Information Systems Development and Business Fit in Dynamic Environments

Panagiotis Kanellis
National and Kapodistrian University of Athens, Greece

Peggy Papadopoulou
National and Kapodistrian University of Athens, Greece

Drakoulis Martakos
National and Kapodistrian University of Athens, Greece

EXECUTIVE SUMMARY

This teaching case describes the effects of privatization on a large industrial organization and sets the context for illustrating the vulnerability of information systems in turbulent environments. Upon privatization, the company put in place a number of business information systems that crippled them with respect to their initial purpose. At the same time, the policy of the company gave users almost complete autonomy and freedom with respect to meeting their own systems and informational needs. Using this freedom, business unit users developed their own small applications, and cannibalized the overarching systems to give themselves a system that worked by adapting it to their needs. The case presents a detailed, factually accurate chronology of the events, raising awareness to the issue of information systems flexibility by detailing the ensuing repercussions on an organization whose information systems were incapable of dealing with a frantic pace of environmental contingencies.

BACKGROUND: THE INDUSTRY

Being an electrical utility in the United Kingdom (UK) was not so long ago a peaceful affair. Total regulation and high barriers to entry (high costs associated with building coal-fired or nuclear power stations) were protecting electricity utilities that were producing and
distributing power without any competition. However, in the late ’80s, three factors marked the end of this era and the beginning of a new one where cutthroat competition and immense uncertainty still define the sector today. The first factor was the over-expansion of the natural-gas industry, leaving producers with surplus capacity. Those producers, who once relied solely on production, were faced with a price of gas below the cost of production, and had for the first time to make up for lost profits through marketing and distribution. The second change factor came in the face of newer and much cheaper power-generation technologies. Small gas-turbine generators cost a fraction of the price of old-fashioned power stations, and could produce electricity at about half the cost. As a result, many utilities had been left with large, uneconomical power plants—and the debt taken on to build them. Arguably, however, the largest shock to the power industry came with deregulation.

Before the privatization initiatives, the Central Electricity Generating Board (CEGB), a public corporation with its own pricing policies and financial targets, carried out the generation and bulk transmission of electricity at wholesale prices. Although CEGB’s wholesale price structure—known as the Bulk Supply Tariff (BST)—was the main driving factor for the industry’s prices, the CEGB did not set the prices for the main consuming markets of residential, commercial and industrial customers. Only a very few large-scale industrial users (such as British Rail) used to buy electricity directly from the CEGB. The bulk of production output was delivered through the national transmission system, the National Grid (NG), to 12 regional distribution authorities, the Area Boards (ABs).

The overriding philosophy of the privatization program had three main objectives: to widen the ownership of shares amongst the UK population, to reduce to the absolute minimum the level of state funding, and to stimulate the internal or operational efficiency of the industries themselves (Weyman-Jones, 1989). The industrial restructuring and privatization program, which began in 1990, saw the non-nuclear part of the generation industry split into the effective duopoly of two companies, who were jointly given 75 percent of the market. During this initial stage of privatization, the British Government divested 60 percent of its shareholding in each company, and floated the remaining 40 percent in March 1991. Thus, created from the break-up of the CEGB, these two major electricity companies found themselves supplying power to the NG, in competition with other suppliers such as Électricité de France and others (Figure 1). NG was jointly owned and operated by the then also privatized twelve ABs who in turn sold electricity to their local industrial, commercial and residential customers.

The structure of this post-privatization electricity market was centered on a spot-market known as the Pool (Thomas, 1991). The mechanics of the Pool were thus: each power station was like a casual worker who quoted a price for his labor according to parameters such as the price of fuel, internal economics, and so forth. Each quote covered half an hour’s generation. The NG—whose job was to manage the Pool—listed the quotations for each half-hour throughout the day in order of increasing cost and the cheapest bidder on the list was called upon to deliver electricity. With increasing demand, the NG called on the next most expensive power station to contribute.

