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The information society: practical applications

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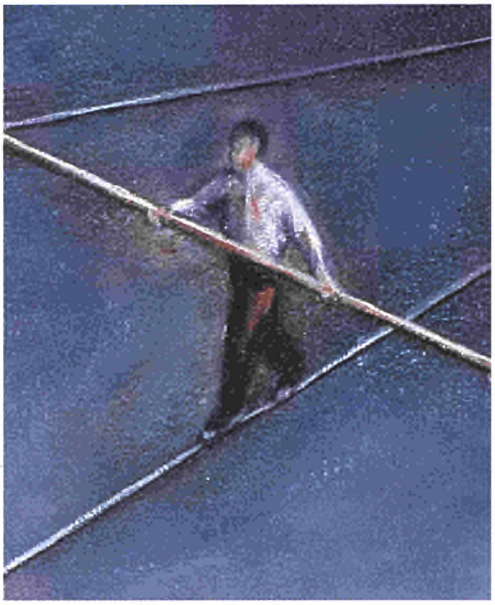

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Editorial

A new momentum towards the information society.

Progress towards the information society has attained a new momentum in the last eighteen months. Now the three key driving forces are all pushing strongly in the same direction.

First and most importantly, the industrial motor is firmly in gear. A strong industrial interest has emerged, led initially by the United States, but swiftly followed up in Europe and Japan. Real investment is being made, in infrastructure, in applications, in "content" and in new services of many kinds.

Second, the political will is now behind the information society. In all major countries and regions the issue has been placed at the top of the political agenda.

Third, this political will is finding expression in new policies. Policy-makers are beginning to examine the information society, the issues it raises, and the obstacles that must be overcome, in a coherent and coordinated way.

Furthermore, in the last year we have seen a shift from a preoccupation with national and regional initiatives to an awareness of the need for truly global efforts to promote the information society.

The recent G-7 ministerial conference on the global information society, and its associated showcase display, hosted by the European Commission in Brussels, was an important step in this direction. It produced a consensus on the fundamental principles to be followed for the global information society, and also highlighted concrete actions to be taken.

One of the issues addressed at the conference was the need to put in place a regulatory framework that would allow market forces to get to work, while at the same time ensuring that the benefits of the information society are made available to all.

This framework includes: telecommunications liberalization; the opening up of markets (for example allowing non-discriminatory access by service and content providers); promoting interconnection and interoperability; fair and effective allocation of licences and frequencies; international cooperation on competition rules; and protection of rights – whether related to privacy, intellectual property or freedom of expression. The conference also emphasized citizens' access to services, employment issues, education and training, and cultural diversity.

In addition, a number of specific actions were decided upon: to share experiences on emerging applications; to establish joint R&D efforts, for example on interoperability and the human interface for universal services; and the development of joint demonstration projects to act as catalysts.

Eleven projects were agreed: these ranged from establishing a global inventory for applications to creating interoperability links between high-speed networks. They covered application projects in the fields of training and education, libraries, museums and galleries, the environment, emergency management, health care, government 'on-line', creating a global marketplace for SMEs, and maritime information systems. These pilot projects will be monitored by a steering committee and by 'human networks', thus avoiding the establishment of new organizations.

While much remains to be done, it is clear that considerable momentum has been generated. Maintaining this momentum will remain a top priority for the Commission in the years to come. ■

Stefano Micossi *DGIII*

The G-7 Pilot Projects

paving the way towards the information society

The information society must focus on addressing people's diverse needs

INFORMATION AND COMMUNICATIONS technologies are changing the way we work, study, do research, and educate our children and ourselves. They are influencing the way we do our banking, pay our bills, entertain ourselves and do business. New options are being provided for us in the field of health care, education, environmental protection, culture, and business. A more direct and open rapport between private individuals and public administrations is becoming increasingly possible.

The impact of this information revolution on our society cannot yet be fully measured or predicted at this time. The combination of new and rapidly developing interactive multimedia computers and applications with electronic networks will require a restructuring of our traditional approach to strategic planning and organisational structure. It will also mean a considerable change in the way we interact with each other, with business and with government.

Moreover, it has the potential to overcome the marginalising effects of distance and geography. It could enable regional economies to be revitalised, and consumers and businesses in rural and remote areas to be re-integrated into mainstream economic and cultural activity.

For each individual citizen, the information society also means greater choice and new opportunities, sharing of cultural knowledge and experiences and the creation of new markets and employment opportunities.

The G-7 partners decided to take the opportunity of the Ministerial

Conference on the Information Society, held in Brussels on February 24-26, 1995, to identify a number of projects where international cooperation could help to demonstrate the potential of the information society, stimulate its development and determine its cultural, economic and social impacts.

The G-7 Pilot Projects are intended to address international issues such as environmental protection and to contribute to the growth and competitiveness of industry and commerce (in particular the development of SMEs). They will help to build up an international consensus on common principles governing the need for access to networks and applications and their interoperability. They will provide an opportunity for future collaboration with countries in economic transition and the developing world.

Eleven project proposals, covering the four Information Society theme areas, were selected for implementation. Though initiated by the G-7 partners, they are also open to other partners, including non G-7 countries as well as public and private sector organisations, international bodies and standards authorities.

This first selection of joint projects was made with the following key objectives in mind:

- to create an opportunity for information exchange leading towards the further development of the information society;
- to establish the groundwork for productive forms of cooperation among the G-7 partners in order to create the critical mass needed before the issue can be addressed on a global basis;
- to identify and select projects with tangible and clearly understandable social, economic and cultural benefits which will act as examples and demonstrate to the public the potential of the information society;
- to identify obstacles related to the implementation of practical applications serving the creation of a global information society;
- to help create markets for new products and services, where appropriate.

Other areas of common economic and social concern are being pursued, such as applications for elderly and disabled people, and opportunities for other cooperative projects studied.

The selected pilot projects can be broadly classified into four main categories: the global inventory of applications and studies; projects that address the needs of the private individuals; projects that address the needs of the economy; and projects that address public interests and concerns.

1. Global inventory of applications and studies

This project will provide a medium for information exchange at the transnational level, which will foster "alliance-building opportunities" for the development of information society applications. The establishment of an electronic forum should act as a catalyst for the creation of partnerships, the development of joint projects and the advancement of the global information society.

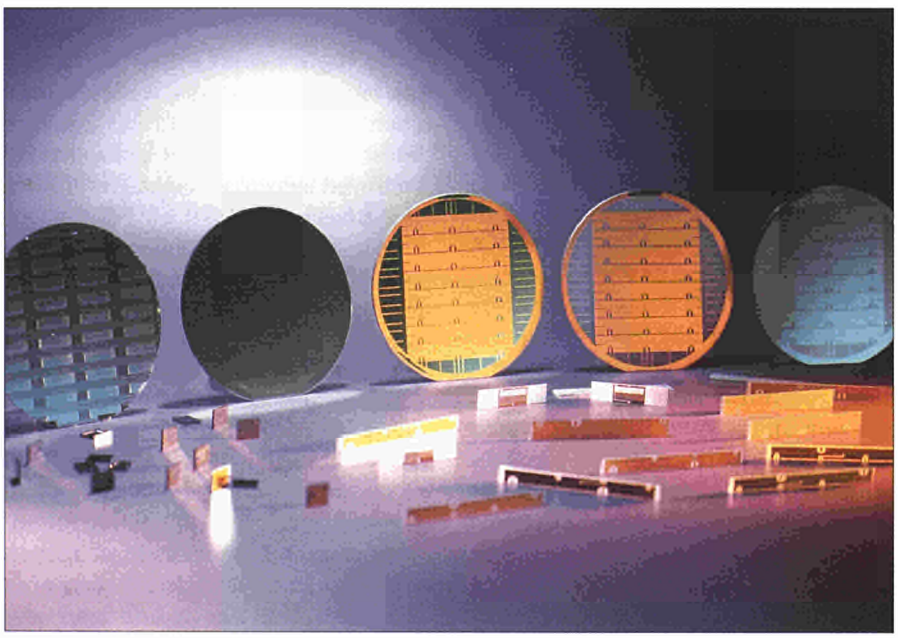
By sharing their experiences and knowledge, the parties involved in the development of the information society can ensure that these challenges will be addressed.

2. Projects addressing the needs of the individual

- Cross-cultural education and training
- Electronic libraries
- Electronic museums and galleries
- Global healthcare applications
- Government on-line access

The information society must focus on addressing members of the public's diverse needs. Distance education programmes provide opportunities for continuous training and upgrading of skills. Access to a nation's cultural heritage and the sharing of this knowledge with others encourages people to understand and appreciate cultural differences and diversity.

