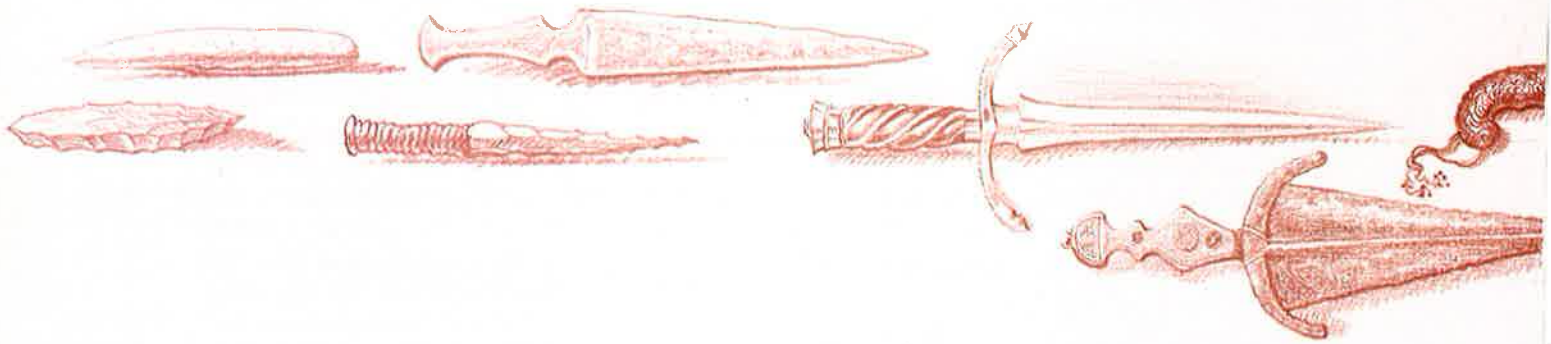
The life cycle of a data processing application begins, quite naturally, with its design, and is then followed by the development of the software. The next step is its operation, more precisely its active life, during which maintenance and conversion activities ensure its viability.

SOFTWARE GENESIS: DESIGN AND DEVELOPMENT

"Naval" engineering refers to the art of ship building; "civil" engineering is the term used to describe public works construction. Both offer good analogies to the concept of software engineering, which uses some of the same techniques in software production.

In order to cover all phases of software design – requirement analyses, general analyses, detailed analyses, programming, integration, delivery, implementation – software engineering makes use of project management methods, design methods, systems methodology and support tools, many of which are prototyping techniques.

The MULTIPRO Software Engineering System designed by Cap Sogeti Instruments, the CADA method (for data analysis support on DP projects, developed by PANDATA, one of Cap Gemini Sogeti's Dutch subsidiaries), the EXPERT methodology (for quality assurance in software development, created by Cap Gemini Sogeti's group France), are all examples of a Group-wide effort to acquire – and thus be able to offer its clients – the most effective tools for software production.



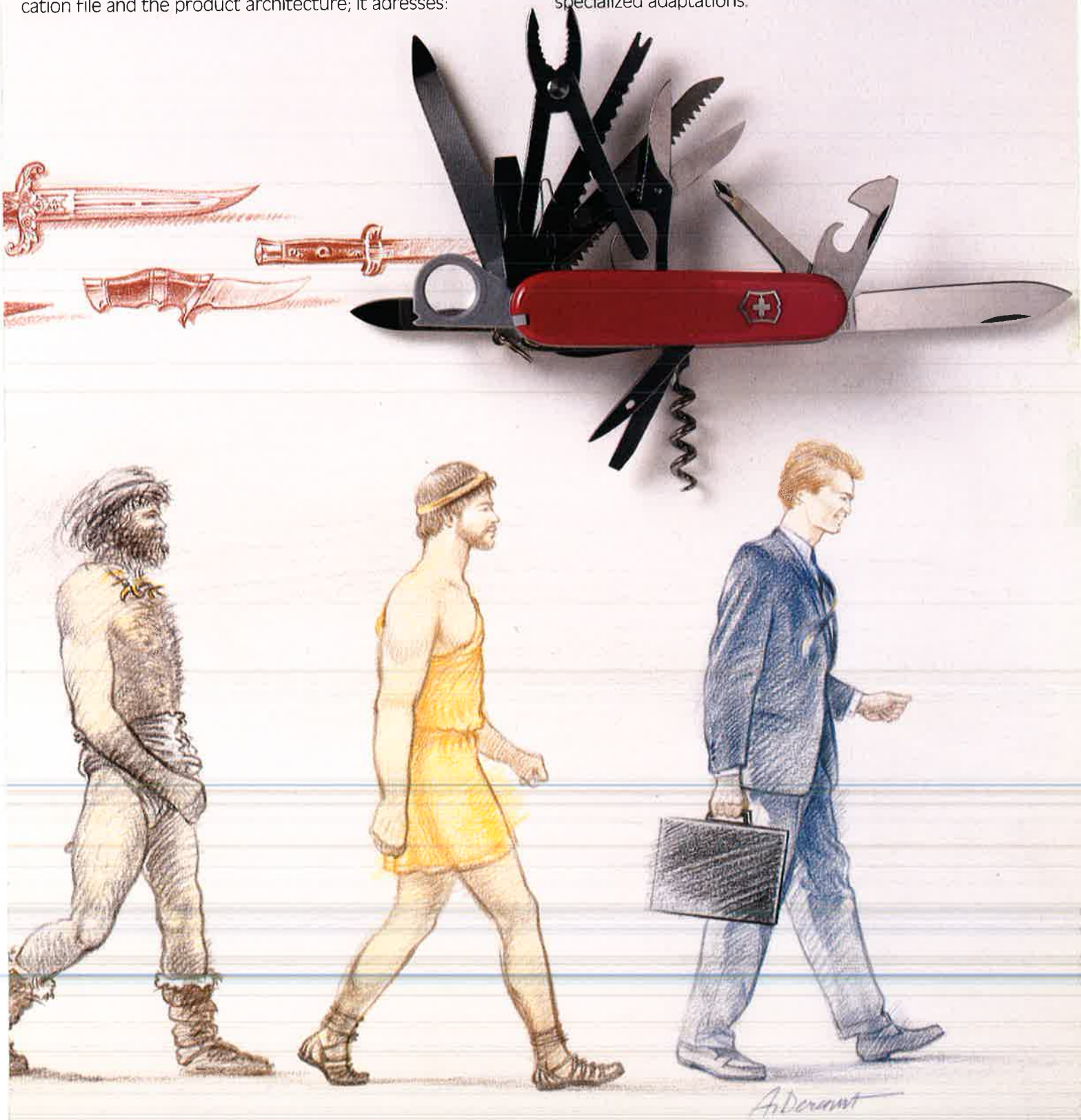
SOFTWARE LIFE-CYCLE: MAINTENANCE AND CONVERSIONS

In software parlance the word maintenance refers, as it does in industry, to a reality which greatly exceeds the notion of simply correcting errors. Maintenance actually covers the evolution of any given software during its entire life-cycle, anywhere from 5 to 25 years. Within this basic definition, may be cited:

- the "corrective" maintenance category, which includes "fixing" mistakes, cleaning up the codes, improving performance, rewriting modules that cannot otherwise be easily maintained;
- "progressive" maintenance which, contrary to the above, may involve adjustments to the external specification file and the product architecture; it adresses:

– either changes in user needs (including changes in software function),
– or a change in the technical environment (hardware, basic software, interfaces with other applications, changes in file or data format); or the application environment (adjustments in the legal or administrative requirements).

To convert software really means to move it. In other words, to shift it from an initial state, one that has been determined by a certain environment – hardware, basic software – to a final state, characterized by a different environment. Such an operation requires specific evaluation tools and methodologies, careful planning and specialized adaptations.



II - DEPARTMENTAL DATA PROCESSING

The concept of "departmental data processing" made its appearance as soon as the structure of corporate data processing – rocked by decentralization – began to stabilize itself. In keeping with fashion, we have attached the "department" label to the organizational level situated between the end user and the DP management of medium-sized and large corporations. The "department" in question here might be Marketing, Purchasing, a plant, etc. The workload of administrative applications might be concentrated within a single department or shared by several, depending on the company's size and structure. The same is true for industrial applications.

Each department has its own computers and provides its own end users with a full-fledged DP service. Obviously, some departments within large corporate groups are actually bigger than a medium-sized company, so that the three-level diagram (central-departmental-end user) is not always applicable. Indeed, where should we place a large foreign subsidiary of a major multinational? In organizations as complex as these, it is not uncommon to find up to six different user levels.

Among the many types of department to choose from, we have decided to discuss those which handle administrative applications and those belonging to manufacturing concerns. Or, to borrow again from today's fashionable lexicon, departments tasked with "office automation" and with "computer-integrated production." Naturally, this choice turns a blind eye to many other corporate functions. Besides the fact that it is sometimes necessary to simplify in order to be clear, however, we should point out that office automation and computer-integrated production are the two corporate functions capable of deriving the most benefit from computerization, in terms of both increased productivity and improved working conditions.

The following pages are divided into two subsections:

- the first deals with departments concerned with office automation;
- the second describes departments concerned with computer-integrated production.

New data processing territories

Satisfying user needs in several of the large application areas requires the implementation of specialized techniques and resources. New methods, computers, specific software have been developed. Whole new businesses have grown up with their fancy new names fashioned from contemporary computer jargon. Among these new data processing territories may be noted:

- Office automation: the discipline linked to the computerization of office tasks, with word processing as its most common tool;
- Electronic Fund Transfer, which corresponds to the application of data processing and telecommunications in financial transactions;
- Distribution Systems, in which data processing is revolutionizing the wholesale/retail business through the computerization of catalogue buying, for example;
- Knowledge Based Systems (KBS), which apply the techniques of artificial intelligence to several different skill areas: diagnostics, decision-making, etc.

CIM

If Office Automation conjures up the office of the future, then CIM calls to mind the factory of tomorrow. With this difference: a number of completely automated plants already exist. It is becoming vital to integrate the "islands of automation" of each of the functions that make up the industrial environment (design, methods, manufacturing), and of each of the factories involved in the overall production process. Software and telecommunications are the central nervous system of this vast production complex.

OFFICE AUTOMATION

If the meaning of this neologism is somewhat vague, at least the goal of its promoters (and of the industry) is clear: provide office workers with tools enabling them to perform their duties in a completely integrated manner. The concept of "integration" applies to various aspects of document and file handling and processing. The number of devices now being used in offices has reached the point that the term "office automation jungle" has been used very recently (see inset, opposite).

The very existence of this term implies that the "office of the future" is still a long way off. This is confirmed by a study conducted in the United States by Arthur A. Little, concluding that only 2% of the 140 companies interviewed have actually integrated their "office tooling" into a departmental OA system. On the other hand, 59% of these corporations are in the process of preparing OA plans and 19% have completed their plans but have not yet started to implement them.

This situation is obviously not the result of chance. It is due both to the difficulty of the task and the size of the stakes involved.

The number and variety of creatures populating this jungle make inter-communication difficult, if not impossible. All the more so as they speak different languages, they follow differing protocols, and new species are making their appearance at a steady pace. It is also a fact that investments in the office sector have been substantially smaller than in other sectors. U.S. Department of Labor statistics tell us that, during the past 20 years, per capita investment was $70,000 in agriculture, $25,000 in industry and only $2,000 in the white-collar sector. Is one of the reasons for this situation the fact that, since the productivity of office workers is much less readily measured than that of other workers, decisions for investment in equipment designed to facilitate their work have not received high priority?

On the other hand, high stakes are on the table. Every corporate function - sales, finance, production - can benefit from OA. Office automation is expected to result not only in lowered administrative costs, but improved customer service (in speed and in quality), enhanced personnel motivation and heightened decision-making potential as well.

The more privileged OA executives will soon be able to install systems providing end users with a substantially full service. This service will include word processing, electronic mail with message distribution, voice messaging, personal office management (including appointment calendar maintenance, electronic telephone directory accessing, phone calling and calculator facilities) and standard applications: spreadsheet, file processing, sorting, graphics and, as applicable, limited payroll, billing and cash management functions. The workstations of end users, who will benefit from the overall service, will be connected to a departmental system. As required, they will select a specific service from a menu displayed on their workstation screen.

Today, in view of the price of these systems - which is still high - and the fact that existing workstations will generally require replacement before being able to communicate with one another, the department manager might decide to opt for a local area network. In this approach, the office building is fitted with a cable to which all items of equipment can be connected by means of wall jacks. Communications between the equipment is managed by a central machine - a telephone switch can do the job - in accordance with precisely-defined, standardized protocols. In this way, microcomputers can not only communicate with one another, but can also share expensive resources such as file servers, telecommunications processors or sophisticated printers.

Local area network (LAN) technology is also going through a phase of dramatic evolution. It is situated at the nexus of data processing and data-carrying telecommunications. No single solution is at hand, nor will there be one for a long time in the future. The problem confronting the OA executive is to make the best choice, in light of his company's specific situation,

THE OA "JUNGLE"

Here is an incomplete list of the creatures lurking in this jungle(*): micro-computers (with word processing, graphics and spreadsheet software), micro-mainframe links, electronic typewriters, management and professional workstations, voice/data switches, photocopiers, telecopiers, image processing, micrography, optical character reading, telex, etc.

(*) According to Data Research Corporation's DP Convention: Paris, 1986.

between the status quo (isolated equipment), direct connection with the central computer, a complete system, a baseband LAN (permitting low-speed data transport), a wideband LAN (high speed)... or a combination of these solutions! The choices involved are ticklish, particularly because the standardizing organizations have recommended a number of standards and technological development is far from concluded.

COMPUTER-INTEGRATED PRODUCTION

If "office automation" suggests the office of the future, so "computer-integrated production" evokes tomorrow's industrial plant. The single main difference: a significant number of production shops are already fully automated. We have just pointed out that the end user possessed tools making use of data processing (if in widely differing forms: CAD graphics terminals, robot control stations, programmable controllers, etc.) at every stage of product design and manufacture.

Computer-integrated production is a superset of what the Americans call CIM ("computer-integrated manufacturing"), i.e., the integration, by means of DP resources, of design, methods and manufacturing functions. Automation results in faster, less arduous production and permits harmonization of work on the shop floor. But that's not enough. Pushed by competition, industries also seek to reduce inventories: annual materials and parts inventory turnover is 6 in Japan as opposed to 3.2 in the USA! Competition necessitates improved service through product customizing: more options for automobiles without stretching delivery times. And it imposes more rapid product evolution, as soon as this becomes necessary from the marketing standpoint.

It thus becomes necessary to integrate the "computerization cells" of each function and each plant into a global process whose central nervous system is made up of its software and communications.