Perhaps a glimpse of future as far as competition was concerned was given by the government’s commitment to nuclear power as the main form of energy. A fixed percentage (close to 25 percent) of UK power had to be supplied from nuclear sources by the year 2000 with the ABs required to take this percentage from nuclear stations by that year. In short, the privatization initiatives resulted in a fundamental reorganization of the electricity market and supply chain that the industry had not seen in at least 40 years.
"Electric Power Pte" (EP) was born from the ashes of the CEGB on the 30th of March 1990. Even as early as 1991, EP was regarded as one of the world’s largest international contenders in the fast-growing independent power market and the biggest in the UK (supplying about 50 percent of the non-nuclear energy in England and Wales with 35 power stations and over £4 billion turnover). Having to come to terms with the radically new market structure centered on the Pool, the challenge to the company was the transformation of a ‘public-sector’ culture rooted in an engineering-led ethos, to a more commercial one in tune with private sector disciplines.

Hence, in common with many post-privatization companies, EP saw several significant restructuring phases. In 1991, which saw the flotation of the company on the stock exchange, cost reduction, UK asset renewal, and efficiency improvement programs were introduced as a response to the new and increasingly competitive market. For this first year as an independent company, EP reported pre-tax profits of £479m, ahead of forecast, on a turnover of £4,378m. Since price was the only differentiating factor between EP’s electricity and that produced by any other company or source, the company was forced in 1992 to set new and clear objectives, with a focus on generating electricity at the lowest possible cost. This required a rapid and radical reorganization to become more flexible and efficient, streamlining operations and applying best practices to the design of business processes. The initiatives resulted in increases in plant availability and maEPower productivity by 3 percent and 23 percent respectively. At the same time, charges to consumers were reduced in real terms by 23 percent for a typical industrial customer, 8 percent for domestic and small users and 4 percent for very large contract customers.

With domestic competition increasing, 1993 saw the company experiencing another reorganization that culminated in the launch of a major international initiative. At the same time,
time, involvement with partners in a range of associated ventures was sought, mainly in combined heat and power schemes, commercial wind power development, and gas acquisition and trading. For 1993, pre-tax profits were up by 13 percent, earnings per share were up by 15 percent, and dividends up 16 percent on a turnover of £4,348m. In 1994, prices to customers fell by a further 7 percent, and the cost associated with UK operations were down by 21 percent to their lowest level ever.

In the period of five years from 1991-1995 following privatization, EP had managed to secure a leading position as a major player in the international independent power sector. In summary, privatization led the company to:

- cut costs and improve efficiency to compete successfully
- apply the world’s best practice to its operations
- improve thermal efficiency and availability, to match the world leaders for plant type
- become experienced in rapid and successful organizational and cultural change to meet commercial market needs
- simplify the company structure, leading to progressive improvements in productivity
- become involved in the design and establishment of competitive electricity trading arrangements

At the end of the ’90s, EP realized that the only word that could best describe the future was ‘uncertainty.’ Competition was flourishing in generation with around 20 generators engaging in tactical battles each year to secure a segment of the market at a certain price. The increasing competition in the production of electricity had seen the market share of EP in England and Wales fall from 50 percent when it was privatized, to around 30 percent in 1996. Regarding the supply side, in addition to the 12 regional electricity companies that bought most of the generated electricity there were more than 20 other intermediaries, which together sold electricity to around 23 million customers.

**SETTING THE STAGE: EP’S STRUCTURE, CULTURE AND INFORMATION SYSTEMS**

Upon its formation EP started by having a hierarchical organizational structure. During 1992-1993, a decision was made in favor of devolving the business activities to power stations and giving them the authority to operate as independent business units with minimal centralized control. All business units across the five main divisions (see Figure 2) were given almost total autonomy. This move was an effort to increase the overall flexibility and competitiveness of the company by enabling decisions to be made closer to the operational level. However, a lack of experience and knowledge with respect to certain business functions such as planning had delayed the introduction of formal mechanisms. Thus, numerous critical functions were performed on an ad hoc basis. Additionally, various change initiatives had attempted to make EP a project and process-oriented organization as opposed to structure-based by trying to assign groups of people assembled from a number of different business units to the various development efforts. This ‘project-oriented’ attitude seemed to work, providing the company with a level of flexibility at the unit level, but at the same time this very flexibility was constrained by senior managers and executives.