These pilot projects were selected to encourage cultural enrichment, highlight existing international co-operation in the field of healthcare, and



The G7 partners recognise the importance of enhancing the exchange and integration of information on the global information society.

provide opportunities for information exchange between governments and public administrations.

3. Projects addressing the needs of the economy

- A marketplace for SMEs
- Global interoperability for broadband networks
- Transport and manufacturing sub-projects within the Maritime Information System.

In an increasingly global economy, the need is for demonstration projects aimed at filling the information gap and promoting the use of interoperable information networks. Such projects should also encourage the private sector to develop and demonstrate new approaches to marketing, co-operation and trade that will rapidly and significantly increase industrial efficiency and global trade. This is particularly important for SMEs. The first project will focus on the demonstration of services, such as electronic networking systems, that result in cost-cutting and reduction of product-to-market lead time. The second project will stimulate the more rapid evolution of high-speed interoperable networks, while the third comprises sub-projects dealing with information systems for transport and improved industrial manufacturing on a global basis.

Regional and rural economies can be strengthened only if local businesses, administrations and individuals have access to information services on a par with those that are available in large urban areas.

4. Projects addressing issues of public concern

- Global emergency management
- Environment and natural resources management
- Safety and environmental sub-projects within the Maritime Information Systems.

The G-7 partners recognise the importance of enhancing the exchange and integration of information on the global environment, building consensus on a global information framework and continuing to support existing network and standards activities to ensure the protection of our environment. These three projects were selected in order to address key environmental issues of relevance to both developed and developing nations.

The G-7 pilot projects selected for initial implementation offer an opportunity to individuals and organisations, both in the private and public sector, to participate in and contribute to the development of the global information society. They were not meant to provide definitive solutions but rather to pave the way for the realisation of a global information society that provides the highest possible level of social, economic and cultural benefits and opportunities for all members of the public. ■

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G-7 Pilot Projects – Executive Summaries: copies are available upon request by contacting ISPO (tel: +32-2 29.68.000 or fax: +32-2-29.94.180). The texts are also available on the World Wide Web network at URL: http://www.ispo.cec/g7/g7main.htm.

The Good European Health Record

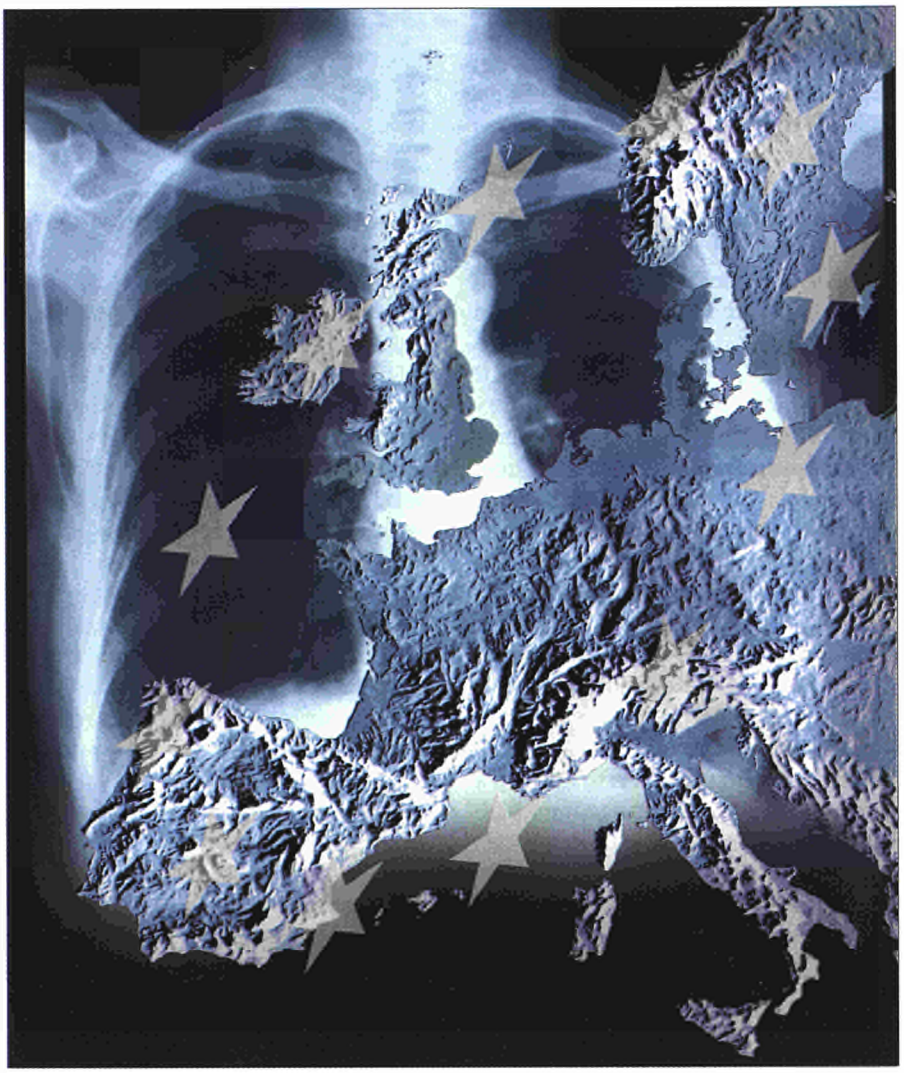
telemedicine crossing national boundaries

TRANS-NATIONAL INFORMATION superhighways could help to create unity out of Europe's diversity – provided some major cultural and technical barriers are overcome. Finding solutions to these constraints will also give Europe a sharp competitive edge in the economic race towards the global information society.

The search for such solutions is a key goal of European Union RTD programmes. An example of the immense benefits these could deliver is provided by the Good European Health Record (GEHR) project within the Telematics for Healthcare sector (formerly AIM – Advanced Informatics in Medicine) of the Telematics Applications Programme.

GEHR seeks to create a consistent framework across Europe for storing and accessing healthcare information. In exploring how this can be achieved, it has developed potential answers to some of the most difficult issues involved in facilitating electronic multimedia and multilingual communications.

GEHR's prime focus is the clinical record created and used during direct interactions between clinicians and patients. In the past, more attention has been given to administrative rather than clinical applications in medical computer systems. The way GEHR could work is illustrated by the following example.



A possible case history

You are living in London, some time in the future. The local GP (General Practitioner) with whom you are registered has a GEHR-compliant personal computer. When you get a job in Munich, your doctor gives you a diskette or 'smartcard' containing your clinical records in GEHR format. Although the doctor you register with in Munich uses different hardware and software to that of your London doctor, nevertheless, as it too is GEHR-compliant it can read your data and present it to the doctor – in German.

One day you feel unwell and go to see your new doctor. He takes a blood sample which he sends to a local laboratory. The results are transmitted by telecommunications links directly from the laboratory to your doctor using the Openlabs protocol (developed in another AIM project). The results are then used to prescribe treatment. A few months later, however, you fall ill again, this time while on holiday in the south of France. The French consultant at the local hospital asks your German doctor in Munich to transmit your relevant health records over a telecommunications link, using the GEHR data transfer standard.

The consultant receives your records – presented to her in French – reviews them, sketches a diagram showing where you are feeling pain and sends you off to have X-rays and an electrocardiograph (ECG). The results are incorporated into your records and transmitted back to Munich.

Treatment again stabilises your condition, until later, while you are visiting London. Blood tests at a specialist hospital in London show abnormal results which demand urgent attention. The consultant treating you uses a GEHR tool to make on-line queries to your files in Munich. Answers

are provided, this time in English, comprising notes, sketches, and results from X-rays, ECGs and blood tests. These help the consultant to give you the correct treatment before you return to Munich – in good health at last.

Effective management of requirements

The above example indicates how the quality of healthcare can be improved through the effective use of advanced Information and Communication Technologies (ICT). The capabilities described have all been shown to be feasible on GEHR prototypes, although they are far from being fully implemented.

"We are still developing and proving GEHR concepts, but have achieved enough to show that its architecture could manage such a mix of requirements effectively," emphasises GEHR's project manager, Dr Dipak Kalra of the Clinical Record Research Unit at St Bartholomew's Hospital Medical College in London.

The College coordinates GEHR work, which involves about twenty medical, industrial and academic participants from Belgium, France, Germany, Greece, Luxembourg, Portugal, Spain and the UK. These include France Télécom, SmithKline Beecham, la Fédération des Association Médecins Généralistes de Bruxelles, Croix Rouge Française and the Instituto Clinica Geral Zona Norte in Oporto.