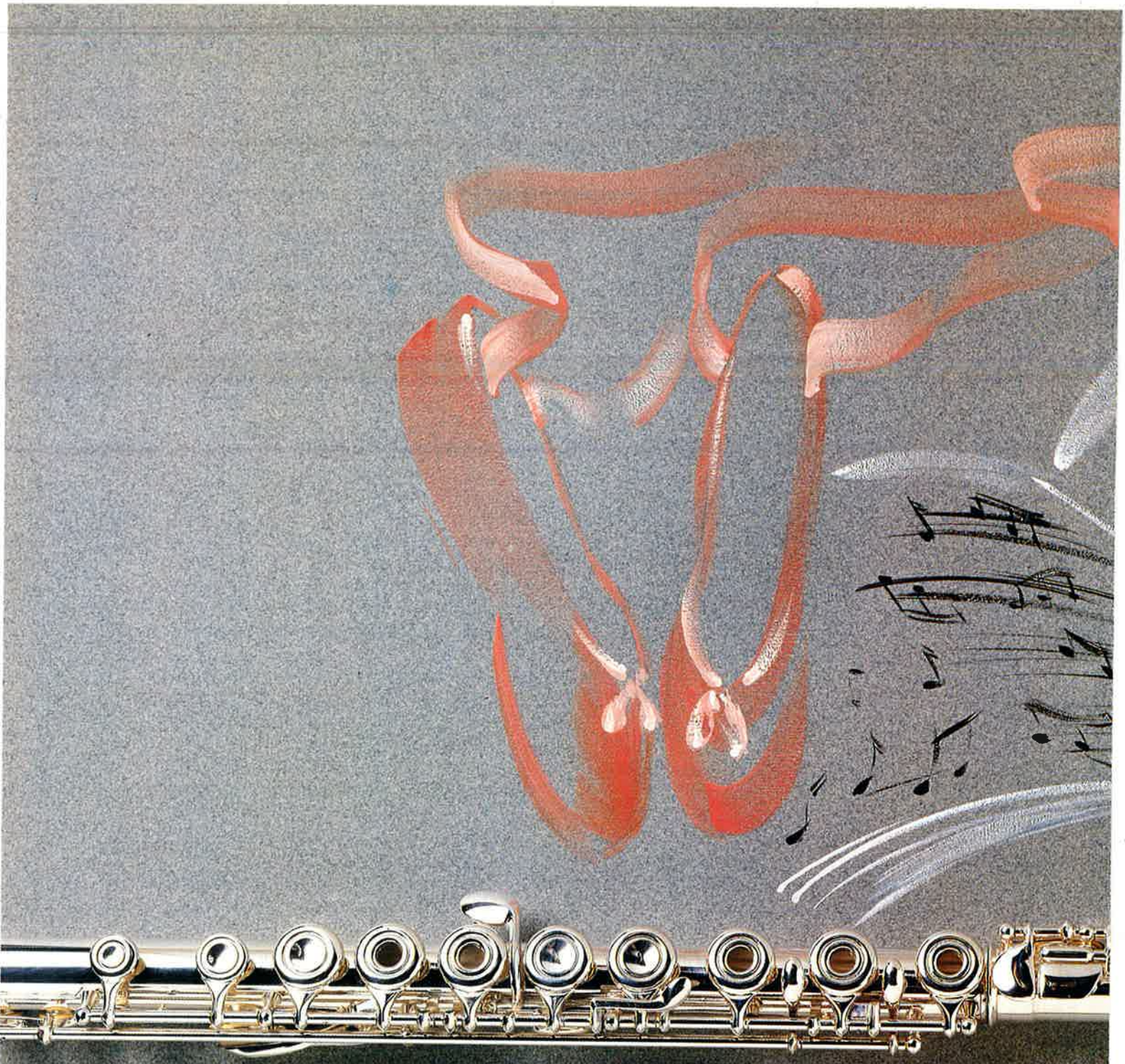
Here, too, data processing occupies a strategic position. In large corporate groups, the task devolves upon the DP executives of the industrial departments and the central DP manager.

To have a concrete idea of the integration required, let us take the case of a user in charge of "shop scheduling and supervision." He will try to set up software-controlled machine groups, linked by automated handling equipment, for the purpose of controlling all of the operations involved: machining, assembly, quality control, storage, handling, shipping, tooling. Integration will next take place at the "production cell" level, then at the shop level and, finally, at the level of "planning and supervision," which will automate day-to-day production management decision-making, particularly on the basis of information exchanged with sales departments. Naturally, this assumes that production department DP systems will be interconnected with management systems, and thus to the corporation's central computers, often located in some other city.

No one expects fully-integrated systems to be implemented in the near term, if only because of the extreme disparity of equipment to be linked. But users are already turning to technical options which are sufficiently "open" to permit integration in some more distant future.

The problem of integration is a complex one. Take the Aerospatiale plant in Saint-Nazaire, France, for example, which manufactures a portion of the Airbus. To begin with, the manufacturing nomenclature contains 50,000 price references, with 15,000 "current" files - each broken down into 10 manufacturing phases - actively tracking the production process. Next, there are four other European partners in this project: Messerschmitt-Bolkow Blohm in Germany, British Aerospace in Great Britain, CASA in Spain and Belairbus in Belgium. And, finally, as product life cycles can exceed twenty years, all old data must remain available despite technological developments and modifications. Furthermore, as companies have not been sitting around waiting for integration to arrive before building their plants, it must align itself with existing structures. Let us take a broad look at some of the steps leading toward integration once the idea has been adopted by corporate management:

- drafting of the implementation plan, with input from interested managements (including sales management) and formation of a team tasked with CIM (Computer Integrated Manufacturing) installation. Available methods for preparing such plans include MACSIME, developed by CAP GEMINI SOGETI. Naturally, the company's present situation and its goals are taken into account. The various segments of the plan deal with integration architectures (the question of standards will be discussed below), network technology, necessary reorganization and training operations. In MACSIME, the "CIM plan," which covers specifications,

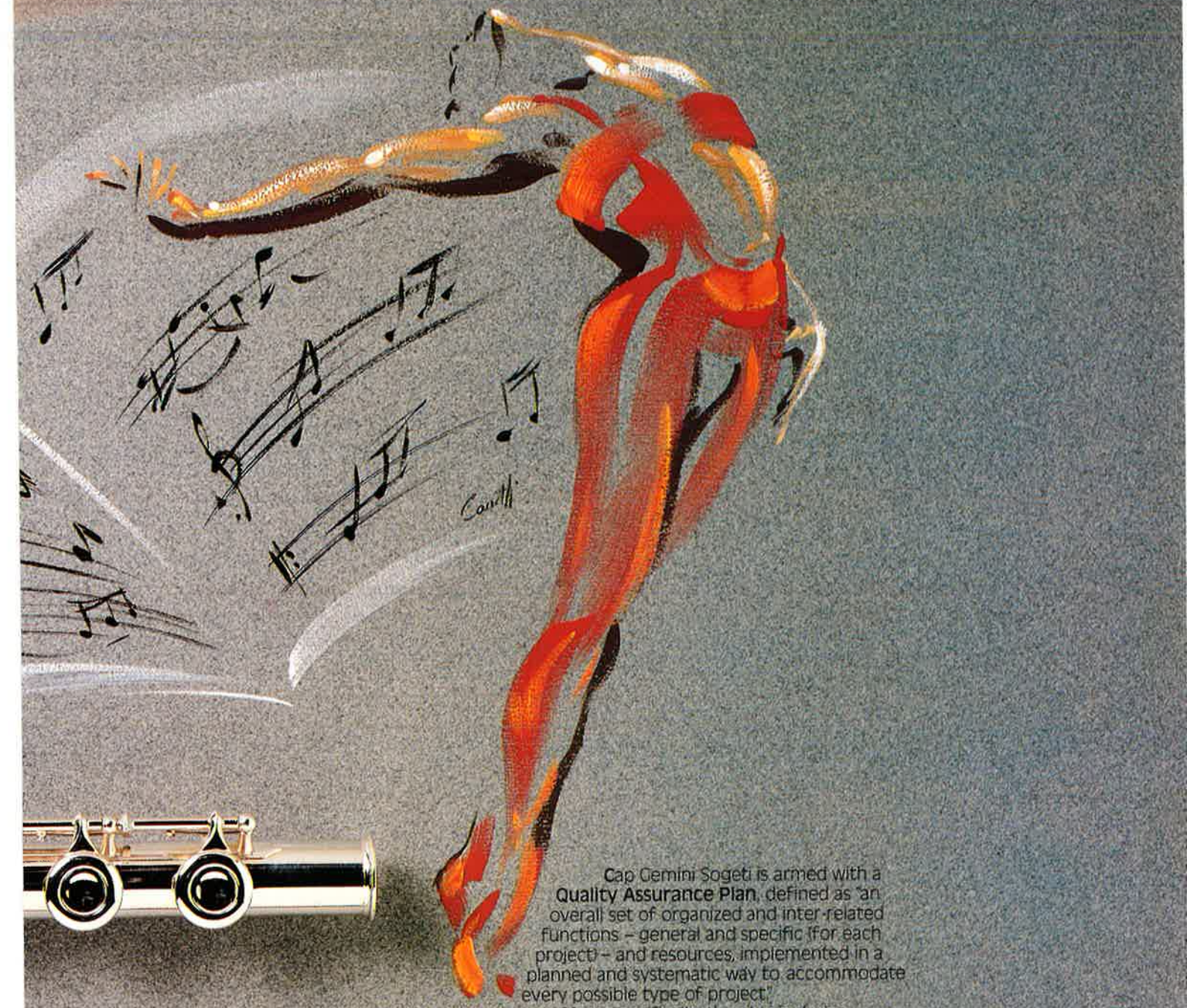


According to a definition jointly agreed upon by the international standards organizations, a product or a service is considered to be of quality when it answers the needs of its user. This equation implies that the product or service be well made (or performed) – quality of form – that it conform to established specifications – quality of function – and that all resources that go into its production are, in themselves, of high quality.

The first imperative is that the technical work be "well done" (**quality of form**), and developed according to the most up to date rules and regulations. Norms and standards for design (specifications, architecture), development (coding, testing, integration) and software documentation to which our Group professionals must conform, make it possible to attain a high degree of quality at this level.

User satisfaction with the software developed and the appropriateness of this software to their needs (**quality of function**), presupposes the very rigorous formalization of these needs. That is the function of the external specifications; with the aid of related methodologies, these specifications must be strictly respected during the entire development cycle of the software.

QUALITY AND TECHNICAL PRIDE



Cap Gemini Sogeti likewise applies its professional quality standards to the area of management, as it rightfully assumes that the **quality of the organization** is a strong contributing factor to the quality of its technical services. The cornerstone of this organization is the branch, the basic operating unit of the Group. The branch guarantees the very personal attention which adapts the services being provided, to the client's individual character and his special problems.

Cap Gemini Sogeti is armed with a **Quality Assurance Plan**, defined as "an overall set of organized and inter-related functions – general and specific (for each project) – and resources, implemented in a planned and systematic way to accommodate every possible type of project".

More specifically, the plan includes:
– general features, such as a complete methodology (for handling technical as well as management tasks), functioning through support activities (training, the Experts' Club in France, the Technical Development Program in Europe, etc.), which are centrally organized,
– specific features (project by project), which constitute a standard quality plan.

In 1986, the Group award for the best quality plan was presented to the person in charge of quality control on the NTA (Norwegian public videotex system) project, jointly developed by Data Logic, Cap Gemini Sogeti's Norwegian subsidiary, and the Toulouse Branch of Cap Sogeti Systèmes.

implementation stages and required resources, is quite distinct from the "CIM project," which is intended to guide the progressive implementation and installation of new systems and structures and permit monitoring of resource use.

- installation of industrial LANs, required whenever a large number of stations must be interconnected within a single establishment. Here the user must select from a group of competing technologies without knowing which will ultimately be standardized. The result of this paradoxical situation is that, in the best of cases, the user installs a separate LAN for each of the major manufacturers (IBM, DEC, Bull, Siemens, ICL, etc.). Industrial LANs establish and manage communications for a number of hardware levels: individual stations (robots, automatons, shop-floor terminals, etc.), process-control and administrative information-gathering minicomputers and production-supervising computers, not to mention the microcomputers used as monitoring and printout stations.
- compilation of a central database covering all of the company's activities, if possible, from product design to sales and after-sale service. This ambitious task requires the installation of hardware, software (database management systems), procedures and fresh documentation. It requires the selection of a database architecture which will preserve the pluralism of systems which, as a rule, are already in place.
- training of all future end users. This condition is all the more necessary for the success of integration as integration itself substantially modifies working methods. A substantial training effort must be carried out. We might point again to IBM: according to an article in a June 1986 issue of *Business Week*, IBM has set up a school for its manufacturing personnel near New York City, where it plans to instruct 5,000 trainees yearly.

Industrial DP users are very attentively following the standardizing activities being conducted by various organizations. The best known deal with MAP (Manufacturing Automation Protocol), a standard for communications between computerized shop systems developed under the aegis of General Motors, and CIM-OSA (CIM-Open System Architecture), a standardized architecture for CIM systems now being implemented within the framework of the European strategic program, ESPRIT. The CIM-OSA project, scheduled for completion in 1989, is being developed by a consortium of 19 companies* with CAP GEMINI SOGETI as prime contractor.

Purpose of the program is to develop a reference model for the construction of well-integrated CIM systems. Taking MAP into consideration, CIM-OSA will include standards for messages and control, as well as shared services made available to specific applications. The architecture's openness means that users are not obliged to construct their system in one fell swoop. They can change their organization – e.g., the number of departments – and take advantage of technological advances without undermining the CIM system's effectiveness.

Computer-integrated production is at once a challenge and an opportunity for all users, whether in large industrial groups or in small production units. It is a challenge because the task is a complex one for which there are no ready-made solutions. The strong growth in demand from small companies for computerized industrial equipment shows that they, like their big counterparts, anticipate a substantial gain in competitiveness.

Finally, we might note the fact that young graduates are once again being attracted to the industrial sector, which is doubtless a positive result of automation and CIM. ■

**The consortium's 19 partners are: AEG Telefunken, Aerospatiale, AT&T and Philips Telecommunications, British Aerospace, Bull, CAP GEMINI SOGETI,CGE, ICL, Computer Resources International, Digital Equipment, Dornier, GEC, IBM Germany, ICL, Italsiel, Philips and MBLE Associated, Selenia-Autotrol, Siemens, Volkswagen, WZL-Aachen University.*

III - THE END USER

Today there are tens of millions of end users throughout the world whose everyday activities bring them into contact with data processing. They include the clerk who enters data at a reservation terminal when a passenger checks in at the airport. They include the secretary who processes her memos and letters on a microcomputer instead of hammering them out on a typewriter. They include the exchange agent who queries the world's money markets before performing transactions over a dedicated telecommunications network.

Some end users, equipped with a microcomputer and a handful of software packages, have been caught up in the game: they have begun to develop their own applications. This is particularly the case with the heads of small companies and with design engineers, who have thereby joined the ranks of the people who "do" data processing. Then, having bought a few additional microcomputers, they start to move out of the "end user" category in the strict sense of the term.

We are devoting two sections to the end user:

- the first describes the main categories of end user, among whom professional users are still the most significant, both in number and in time spent using DP resources. One day, when the price of hardware and services – particularly telecommunications – will have dropped substantially, the consumer users will become more significant.
- the second section reports on their concerns and their needs, as revealed by surveys undertaken in France and the United States. Naturally, the most active users are the ones who make themselves heard first: their desire to do more is going to tax the DP community for a long time to come!

END USER CATEGORIES

It is estimated that one out of every six administrative employees in the USA makes use of a data processing tool, and that five years from now this ratio will be one out of two. This progression will probably be similar in Europe, with a time lag of one or two years. So it is not surprising that the diversity of situations is already very marked. In spite of this, we believe that it is still possible to isolate four main end user categories:

- **the administrative user**

In most cases, the administrative user has been the first end user in his organization's DP service. He or she might be a bank employee at a teller's terminal, a secretary at a word processor or messaging terminal, or a sales representative with his portable order-entry system. The company's customers are themselves becoming end users. We can point to auto dealers (CAP GEMINI SOGETI has developed a videotex system for dealer order management for Renault Véhicules Industriels), for example, or home banking, or mail-order sales (direct order-taking), or government services (information via the Minitel terminal, key instrument of the Electronic Telephone Directory System implemented by CAP GEMINI SOGETI).

- **the industrial user**

The first industrial users emerged in research and development units: certain minicomputer manufacturers, realizing that they had found a vacant market slot, began to install dedicated CAD (computer-assisted design) tools in design offices. Next, production engineers began to equip themselves with computer-assisted production management systems, whereas plants and shops witnessed the arrival of robot technology and CAM (computer-assisted manufacturing), with its flexible workshops. Step by step, then, every player in the production cycle was affected, from the plant manager to the warehouseman, from the methods engineer to the scheduling officer, from the skilled worker to the design engineer. All of them are participants in a single production cycle. We have already seen (in section II. above) how the concept of "computer-integrated production" was created in the effort to provide overall coherence for the information system.

- **the self-employed worker**

Lawyers, architects, physicians and members of all the professions, along with craftspeople, merchants, farmers and small-business owners in general all use microcomputers to process information very specific to their activities.

They often obtain support from professional organizations and associations, some of which even provide software tools adapted to the profession's special needs, sometimes through a DP management center. The role played by these organizations is thus somewhat comparable to that of a corporation's DP management.

- **the consumer-user**

This is anything but a homogeneous category! Considering only the uses to which several million people put their Minitel terminals in France, we encounter applications as diverse as queries for useful everyday information (phone numbers, movie programs, train timetables, etc.), a variety of games, computer-assisted education, inter-account money transfers and income tax computation. The consumer-user can likewise find a wide variety of application programs for his personal computer at specialized shops and department stores. He and his family can delve into the mysteries of programming in BASIC or PASCAL. We might say that today's situation marks the beginning of a groundswell: access to the public of new tools enabling it to send orders, pay bills, communicate visually with others, and so on.