These disparities at the unit and organizational levels were related to EP’s culture: receptive and open to changes at one end, but at the same time a great lack of trust and territorialism at the other end. When a change occurred, for example, there was an aggressive/
defensive stand rather than a co-operative one—exactly when co-operation was most needed. CEGB, from which EP came into being, was a hierarchical organization. Teamwork did not happen at all and managers referred to it as a ‘patch-protected’ organization, where in a sense no one was allowed to infringe on what you did. The culture promoted in the new organization was a strikingly different one. Innovation was encouraged, and so was individuality and devolution of responsibilities, resulting in intense competition at the individual and business unit levels. The coexistence of these two opposite cultural dimensions had given rise to a deadlock situation that seemed to plague the organization. On the one end, there was almost total autonomy and freedom with respect to performing any task or activities one saw fit with the prospect of adding value to the company. At the other end, the culture brought by the same people based on the history of the CEGB made them unwilling to take a macro view past the boundaries of their own business units.

As far as information technology was concerned, the company was a ‘green field’ upon its establishment in 1990. A major consulting firm who adopted the classic ‘big-bang’ approach for their development undertook the task of putting the information systems in place. At the same time, the company had the opportunity to invest in an infrastructure—an organization-wide network that aimed to streamline communications between the various geographically dispersed locations facilitating faster decision-making, providing immediate...
access to key and up-to-date information and improving the quality of power station operations. One of the past main objectives, namely to produce electricity cheaply, had been in a way reflected by the information systems in the company which were developed to serve this objective faithfully, and be as rigid and dependable as possible. The main information systems in the company were the following:

- **Plant Reliability—Integrated System for Management (PRISM):** In broad terms, this was a work management system monitoring and reporting on parts that were required for scheduled works on the various power stations. PRISM directly interfaced with the financial systems.

- **Integrated Labor Management/Electronic Dispatch Line (ILM/EDL):** This system was fundamental to the company on a day-to-day basis. EP was required by the NG to generate a particular electricity profile. For example, a profile might to start generation at 6:00 a.m. producing 200 MW, rising to 540 MW by 12:00 a.m., running at that level until 4:00 p.m. and dropping down to 300 MW by 6:00 p.m. There were rules around that profile by which the company was penalized if it failed to deliver according to the rules. What ILM/EDL did was to put some parameter boundaries around this, which allowed the operator to see what this output was doing. A whole list of other parameters was also provided by the system that could be manipulated and controlled to alter this output. ILM/EDL provided an electronic link to the NG, and interfaced with the Energy Management Center systems.

- **The Energy Management Center Systems (EMC):** The EMC systems were built for decision support and the analysis section of the EMC, responsible for satisfying MIS-type requirements, led the initiative. The business issue behind the development of the EMC systems was quite simply the vast amounts of data the company was receiving from the NG. The unit was finding it too difficult or almost impossible to query the data which was needed for many purposes—for example, to answer the questions that the industry regulator would ask concerning price or volume variations from month to month, or from year to year. The EMC systems were thus vital to the company as they provided the link to the outside world; communicating on a daily basis with the NG and trying to optimize the company’s trading position.

- **Finance Systems:** This pool of systems was centered around a software package called Walker, which catered for the General Ledger, Procurement, Accounts Payable, Accounts Receivable, etc. The finance systems had become very sophisticated with lots of interfaces to every other system that was in operation. The EMC systems, the applications at the Sales and Marketing unit (S&M), PRISM—all took financial information and statistics from the finance systems, processed it and then threw it back again.

**CASE DESCRIPTION: INFORMATION SYSTEMS AND CHANGE**

The spectrum of change that EP was experiencing affected both systems currently in place as well as ongoing development efforts. It gave rise to a managerial challenge that could best be defined as a question; what could be the best development strategy for information systems where requirements seem to change on a day-to-day basis? It is easy to understand
the challenge if one looks into the devastating effects that internally and externally induced changes had on EP’s main information systems.

There were three major types of information systems misfits being experienced at EP. The first type reflected a change in the organizational structure that the information system had not been able to follow. A second type of misfit was due to the inability of a system to keep providing the same level of service to a business process that had changed. Finally, the third type was caused by a change in technology itself that made existing systems obsolete and cumbersome in the eyes of the users. Things had changed at EP during 1990-1997 while systems had not; and people had to adapt to the way the systems worked, rather than the other way round. A manager from Research and Engineering remarked:

“There are two points to the question ‘how well do I think my information systems fit my business now?’ How well does the IS fit with what we do, and how well we have to fit with what they do.”

At EP, there were two types of systems: what managers called ‘intellectual’ systems, usually referring to Management Information Systems (MIS) and Decision Support Systems (DSS) such as the EMC and certain systems at Sales and Marketing, and the operational systems such as the Finance and PRISM systems. The first type of misfit seemed to address predominantly the operational systems, whereas the second type of misfit, the ‘intellectual’ systems. The level of the third type of misfit seemed to apply to both types of systems.