Common data architecture

The project's central aim is to develop a common logical data architecture which is applicable and acceptable across different countries, computers, media and clinical environments. To do this, the partners needed to resolve many technical incompatibilities and language differences, while at the same time fulfilling strict professional and ethical principles.

The GEHR architecture will be published to provide a common baseline on which suppliers can build compatible software applications. In order to function effectively, it must unravel the enormous variety of frequently incompatible systems and data formats currently used in healthcare activities.

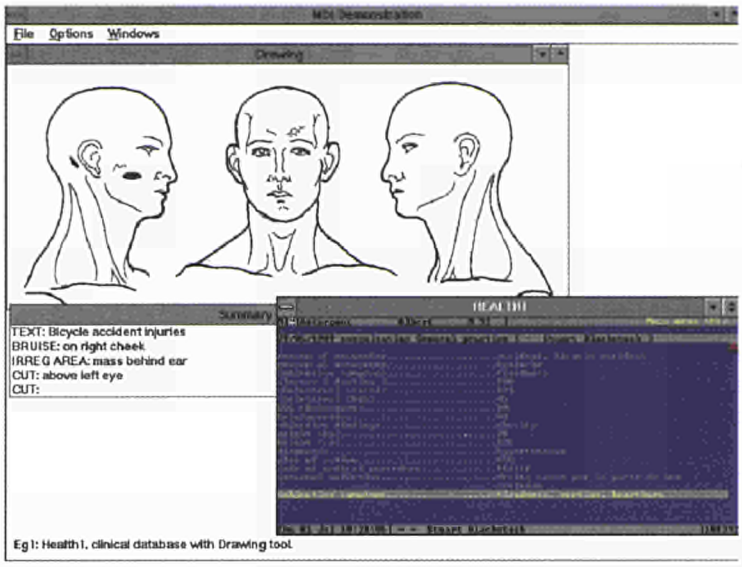
"Many computerised medical systems were created to meet specific requirements within individual institutions," points out Dr Kalra. "Doctors, hospitals and laboratories have therefore often selected systems to satisfy their immediate needs without considering broader compatibility issues. "

The data model on which GEHR's architecture is based must be able to cope with very complex storage and access demands. "The narrative sequence of a patient interview is very important in clinical diagnoses," Dr Kalra explains. "It gives the context in which information was elicited, which can become especially significant if a problem arises with legal consequences that require accurate auditing of clinical sessions."

This narrative is usually written by hand as informal consultation notes, perhaps with sketches added to the text. Clinical records also include more structured and quantitative data – like blood pressure readings – as well as various specialised information, such as X-rays, ECGs, or computerised brain and body scans.

The human dimension

The great care needed in managing this kind of sensitive information is stressed by Dr Stan Shepherd, Managing Director of Trident Health, which helped to develop an initial GEHR prototype. "The discussion between patient and doctor in a consulting room is where the doctor gains a great deal of vital information and a relationship of trust is built up," says Dr Shepherd, a former GP in the UK.



Eg1: Health1, clinical database with Drawing tool

Language translation with GEHR is currently carried out through a specially created thesaurus containing about 2000 heading classifications and 5000 specific terms within them. Dr Kalra acknowledges a much bigger thesaurus will eventually be required and says users will be able to incorporate any medical classification and terminology system.

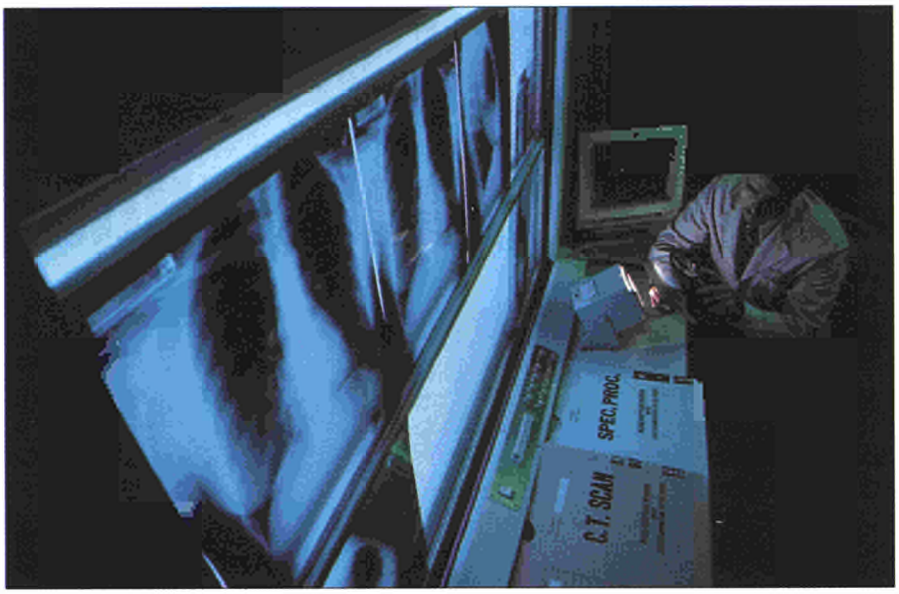
"Consultations are extremely personal events. Yet many other professionals involved in the patient's care must also gain access to these clinical records. Effective protection of the confidentiality of electronic records is therefore crucial to providing the reassurance needed to overcome any fears about the widespread adoption of ICT in healthcare."

GEHR provides such controls. They are designed to be sufficiently flexible to incorporate the various different professional and legal requirements of individual countries.

For example, in the UK people register with one GP, who could become the sole controller of information integrated into an electronic GEHR record. In other countries, a person may be registered with many specialist doctors, so multiple authorisation might be needed.

Defining data entities

A key task in building the GEHR architecture was to define the basic data entities or 'objects' – the smallest meaningful information particles.



Anything from a complete clinical interview to something as simple as a measurement, comprising a number plus the relevant unit, for example 22mg, could be included within a single 'object wrapper'.

Much effort is currently going into finalising GEHR's object model – the basic entities and relationships between them. For this, each object in the GEHR data model is also assigned specific attributes, such as authorisation locks to help protect confidentiality.

The model allows data entities to be interlinked to give an evolving account of a person's healthcare history. This can be used, say, to look at recent blood sugar levels in order to diagnose diabetes or to trace a health problem back to childhood.

Object wrappers also give an effective means of overcoming incompatibilities between computers. Any object can be transmitted in any sequence to any point in a network. They are reassembled as required for a doctor/patient consultation through a mechanism that coordinates messages sent between objects.

This approach was preferred to the relational database management systems widely used in traditional computing applications. "Relational techniques work well when you have many records with similar formats, as in a typical commercial file," Dr Kalra notes. "Each clinical medical record, however, is completely different from any other."

The Microsoft-inspired Unicode is being considered to support the broad character set needed for GEHR's multi-lingual capability. It is based on a two-byte (16 digits) structure, which gives a repertoire of almost 70, 000 characters compared to 256 for the traditional one-byte ASCII code.

GEHR prototypes incorporating patient data management, information analyses and translation capabilities have been implemented on systems running under PC-DOS, Windows and Unix operating systems. These are being used in the UK, France and Luxembourg to develop pilot applications, which include an exploration of how GEHR can be employed in integrated clinical and administrative hospital information systems.

The project will culminate in June 1995 with the completion of the pilot demonstrations and final definition of the GEHR object model and full architecture and exchange format. Dr Kalra hopes GEHR achievements can be carried forward in conjunction with results from other RTD framework projects in areas like hospital computer networks and language translation services.

"Once GEHR's technical performance has been proven, I expect its published architecture will be taken up by many countries," he observes. "The GEHR concept offers such substantial benefits to patients, medical professionals and system suppliers, I am sure it will eventually be given the support needed to develop fully the capabilities demonstrated by the pilot systems." ■

Malcolm Peltu *journalist*

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From Mount Olympos to Luxembourg – with multimedia

THE INTERNATIONAL MULTIMEDIA market always starts the year in style at Cannes, in the South of France, in January, with the International Illustrated Book and New Media Fair – MILIA (le Marché Internationale du Livre Illustre et des nouveaux médias). The 1995 event saw European talent out in force, not least with the debut of a virtual catalogue of new multimedia titles developed under the ægis of the IMPACT 2 programme of the European Commission. With 22 packages on topics as diverse as Mount Olympos and Health and Safety in the Workplace, the fruits of IMPACT 2 are as impressive as any in the multimedia market today.