THE MINITEL TERMINAL AND THE ELECTRONIC DIRECTORY

Cornerstone of the development of telematic applications in France, today there are 2.5 million Minitel terminals installed. Credit for this achievement belongs to Cap Gemini Sogeti's Electronic Directory system, which is currently undergoing nationwide expansion (an assignment being carried out in collaboration with SESA). The system involves 150 interconnected computers and processes 20 million calls a month; during peak periods, there may be as many as 6,000 simultaneous calls.

THEIR NEEDS

A recent survey by **L'Expansion**, a French economic journal, shows what microcomputer users really want: continuous, immediate access to the information they need - and to that information only - and the ability to shape it according to their requirements and their predilections.

Surveys conducted among French users show a concern for selectivity and flexibility in data availability and manipulation. More specifically, these surveys indicate:

- a desire for autonomy: rather than depend on DP professionals to adjust his applications, the user would rather do it himself, using a flexible tool to which he can adapt his personal working methods.
- a drive toward self-assertion: the user is no longer content with the passive operator's role. He wants to become an active force in the evolution of his information system: his increasing "DP maturity" further enhances this ability with each passing day.
- a determination to achieve efficiency: the user wants to master his DP tool just as he masters the other aspects of his work. As a consequence, this tool must be at once easy to use, easy to learn and generous in performance.
- a need to communicate: the myth of the isolated user has been dissipated. Today's watchword is "dialogue," not only with DP management, but with the corporation's other departments as well (if only for sharing data or printer resources).
- a need for assistance: the user wishes to be advised, trained, seconded in his technical choices and aided in maintaining his system.

These surveys also show that the most widely used microprocessor-based business software in France includes word processing (70% of users), spreadsheets (55%), accounting (40%), database access (35%) and scientific calculation (20%).

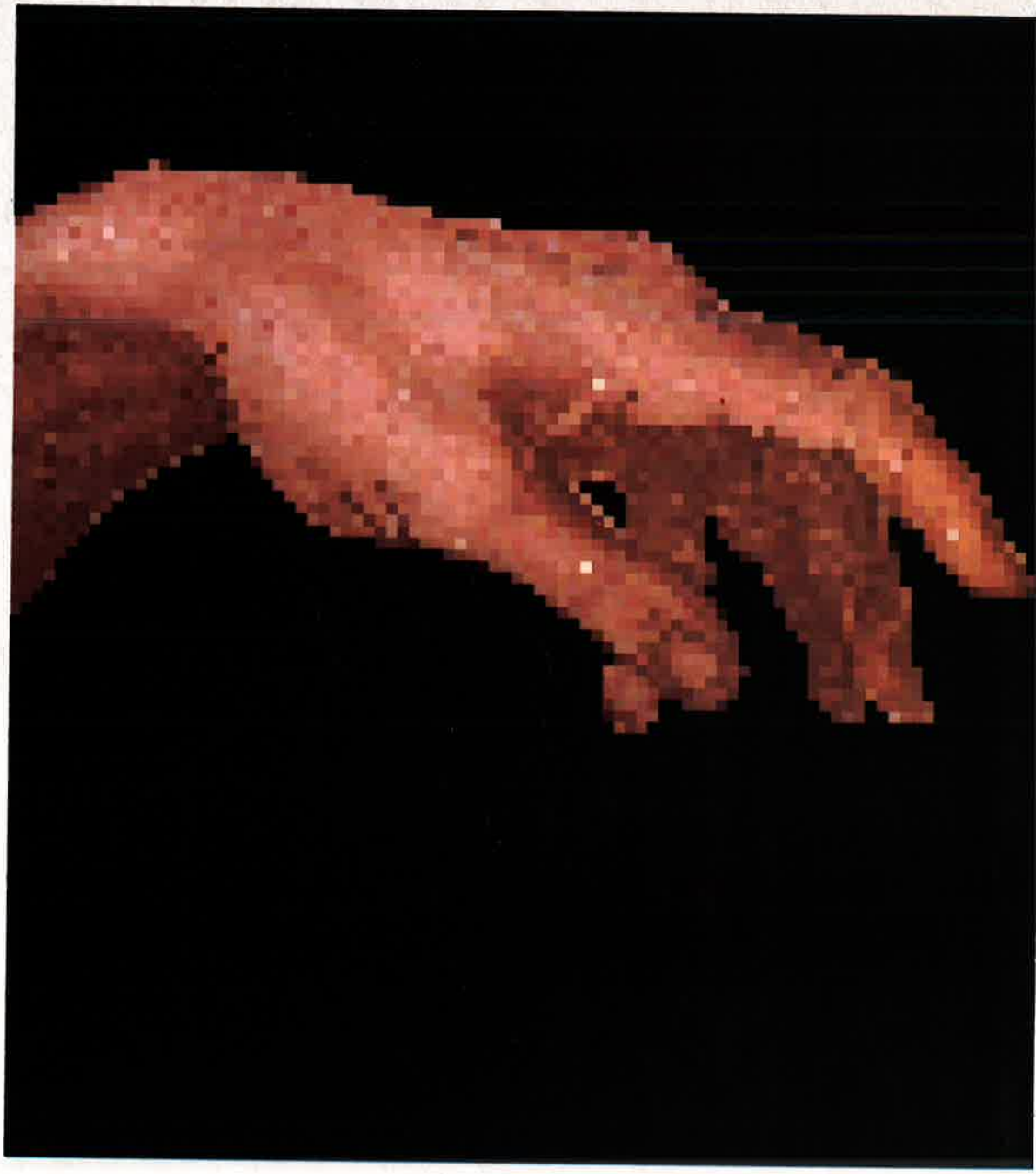
Networks meet the need to communicate and make it possible to share data and resources locally (LANs), to access central data (interconnection of dissimilar systems), to exchange messages (electronic mail) or to consult outside data banks or services (public networks).

The same end-user motivations and concerns are observed in the United States, although with greater emphasis on the following points:

- microcomputers have been primarily viewed as tools for use with standard application software. The rapid growth in hardware capacity has whetted the appetite of users who, wishing to computerize complex applications, are requiring increasing volumes of assistance. In medium-sized companies (1,000 to 30,000 employees, 200 to 5,000 microcomputers), DP department infocenters are providing assistance at a rate of one engineer for every 20-100 end users, and this level of support is considered inadequate.
- many small businesses have acquired a number of microcomputers. At first, files were exchanged by swapping diskettes. Next came a need to update multiple files simultaneously - whence a strong demand for local microcomputer networks. Note the striking similarity between this evolution of requirements and that experienced by DP managers twenty years ago!
- communications are the source of a certain amount of frustration. Demand for access to company databases is strong, but 80% of personal computers have yet to be linked to mainframes.

Much remains to be done: develop programs to connect incompatible hardware, train more end users, simultaneously channel voice and data, refine decision support tools, and so on. Software service firms and hardware manufacturers must still invent and achieve a great deal if end users are to do their jobs more comfortably and more efficiently. ■

Natural language processing



"Natural language processing" analyzes the ways in which a user can converse with a data processing system in the language which is most familiar to him (natural language). User comfort is by no means the only justification for such research. It also represents a way of making data processing applications easily accessible to the greatest number of people. After all, the user is being offered many applications, often dealing with very complex problems. He should be able to present his problem as he conceives it, express himself naturally and without encountering any obstacles to the operation of the data processing tool.

In the last ten years, a great distance has been covered in the field of natural language processing, especially by the teams at Cap Sogeti Innovation. Today they are developing basic tools and techniques, progressively integrating them into specific applications, thereby foreshadowing the generalized interfaces of tomorrow.

Many linguistic tools have already been, or are in the process of being, developed. Among them: French and English dictionaries, phonemic (or language structure) tools, morphological (word formation) and syntactic/semantic analyzers, spelling and grammar checks, text generators, etc.

The language of the user is different from the language used by the DP system (machine language – which is binary – evolved programming languages, messages issued or received by the applications, etc.). An "interpreter" must therefore intervene to make this "conversation" mutually intelligible. In data processing specifically, this is the role played by "interfaces," comprised of software and/or hardware. Interpreting a user's message, issued in natural language, requires prior semantic analysis. Through the combined implementation of linguistical data processing and the techniques of artificial intelligence, such interfaces are now possible. In the future, they will be even further enhanced by vocal input.

Included in the numerous applications already installed or currently under development by Cap Sogeti Innovation are:
- accent restorers for vocal synthesis of French texts;
- index aid and natural language document inquiry;
- The ESPRIT ESTEAM project's "intelligent dialoguer," allowing language inquiry of expert consulting systems;
- expert system documentary research, which selects databases corresponding to the user's request and automatically generates the correct inquiry;
- multilingual database inquiry.

IV - THE INTEGRATING USER

We have chosen the name "integrating users" to describe everyone participating in the process of incorporating data processing into whatever it is they design, manufacture and sell, whether industrial goods or services.

It is undeniably in the implementation of these industrial products and these large services that the technology of components (and data processing in general) has yielded the most remarkable development. This is due to the evolution of the products of this technology which, we recall, is characterized by an exponential growth in their processing power and storage capacity, by a reduction in their bulk and weight, by the steady drop in costs and by symbiosis with telecommunications.

There are many application fields: telecommunications, the aircraft and aerospace industries, industrial process control, automated handling, robot technology, ticket vending, surveillance, access control and alarm systems, medical prothesis, among others. In these areas, the term "DP use" takes on a much broader meaning than in business applications. Here, DP industry products are used along with DP concepts and techniques - both hardware and software - designed to make them shoulder tasks heretofore carried out by electrical or mechanical means.

The first pages of this section will point out the scope and diversity of areas of use, as well as the complexity of functions automated by the integrating user.

To give the reader a more concrete idea of the role played by data processing when integrated into given products and services, the second part of this section will present specific examples.

The concluding part is dedicated to the new tasks generated by the interlacing of skills. Indeed, the integrating user is compelled to include data processing in his arsenal of techniques, and his life is transformed in consequence!

AREAS OF USE AND AUTOMATED FUNCTIONS

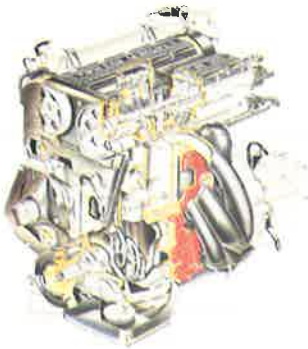
The products and services in question are characterized by their repetitive nature and by the sector of activity which implements them. Production quantities are highly variable, as DP integration is applicable to systems developed on a one-off basis or in small quantities as well as to industrial systems and products manufactured in thousands of units, or to consumer goods with production runs in the tens of thousands, or higher. In the following roster, the leading suppliers making use of DP integration are listed in increasing order of units produced. This ranking includes:

- **turnkey contractors:** engineering companies and large industrial firms which construct entire plants or infrastructural projects (cement plants, subway systems, power switching systems, urban mass-transport systems, etc.). This category might also include large military systems contractors (weapons systems, command and control systems) and DP service companies acting as prime contractors for data communications networks (e.g., the Electronic Directory in France) and other value-added networks.
- **members of the aircraft and aerospace industries,** who are increasingly integrating onboard computers in their products in order to achieve more reliable, "intelligent" systems.
- **computer manufacturers,** who are also incorporating data processing into their products, with today's high point of sophistication being the development of computers... which themselves manufacture computers!
- **telecommunications manufacturers,** producing private and public switches and data-transmission networks which will be tomorrow's integrated-service digital networks.
- **manufacturers of industrial products and instrumentation:** these products embrace medical equipment (scanners), building surveillance, access control, toll collection and ticket vending, electronic payment and instrumentation in general (guidance systems, gyroscopes), etc.
- **manufacturers of consumer products** which integrate microprocessors and range from cameras to automobiles, from computerized footwear to household appliances. Without overlooking the home robots which will soon be taking on duties as diverse as helping out with household chores, surveillance and security, or assistance to the handicapped.

Integrating users employ the tools and techniques of data processing in a different manner from other users. The shared characteristic of most of these applications is automation, i.e., process execution without direct human intervention. The operation of an automatic control device can be reduced to three main operations: data acquisition, data processing and the transmission of commands and information.

Generally speaking the corresponding structure includes:

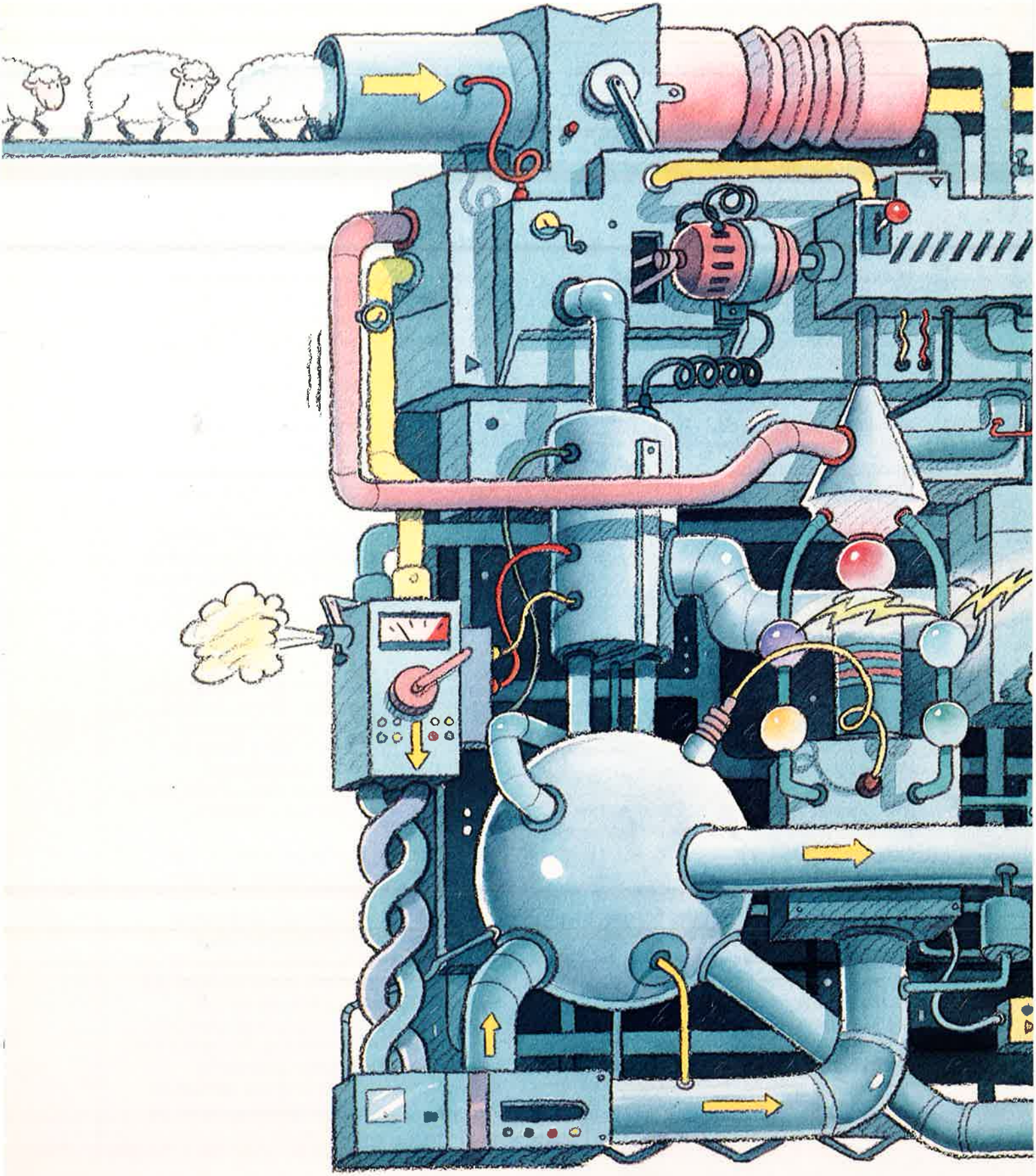
- an "operating" segment, consisting of a machine or installation which is driven by actuators and outside energy to perform physical tasks,
- and a "command" segment, made up of the actual automatic control device which governs the actuators. In turn, the control device includes sensors which perform detection and measurement functions, a programmable controller* which handles processing operations, power control components and communications features for man-machine dialogue.