As far as the operational systems were concerned, these were built around the structure of the company as it emerged from the CEGB, and either just after they were implemented or at the point that they were implemented, the company changed. A review was carried out in the three months to February 1992 of the suitability of the information systems to operate following the devolution of business activities to power stations. The systems in question were mainly the Finance and PRISM systems. The findings of the review were that the systems available were suitable for devolved use with some minor modifications. Those modifications represented only those aspects of the systems that could directly prevent devolution. It was also recognized that as those systems were designed prior to devolution, other changes could be usefully made to enhance effectiveness or efficiency. In a time space of almost three and a half years (February 1992 to May 1995) where another review sought to examine how well they systems were faring in supporting business operations, one would expect that the modifications would have been completed successfully, resulting to no misalignment at all. However, this was not the case. The process of devolution made demands on the systems that could not be satisfied by simply maintaining them.

“The finance systems we put in, we set up for a particular structure, culture—whatever you want to say and that changed in the last couple of years tremendously. It was like trying to fit a square in a rounded hole, and the number of changes requests to the systems increased, and have been coming non-stop ever since.”

Procurement for example, was a central activity that had specialist people dedicated to this task. Devolution meant that this task was now undertaken ‘part-time’ by non-specialist personnel, as people were required to be more flexible and to work on different job aspects. This meant that the task was now only four or five hours a week of an employee’s time, resulting in a negative perception about the systems as being geared towards professionals, and hence too complicated and difficult to use.

“In the early days, we regretted some of the assumptions that we made, as we used to design systems to particularly reflect the structure of the organization, or the
way people worked, and while it may have been true at the time, it wasn’t always true in the longer term… and I think one of the major problem areas was in the procurement side of things, and still is…”

Another example of this type of misfit was the very clear division of the organization into distinct business units. The systems were designed to fit this structure, but in time, the business cycle had come to cross all the function areas; the systems fit the functional breakdown, but they did not fit the organization as one entity. In addition, systems were perceived as being too ‘big’ for what the organization needed for what it did. A senior developer explained:

“You cannot shrink the business continually and expect those projects of that size to remain unchallenged. So far as the changes concerned, the threat is that if the operation is reduced, we get to a particular financial level where the IS activity becomes disproportionately large in terms of operation. I think that is perhaps the single area where the greatest threat is.”

At the process level, it would not be an exaggeration to say that no process had remained the same since the early stages of privatization; processes had not only changed, but they had kept on changing. Information systems that supported these kinds of business processes were the most vulnerable to change as they dealt with voluminous and complicated data at the half-hour level. The systems at the EMC had to be scrapped altogether and a new breed of systems had to be developed to account for the changed processes. A senior manager commented:

“The part of the systems that you can define—that you know it has to be a deliverable—your interfaces, getting the data from the power stations and into your offer file—that is the easy part. What it is, it is the analysis of all that—the kind of thinking—the strategy point of view. It is all around the main deliverable for the EMC—that’s what is continually changing. It is impossible to define or specify in advance a deliverable. It changes every day!”

Such misfit was also evident with other business units such as Fuel:

“I have seen a couple of instances where management information systems have failed to cope with the pace of change and have caused the organization to make inappropriate decisions as a result, and we then had to run to catch up with the circumstances.”

The so-called ‘operational’ systems, which were expected to be stable, were equally vulnerable to change. For example, the process of work management, although it might have seemed stable, had changed in the way the work was done much differently at the power stations. There was not the same number of personnel that used to be available at one time, and there were no planning departments, which there were before. There was a much greater emphasis on cost-benefit that determined the maintenance philosophy in deciding to change processes or operations. A manager from Generation said:

“Some of the changes were never at the outset envisaged as being as extensive as they actually were, which resulted in us making more changes to the systems that we have otherwise had anticipated. It also meant that some of the more refined facilities of the systems have become less used. So yes, they have been inflexible in the sense that it would require a large amount of effort to change or add some functionality.”

Technological advancements seemed to affect all the main systems at EP as they were character-based and with busy screen representation. In the sense of usability, they were
perceived as not being up to current practice standards. This meant that in order to use the systems, users had to get familiar with them for some time, and this was not always possible under the current situation—few employees, many tasks, little time. Users had to be able to switch from one system to another and perform various tasks at the same time—something that their systems were not allowing them to do.