Appealing projects

IMPACT 2 is the main phase of the Information Market Policy Actions (IMPACT) Programme, which is concerned with establishing an internal information services market within Europe. The 22 multimedia projects developed under IMPACT 2 are all electronic publications with immediate appeal to business, industry, education and consumer markets. However, many also provide models from which other, similar titles and projects could be developed, and several helped to cultivate creative and technical skills in individuals and organisations which can now go on to produce more and different work in a variety of electronic media and market sectors.

A call for proposals in June 1992 attracted some 317 responses, 56 of which were explored during a six-month definition phase in 1993. After detailed evaluation, 22 of these went on to develop their projects during an implementation phase which ended early in 1995.

The European Commission provided part-funding, with the balance met from the consortia's own resources and, in a few cases, schemes such as product placements, advertising, and the offer of royalties in lieu of upfront payments to content-owners.

The 22 titles range from *Folk Culture on Multimedia* to *Total Productive Maintenance*, by way of a health and fitness programme based on step aerobics, instructions in road safety for schoolchildren, and an exploration of nineteenth century European history and culture through the life of Hans Christian Andersen.

Two health and safety packages make reams of otherwise dry legislation and guidelines accessible through practical resources for use in the workplace. A prototype for an electronic manual similarly transforms technical documentation with video footage of complex operations and attractive screen text – a far cry from your average computer handbook.

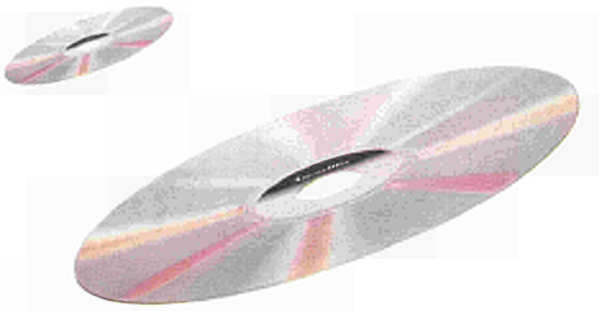
Two other projects similarly provide models for local and regional information services, one of which will feature prominently in this year's European City of Culture, Luxembourg. Cultural history is also variously explored in a four-disc study of Flemish art from van Eyck to Rembrandt, a celebration of what the developers describe as the 'absolute excess' of the southern Baroque, and a *Multimedia Dictionary of Modern and Contemporary Art.*

Which CD?

All 22 titles are being published on interactive compact disc (CD) in either the CD-ROM format (for use with a desktop computer) or CD-i (a consumer entertainment product developed primarily by Philips).

With literally dozens of electronic publishing formats to choose from, this conservative approach to an emerging market was vindicated in the two years during which these projects were developed. CD-ROM has been adopted as a *de facto* standard by computer users in business, education and the home at a rate which has surprised even seasoned commentators. At the same time, despite lively competition from games and other entertainment formats, CD-i is holding its own in the consumer market, and making some inroads into education and training as a low-cost delivery medium for audio-visual reference material and 'courseware'.

Some of the 22 consortia are already looking to other formats and market sectors for the development of their work. *Gothic Cathedrals*, for example, could complement the initial CD-i disc with separate scholarly and scholastic editions on CD-ROM, and a souvenir version on Photo CD. *Journeys through 19th Century London* could provide not only a gallery guide for the Museum of London but also a souvenir for visitors, an information service for the city, and entertainment and educational resources – as well as a model for similar titles from other collections. Most of the 22 projects hope to reach at



least two markets within the broad categories of entertainment, education, information and training.

Challenges of producing multimedia

All 22 consortia drew members from at least two countries in the European Union. A few found that the challenges of developing interactive multimedia titles in a rapidly changing technical environment were fully matched by those of working co-operatively across national and professional borders. Some reported that a common professional culture can be more important than a common language, having found that two video producers from different countries may think and work more similarly than a video producer and book publisher from the same city.

Accommodating the many subtle nuances of national cultures proved more challenging on the creative side. The producers of *All About Everything*, for example, spent a good deal of time seeking the common ground which would make their early learning programme accessible to very young children (and their parents and teachers) across Europe.

Edusex also devoted considerable attention to research and design to create a versatile and sensitive programme on sexual education for young people. The developers consulted an international array of subject experts and educationalists to ensure a substantial and representative selection of data and opinion. The designers offered a choice of presenters from doctors and psychologists to family members and other teenagers. This approach skilfully conveys a large volume of diverse and challenging content through a variety of presentation styles, and reinforces the important message that very different opinions may be equally valid and sincere.

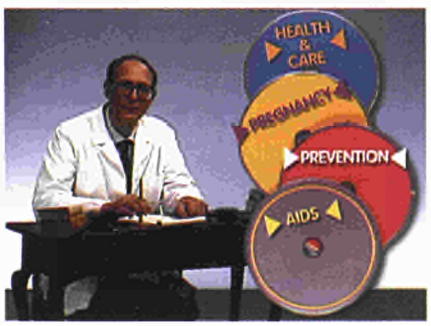
Sofia Scatena of Giunti Multimedia, project coordinators for *Edusex*, observes that consumers are becoming more discriminating in their approach to multimedia software, choosing titles for content and quality rather than novelty alone. She is confident that, with a judicious choice of subject matter and strong production values, electronic publishing is a promising new market for conscientious developers.

Securing audio-visual resources of sufficient quality and appropriate content challenged many consortia. Their experience illustrated a significant trend in multimedia production as a whole, with developers minimising their dependence on external content-owners either by including a publisher or other rights-holder in the consortium, or by creating original materials from scratch.

After evaluating the cost of research, rights acquisition and the technical processing required to adapt conventional materials to electronic formats, projects as diverse as *Gothic Cathedrals* and *Baby – A Multimedia Companion for Expectant Parents* concluded that it would be most cost-effective to shoot original footage to order, and thus secure creative and technical control as well as publishing rights.

On a similar tack, *Transmanche Adventure* cleverly combined original graphics with copyright free archival images to create evocative collages with fragments from several sources. The game develops French and English language skills and an awareness of history through a series of episodes which take players across the English Channel and back through time from 1968 to 1066. Another retrospective game, *Berlin Connection*, also combines original and archival material in an adventure that leads from the fall of the Wall in 1989 back to the height of the Cold War.

A third educational game, *EuropaQuest*, uses recent statistical data and a variety of audio-visual resources in role-playing adventures which take players in pursuit of information all around Europe. The episodic structure of the game provided an ideal model for



co-production: having agreed common standards, each partner could then develop complete adventures, both nurturing a range of creative and technical skills in-house, and sharing new-found experience and resources with other members of the consortium. David Attwooll of Helicon Publishing compares this development process to the preparation of a television series, with several production units each contributing a number of separate episodes. He cites this diversity as a critical element in maintaining the appeal of the ongoing adventure.

Frédéric de Goldschmidt of Media International, project co-ordinators for *Baby*, particularly advises newcomers to allow sufficient time to acquire new skills and develop complex interactive sequences. *Baby* achieved its objectives, including a series of preparatory activities and exercises for prospective parents, and an ambitious visual effect which simulates the growth of an infant in the womb from conception to birth in elapsed time. However, de Goldschmidt also advises that accomplishing such artistry to the mutual satisfaction of subject experts, creative talent and technical staff demands both subtle management skills and ample time for consultation and refinement.

Learning from experience

Although the 22 multimedia packages represent a significant end in themselves, IMPACT 2 has broader implications. *Europaquest* is only one of several projects in which partners are trading both information and resources as they develop expertise together. Mike Seaborne of the Museum of London quickly discovered that there is no substitute for hands-on experience: "You have to engage in the process," he says.

The European Commission has played a key role in this invaluable exchange of ideas and experience. A workshop in March 1993 in Luxembourg and a two-day meeting in Paris in May 1994 allowed participants to meet and share ideas, and even to see some of each other's work in progress. The Commission has published a comprehensive information pack, with illustrated descriptions of every project and key findings of value and interest to other multimedia developers and publishers. Other activities, including an opinion survey of key companies in the European multimedia industry, and face-to-face interviews with leading theorists and practitioners, are helping to inform the way forward for multimedia.