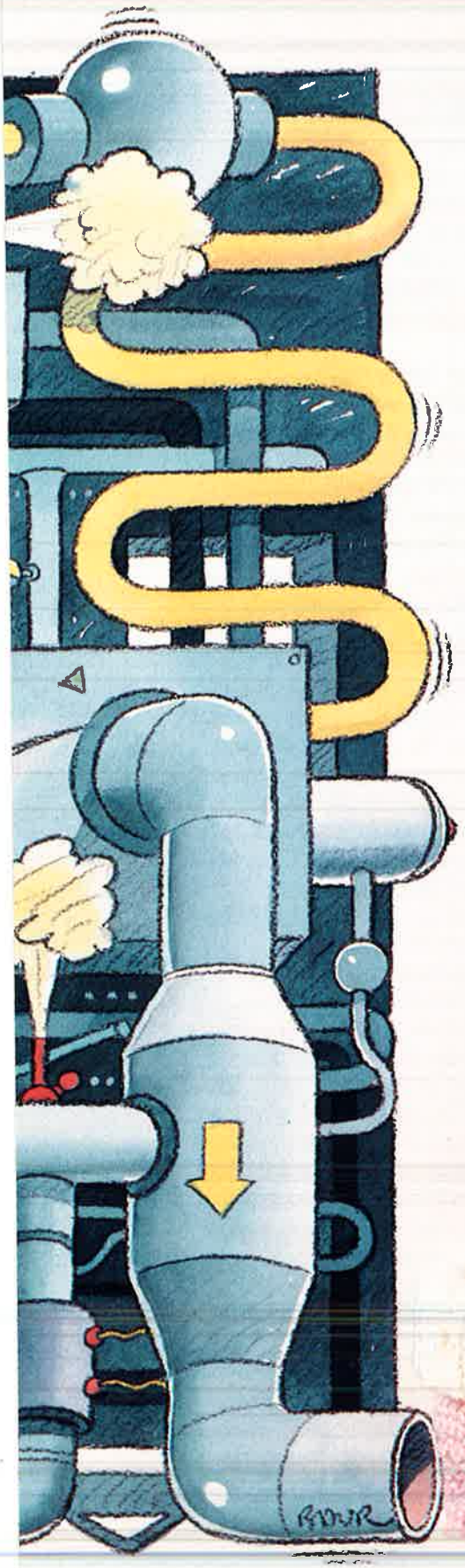


(*) A programmable controller is a software-driven processor which reads input data and issues output commands (e.g., reading a level switch and starting a motor). Today's programmable controllers are veritable data processing systems.

Automatic control systems differ from conventional DP systems in a number of characteristics:

- **speed,** which requires that they react – i.e., make decisions – in very brief time intervals, as in rocket guidance.
- **synchronization** with external – and sometimes random – events which require highest-priority acknowledgement. In the case of a mesh-type telecommunications network, for example, failure of a transit node must trigger information rerouting.
- **very high reliability,** in order to avoid operational failure which can lead to destruction of the product and endanger human life. Reliability is provided by hardware redundancy, with the system automatically switching over to a sound component as needed. The





VALUE ADDED NETWORKS

A Value Added Network (VAN) is a distributed data processing system made up of a set of telecommunication lines, related switching devices and computers holding the data processing applications that the VAN user has at his disposal.

This user is generally provided with three types of integrated services:

- **transmittal of information** services between the access terminal and the computers,
- **utility services:** helping the user interface with a particular DP application, billing the user, monitoring security, etc.
- **specific services** arising from the use of **DP applications** available on the networks.

Transmission of information is almost always handled by a specialized transporter, separate from the VAN operator. Throughout most of Europe, the transmission of such information is State controlled. In the U.S., this function is handled by more than thirty companies under public regulation. The "value added" aspect of the service, therefore, relates to utility services and specific services combined; transmission of information services are excluded.

VAN NAME	TYPES OF DP APPLICATIONS	TYPES OF USERS	TYPE OF NETWORK
SITA	International electronic mail among various communicating parties in the transportation industry	Airline companies (worldwide)	Heterogeneous Specialized
TELEDATA (*)	Norwegian public videotex system	Telephone subscribers	Homogeneous Generic
TELETEL	Interrogation of databases (airline and train schedules, classified ads, entertainment listings, etc.). Home banking services. Special mailing.	All telephone subscribers (mainly in France)	Homogeneous Generic
TD-CAM (*)	Transmittal of banking orders (8 million per day at the end of 1986)	National and Regional branches of Crédit Agricole	Heterogeneous Specialized
SABRE	American Airlines reservations and various other services	Travel agencies (mainly in the U.S.)	Heterogeneous Specialized
TRANSPOTEL (*)	Messaging service for transporters (boat schedules, freight, supply and availability of transport)	Maritime and surface transporters (various countries in Europe)	Homogeneous Specialized
GEISCO	Many management services (international cash management, handling of spare parts, etc.)	Multinational companies (service available in 50 countries)	Heterogeneous Generic
ELECTRONIC DIRECTORY (*)	Telephone information (700,000 hours of connection monthly at the end of 1986)	All telephone subscribers in France using a Minitel (largest network in the world)	Homogeneous Specialized

(*) With the participation of CAP GEMINI SOGETI.

Specialized VAN: addresses itself to companies within a specific economic sector or particular business area to which it offers very definite services. Generic VAN: offers several types of service to a very diversified clientele. Heterogeneous VAN: a VAN responsible for different types of equipment and communication lines (its opposite is the homogeneous VAN).

degree of redundancy increases with the level of reliability required. In this case, the complexity of software components also increases dramatically.

• **compactness**, when the finished product is limited in size and weight, as in space and military rockets. Miniaturization of components has madeçû it possible to create many new products. It has also led to spectacular advances in fields like medicine, particularly in the area of prosthetic devices. It should be noted that software dimensions should be kept to a minimum in such applications, in order to reduce required memory capacity. The task of user-performed integration varies widely with the degree of complexity of the functions to be handled by data processing. Many products will require only installation of a microprocessor-based controller and programming of the simple processing operations required. In contrast, a good-sized integration project will involve many programmable controllers, minicomputers, mainframes and data communications networks. Regardless of their intricacy, all of these automatic control systems have a common feature: they operate in accordance with instructions contained in a software program tasked with managing all of this complexity. As with more conventional applications, the "weight" of software within these systems keeps on growing. In the third part of this section, we will explain how integrating users are organizing themselves to deal with this situation.

Cap Gemini Sogeti – either on its own, or on commission from some of the program suppliers of the Airbus A 320 – has fulfilled a number of assignments. Among them:
• development of the software for screen display of the aircraft's navigational elements;
• programming for the aircraft's thermal regulating systems;
• definition of the quality clauses for the on-board equipment software (in preparation for the Airbus A 340);
• development of a number of management applications.

EXAMPLES OF DP INTEGRATION

We have purposely chosen examples that are very disparate in nature. They testify to the diversity of users' situations. The cases presented hereunder are taken first from the transportation field, then from telecommunications and, finally, from areas closer to the general public.

Transportation

Our very large cities would be massive traffic jams if they did not have traffic plans. This is why in 1982, the municipality of Paris had an engineering firm develop a computerized system for downtown traffic-light control. Traffic is orchestrated from a central operations station by a minicomputer featuring two central processing units and automatic switchover from one unit to the other in case of failure. This control system is based on individual "traffic-light plans" for given traffic situations, with typical scenarios for the city's main intersections having been defined on the basis of statistical studies.

A microprocessor-based "intersection monitor" sends information to the central operations station at five-second intervals. The station, in turn, determines traffic-light settings (duration of green light, cycle offset, cycle duration, etc.) for each situation. Nonetheless, with peak traffic levels exceeding 5,000 vehicles per hour, conventional data processing reaches its limits, as the problem ceases to be an algorithmic one. This is why an expert system for handling traffic saturation has proved necessary, for real-time adaptation and activation of traffic-light plans.

Another example from the transportation field relates to aviation, where microprocessors are being massively used in onboard systems. In only three generations of aircraft, we have moved from a juxtaposition of miscellaneous instruments and devices – radio communications, radio compass, artificial horizon, etc. – to the "generalized active control" which will be placed in the Airbus A320. This involves the onboard installation of a large number of computers running integrated software to carry out four main functions: assistance to piloting (with the classic joystick-rudder-aileron combination replaced by a miniature joystick sending information to a computer), navigation, technical management and flight surveillance.

Service firms are helping develop software for these systems. CAP SOGETI INDUSTRIE, for example, provided assistance to Intertechnique for programming the new Airbus A320's thermal regulation system; while PANDATA, one of the Group's Dutch subsidiaries, implemented a test system for the prototypes of the future Fokker 50 and Fokker 100 aircraft.

Between now and the year 2000, it is not only the aircraft that will change, but its environment as well. Thanks to data processing, the aircraft is going to become a terminal in a total transportation system embracing satellite-based navigation aids, microwave landing guidance, automatic in-flight collision avoidance and in-flight remote surveillance of equipment in preparation for ground maintenance.

Telecommunications

Telecommunications is the technology showing the most complete symbiosis with data processing. Automation of its various functions, beginning with the digital encoding of signals, involves all the resources of data processing: its concepts, its products, its techniques and its tools.

For an example, we will look at networks, where integration is generally carried out by turnkey contractors (including DP service companies), because these systems incorporate hardware devices (switches, concentrators, modems, etc.) which are themselves the result of an incorporation of DP tools, and because their assembly requires a substantial amount of software design and implementation work. Value-added networks provide a particularly interesting and timely example of integration: they are discussed in the inset on page 00 of this report.

Integrated service digital networks (ISDNs) will be tomorrow's telecommunications infrastructure permitting the storage, processing and transmission of images, text, data and voice on a single medium. The widespread use of digital techniques will make compatible information suitable for archiving, mixing and transmission to the "consumer" via a single carrier. These networks will be highly universal, as they will be transmitting information in all its forms everywhere. Nonetheless, much remains to be accomplished. Optical fibers offer satisfactory performance levels (bandwidth, transmission rate, attenuation) for transmission of moving images, but their introduction into networks has hardly begun, due to their high installation cost. It will also be necessary to define new standards, refine existing technologies, design the equipment required, develop new generations of multi-service transmission centers, and so on. All of this represents a gigantic task facing the telecommunications industry and for all the other integrating users concerned. One can well imagine the volume of software to be developed and the role to be played by capable service firms in a task of such magnitude.

ISDNs (Integrated Service Digital Networks) will be tomorrow's telecommunications infrastructures permitting the storage, processing and transmission of images, text, data and voice on a single medium.

Consumer applications

Consumer products and services are also integrating increasing volumes of data processing, whether in the fields of electronic information and payment ("smart" cards, automatic ticket dispensers, toll ticketing and collection systems, etc.) or, obviously, in telecommunications.

An example of the latter is Radiocom 2000, the cellular mobile telephone system developed by Matra Communications in association with the French government. CAP GEMINI SOGETI assisted in development of the system's many software components.

The system is made up of vehicle-mounted mobile telephone equipment and some 500 fixed relay stations for nationwide communications coverage.

The integration of microprocessors and software components to handle system functions provides the user with a wide range of services, including:

- two-way calling throughout France using a single telephone number,
- availability of a number of local functions (mini-directory of priority numbers accessible by speed dialing, call duration display, user assistance messages, etc.),
- access keys preventing unauthorized telephone use by third parties; for example, the system completely deactivates the mobile unit in case of vehicle theft.

Another brand-new example (on the lighter side) of intimacy between man and machine: the computerized shoe. The ultimate in refinement for the runner, this microprocessor-equipped item of footwear lets a runner calculate his distance, average speed...and even the number of calories he has burnt up, as the system can

be calibrated to the runner's physiology! Better yet, the microprocessor can be connected to a personal computer, enabling the runner to create a data bank yielding statistics on his performance.

INTERLACING SKILLS

The integration of data processing has become an essential factor behind competitiveness – if not outright survival – for many manufacturers and service providers. This again explains the strategic importance of the integrating user, whether working on simple products such as digital scales or complex ensembles such as public telephone switching centers.

In technically-simple cases, the most critical phases of work for the user are new-product design and selection of automatic control functions. These phases are inexpensive (at most a few percent of sales) viewed in relation to the size of production runs, but they are crucial for the product's competitiveness.

In complex cases, the main problems are different in nature, as shown by the following three descriptions:

- the major technical options which condition implementation of the system (and sometimes even of the product). These relate to basic DP technology (16-bit vs. 32-bit, standard vs. custom components, etc.), distribution of DP functions and capacities, data architecture and others. Necessary decisions are often ticklish, as new technologies offer high performance levels but are somewhat protean and lack tooling, whereas tried-and-true technologies might render a product obsolete before its market has been saturated.
- subcontracting policy, which unquestionably must be an element of general corporate policy. While direct purchase of computers and peripherals (e.g., sensors) is a relatively widespread policy, software implementation and integration of DP subsystems are more difficult to deal with.

In fact, these tasks are often situated on the critical path, particularly because they are begun late in the development cycle. Given the high investment cost of some of these implementations (possibly in the hundreds of millions of dollars for a public telephone switching system) and the extreme complexity of systems, it is to the user's advantage to distribute his effort and his risk between his own teams and those provided by companies specializing in DP systems development. To this end, the user will himself do the work related to his industrial activity, and he will concentrate his management on overall scheduling and supervision of associates and subcontractors.

Regardless of the techniques involved, selection of the best available implementors and careful management of work progress are essential to the success of technically-sophisticated large projects. This is why the use of – and the maintenance of close relations with – large DP service firms are policies frequently applied with success by integrating users.

THE COMPUTERIZED SHOE
The ultimate in refinement for the runner, this microprocessor-equipped item of footwear lets a runner calculate his distance, average speed, and even the number of calories he has burnt up, as the system can be calibrated to the runner's physiology. Better yet, the microprocessor can be connected to a personal computer, enabling the runner to create a data bank yielding statistics on his performance!

- the manner in which a new product is placed on the market, which is decisive to the nature and sequence of development operations.

The question is: What are preliminary tests aimed at? Should they deal with technical feasibility, end-user acceptance, competition by differing products or services? The answer to these questions will permit definition of mock-ups, drafting of the list of information to be obtained, definition of strategic analyses to be performed. As a rule, subcontractors take part in these operations preceding final product development. Indeed, technical options and specifications related to subcontractors' specialties will be affected by preliminary test results. The integrating user must interlace his specific industrial know-how with a DP know-how on which "systems intelligence" is based.

Naturally, the large DP service firms working with the user toward this goal must have an in-depth familiarity with their own field of activity, so that together they can form multidisciplinary teams capable of performing all required integration operations.

This is why CAP GEMINI SOGETI is organized on the basis of specialized branches (Automation Branch in

Paris, Space Branch in Toulouse, Computer-Integrated Production Branch in Essen, Command and Control Systems Branch in London, Telecommunications Branches in Paris, Chicago and New Jersey). The same need led the Group to set up specialized "skill centers" and an "Experts' Club" which bring together professionals who have mastered specific fields of activity or DP techniques.

Technical sophistication, longevity, size, quality of methods and tools: these assets allow large service firms to respond speedily and reliably as problems arise. In and of themselves, these companies at once combine:

- thorough familiarity with the product types whose functions must be automated,
- past experience with comparable implementations, guaranteeing both the reliability and the innovative nature of proposed solutions,
- knowledge of the hardware, equipment and architecture most appropriate for the problem at hand,
- the level of professionalism needed for rapid implementation of software offering the required qualities of operating reliability, maintainability and upward compatibility,
- the capability of reacting, the muscle and the solidity sought by implementors of systems whose life cycles might run into the tens of years,
- the ability to bring together the best associates as needed for large-scale projects. ■

We have seen that all users are, in the long run, participants in the life of data processing. If they do not all develop software, they nonetheless express their opinion on the quality of the tools made available to them, and they state their needs.

The field of data processing has heretofore enjoyed an extraordinary wealth of innovation. The future, too, seems so promising that little doubt remains that the user's professional life will be rich in challenges for many years to come. We will review some of these challenges here.

Since technology is what stimulates the user's imagination, let's begin there. The power of basic components is going to continue to grow: someday, it will doubtless be possible to manufacture circuits integrating 100 million components, for a gain over present density by a factor of 50. Not to mention the photon computer...but this is perhaps a bit premature, as the photon transistor has yet to be invented!