In summary, these types of misalignment had caused the following problems at EP, as its information systems had not been designed to provide for change:

- The quality of information provided limited the purpose, which particular systems were, designed to serve.
- Accessing the information was difficult; users were asking for a lot of information but they did not know how to get at it.
- Users needed the information in different ways and at the same time, the number of users who needed this information was increasing; this demanded a level of sophistication that existing systems could not provide.
- The level of integration between the systems hardly approximated the one required; as a result, the information flows suffered considerably.
- Management information had been neglected; attempts to provide for it by combining systems or building on top of operational systems had produced ones that were over-complicated and under-utilized.

The following remark sums up the situation, coming from a project manager responsible for the development of applications for the Sales and Marketing and Strategy and Financial Planning units:

“If everything is changing which it does do, then one thing that I have found is that it is actually quite difficult to alter the scope of an application whilst under development. You tend to fix your scope at the beginning, and you refine it into more and more detail, and by that stage it is quite difficult to stick your head above the parapet and see if you are still at the same place. Then you show it to the users for acceptance test, and they say “Oh! But that was all very well then—we do things differently now!”

However, and as far as information technology was concerned, the company’s four main business systems—PRISM, ILM/EDL, EMC and the Finance Systems—painted only half of the picture. In true entrepreneurial spirit and in order to remain “state-of-the-art” EP encouraged the consideration of alternative approaches to the development of systems and it was constantly assessing the viability of new roadmaps. As such, bespoke application development painted the other half of the picture. Following the decision to devolve, the emergent autonomous business units were given complete freedom regarding the development of bespoke applications that suited their own particular needs. The ITSP unit (see Figure 2) was formed to provide strategic technological directions and act as a buffer between the units and the management of the company. However, its recommendations were most of the time largely ignored and scoffed at by the units who approached it as an ‘ivory tower’, in safe distance from operations and the heat of the battle.

The above situation gave rise to the existence of two parallel but contrasting worlds that can be summed up by the two following development scenarios:

- Business requirements were identified, and a system was designed, built, and tested to those requirements (the ‘classic,’ formal approach to development by which the four main enterprise information systems were put into place).
• The user, when given tools, created added value to the business in the form of some kind of ‘informal’ application. Other users viewed this and requested to use the result, upon where the application was then used as a multi-user system (an alternative, informal approach to development which gave rise to a multitude of applications serving individual requirements at the business unit level).

Some managers from ITSP looking at this phenomenon from a macro perspective believed that any information system should fit into the overall business strategy of the company and therefore development should be totally driven by the latter. However, there were contrasting opinions. Managers from Group Finance (GF), for example, were in favor of the view to disregard the long term and instead concentrate on the short term by putting in place the application that they thought would suit the business needs of the moment. One manager commented:

“I tend to think these days that if you are looking at the long term fit at the application level, you are wasting your time because the business is changing. In the short term, the benefits are that you produce something very quickly, very cheaply, and you get reasonable user satisfaction because they get what they want quickly. But you are going to have problems in the long run because these systems run out of date, they are not cohesive, and they are going to lose this fit, and you will have a much bigger problem in replacing all these diverse elements.”

EPILOGUE: THE CHALLENGE OF MANAGING CHANGE AND INFORMATION SYSTEMS DEVELOPMENT

A question that should be asked at this stage is thus: how, on one hand, is it possible for such a level of information system misfit to exist, and yet an organization as heavily dependent on its systems as EP, to be able to flex and adapt successfully to the continuous environmental contingencies? Although it can be safely said that there was a negative overall perception regarding the alignment of the systems, with a large percentage of those not being used as they were supposed to—user activities and tasks did not seem to be disrupted in any way. Paradoxically, users were not tied down by the systems. What explained this phenomenon is perhaps the simple rule of survival: threatened by adverse circumstances, one has no choice but to adapt. One manager from Group Finance commented:

“You think that you have a financial accounting system, and you think you are producing the company’s trading account, and one day you find that everybody is doing it in a different way by the spreadsheets. And you could say, “You shouldn’t do that! It is all there. It is a waste of time!” But people do not waste their time for the sake of it, do they? It is obvious then that they are doing it because there is some great hole in there.”