These lessons represent a significant part of IMPACT's contribution to the electronic publishing market. As well as developing 22 valuable multimedia titles, the initiative has helped over 80 organisations – from production companies and conventional publishers to subject experts and institutions – to develop new skills and contacts in an important international market for European talent and resources. ■

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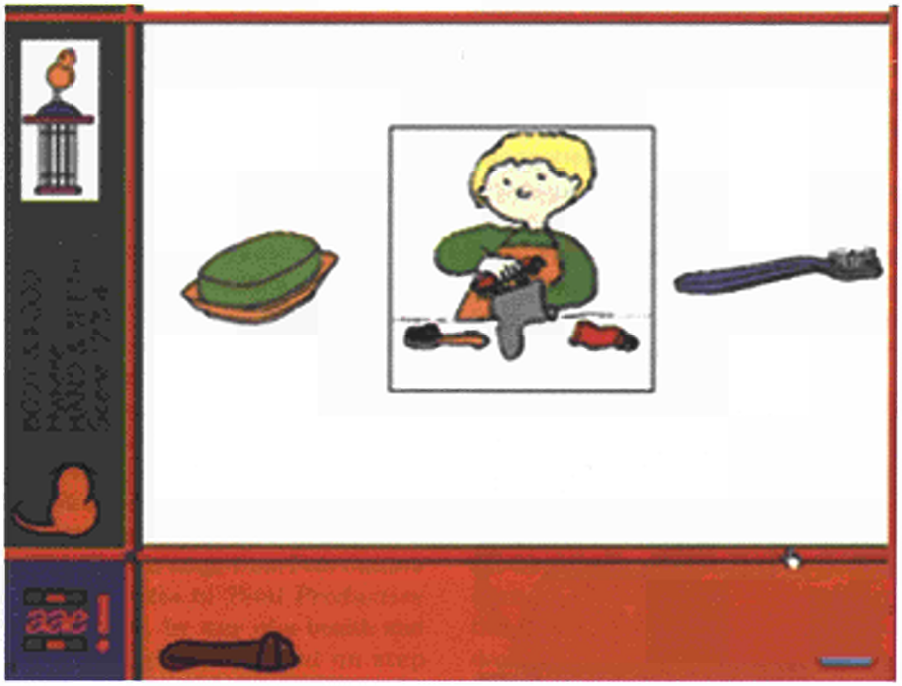
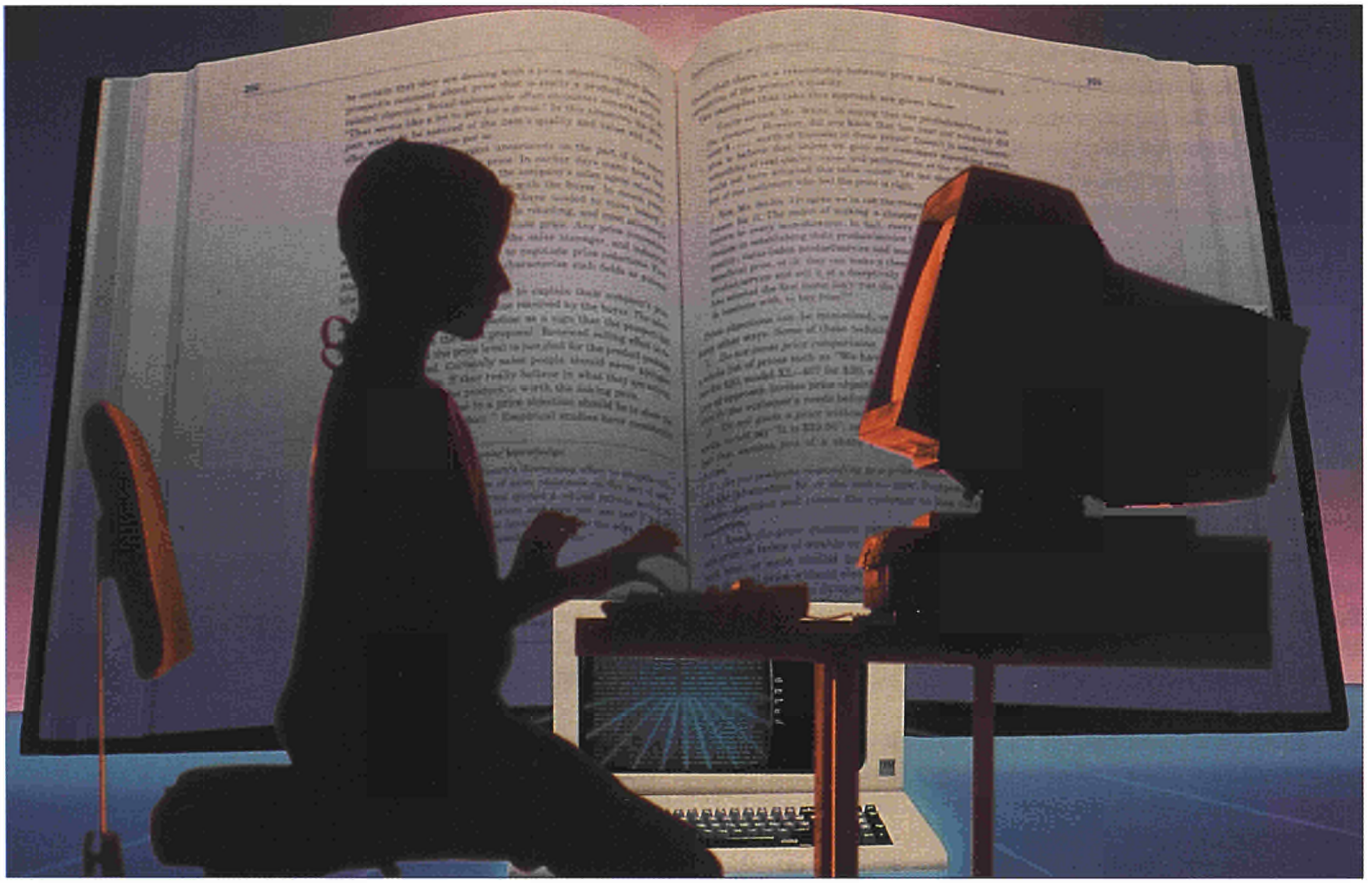


Education, and vocational training in the information society

Catchphrase culture?



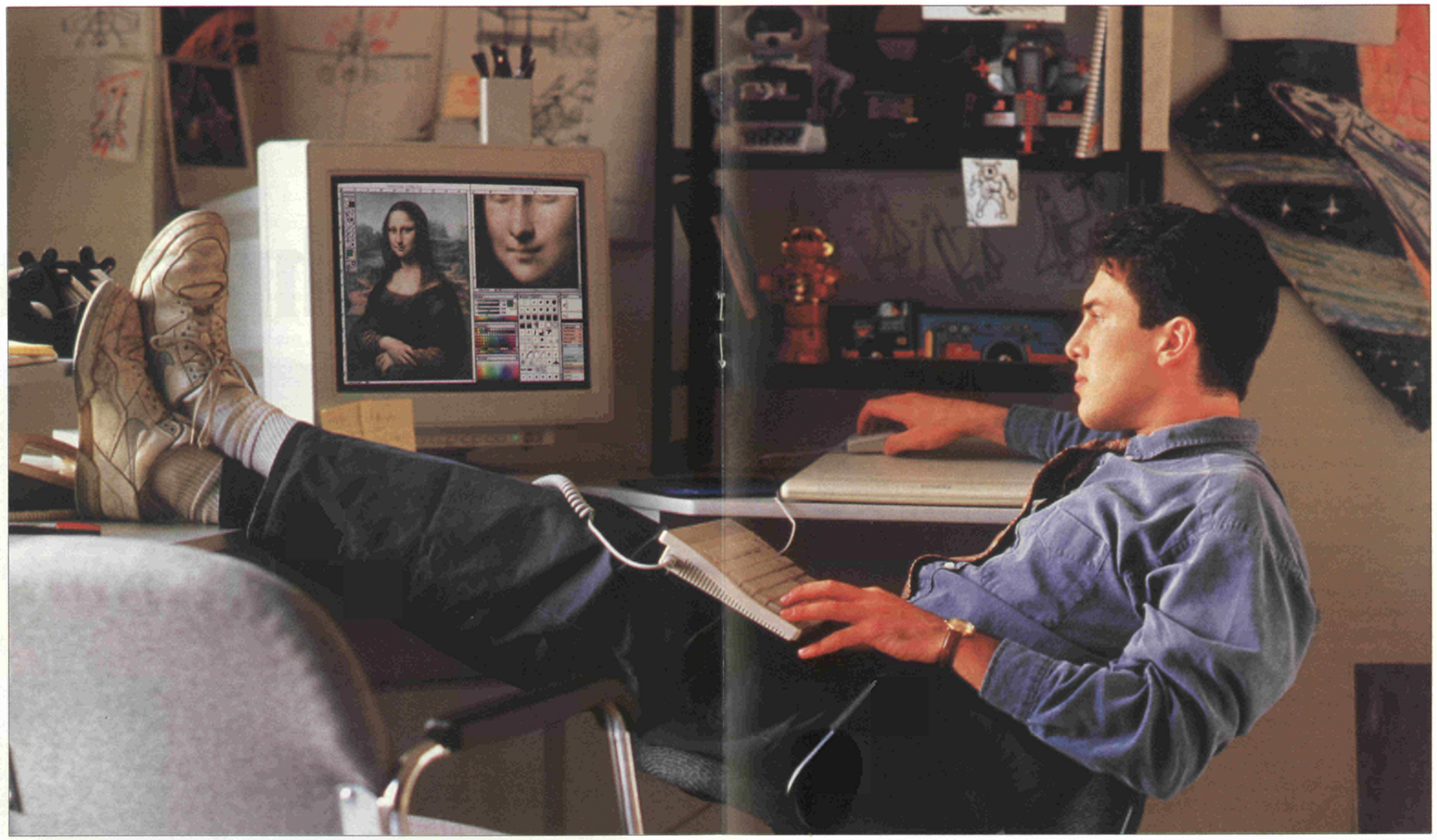
SELDOM HAVE TWO CONCEPTS in the political debate taken off quite like the information superhighway and the information society. They now crop up in practically every other Commission document, and are gaining ground in the national press of the European Union Member States every day.