Increased power will also be achieved through evolution of systems architecture, the most promising path being that of "parallel processing." This consists of increasing the number of computers in a system, either through integral construction (supercomputers) or by harnessing together a large number of microprocessors. In both cases, the computing units process multiple programs in parallel.

A more or less lengthy wait is in store before we shall see machines capable of combining optical vision, voice recognition and natural-language comprehension. Before this is possible, a device will not only have to recognize shapes, but also "understand" the image by taking into account the surroundings of the viewed scene. Voice recognition must be accompanied by understanding the meaning of words owing to contextual analysis. But real-time comprehension and response with a 15,000-word vocabulary presupposes the performance of one billion operations per second! Whence the advantages of developing very powerful parallel architectures and dedicated algorithms for natural-language comprehension.

As in the field of applications design, the most promising hopes in software engineering lie in artificial intelligence and, in particular, the "expert systems" aimed

at reproducing human behavior in areas of perception, comprehension and decision-making, for scientific, industrial, medical and other applications. The novel aspect of expert systems is their ability to reason on the basis of indeterminate knowledge or data. Users are conducting applications development tests in most fields using expert systems. CAP GEMINI SOGETI has already implemented over twenty studies of prototypes and applications for its customers.

In a shorter-term view, DP managers will have to keep on accepting the major challenges facing them:

- their task is becoming more burdensome. Paradoxically, this is the result of decentralization of resources and know-how. Increasing numbers of end users wish to deal with increasingly complex problems. And they are turning to DP services for training, for assistance or for implementation of long-term development projects.
- the existence of a "corporate network" is becoming a matter of essential priority. All systems, central and departmental, will ultimately become part of this corporate network and will be linked to outside networks. The job of creating the corporate network will represent a centralized effort.
- movement toward higher skill levels is inexorable. Beginning with the DP manager, whose strategic role is being confirmed. And not overlooking operations personnel (as a result of automation) or design experts called upon to spend less time on coding and more on design. And without forgetting the new tasks to be carried out: database architecture, network management, knowledge surveys and compilations, and so on.
- we have entered the era of "open" data processing, as access to data and to machines is becoming widespread. Security must be a matter of major concern. The problems raised by detection of intrusion and abuse, by identification of individuals and terminals, by changes of system must all be solved. It will be necessary to limit functions available to people with access to the system, ensure message confidentiality, increase overall reliability, etc.

Before concluding, we would like to quote a user, Mr. Bertoncini, DP Manager of Automobiles Peugeot:

"Through its relatively brief history, data processing, initially viewed as a marginal managerial phenomenon, has been acknowledged as a useful factor in the enhancement of operational procedures. Today, in a new phase of development, it is enabling us to improve and propagate past achievements by adding new and original solutions: original from the standpoints of technology and of impact on corporate potential for action. As a tool, data processing is becoming universal, and its proper use is a decisive factor of corporate success. The options involving data processing belong to the corporation's strategic plan."
(From a report delivered at the 1986 Paris DP Convention)

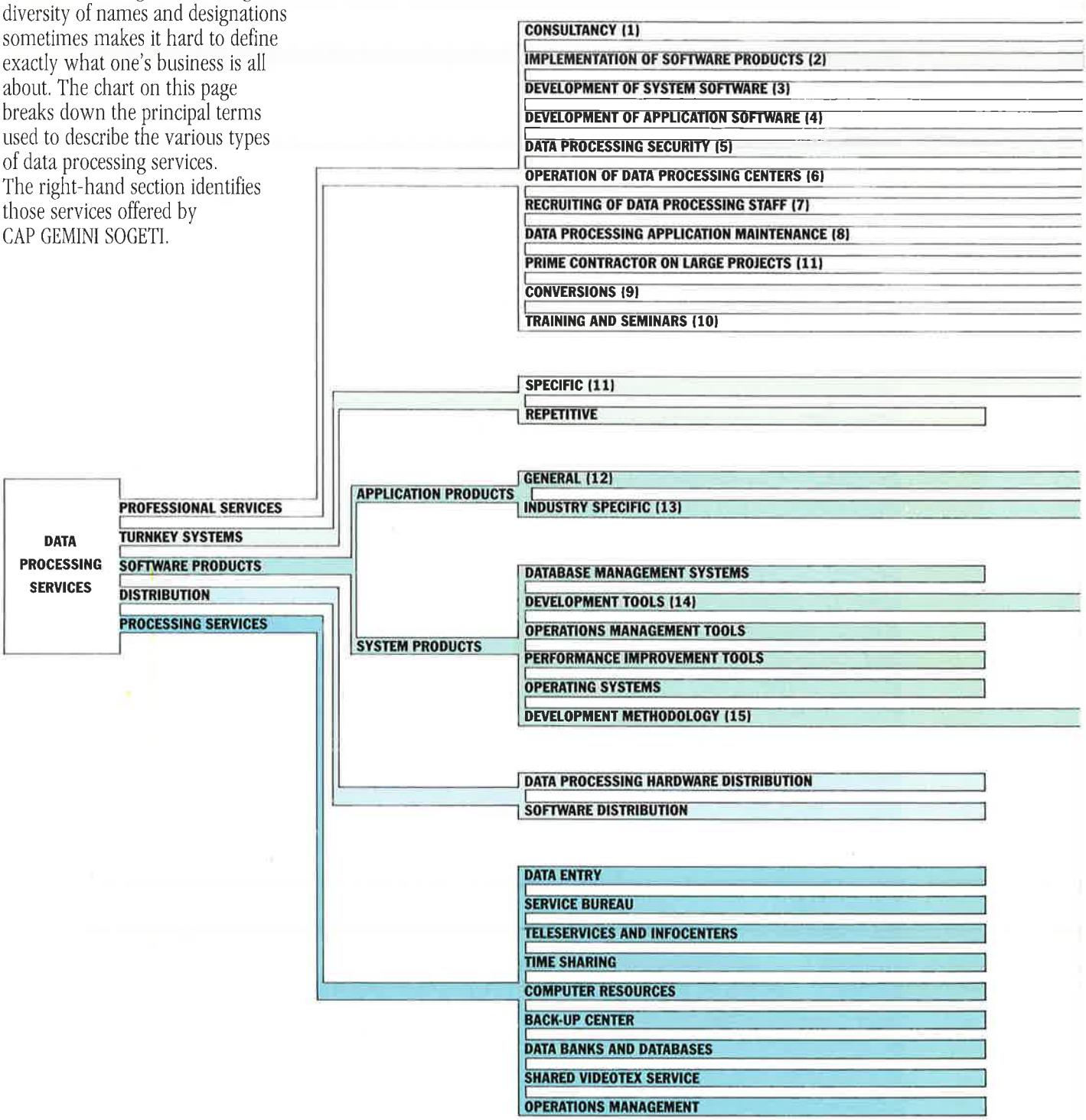
The word "history" is eloquent when referred to the preceding pages. Indeed, when we look at the past, we cannot help being struck by the extraordinary feat that users have achieved in such a brief period of time: data processing is barely more than thirty years old!

After thirty years, the number of applications at work today is impressive, with millions of professionals operating, updating and continually adding to their number. Modest service firms have become major international companies and full partners in a worldwide activity.

The future is equally promising: technologies remain just as rich in new ideas and the quest for achievement is as lively now as ever before.

AT APRIL 1, 1987

CAP GEMINI SOGETI is a Data Processing Services company specializing in "professional services." Within this relatively new and evolving universe, a great diversity of names and designations sometimes makes it hard to define exactly what one's business is all about. The chart on this page breaks down the principal terms used to describe the various types of data processing services. The right-hand section identifies those services offered by CAP GEMINI SOGETI.



REMARKS (NUMBERS REFER TO THE BREAKDOWN LEFT)

1 To provide consulting services and/or to conduct studies prior to the development of DP systems or applications. This may involve, for instance: drawing up a DP master plan; establishing specifications; advising on methodology; design and implementation of a quality-assurance plan; consulting on the choice of equipment, software packages, new technologies, etc.

2 CAP GEMINI SOGETI assists its clients in the implementation and use of products (such as database management systems, 4th generation languages, etc.), or of new techniques such as expert systems, videotex, smart card, CAD/CAM (Computer Assisted Design and Manufacture), etc. The Group performs specific adaptations, modifications or developments for its clients on program products they are using or that they plan to acquire.

3 The development of system software includes specifying software functions and its interfaces with existing systems, defining portability and performance criteria, writing and debugging codes, conducting tests, editing documentation, etc.

4 The development of application software entails analyzing the clients' needs, defining functional specifications, setting up the team. It involves project management, system analysis, program writing and debugging, editing the documentation, training users, installing the application and formally delivering it to the customer.

5 Ensuring system security and confidentiality involves studying the devices and procedures that provide the physical protection of the facility, the security of the files, control of the access to information, data encryption, the restart of the DP centers after accidental interruption, etc.

6 Consulting and technical assistance in computer operations cover a whole a range of functions: from defining the organizational procedures of a DP center – including the actual running of the computer room – to auditing operations. These tasks may finally amount to complete responsibility for operating the DP center.

7 CAP GEMINI SOGETI assists its customers in analyzing staff requirements, and in recruiting and selecting appropriate candidates for the various positions within a DP department: research, development, operations, technical support, etc.

8 Maintaining DP applications refers, on the one hand, to consulting activities – help with the implementation of technical and administrative procedures – on the other, to assistance with the actual maintenance tasks themselves.

9 Converting software so that it will function on a different system (hardware and/or operating systems) – the terms "conversion" and "migration" are both used – requires highly specialized tools. CAP GEMINI SOGETI uses methodologies, computerized planning tools and translators.

10 Technical training sessions provided by CAP GEMINI SOGETI address both DP users, whatever their functions within the company, and the DP personnel (managers, development staff, operations staff). Several formats are available: seminars, inter-company of single-company classes.

11 CAP GEMINI SOGETI takes on responsibility for the development of complete systems: general specifications, consulting with possible sub-contractors, project management and administration, technical coordination, definition of the systems architecture, software development and implementation, software and hardware integration, acceptance of the system, follow-up and maintenance, etc.

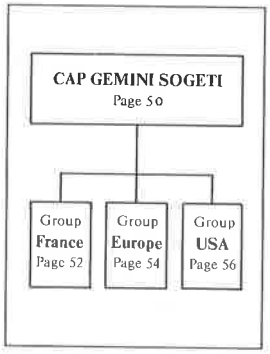
12 CAP GEMINI SOGETI's generic application products respond to the users' needs with the most economical solutions available. Among them: the Standard Application Modules (SAM) covering all the major business applications; the MULTITEL videotex server systems; the range of MULTI 11 electronic directories for business applications; the MULTIMAIL 400 multimedia electronic messaging system.

13 CAP GEMINI SOGETI also offers a number of specific application software products, including ARIES for purchasing; inventory control, re-supply and workshop planning in industrial environments; and the TIGRE software product for interactive securities management.

14 Development support tools feature the MULTIPRO software engineering system with its many options, and INFOLIB, a conversion estimating and scheduling tool, along with a complete range of conversion products.

15 CAP GEMINI SOGETI proposes to its clients software development methodologies that have been developed and used by its own subsidiaries. Examples of such methodologies are SDM developed by PANDATA in the Netherlands and EXPERT developed by Group France. CGS also helps its clients with the implementation of these products, some of which are specifically supported by the MULTIPRO software engineering system.

The most striking feature of CAP GEMINI SOGETI's organizational structure is its broad decentralization.



• The basic operational unit is the branch, which consists of anywhere from 50 to 150 professionals.
Today, CAP GEMINI SOGETI numbers 120 such branches, with each covering a specific geographic territory or business sector, under the leadership of a Branch Manager who has total responsibility for his resources and his results.

• This kind of "on-the-spot" presence offers the best possible framework in which the Branch Manager can perform the two basic functions underlying all service and consulting activities: to manage his team of consultants and to act as a full-time intermediary vis-à-vis his clients.

• Coverage in all the major countries of Western Europe and the United States, provides the Group with a vast, permanent technological observation point, from which it can constantly verify that its services are in tune with the demands of the marketplace. On January 1, 1987, for example, 20 new branches were opened in response to user needs.

• These branches are gathered into Companies or Regions, which are then consolidated into three operational groups with specific geographic responsibility (France, Europe, USA). CAP GEMINI SOGETI's General Management organization, which rounds out this decentralized structure, along with the organization of the three operational groups, are presented in detail on the following pages.

This kind of decentralized structure can only operate efficiently if its major supervisory functions are well defined and clearly understood, if the necessary controls can be freely executed and if information is thoroughly and quickly circulated. That is the role of the three General Management divisions, which are responsible for a relatively small number of supervisory services; they too are outlined on the following pages.

Coordination of this overall structure is handled by two management bodies:

• THE EXECUTIVE COMMITTEE, with Serge KAMPF, Executive Chairman of the Holding, presiding over six of the Group's principal managers.
It is the forum in which CAP GEMINI SOGETI's broad strategic guidelines are defined, and where important decisions affecting the entire Group are made. It is the guardian of the basic principles which underlie the activities of all the operational units.

• THE GENERAL MANAGEMENT COMMITTEE is an assembly of about 50 of the Group's top managers, the company and regional managers in particular. They develop general Group policy and offer opinions on matters of basic strategy, and on technical and commercial subjects as they apply to the present and future of CAP GEMINI SOGETI.

Other opportunities are provided for managerial get-togethers. Among the most important:

• The Management Committees, attended by the top managers within each of the three operational groups;

• A similar forum also exists in the subsidiaries, thereby adding to the flow of information and extending the decision-making process.

• The Experts' Club is a gathering, within each group, of its most experienced consultants, who then go on to share their know-how with other Group members.

• The "110% Club". Each year, the Branch Managers who have achieved 110% of their budgets are invited, along with a companion, to take part in an exciting foreign trip during the following spring.

CAP GEMINI SOGETI's highly decentralized structure is complemented by various meetings or "rencontres", which act as a cohesive force within the Group.

The Executive Committee of CAP GEMINI SOGETI consists of 7 members. From left to right: Daniel SETBON, Christer UGANDER, Michel BERTY, Bob SYWOLSKI, Michel JALABERT, Alain LEMAIRE, Serge KAMPF.

General Management Committee meeting on December 5, 1986 in Paris.

THE RENCONTRES

From its very beginnings, the Group initiated the custom of assembling its entire staff once a year. Then, as the size of the Group increased, it became necessary to limit these Rencontres to the managers.

Thus, in June of 1986, CAP GEMINI SOGETI's XVth Rencontres were held in Cannes on the French Riviera. 220 Group managers participated (along with two invited guest speakers: Jacques MAISONROUGE, former director at IBM; and Bob WATERMAN, co-author of the successful book, "In Search of Excellence"). The working theme for the meeting was "Manager in an International Group."

In 1987, as is the case for all odd-numbered years, these Rencontres will be held within each of the three operational groups: France, Europe, the USA.

This makes it possible, every other year, to enlarge slightly the number of participants and to deal with more specific subjects, as a prelude to the large CAP GEMINI SOGETI gathering the following year.

Although certainly an opportunity for working together, these Rencontres are also an occasion for getting better acquainted, for exchanging ideas and experiences and in so doing, for developing a real CAP GEMINI SOGETI culture. Historically, the Rencontres have always been among the Group's most memorable highlights.

GENERAL MANAGEMENT

In all companies of any size, the basic role of general management is to "handle the contradictions": short term/long term, profitability and growth, internal competition and solidarity, individual initiative and Group consensus, etc.
The same is obviously true for CAP GEMINI SOGETI. But because it is a service company – that is, first and foremost a community of people – and in view of its highly decentralized structure, General Management must also **oversee the cohesion of the entire organization.** This does not mean acting simply as a keystone holding together the individual components of that structure, but rather contributing to the efficient running of the enterprise through a series of functions and activities which may be generally classified as follows:

- choosing strategy and defining general Group policy: spheres of activity, rates of growth, profitability, autonomy, internationalization, etc.;
- evaluating risks and allocating resources;
- analyzing costs and administrative management;
- monitoring the environment and key indicators;
- overseeing systems and organizational structures;
- managing managers' career development: hires and appointments, training, promotions, transfers, motivation, profit sharing and approval systems, the "right to make mistakes," etc.;
- arbitrating and managing conflicting interests;
- managing and presiding over governing or coordinating bodies: the Executive Committee, General Management Committee, etc.;
- promoting and defending the company's system of values: integrity, strict independence from all external powers, professionalism, respect for the rules, respect for cultural diversity, etc.;
- enhancing the Group's corporate image, its esthetics, distinguishing it from the competition, communication strategy;
- refining and periodically questioning (strategy, structures, systems, established positions, etc.).