The same phenomenon was evident in what a manager from Generation said:

Systems have fallen away and people are not using them as much as they should. And just about everybody, everywhere, is taking data out of the main systems, and either re-keying it in, or use whatever method is available to them to get data into little applications, so that they can then move the data around and use it the way they want to, because they see that the system they access—the PRISM
system—is inflexible. What we are trying to do now is to recognize that this is a key requirement, and just deal with the data—not to deliver them any systems. The Sales and Marketing business unit was a heavy user of the Finance systems. This is what a manager there said:

“As changes occur in the business world, if you cannot get to change the system because the money or the project team has gone—they do it with a spreadsheet—they do not bother with the system that you have spend half of your life to develop—that’s a hidden problem as well. I mean, we look at systems and say “Oh! We never change the system. It is a bloody success!” But really, what happens is that the buggers put a Lotus spreadsheet there to do their work with it. I mean our Finance systems are crap. If I want to know how much money I have spent on contracts at the end of this month, I go and get a bloody spreadsheet. Walker cannot tell me—not in the way I want to say it. So people do bits and bobs around the edges, don’t they?”

The ITSP unit had a name to describe this situation. They were calmly referring to it as the ‘Lotus Cult.’ An appropriate name—’cult’ signifying a kind of underground alliance—for the groups of users who had a disregard for the formal information system imposed on them, and in a way had taken control of their own ‘fate’. However, this underground activity had come to be seen as essential even by the ‘authorities’ themselves. One member of the ITSP team said that if one ever attempted to take this away, parts of EP would stop operating within a day, and the company would soon collapse. Hence, EP was facing an obvious challenge. What were the plans for future systems development in the light of this situation?

The leader of the ITSP team said:

“Why don’t we just build them a Lotus system that does all that? Well, the real reason is that they will not use it—they all got a slightly different view of what they want it to be.”

Such was the extent of the issue facing the company, that in late 1996, a new business unit called Business Systems Department (BSD) was established to address this seemingly problematic situation. Its objectives were clear: to scale down and maintain the complexity quotients of the infrastructure as low as possible, and create an integrated high-caliber UK business systems competency. Thus, having started from nothing in 1990, EP went through a period of major information technology investments, through a period of devolved budgeting and responsibility for development, and was heading towards one of more coordinated control, having as few products to be used to deliver bespoke applications as possible. The argument for that form of policy was that the liberty given to the business units with respect to developing their own applications had culminated in a highly complex, and hence difficult to manage infrastructure. A senior manager noted:

“One of the factors that has happened to EP, is that we are disintegrating, we are devolving in terms of development and as a result of that, we lost a lot of coordination, so department A is using one tool, and the department B is using another tool. I mean, if you give users a lot of autonomy, you should not be surprised that they use it.”

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**BIOGRAPHICAL SKETCHES**

Panagiotis Kanellis (kanellis@di.uoa.gr) is currently a senior consultant with Arthur Andersen in Greece. He was educated at Western Intl. University (USA) in Business Administration (BSc), at the University of Ulster (UK) in Computing and Information Systems (Post-Graduate Diploma), and at Brunel University (UK) in Data Communication Systems (MSc) and Information Systems (PhD). His research interests revolve around information systems development and evaluation, information systems flexibility and organizational change and electronic commerce. He is a research fellow in the Department of Informatics and telecommunications at the National and Kapodistrian University of Athens.

Peggy Papadopoulou (peggy@di.uoa.gr) is a doctoral candidate in the Department of Informatics and Telecommunications at the National and Kapodistrian University of Athens, Greece. She was educated at the same university in Computer Science (BSc) and at Heriot-Watt University (UK) in Distributed and Multimedia Information Systems (MSc). Her dissertation focuses on trust in electronic commerce and how agent and virtual reality technologies can be applied to aid its development in commercial relationships.

Drakoulisi Martakos (martakos@di.uoa.gr) is an associate professor in the Department of Informatics and Telecommunications at the National and Kapodistrian University of Athens, Greece. He received his BSc in Physics, his MSc in Electronics and Radio Communications, and his PhD in Real-Time Computing from the same university. Professor Martakos is a consultant to public and private organizations and a project leader in numerous national and international projects. His current research interests include information systems, multimedia and hypermedia technologies multilingual environments, information retrieval, added-value networks, electronic certification, digital libraries and electronic publishing. He is author or co-author of more than 40 scientific publications and a number of technical reports and studies.