Their media impact is due to a number of causes. For politicians they signal a vision of radical social change that promises to go a long way towards eliminating the greatest problem facing late industrial society: unemployment. The Commission estimates that the information and communications sector will provide 60 million jobs by the turn of the century, compared with today's 13 million.

For network operators and multimedia and hardware manufacturers, the concepts herald a period of massive investment and economic opportunity. End users mostly hope to gain direct access to the information superhighway from their own homes, chiefly for entertainment but also for practical purposes.

Critics, on the other hand, see this as the end of western civilisation as we know it. They paint a picture of a society of television consumers devoid of critical and intellectual faculties, zapping in and out of the much publicised 500 channels along a one-way street, finding nothing of interest and eventually opting for yet another violent blood-and-guts saga or blue movie via video-on-demand, or further straining their meagre housekeeping budget by going teleshopping after-hours. Doubtless the information society will have something of all of this.

One information superhighway is in fact now commercially available from Deutsche Telekom: a fibre optic ring linking Germany's major cities and industrial centres, running from Hamburg to Berlin, Leipzig, Munich, Stuttgart, Mannheim, Frankfurt, Cologne, Dusseldorf, Dortmund and Hannover and back to Hamburg. Deutsche Telekom has christened it Datex-M. At 2.5 gigabits, its data transmission rate is many times that of an ISDN connection. And it can transmit vast quantities of multimedia data (speech, text, sound, graphics and



moving images). It is still an expensive exercise, but relatively cost-effective for the economy as a whole. And, depending on their particular access road onto the superhighway, end users now have interactive multimedia functions such as video-conferencing within their grasp.

This is a sign that the Europeans have caught up with the Americans in terms of information and communications infrastructure (satellites, cable and terminals) and recognises the importance that information as a production factor has for the competitiveness of the European economy. But both continents are in search of data for these broadband networks. This will include not only films and games but in theory anything that can be digitised, from CD-ROM-quality classical music to medical video conferences bringing experts in on a delicate surgical operation.

Content – putting flesh on the bones

Science and industry urgently need serious, essential content and applications, for example in education and continuing training. The Commission's White Paper [1] describes the competitive disadvantages of Europe's national economies as the continent's most serious problem and the product of a rigid employment system crippled by outmoded training structures, insufficient continuing training provision and generally inadequate levels of basic skills and technological know-how. The March 1994 IRDAC report *Quality and Relevance* concludes that Europe is not making sufficient use of its substantial human resource potential, thereby jeopardising its chances of maintaining and improving standards of living for its citizens. [2]

Technological progress has displaced some professions and fundamentally altered many others. Our prosperity no longer depends on traditional industries, but in many respects on services and new production processes which combine complex assembly operations, logistics, supply and distribution know-how and intelligent design in original equipment manufacturing. It is estimated that leading-edge knowledge in high-technology fields becomes outdated within three to five years. This means that technicians and engineers have to refresh their basic theoretical and vocational knowledge four or five times in the course of their working lives. Other estimates suggest that 80% of existing professions will have to be "re-engineered" within the next 10 years. Life-long learning is something everyone is going to need.

Sectors with fast-changing product technologies (e.g. information and communications technologies) set the pace for change in every other sphere of industry. No-one is exempt or can afford to ignore the process. Consequently Europe needs a highly trained workforce with advanced vocational, technical and problem-solving skills, and businesses that are willing to learn. Concepts such as business flow, total quality management (TQM), intelligent enterprise and the Seven Ss (structure, strategy, skills, staff, style, systems and shared values) point to the fact that businesses, too, must learn or go under.

Can information and communications technologies help? Of course they can, since by combining broadband capacity, mobility and user control for education and training applications, they are the only fast, efficient and cost-effective means of handling the massive demand for new skills. Teletraining and distance learning already use these technologies, which incorporate several media and offer genuine added value in the form of full interactivity and the option of real-time communication with a tutor.

Electronic data transmission

A two-day seminar on "Training in the Information Society" was held in Brussels on 6 and 7 December.[3] The main topic was not the technology needed for online and offline multimedia initial and continuing training, the relative merits of open distance learning via CD-ROM and terrestrial communication lines, or telelearning via satellite. Even the important issue of standards took a back seat. Instead participants were given demonstrations of successful telematic and multimedia applications for vocational training and study (the virtual global university on the Internet), using a variety of technologies.

Computer-assisted learning is not that uncommon nowadays. We already live in a multimedia society, with our radios, televisions, computer games, videos, mobile phones, and the Internet and many other networks. We are connected by ISDN and satellite to every other point on the globe. Multimedia software, like CD-ROM, is already a recognised product. Interactive video technology links cameras, computers, networks, software and speech, and enables the student to combine graphics, animation, sound, video, text and numerical data in a customised learning tool. Open, flexible training on PCs for individuals and groups, online and offline, is clearly set to be one of the most important multimedia applications of the future. It is an efficient, cost-effective tool for individually-tailored, self-guided study, building upon each child's natural curiosity and hunger for information, irrespective of social background or previous knowledge. Equally, the means exist to meet the training needs of adults wishing to explore the universe of information this technology opens up.[4]

The Community Learning Utility

One central theme of the seminar was the relevance of telematics-based initial and continuing vocational training for industry, in terms of both efficiency and the organisational changes that new education technologies and course content will require. The idea of a Community Learning Utility (CLU) was presented in this connection. Electronic study resources should be equally and easily accessible to all: individual students, educational establishments such as schools and universities, and local businesses alike. The CLU could operate like a public electricity, water or sanitation utility or a town library, supplying, storing, managing electronically and distributing the latest multimedia study programs.

Picture a system where every citizen would have online access, via individual workstations, to terabytes of information directly available within a CLU or via a network, on a pay-as-you-use basis. Performance-related grants would be available; schools and universities would enjoy special conditions for access to CLU materials. Individual students would have access at any time to material precisely geared to their needs, and would themselves determine the pace of their studies. It could be in the interests of society to promote the upgrading of skills and the relevance and quality of course content by means of a performance-based system of bonuses. All educational establishments and businesses will be connected to the CLU's technological support and delivery environment. Scientific and industrial advisers will set quality specifications and standards and monitor compliance with them.

Of course, these developments would not dispense with the need for teachers: instead they would free them from routine tasks and leave them more time for individual supervision of self-guided study, at a higher level of the coaching process. The CLU's teaching materials and electronic tools will be constantly updated.

The CLU will give access to teaching and study programmes, multimedia training software, reports from news agencies, electronic technical journals, network access to distant databases and electronic tools such as E-mail, and authoring systems to allow rapid

prototyping of teaching material, and will also supervise study progress and meter information usage. Where quality standards and controls exist, the CLU could act as a distribution network for licensed software and study programs. Since users will pay *pro rata* for the software and licensed materials they use, the system should generate royalties and licence fees for authors and publishers and promote continued development of teaching and study software.

Initial and continuing training in industry

New, more horizontal management structures and greater flexibility among skilled workers have created continuing education and training needs in industry. Both groups are key factors in a company's learning potential.