Serge KAMPF


Philippe DREYFUS

Serge KAMPF, Executive Chairman of the Group, is assisted by a Vice-President in charge of Public Relations: Philippe DREYFUS. He is Mr. Kampf's representative at many external functions and vis-à-vis professional organizations.

> Decentralization is the guiding principle behind CAP GEMINI SOGETI's organizational structure. Nowhere in the company hierarchy will departments be found devoted to "Sales" or "Personnel" Management. It is the **Branch Manager** who is responsible for setting up his sales activities and for choosing and directing his staff.
>
> Decentralization, however, does not mean "balkanization," a system in which central power is merely parceled out among local governing agencies. All decentralization within a company implies the existence of an informed, efficient central body

CORPORATE DEVELOPMENT

Corporate Development performs the following functions:

- studies and analyzes **trends**:
  - DP and telecommunications technologies and industries;
  - user needs to which these technologies may respond;
  - the competitive environment;
  - the Group's position in the market.
- Proposes medium- and long-term strategic approaches, carries out studies on various activity sectors (current or potential), and works out the most favorable **development scenarios**, with relation to technological and economic forecasts;
- defines development hypotheses which best correspond to Group objectives in conjunction with each operational group; synthesizes plans prepared on the basis of these hypotheses, and then formulates the **5-year plan** of the entire Group;
- selects and implements **shareholding systems** and agreements enabling the Group to extend its geographic activities, expand its range of skills, acquire technological specialization, and create new activities with one or several partners;
- assures cooperation between CAP GEMINI SOGETI and those companies in which it holds a minority interest, namely:


Michel JALABERT


Jacques LESCAULT


Jean-Jack LOUDES


Eric LUTAUD


Pierre BALSOLLIER

□ **the BOSSARD Group**, organizational consultants; Jean-Pierre AUZIMOUR, Chairman; 1986 revenue: FF 377 M (Cap Gemini Sogeti interest: 49%);
□ **S.E.S.A.** (Société d'Etudes des Systèmes d'Automation), Jacques ARNOULD, Chairman; Michel FIEVET, General Manager; 1986 revenue: FF 1,048 M (Cap Gemini Sogeti interest: 42%).

Michel JALABERT, Vice-President Corporate Development, heads a team composed of:
- Pierre BALSOLLIER, Statistical Analyses and Plans,
- Jacques LESCAULT, Strategic Studies,
- Jean-Jack LOUDES, Investments,
- Eric LUTAUD, Technological Studies and Contracts.

FINANCIAL MANAGEMENT

Financial Management is responsible for the broad financial equilibrium of the Group and for protecting its assets. It is charged with the following functions:
- defining the administrative and financial **procedures** which must be respected by all the operational units to assure the standardization of working methods, and to facilitate the preparation and supervision of Group accounts;
- preparing the **annual Group budget**, on the basis of the branch, divisional, company and operational group budgets;
- managing central staff expenses;
- centralizing and **consolidating results** (in French francs) and comparing them to budgets and results of previous fiscal years, based on information transmitted monthly by the operational units;


Daniel SETBON


Pascal GIRAUD


Manuel JAVARY


Hervé MARIN


Philippe HENNEQUIN

- setting up the Group's **consolidated accounts**, those of the intermediary holdings and of the parent company CAP GEMINI SOGETI S.A.;
- managing general **legal and fiscal problems**: analyzing and approving formal prototype agreements and important contracts, monitoring and supervising legal departments, providing central legal support systems, documentation, liaison with lawyers from the various countries in which the Group is located, etc.;
- determining Group **financial policy**, relations with banks and financial establishments, monitoring receivables, cash management;
- controlling the results and application of procedures through an **internal auditing** service working in conjunction with outside auditors, both French and international;
- overseeing opportunities for, and profitability of, **investments**;
- designing and implementing financial structures necessary for growth: financial plan, debt management, capital increase, financial packages for acquisitions, etc.

Daniel SETBON, the Group's Chief Financial Officer, heads a team composed of:
- Pascal GIRAUD, Controller,
- Philippe HENNEQUIN, Corporate Counsel,
- Manuel JAVARY, Treasurer,
- Hervé MARIN, Internal Auditor.

empowered to supervise a certain number of basic functions: overseeing the company's image and its general strategy, assisting and counseling the operational units, coordinating their activities, consolidating results, controlling management activities, etc.

At CAP GEMINI SOGETI, these duties are performed on three levels: the holding, management of the three operational groups (France, Europe, USA) and management of each of the subsidiaries.

At the holding level, these responsibilities are divided among four management divisions, whose functions are described in detail on the pages opposite.

ORGANIZATION, COMMUNICATIONS AND INTERNATIONAL MARKETING

This Corporate Management division combines four major functions:

Internal organization of the Group:
- formalizing decisions made by the Executive Committee, transmitting them to those directly affected, monitoring their application;
- working out Group procedures targeted to all operational units, transmitting them, providing training in their implementation;
- setting up the internal DP system;
- supervising general services.

Communications Systems:
- approving topics and methods, coordinating actions;
- defining and regulating conditions for use of the Group trademark;
- internal communications (managers and staff);
- external communications and press relations;
- the Annual Report.


Michel BERTY


Jean-Louis BOUR


Catherine THOMAIN


Didier CASADO


Jean VACHERON

International Marketing:
- strategic considerations for adapting major marketing trends and assuring their cohesion;
- coordinating certain multinational marketing activities;
- stimulating internal cooperation and exchanges among subsidiaries;
- assisting the operational units;
- proposing and presiding over joint external presentations;
- developing Group-wide internal programs: sales training, subject brochures, sales literature, references, marketing statistics, publicity, etc.;
- setting up procedures for export and foreign investment.

General Business:
- risk management, insurance, advice to subsidiaries;
- corporate legislation and key personnel indicators;
- management of Group real estate holdings;
- security of personnel and premises;
- preliminary litigation and documentation;
- inventories (staff, equipment, work assignments, etc.);
- organization of international meetings;
- relations with major suppliers.

Michel BERTY, Secretary General of the Group, is in charge of these management functions and is assisted by:
- Jean Louis BOUR, Communications,
- Didier CASADO, Internal DP,
- Catherine THOMAIN, Press Relations,
- Jean VACHERON, General Business.

GROUP FRANCE

The DP user is changing, diversifying, multiplying, a fact made amply clear in the preceding pages.
One of the most outstanding of these changes is the attention that both public and private sector companies are now paying to the fundamental role of data processing in the formation of their strategy.
Face to face with this evolution, our ongoing aim is make our know-how easily accessible to all users. That is why, within our operational units, we have fortified our areas of specialization, sector by sector. By so doing, we have been able to provide our clients with the value added services that result from combining "DP expertise" with "application expertise."
Likewise, within a single company, we have combined a full range of training activities so that our DP professionals, as well as our present and future non-professional users, might benefit from our educational capability.
Although less visible on the organizational chart, our constant quest to improve quality and productivity at every group France level, nonetheless represented an important part of our activity in 1986. We have refined our methods, developed more sophisticated tools, invested heavily in training our technicians. Such efforts reflect our conviction that the use of a data processing tool is a job for professionals.
Thus, we have been able to draw from our experience the skills needed to provide our clients with the highest quality services.
That, after all, is what our business is all about!

Alain LEMAIRE*
President
group France

Jean-François DUBOURG*
General Manager

Edouard BAZEILLE*
Deputy General Manager

Jean-Paul FIGER*
Deputy General Manager

Bernard LORIMY*
Director

Jacques BERTHELOT*
External Development

José BOURBOULON*
General Secretary

Jacques de COMBRET*
Human Resources Manager

Main Support Functions

José BREVAL	Special Projects
	Videography
	Networks
Claude-Pierre DENIAUD	Quality Support and Methods
Claude DRAY	Micro-Center
Francis DROUIN	Technical Support
Christian GALLIN	Military
Christine GOAVEC	Communications
Yves GUILLAUME	Special Projects
Dominique ILLIEN	Controller
Paul OLCESE	Quality Control
Frank O'MEARA	Human Resources
Jean SAINT-HUBERT	Communications
André WORONIAK	Quality

(*) Members of the group France Management Committee

GROUP FRANCE OPERATIONAL COMPANIES

CAP SOGETI EXPLOITATION

Jean-François DUBOURG
Chairman

Georges COHEN
Deputy General Manager

Pierre DALMAZ	AFM
François NEANT	DTSM
Jacques AUGER	MSSM
Jean-Marc BY	TSSM

Branches	Branch Managers
Branch 1	Dominique DUFLO
Branch 2	Claude CHIABRANDO
Branch 3	Gérard JAMAIS
Branch 4	Christian TOURNIER
Branch 5	Jean-Pierre POUTEAU
Branch 6	Bernard DELALEU
Branch for French speaking Switzerland	Claude BUGEY

CAP SOGETI LOGICIEL

Henri STURTZ*
Chairman

Jean BISSELICHES
General Manager

Jacques TIXERANT	Deputy General Manager
Frédéric PLACES	AF
Alain SARRAZIN	MSSM
Christian RENARD	DTSM

Branches	Branch Managers
Government Agencies	Jacques LAGORCE
Public Corporations	Michel ROUZAUD
Military information Technology	Jean-Marie BARRE Jacques TIXERANT, actg

CAP SOGETI FORMATION

Jacques BERTHELOT
Chairman

Cornel SIMIU
Deputy General Manager

Guy EREL	AF
Any BOULADE	Manager

Branches	Branch Managers
Institute	Cornel SIMIU
Training	Alain LE BRETON Jacques CHEMLA
Selection	Jean SAINT-HUBERT

CAP SOGETI TERTIAIRE

Jean-Marc SCHAUVLIEGE *
Chairman

Christian CHEVALLIER
Deputy General Manager

Martine BIGE	AFM
Jean-Luc CHATEAU	MSSM
Christian DOEHR	DTSM

Branches	Branch Managers
Banking 1	Bernard SARRAZIN
Banking 2	Bernard LEUBA
Insurance	Pierre BONVARLET
Services	Gérard PAYEN
Special Projects	Jean-Louis PRADELS

CAP SOGETI INDUSTRIE

Jean-Philippe GAILLARD*
Chairman

Gilbert ELOIRE
Deputy General Manager

Geneviève MICELI	AF
Claude FORSANS	MSSM
Eric PIAT	DTSM

Branches	Branch Managers
Mech., Electr. & Eng. Constr.	Alain WILBOIS
Petrol, Chemicals & Food Industries	Jean-Pierre FOUSSIER
Aerospace Industries	Serge CHIARINI
Division Manufacturing Data Processing: Real Time Systems	Alexandre LEVY
Automated Process Control	Dominique PASTOUREL Thierry KOCH

CAP SOGETI INNOVATION

Jean-Paul FIGER
Chairman

Roland VARENNE
Deputy General Manager

Branches	Branch Managers
Grenoble Research Center	Maurice SCHLUMBERGER
Paris Research Center	Daniel DEBROSSE

CAP SOGETI INSTRUMENTS

Francis BEHR*
Chairman

Jean-Loup PERRIN
Deputy General Manager

Claude HENON	AF
Bruno PERRIN	DM
David LLEWELLYN	MSSM
Sherman DRUSIN	USA General Manager

CAP SOGETI SYSTEMES

Alexandre HAEFFNER*
Chairman

Jean-Claude BUSELLI
General Manager

Roland DUNAND
Deputy General Manager

Christian GLEYO	AFM
Françoise DOUTRIAUX	Human Resources

Branches	Branch Managers
Region North:	Marcel de TAEVERNIER
• Lille Manufacturing	Michel GUINARD
• Lille Services	Michel TURPYN
• Rouen	Jean-Jacques NICOLLE
• Senlis	Raymond PAWLOWSKI
Region West:	Bertrand de TROGOFF
• West Manufacturing	Philippe de BEAUCHAMP
• West Services	Patrick de BOISFOSSE
• Telecommunications	Joseph HURTUT
• Orléans	Jean-Michel PARMENTIER
Region South-West:	Jean-Loup BOUDINEAU
• Bordeaux Services	Charles-Henri LIMOUSIN, actg
• Bordeaux Manufacturing	Charles-Henri LIMOUSIN
• Pau/Tarbes	Charles-Henri LIMOUSIN, actg
• Toulouse Aerospace	Jean-Loup BOUDINEAU, actg
• Toulouse Manufacturing	Henri LAGRASSE
• Toulouse Services	Jean-Michel ROY
Region Méditerranée:	Paul CHAFFARD
• Marseille Manufacturing	Paul CHAFFARD, actg
• Marseille Services	Bruno BAIXE
• Montpellier	Alain GIRAUD
• Nice	Philippe BRACONNIER
Region Rhône-Alpes:	Jean ROCHET
• Lyon Manufacturing	Jean-Pierre REY
• Lyon Services	Jean-Pierre REY, actg
• Grenoble	Patric BARBEROUSSE
• Valence	Raoul RUIZ
Region East:	Denis SERGENT
• Nancy	Bernard REGNAULT
• Strasbourg	Denis SERGENT, actg
• Reims	Bernard REGNAULT, actg
• Luxemburg	Eric BRIDE

(*) Members of the group France Management Committee

AF	Administration and Finance
AFM	Administration and Finance Manager
MSSM	Marketing and Sales Support Manager
DTSM	Development and Technical Support Manager
DM	Development Manager
TSSM	Technical Staff Support Manager

GROUP EUROPE

1986 was another year of continued growth for group Europe, during which we just about hit the threshold of 1 billion francs in revenue, with a total staff of well over 2,600 at the end of the year. These results were achieved thanks to:

Christer UGANDER*
President group Europe

- a healthy organic growth which, over the last 3 years has averaged 41% in revenue (compounded yearly) and 34% in staff;
- the acquisitions toward the end of 1986, of IBAT in West Germany and GE-DA in Italy. The first is an example of increasing our expertise in an important area (industrial automation), the second of improving our market share.

To manage this expansion, Group Europe's organization is, of course, being adapted to its fundamental principles:

- reliance on a strong local presence as close as possible to our clients: the number of fully equipped group Europe branches has increased from 44 in early 1986, to 59 today;
- in-depth competence in our clients' applications and the ability to contribute actively to the development of their information systems: out of 59 branches, 33 are currently specializing in areas representative of our clients' business sectors: banking and insurance, manufacturing, distribution or public services.

We are also expanding our range of services to comply with our objective of providing our clients with the full spectrum of software services, from the first strategic information systems studies to operation of the installed systems. To our basic systems development and programming services, therefore, we are rounding out our offering in such areas as consultancy, systems integration, training, maintenance and operations.

Finally, in order to ensure that our services are of the highest quality possible, we are continuing our efforts to use the best available tools and methods and to train and educate our staff in the use of new technologies and applications. And while these activities remain very much the responsibility of the operational companies, we coordinate them throughout group Europe with our development committees: technical, commercial, personnel and administrative.

Committees with representatives from all the operating companies are backed up by central skill centers and staff in areas such as conversions, telecommunications, computer integrated manufacturing (CIM), project audits, etc.

Thus, an expanding organization, with a total workforce of over 3,000, is dedicated to serving its clients' needs and to providing a full range of top quality software services.

Jean RONCERAY*
Vice President
Administration and Finance

Tom PATTI*
Vice President
Operational Support

Paul HOFMANN
Vice President
Business Development

Main Support Functions

Jean-Claude AMIEL	Director Videotex Support
Meinard DONKER de MARILLAC	Director Communications
Klaus FEKETE	Director Conversions Support
Harry KOELLIKER	Director Finance
Jean PRADES	Director Technical Development

(*) Members of the group Europe Management Committee

GROUP EUROPE OPERATIONAL COMPANIES

GERMANY

Werner BRODT
General Manager

Michaël GASPER
Deputy General Manager

CAP GEMINI DEUTSCHLAND

Baerbel von ASCHWEGE	AFM C/G Deutschland
Norbert JORDANS	AFM C/G IBAT

Branches	Branch Managers
CAP GEMINI DEUTSCHLAND	
• Düsseldorf	Werner BONGARTZ
• Frankfurt	Paul Josef LEUSCHNER
• Hamburg	Volker CALLSEN
• Munich	Ulli NOLLE
• Stuttgart	Ulrich REITER
CAP GEMINI IBAT	
• Braunschweig	Reiner KONITZ
• Erlangen	Manfred SCHIEMICHEN
• Essen	Gerd-Willried HOCKENHOLZ
• Karlsruhe	Norbert FRIESEL
• Ulm	Stefan PFEIFFER
• Products	Jürgen STEINFORTH

BELGIUM

Jean MILAN
General Manager

CAP GEMINI BELGIUM

Yvonne STORME	AFM
Jacques BALIGANT	DTSM

Branches	Branch Managers
• Brussels Public Sector and Finance	Aimé D'HELFT
• Brussels Private Sector	Jean PEETERS
• Antwerp	Robert MALOMGRE

SPAIN

Philippe DANGLADE
General Manager

CAP GEMINI ESPANA

Luis GONZALES	DTSM

Branch	Branch Manager
• Madrid	Philippe DANGLADE

UNITED KINGDOM

Jeff ENGLAND
General Manager

CGS (UK)

Brian HARRIS	MSSM
Brian OXLEY	DTSM
Prakash AGARWAL	AFM

Branches	Branch Managers
• Public Services	Sandy CLAIREAUX
• Information Systems	Jeff ENGLAND, actg
• North	Gerald PLIMBLEY

ITALY

Adolfo CEFIS
General Manager

GE-DA

Enrico RUSCA	MSSM
Christopher COLEMAN	AFM

Branches	Branch Managers
• North	Claudio TELONI
• South	Ettore ZANAZZO

NORWAY

Kai MARTHINSEN
General Manager

Arne OEN
Deputy General Manager

CAP GEMINI DATA LOGIC

Jens-Peller MATHISEN	MSSM
Svein WEINHOLDT	DTSM
Dag POULSSON	AFM

Branches	Branch Managers
• Oslo 1	Eric RINGSBY
• Oslo 2	Leif BREKKE
• Oslo 3	Erling HANSSON
• Bergen	Bjorn SOEVIK
• Stavanger	Per HETLAND
• Development	Arne OEN, actg

NETHERLANDS

Aad UIJTTENBROEK*
Senior Vice President group Europe General Manager

Ton KNOTSCHKE
Deputy General Manager

PANDATA

Piet ADRIAANSE	DM
Bert NOLLEN	FM
Janet CLARK	AM

Branches	Branch Managers
Industry Division:	Peter BUISMAN
• TIS	Peter DE ROOS
• Zwolle	Theo PETERS
• Eindhoven	Martin LA HAYE
• Amsterdam	Jaap BOON
Public Sector Division:	Eric PLANTE
• Rijswijk	Jaap VAN DUFFELEN
• PTT	Peter BARBIER
• Amsterdam	Norman VAN ES
• Zwolle	Geerlof LODE
Trade and Services Division:	Hans TIJSSEN
• Rijswijk/Amsterdam	Ben ALFRINK
• Zwolle	Jan DERKSEN
• Eindhoven	Jos MELSSEN
Organisation & Informatics:	Wim VAN DE GEIJN
Informatics Institute:	Guido VAN SPALL

NETHERLANDS

Chris van BREUGEL*
Vice President group Europe General Manager

Rob STARREVELD
Deputy General Manager

Hans BOOM
Deputy General Manager

CAP GEMINI NEDERLAND

Jan PIETERMAN	TSSM
Arie EDELMAN	AFM

Branches	Branch Managers
Public Sectors Division:	Henk BREMER
• Branch 1	Theo BOUWMEISTER
• Branch 2	Nico COENEN
• Branch 3	Theo JANSEN
Industry and Commerce Division:	Wim HEUKELS
• Branch 1	Hans VISSER
• Branch 2	Dick VAN EEDEN
• Branch 3	Theo GIELIS
Banking and Insurance Division:	Hans BOOM, actg
• Branch 1	Rob BAKKER
• Branch 2	Bert DE VRIES
Special Products and Services:	Cor ALBERTS
• Training	Cees DE WOLF
• Operations	Arnold BRUGGEMAN

SWEDEN

Kaj GREEN*
Vice President group Europe General Manager

Lars Olof NORELL
Deputy General Manager

CAP GEMINI BRA

Gunnar ALDEN	DTSM
Eva KARNEHED-WERNE	AFM

Branches	Branch Managers
• Products	Christer ABERG
• Finance	Torsten PRAHL
• Public Sector	Stefan OLOWSSON
• Industry	Tore HAGENBLAD
• Mid	Leif BJORDELL
• West	Berndt OSMUND
• North	Lars SUNDBERG
• Finland	Kaj GREEN, actg

SWITZERLAND

Werner ZÜLLIG
General Manager

CAP GEMINI SUISSE

Erwin ESTERMANN	DTSM
Daniel SANTANDER	AFM

Branches	Branch Managers
• Basle	Fritz WOODTLI
• Bern	Walter WEISS
• Geneva	Victor GANI
• Lausanne	Alain MARÉCHAL
• Zürich Finance and Services	Hans BRUNNER
• Zürich Commerce and Industry	Arthur HOLENWEG

(*) Members of the group Europe Management Committee

AF	Administration and Finance
AM	Administration Manager
AFM	Administration and Finance Manager
FM	Finance Manager
MSSM	Marketing and Sales Support Manager
DTSM	Development and Technical Support Manager
DM	Development Manager
TSSM	Technical Staff Support Manager

GROUP USA

1986 was a year of consolidation, success, and further expansion for CAP GEMINI AMERICA.

Created on January 1, 1986, from the merger of CAP GEMINI DASD and the Consulting Division of CGA Computer, Inc., the prime objectives for the year were to merge and effectively integrate two large people-oriented companies into one cohesive unit while producing a solid financial performance. This was accomplished.

Robert J. SYWOLSKI*
Chairman group USA

The financial, operational and management integration of the two companies was completed, giving the USA group a strong, highly effective organization. There were minimum personnel changes within the group, and the merger-related objectives were accomplished without major impact on clients and employees. The administrative activities were strengthened and centralized; a new, improved benefits package was designed, installed and well received by employees; and a strategic plan was completed for the future.

CAP GEMINI AMERICA reached another milestone in the latter part of 1986, with the acquisition of SYCOMM SYSTEMS CORPORATION, a data processing consulting organization with 285 employees.

With the addition of SYCOMM, CAP GEMINI AMERICA now has 32 branches in 8 regions throughout the United States with over 1,900 employees.

CAP GEMINI AMERICA's services range from programming assistance in a wide variety of technical environments to full responsibility for projects requiring highly sophisticated technical expertise. In 1986, further specializations were developed along functional lines, responding to the needs of the marketplace, focusing on the areas of banking, insurance, securities and telecommunications. CAP GEMINI AMERICA also offers specialized services, including expertise in Conversions, Data Base Management Systems (DBMS), Management Consulting and Operations Services.

In 1987 and beyond, CAP GEMINI AMERICA will maintain and develop its basic data processing professional services business through increased market share and the opening of new markets. It will continue to augment this business with more emphasis on specialized and profitable technical services.

CAP GEMINI SOGETI is positioned for increased growth and success in the future.

James G. KERRIDGE*
President

Nic P. NEUMANN*
Vice President

Main Support Functions

Paul J. FORREST*	Chief Financial Officer
Jack L. GOODSITT	Legal Counsel
Susan M. JORDAN	Vice President Human Resources
Bruce D. POSNER	Controller
Luc-François SALVADOR	Corporate Support Conversions/Operations
Lawrence C. SCHLEGEL	Director Corporate Communications
Bruno SICURANI	Financial Control
A. Maria SMITH	Vice President Conversions

(*) Members of the group USA Management Committee

GROUP USA OPERATIONAL REGIONS

CENTRAL REGION

Glen MILLER
Regional Vice President

Branches	Branch Managers
• Dayton	Glen MILLER
• Cleveland	Glen MILLER, actg

MIDATLANTIC REGION

Paul OPALACK
Senior Vice President

Branches	Branch Managers
• Baltimore	Steven LANDSMAN, Vice President
• Washington, DC	Peter J. KENDALL
• Richmond	Jeffrey BROWNSTEIN
• Philadelphia	Jerome K. JEWELL
• Harrisburg	William FLANNERY
• Management Consulting	Paul OPALACK, actg

MIDWEST REGION

Richard E. EARLEY*
Senior Vice President

Branches	Branch Managers
• Chicago Commercial	James WOODWARD
• Chicago Advanced Technology and Telecommunications	Eugene J. FRANZ
• Chicago Insurance and Finance	John WEIDENBACH
• Denver	Susan LARSON
• St Louis	Jon E. JENSEN
• Omaha	Richard E. EARLEY, actg

SOUTHERN REGION

John R. HAMON
Regional Vice President

Branches	Branch Managers
• Atlanta	Roger SPITZ
• Jacksonville	William S. DIXON
• Orlando	Douglas C. BERRYHILL
• Tampa	Steven R. SWANSON

NORTHEAST REGION

Ronald EZRING*
Senior Vice President

Branches	Branch Managers
• New Jersey Advanced Technology and Telecommunications	Thomas KLIMUC
• New Jersey Commercial	Marty KORNBLUH
• New Jersey Communications	Craig NORRIS
• New York Banking and Investment	Michael J. PACCIONE
• New York Manufacturing	Barry SHULER
• New York Brokerage	Matthew BEZINSKI

SOUTHWEST REGION

Michael SCHERMER
Regional Vice President

Branches	Branch Managers
• Dallas	Michael SCHERMER, actg
• Houston	David BALLERING

NORTH CENTRAL REGION

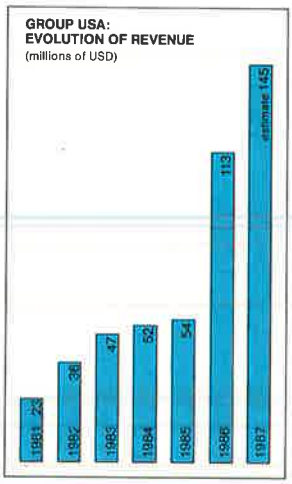
Gerald J. QUARTANA*
Senior Vice President

Branches	Branch Managers
• Milwaukee	James P. WALKER, Vice President
• Minneapolis	Kerry BAHNICK

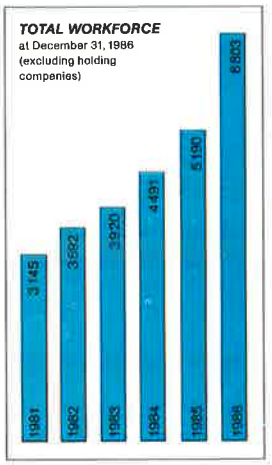
WESTERN REGION

James G. KERRIDGE
Regional Vice President, actg

Branches	Branch Managers
• Los Angeles	James G. KERRIDGE, actg
• San Francisco	Steven B. COFFMAN
• Portland	La Velle DAY
• Seattle	Terry L. FRAZIER



CAP GEMINI SOGETI's greatest resource is its people; they represent the Group's most precious asset, even though it is one that will not figure on any of the financial statements in this Annual Report.
As of December 31, 1986, Group personnel numbered 6,858. Apart from the Holdings, the workforce reached a total of 6,803 which, compared to December 31, 1985, is an increase of 1,615 people. Part of this increase stems from the creation of 743 new jobs; the remainder (872), to the addition of the staff of the Consulting Division of CGA Computer, which joined the Group on January 1, 1986. During the final days of this fiscal year, the Group was enhanced by four new companies: IBAT (138 people), GE-DA (211), HELIAS (104) and SYCOMM (285). Therefore, at January 1, 1987, the workforce for the start of the new fiscal year was 7,596.



The professionals at CAP GEMINI SOGETI are young. For about the last 10 years, the **average age** has remained remarkably constant: 32 at the end of 1986. The **educational level** of the Group's professionals is very high, an obvious necessity in light of the increasingly complex problems they are being called upon to tackle. About 60% of its technicians have received post-graduate degrees from top colleges and universities in Europe and the United States. Group professionals have **strong technical backgrounds** and the proportion of its engineers – evaluated according to standardized criteria – greatly surpasses half the total workforce.

THREE TYPES OF TRAINING

The objective is to train. In a recent document put out by the Frederik R. BULL Foundation, three methods were recommended to reach this goal. The thrust of the report is that any training program must be made up of a combination of these three methods; what we normally call "teaching" is, in fact, only one of them:

- **diffuse training** refers to all that "background noise" generated by contact with colleagues, exposure to the media and to a variety of perspectives which, in a more or less organized way, transmit large quantities of information;
- **standard teaching** is the best known type of training, with its use of proven methods in an organized framework and the ability to monitor results;
- **channeled curiosity** is not as generalized and control is more difficult. It grows out of an individual's own curiosity and his increasing desire to choose himself when and what to learn.

Modern pedagogical methods (Computer Assisted Teaching) encourage this type of training.

* *See also pages 16 and 17.*

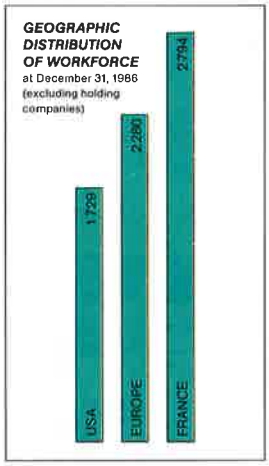
Career development at CAP GEMINI SOGETI is not, as all its technicians will testify, based on seniority.

Technical capability within the Group increases rapidly.

By means of internal promotions, professionals are rewarded not only for the enrichment of their technical knowledge, but also for their ability to take on responsibility.

In 1986, 1,084 technicians in the Group were promoted.

Finally, the Group offers equal professional opportunities to men and women. At the end of 1986, the percentage of women in the workforce was 23.6%.



A CAREER WITH CAP GEMINI SOGETI: A PATH TO PROFESSIONAL DEVELOPMENT.

Since its beginnings, the Group has instituted a clear and ambitious professional development policy, which emphasizes the quest for personal progress and which offers its people the opportunity to plan for their futures intelligently.

CAP GEMINI SOGETI has based this policy upon the following principles:

- **recruitment guidelines** which strictly define the technical competence required for each qualification, but which also favor candidates best suited to careers in a large professional services company; i.e., those with imagination, creative sensibility, the taste for hard work and ambition.

GROUP FRANCE'S EXPERTS' CLUB

Created by group France on January 1, 1986, the Experts' Club currently has about 30 members. Its primary aim is to encourage the circulation of expertise within group France and to make it available to all the French branches, whenever needed. Every Expert Club member, although belonging to a group France branch, places his know-how at the service of the whole Group to improve the overall quality of the services provided.

A second, similar objective is the setting up of a multidisciplined team, often necessitated by the extreme diversity of the technical requirements on certain projects.

To qualify for entry into the Experts' Club, a professional must have proven his (or her) skill in a particular technical area on at least two important projects. In fulfilling his assignments, he must have demonstrated respect for CAP GEMINI SOGETI's basic rules and regulations. Members are chosen by their superiors and by group France technical committees, and their qualifications are re-evaluated every year.

Expert Club members meet regularly to share their experiences and prepare recommendations, which are then presented to Jean-Paul FIGER, Deputy General Manager of group France.

• **a training policy** which guarantees to everybody – even though based on methods that may differ from one company to another – ongoing and individual training in accordance with that person's experience and the probable development of his career. At CAP GEMINI SOGETI, good training means the best possible preparation for work on clients' projects.
Conversely, these same projects are the professionals' training ground for gaining experience and acquiring new skills. But it is the clients who benefit most from the increasing professionalism of CAP GEMINI SOGETI's workforce. It is this interaction between training acquired internally and training gained on the job, which is one of the real keys to the professional development of the Group's technicians and, consequently, to the quality of the services ultimately provided to its clients.

• **insistence on technical quality**, which is attained by the use of specific working methods and tools which, in turn, assure the desired level of professionalism; by the experience of the project leaders; by the supervision and assistance of the technical managers; by the auditing of large projects and complex systems, etc.
• **guidelines for promotion**, which offer exceptional career opportunities to all, and which operate on the principle that CAP GEMINI SOGETI will recruit from outside only after being fully convinced that none of its own professionals can fill the spot.
• a considerable **Research and Development** effort in high-tech data processing areas, the aim of which is to develop and transfer know-how throughout the Group. This effort is seen, for example, in the activities of CAP SOGETI INNOVATION, a company whose name aptly describes its function: research work. Its teams are made up of professionals

GROUP EUROPE PROFESSIONAL DEVELOPMENT

Group Europe provides the finest illustration of CAP GEMINI SOGETI's multinational character.
It is made up of 11 companies in nine countries, all with different languages and working methods. Such diversity has imposed upon group Europe a choice of original solutions for respecting the decision-making independence of each unit, while at the same time providing a forum for sharing accumulated know-how among the various countries.
A Professional Development policy well adapted to these constraints is one of the most important means of assuring cohesion and of transmitting acquired experience within the Group.