Unfortunately, multimedia study materials are expensive both to produce and to transmit (whether via network or by satellite). The IRDAC report sets the cost of one hour's new, interactive video material (e.g. on CD-I) at between 50 and 100 times that of an hour's conventional teaching. There are compensations, however: increased flexibility, faster learning speeds and the possibility of providing rapid continuing training for a larger number of staff without interrupting the production process. There is therefore a critical group size for the use of study software. Cooperation on continuing training between large and small companies (the latter generally suppliers or subcontractors) benefits both parties.

Telematics-based learning will reorganise initial and continuing corporate training, and thus, in combination with quality management and corporate restructuring, will considerably enhance the competitiveness of European industry.

Training resources could be pooled within groups of cooperating companies with a view to developing strategic skills.[5] This would meet the training needs of a sector, region or large industrial concern and its associated companies, thereby making each member of the group more competitive.

Training would be focused on areas designed to secure the group's competitive advantage, in response either to an urgent need for initial and continuing training or to an analysis of future skills and capability profiles. This strategy could include plans for the development of both general and sector-specific, and industry- and company-specific skills. Companies and educational establishments could cooperate, for example via a CLU, on preparing and producing general, strategic and sectoral expertise for the process of life-long learning.

Political responsibility

For the Europe-wide information society to happen, policy-makers must first reach agreement on the requirements and common goals of technology-based initial and continuing vocational training. Issues to be determined include:

- Convergence within Europe on planning for education and vocational training, to increase transparency and comparability
- Stimulation of a corporate culture of leaming and promotion of life-long learning by means of incentives and measures to motivate the workforce
- Improvements in the training of trainers
- Intensive cooperation between industry, schools and universities, to ensure better curricular response to changing needs, speed up the transfer of research findings by means of targeted continuing training measures, and increase the social relevance of R&D
- Promotion of models of cooperation on continuing training between SMEs and large companies, with the involvement of educational establishments
- Measures to promote and facilitate the application of study technology for cost-effective, flexible, open and efficient distance learning, using innovative course content and teaching methods.

The seminar reviewed education technology in four European countries, and the California Research and Education Network (CalREN) was presented to increase awareness of international activities.

The Commission is considering a proposal for the establishment of a joint

EU-USA Forum on Telecommunication and Technology for Education and Training, to enable mutually beneficial cooperation when the national information infrastructure for education and training activities comes on-stream. A similar arrangement with Japan is also under consideration. During the closing panel discussion, to improve information transfer within the Commission, representatives of various Directorates-General put forward their main policy objectives in the field of telematic applications for education and training, human resource development and the building of the information society.

Financing

In a context where national budgets are at full stretch, public funds never suffice to meet the real investment needs of education, vocational training and science. Since in addition to the existing need for innovative technology in education, new organisational structures for life-long learning, new course content and new methods need to be financed, the following principles should be observed:

- New education infrastructure and technology should be financed via a partnership between private and public investors.
- There should be a charge for the services used.

Thus the new education infrastructure should be run in accordance with economic criteria. It should produce turnover and profit, so that technological and methodological upgrading and updating will ultimately be self-financed. Facilities and services would be open to every interested party and potential customer in a given town, region or indeed sector of industry: schools, colleges, universities, local business, public bodies and every citizen, regardless of age, sex, ethnic origin, etc. The particular social advantage of this form of education technology and infrastructure would be that educational establishments would have preferential access.

The risk of status quo

Change brings uncertainty. Uncertainty often provokes rejection. Training for trainers is seen as a major threat: "Everything that suggests change causes panic in the education fraternity" (Alan Benjamin).(6) Yet the biggest threat to European society would be to avoid change, thereby ruling out the possibility of making innovative use of information and communications technology for educational purposes in our schools, universities and businesses. ■

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(1) *Growth, Competitiveness, Employment. The Challenges and Ways Forward into the 21st Century*, Commission of the European Communities, Brussels/Luxembourg, 1993

(2) *Quality and Relevance. The Challenge to European Education, Industrial Research and Development Advisory Committee of the European Commission (IRDAC)*, p. vi

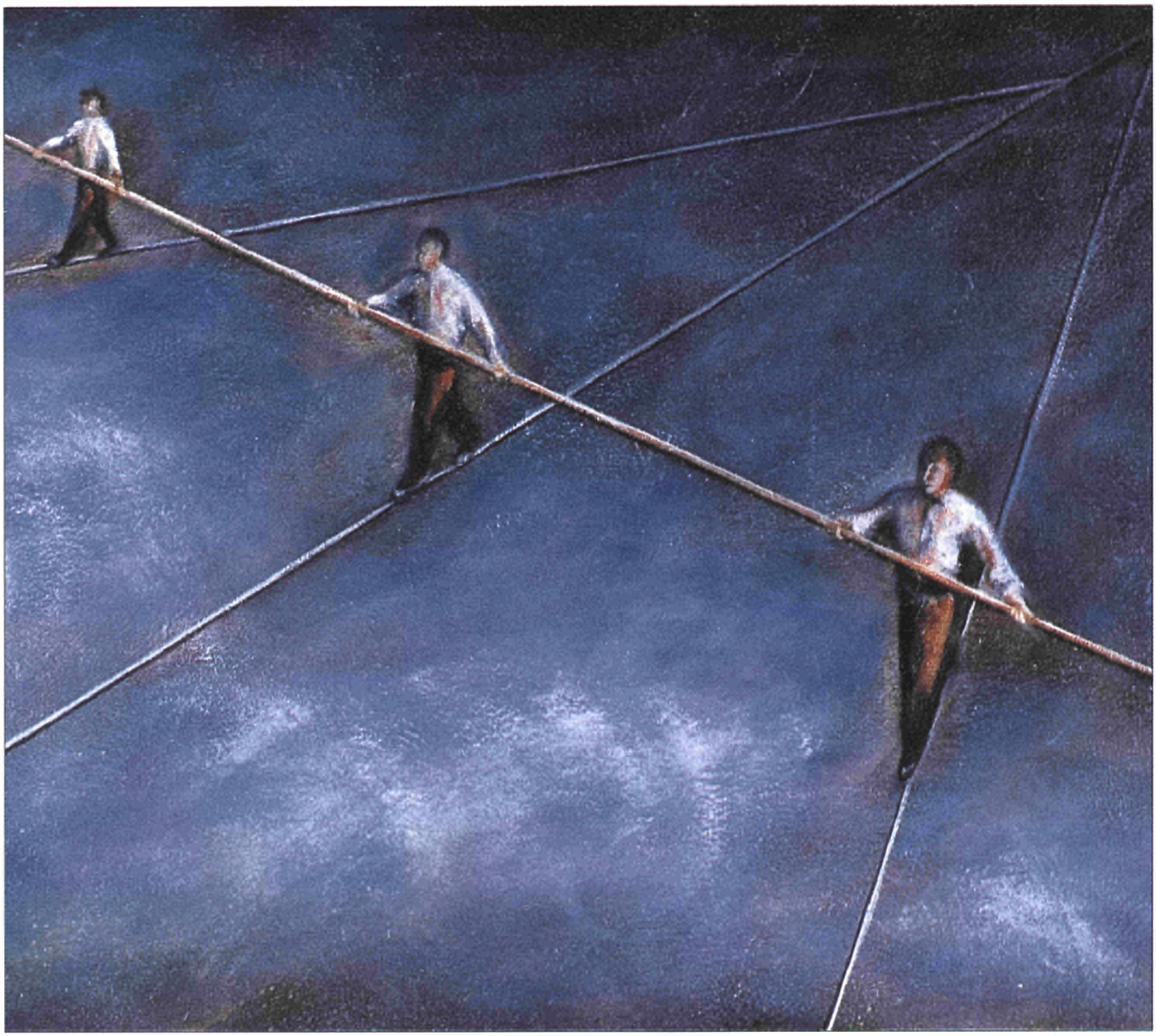
(3) The proceedings are being prepared and will shortly be available.

(4) As a glance at the volume of information available on the Internet will show.

(5) See *The Competitive Advantage of Nations*, Michael Porter, Macmillan, London, 1990

(6) *"Affordable restructured education: a solution through information technology"*, Alan Benjamin, in RSA Journal, Vol.CXLII No. 5449, 1994

The links between research, standardisation and production



STANDARDISATION in manufacturing, industry and business offers various advantages in a range of fields, which has led to its widespread adoption as a technique. It can avoid expensive duplification, make production easier, improve product information and customer choice, and encourage interoperability.

Avoiding duplification of effort: if standard solutions to technical problems can be found, manufacturers no longer have to devise their own ones each time, thus saving time, money, and duplification of effort.

Making production easier: selecting a small number of options from a large number of equal validity makes production – and the specification of components – easier.