The policy is based on four essential features:
• a communal training program, made up of a prescribed number of seminars, both technical and general, to round out the training programs within individual countries. This provides professionals of different origins with the opportunity to expand their horizons within an "international" environment, one in which English is the working language.
• quality standards independent of the methodologies practiced in the separate countries, with the aim of promoting a coherent "quality assurance" plan.
• technical exchanges between countries are systematically encouraged: by publication of a "Technical Newsletter" in which the professionals talk about their work; by an Experts' Club, which brings together group Europe's leading specialists; and by international work meetings covering a wide variety of subjects.
• communal, specialized skill Centers to assure the spread of advanced technology developed within a given country.
As a result of this policy, the group Europe professional has the justifiable conviction that he is seeing his work in its broadest context. This policy also allows the group to take advantage of the variety of languages and cultures that are part of the wealth of Europe.

from the various Group companies, to which they subsequently return to train their colleagues in the new skills they have acquired.

- a **communications policy** that offers Group professionals numerous avenues for contact and information, both technical and general (branch and company meetings; technical meetings, internal company and branch publications; COGITAS, the internal magazine of the Group; the Annual Report, etc.).

A CAREER WITH CAP GEMINI SOGETI: A PATH TO PERSONAL DEVELOPMENT.

The data processing professions, especially within a consulting and services company, are an important source of **personal development**. The technique of data processing itself, particularly as it applies to concrete problem solving, sharpens the analytical facilities, imposes clarity and objectivity and enhances the ability to synthesize. Taking part in projects - the scope and variety of which demand enormous intellectual flexibility - provides excellent training in team effort.

The diversity of projects in which CAP GEMINI SOGETI professionals participate is not unlike the "Tour de France" of the Middle Ages, with its young journeymen (or "compagnons," as they were called), moving from workplace to workplace, and finding vocational as well as personal guidance. Apart from honing his thinking processes and broadening his outlook, the professional at CAP GEMINI SOGETI learns how to be open to dialogue.

Every profession offers those who practice it opportunities for personal enrichment. Being a professional in a data processing services company such as CAP GEMINI SOGETI develops both maturity and intellectual capacity.

GROUP USA'S "EXCELLENCE IN CONSULTING" AWARDS PROGRAM

CAP GEMINI AMERICA has established an awards program entitled "Excellence in Consulting." It provides company-wide recognition to those on its technical staff who exemplify the professionalism, commitment and quality of service that make CAP GEMINI AMERICA stand above the competition.

Every quarter, each of CAP GEMINI AMERICA's eight regions selects an "Employee of the Quarter," and at the end of the year, each region chooses from among the quarterly winners, its "Employee of the Year." These eight winners are featured in an article in CAP GEMINI AMERICA's internal magazine and they are rewarded with a trip to Europe or Hawaii.

There are several criteria for selecting the "Employee of the Year." Some deal with the quality of the technical work accomplished, others focus on the willingness to undergo training or to assume additional responsibility.

Equally important are relations with clients, involvement in branch and company life, and in a more general way, a demonstration of the kind of behavior that gives the client confidence in the quality of the services he is receiving.

PRINCIPAL LOCATIONS

HOLDING COMPANY

Head Office: Grenoble
6, boulevard Jean-Pain - BP 206
38005 Grenoble
☏ 33 76 44 82 01

Finance: Lyons
190, rue Garibaldi
BP 3265
69403 Lyon Cedex 03
☏ 33 78 62 20 44

General Management: Paris
Place de l'Etoile
11, rue de Tilsitt
75017 Paris
☏ 33 (1) 42 67 97 57

PRINCIPAL LOCATIONS IN FRANCE

CAP SOGETI FRANCE CAP SOGETI OPERATIONS	Paris	Place de l'Etoile - 11, rue de Tilsitt	75017 Paris	33 (1) 42 67 97 57
CAP SOGETI SYSTEMES	Paris	14/20, rue Leriche	75738 Paris Cedex 15	33 (1) 45 39 22 25
	Bordeaux	31, rue de l'Ecole Normale	33073 Bordeaux Cedex	33 56 02 00 57
	Caen	9, rue du Général-Giraud	14000 Caen	33 31 85 12 69
	Grenoble	6, boulevard Jean-Pain - B.P. 206	38005 Grenoble Cedex	33 76 44 82 01
	Lille	276/6, avenue de la Marne	59700 Marcq-en-Barœul	33 20 72 95 09
	Lyons	190, rue Garibaldi	69212 Lyon Cedex 03	33 78 62 20 41
	Marseilles	Les Bureaux Borely - bât. A - 40, av. de Hambourg - B.P. 332	13271 Marseille	33 91 25 11 00
	Metz	Le Technopôle-bât. 8 - rue Graham-Bell	57000 Metz-Queleu	33 87 37 11 23
	Montpellier	Allée Jules-Milhau - Immeuble Le Triangle	34000 Montpellier	33 62 92 20 17
	Mulhouse	14, boulevard de l'Europe	68100 Mulhouse	33 89 45 10 60
	Nancy	25/29, rue de Saurupt	54000 Nancy	33 83 51 43 96
	Nantes	Immeuble Horizon - 12, rue Gaëtan-Rondeau	44200 Nantes-Beaulieu	33 40 47 80 23
	Nice	179, boulevard René-Cassin	06200 Nice	33 93 31 01 41
	Orléans	33/35, avenue de Paris	45000 Orléans	33 38 53 86 50
	Pau	16, rue Montpensier	64000 Pau	33 59 84 71 85
	Reims	Résidence Lundy - 6, rue Andrieux	51100 Reims	33 26 47 38 38
	Rennes	ZACE de la Rigourdière - rue de la Rigourdière	35510 Cesson-Sévigné	33 99 83 85 85
	Rouen	Place de la Verrerie - Centre Régional St-Sever Immeuble Le Montmorency 1	76100 Rouen	33 35 63 50 45
	Senlis	Avenue Félix-Louat - ZACE	60300 Senlis	33 44 60 06 71
	Strasbourg	20, place des Halles - Tour Europe	67000 Strasbourg	33 88 32 22 42
	Toulouse	Immeuble Péripole - 1, chemin du Pigeonnier de la Cépière	31100 Toulouse	33 61 40 55 58
	Valence	Le Métropole 2 - 10-12, rue du Parc	26000 Valence	33 75 42 56 19
CAP SOGETI LOGICIEL	Paris	129, rue de l'Université	75007 Paris	33 (1) 45 55 91 57
CAP SOGETI INDUSTRIE	Paris	92, boulevard du Montparnasse	75682 Paris Cedex 14	33 (1) 43 20 13 81
CAP SOGETI TERTIAIRE	Paris	26, rue de la Pépinière	75008 Paris	33 (1) 42 93 22 00
CAP SOGETI EXPLOITATION	Paris	5/7, avenue de Bouvines	75544 Paris Cedex 11	33 (1) 40 24 10 10
CAP SOGETI FORMATION	Paris	Tour Mattéi - 207, rue de Bercy	75587 Parix Cedex 12	33 (1) 43 46 95 00
CAP SOGETI SELECTION	Paris	Tour Mattéi - 207, rue de Bercy	75587 Paris Cedex 12	33 (1) 43 46 95 00
CAP SOGETI INNOVATION	Paris	118, rue de Tocqueville	75017 Paris	33 (1) 45 55 91 57
	Grenoble	Chemin du Vieux-Chêne - ZIRST	38240 Meylan	33 76 90 80 40
CAP SOGETI INSTRUMENTS	Paris	15, rue de la Vanne	92120 Montrouge	33 (1) 46 56 52 08

For all general information, please call 33 (1) 42 67 97 57.

ASSOCIATED COMPANIES

Groupe BOSSARD	Paris	12, rue Jean-Jaurès	92807 Puteaux	33 (1) 47 76 42 01
SESA	Paris	30, quai de Dion-Bouton	92806 Puteaux	33 (1) 49 00 40 00

PRINCIPAL LOCATIONS IN EUROPE

BELGIUM	CAP GEMINI BELGIUM	Brussels	49, rue du Châtelain	1050 Brussels	32 (2) 649 96 40
		Antwerp	Melchelsesteenweg 163	2018 Antwerp	32 (3) 218 77 52
		Liège	10A, quai Churchill	4020 Liège	32 (41) 42 74 63
DENMARK	CAP GEMINI BRA	Allerød	Skovmosen 5 Postbox 135	3450 Allerød	45 (2) 27 08 11
FEDERAL REPUBLIK OF GERMANY	CAP GEMINI DEUTSCHLAND	Munich	Ridlerstrasse 35 A	8000 München 2	49 (89) 51 99 10
		Düsseldorf	Grafenberger Allee 54/56	4000 Düsseldorf 1	49 (211) 67 50 05
		Hamburg	Kanalstrasse 44	2000 Hamburg 76	49 (40) 227 09 54
		Frankfurt	AM Salzhaus 4	6000 Frankfurt 1	49 (69) 29 00 71
		Stuttgart	Zettachring 12	7000 Stuttgart 80	49 (711) 71 50 053
	CAP GEMINI IBAT	Essen	Postfach 340154	4300 Essen 1	49 (201) 72 240
		Ulm	Rosengasse 26	7900 Ulm	49 (731) 67 000/009
		Karlsruhe	Kaiserallee 62 Postfach 210543	7500 Karlsruhe	49 (721) 55 80 63/64
		Erlangen	Hauptstrasse 64	8520 Erlangen	49 (9131) 26 053/054
		Braunschweig	Wolfenbutteler strasse 33	3300 Braunschweig	49 (531) 72 096/097
FINLAND	CAP GEMINI BRA	Helsinki	Kaisaniemenkatu 1 BA	00100 Helsinki	358 (0) 17 69 55
ITALY	GE-DA	Milan	Via Cesare Lumbroso 54	20137 Milano	39 (2) 54 23 343
		Rome	Via Nicola Martelli 3	00197 Roma	39 (6) 87 82 61 39 (6) 87 96 56
		Turin	Via Santo Pio V 30/bis	10125 Torino	39 (11) 65 08 282
NETHERLANDS	CAP GEMINI NEDERLAND	Utrecht	Adm. Helfrichlaan 1	3527 KV Utrecht	31 (30) 91 02 46
	PANDATA	Rijswijk	Verrijn Stuartlaan 28	2280 EL Rijswijk	31 (70) 95 71 71
		Geldrop	Laan der Vierheemskinderen 7	5664 TH Geldrop	31 (40) 85 77 85
		Zwolle	Burgemeester Roelenweg 33	8031 ES Zwolle	31 (38) 22 44 42
		Amsterdam	Joan Muyskenweg 48	1099 KC Amsterdam	31 (20) 68 29 91
		Groningen	Queridolaan 5	9721 SZ Groningen	31 (50) 27 20 70
		Utrecht	Catharijnesingel 52	3511 CG Utrecht	31 (30) 31 87 04
		Leeuwarden	Brandemeer 33	8918 CT Leeuwarden	31 (58) 67 33 80
NORWAY	CAP GEMINI DATA LOGIC	Oslo	Rosenkrantz gate 16	0160 Oslo 1	47 (2) 42 07 60
		Bergen	Lars Hillesgate 30	5000 Bergen	47 (5) 31 11 17
		Stavanger	Kirkebakken 10	4000 Stavanger	47 (4) 52 29 35
		Trondheim	Kjopmannsgate 8	7000 Trondheim	47 (7) 53 37 65
		Skien	Telemarksgate 8	3700 Skien	47 (35) 27 545
		Tonsberg	Havnegate 2	3000 Tønsberg	47 (33) 18 711
SPAIN	CAP GEMINI ESPANA	Madrid	Claudio Coello 91	28006 Madrid	34 (1) 431 43 04
SWEDEN	CAP GEMINI BRA	Stockholm	Kungsgatan 38	11135 Stockholm	46 (8) 24 55 40
		Göteborg	Stora Badhusgatan 18-20	41121 Göteborg	46 (31) 10 06 10
		Sundsvall	Storgatan 10	85230 Sundsvall	46 (60) 12 55 40
		Karlskoga	Kungsvagen 33	69131 Karlskoga	46 (586) 503 80
SWITZERLAND	CAP GEMINI SUISSE	Geneva	2, chemin du Beau-Soleil	1206 Geneva	41 (22) 46 14 44
		Geneva	4, chemin du Beau-Soleil	1206 Geneva	41 (22) 47 88 00
		Zürich	Brauerstrasse 60 (F+D)	8004 Zurich	41 (1) 242 28 26
		Zürich	Brauerstrasse 60 (H+I)	8004 Zurich	41 (1) 241 06 70
		Zürich	Brauerstrasse 60 (Tech. Dev.)	8004 Zurich	41 (1) 241 23 31
		Basle	Grosspeterstrasse 23	4052 Basle	41 (61) 96 34 61
		Bern	Koenizstrasse 74, Postfach	3000 Bern 21	41 (31) 46 01 31
		Lausanne	25, rue du Simplon	1006 Lausanne	41 (21) 26 31 33
UNITED KINGDOM	CGS (UK)	London	133 High Street	Yiewsley, Mdx UB7 7QL	44 (895) 44 40 22
		London	41 High Street	Yiewsley, Mdx UB7 7QQ	44 (895) 44 85 51
		Altrincham	2 Victoria Street	Altrincham, Cheshire WA14 1ET	44 (61) 941 19 22
		Sheffield	Vicar Lane	Sheffield, Yorkshire S1 2EX	44 (742) 701 503

For all general information, please call 33 (1) 42 67 97 57

PRINCIPAL LOCATIONS IN THE UNITED STATES

CAP GEMINI AMERICA	New York	1133 Avenue of the Americas	New York, NY 10036	1 (212) 221-7270
	Holmdel	960 Holmdel Road	Holmdel, NJ 07733	1 (201) 946-8900
	Atlanta	1800 Century Blvd	Atlanta, GA 30345	1 (404) 633-2600
	Baltimore	401 East Pratt Street World Trade Center	Baltimore, MD 21202	1 (301) 837-0343
	Chicago Commercial	1011 East Touhy Avenue	Des Plaines, IL 60018	1 (312) 296-9660
	Chicago A.T.T.	901 Warrensville Road	Lisle, IL 60632	1 (312) 810-0052
	Chicago Insurance & Finance	8420 W. Bryn Mawr Avenue	Chicago, IL 60631	1 (312) 693-9790
	Cleveland	5800 Lombardo Centre Drive	Cleveland, OH 44131	1 (216) 642-1491
	Dallas	5757 Alpha Rd.	Dallas, TX 75240	1 (214) 385-3290
	Dayton	3401 Park Center Drive	Dayton, OH 45414	1 (513) 890-1200
	Denver	5299 DTC Boulevard	Englewood, CO 80111	1 (303) 220-1700
	Houston	1700 West Loop South	Houston, TX 77027	1 (713) 622-0105
	Jacksonville	6821 Southpoint Drive North	Jacksonville, FL 32216	1 (904) 636-7800
	Los Angeles	606 S. Olive Street	Los Angeles, CA 90014	1 (213) 624-0855
	Management Consulting	8381 Old Courthouse Road	Vienna, VA 22180	1 (703) 734-1511
	Milwaukee	10150 W. National Avenue	Milwaukee, WI 53227	1 (414) 546-4644
	Minneapolis	7300 France Avenue South	Edina, MN 55435	1 (612) 835-7779
	New Jersey Commercial	Raritan Plaza III Raritan Center	Edison, NJ 08837	1 (201) 225-7880
	New Jersey A.T.T.	25 Commerce Drive	Cranford, NJ 07016	1 (201) 272-7950
	New Jersey Communications	25 Commerce Drive	Cranford, NJ 07016	1 (201) 272-7950
	New York Banking & Insurance	369 Lexington Avenue	New York, NY 10017	1 (212) 883-0900
	New York Brokerage	369 Lexington Avenue	New York, NY 10017	1 (212) 883-0900
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