Improving product information and customer choice: providing potential customers for a product with a statement of its compliance with a particular standard gives customers a clearly defined idea of what the product offers, so they can make an informed choice.

Encouraging interoperability: a standardised set of specifications showing what one item of equipment presents to another will enable customers to use these items together, – that is, it offers the useful prospect of interoperability.

In short, standards reduce barriers to trade, and help the development of markets across the economic area in which the standards are used.

However, standards are not mandatory rules established by the public authorities: they are voluntary documents established by those who will use them, and this explains the need for consensus. If standards do not enjoy

a broad consensus, they will not be used, for where application of a document is merely voluntary, there will be no reason to apply it unless using it offers certain advantages. Should the supplier, or customer, see no advantage in a standard, he will simply ignore it and use something else instead.

Thus complaints along the lines of "Suppliers are not manufacturing/ Customers are not buying in accordance with standards", or "Standard equipment is unavailable" are clear signs that something is wrong – but wrong with the standards. It means these are not offering any advantage to their users, for if they were, traders in a free market would be quick to seize them.

Standards for transferring research results to the marketplace

How does research fit into this? There are, after all, fundamental differences between the purpose of research and that of standards, and some tension between the fundamentally static nature of a written standard and the continuing change characteristic of research. The researcher is basically concerned with the extension of knowledge, and the economic motive is often not the only one (it may not even be present at all).

Practical results may arise out of scientific development, but this is often not the aim, and even when it is, the use of equipment implementing a novel technique does not fall within the researcher's prime area of expertise. All too frequently the result is that the economic benefit of scientific discoveries is lost to competitors because incompatible and competing implementations are marketed, confusing the customer with widely differing solutions for the same problem. The eventual market result tends to leave in place a dominant "standard" solution that may not be technically or economically the best.

The existence of publicly available specifications that make use of research results will enable suppliers and other economic interests to exploit such research results more effectively in the market place. Here, standardisation has a role to play.

If applied at the appropriate stage, the strengths of the standardising process – consensus-building, experience in drawing up technical requirements (not an easy process in itself) and the openness of the system – can be applied to the task of putting innovative products on the market in a fruitful way. It can enable both suppliers and customers to obtain maximum benefit from the underlying discovery, while avoiding wasteful competition between competing, equally valid, but incompatible solutions.

Although the authorities can help in facilitating this task, it must eventually be carried out by those directly involved. If not, there will be no true consensus, and as mentioned above, the standards will not be used.

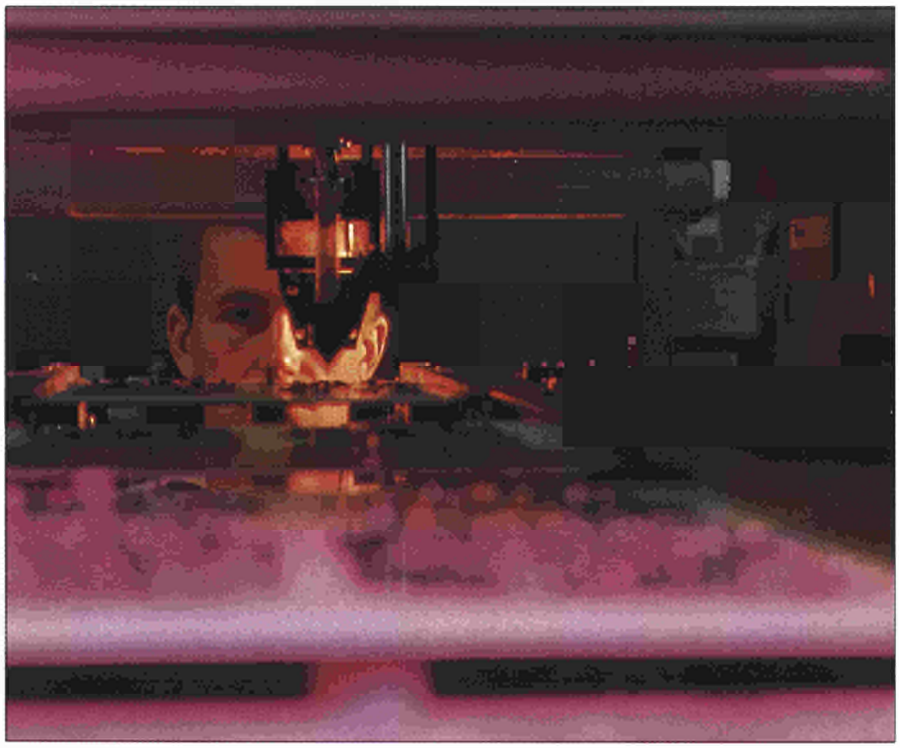
The establishment of a system to accomplish this has begun. A workshop on the subject took place in early 1994, organised by CEN (le Comité européen de normalisation – the European Standarisation Committee), and a standing group in CEN has been established to manage the links between standards and research.

The Commission has contributed by mandating standards in innovative areas with the specific aim of assisting the transition from research to the market, for example in the area of advanced ceramic materials and steels. But much remains to be done, both in informing the research community of how standards can help bring products based on their research to market; and in developing mechanisms for the standards bodies to be able to respond to these needs.

Research in support of standardisation

As described above, standards can contribute to the value of research results by assisting their transition to the market. Research, on the other hand, can make a contribution to standards by reinforcing the scientific basis of the standards themselves.

In what may be loosely referred to as traditional areas of standardisation, the technical content of the work is based on the experience shared by those round the table, and frequently on a shared technological culture. This is valuable in itself, for a standard is a practical document if it is anything at all, and its aim is to provide usable technical specifications rather than philosophically rigorous perfection – a principle, it must be said, that is not necessarily always followed.



There is, nonetheless, a need for standards to be based on sound science, since a flawed standard will specify a flawed product with consequent economic losses or even, in some cases, actual hazard.

The obvious areas in which this applies are innovative ones. Where science is moving quickly and product cycle times are fast, empirical solutions may conceal errors in the underlying assumptions; it may be also that there has not been sufficient experience to reach empirical solutions.

Even in the traditionally standardised areas, the drawing up of standards may reveal areas in which the theoretical basis is unsound or not well enough understood, or where the state of knowledge is insufficient for the drafting of reliable specifications, requirements or test methods. Here, again, the tasks fall mainly on those involved; in particular, it is up to the standardisers to define their research needs in such a way that the necessary actions can be carried out.

Clearly, standards are not a solution to every problem, but they can provide an effective instrument for improving market efficiency.

Developments in European policy have given a new dimension to standardization, in providing a link between the needs of public policy on the one hand, and safety and other technical requirements on the other. Where the standards are needed for the support of European policy, the Commission has a role. Both in the transfer of research results to standards, and the provision of research support to the needs of standardization, activities are underway at European level.

Standards as a link between research and public policy

By providing a mechanism for the presentation of research results in a common, accepted and practical format, standards have the capacity to provide a link between public policy and innovation. In the absence of proper understanding of the underlying science, over-regulation can be a temptation in some technological areas.

Furthermore, it can be difficult for regulations or other legislative requirements to refer directly to scientific data. Standards, on the other hand, as publicly available documents with a recognised status, can provide a source that can be more easily referred to. Thus standards are able to provide a route for the transfer of innovative development and discovery to the regulatory domain.

Conclusions

In a short article such as this there is no space to examine in detail the further potential of the interaction between standards, legislation and research. However, there are some conclusions that can be drawn. Wherever possible, standards must be drawn up in such a way as to avoid stifling innovation by the need for compatibility with existing specifications. Standards should not be abused to erect trade barriers. The delays inherent in the standardizing process (which in innovative areas can be comparable with product cycle times) should be reduced.

Clearly, standards are not a solution to every problem, but in many areas they can provide an effective instrument for the improvement of market efficiency. ■

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Chronicles of a domestic revolution to come

LIVING IN AN "INTELLIGENT" home before the end of the century is no longer a pipe dream. The impetus of the main market players and advances in information technology over the last decade have transformed home systems from a concept inaccessible to most people into a potential range of products and services aimed at mass markets. The basic components emerged in the early 1990s, thanks to the efforts of research teams in the most active companies and support from the Community programme Esprit. It is now possible to design interoperable electronic systems at costs which could allow home systems to become widespread by the beginning of the third millennium.

Future users of home systems technology will benefit from advanced facilities in terms of security, comfort, energy management, communications and access to future services, which will become available as the information society develops.

To illustrate this concept, imagine being able to control all the equipment in your home at any time, while watching your favourite television programme. If the doorbell rings, you could view the visitor immediately on your television set or personal computer. Without leaving your armchair, or from any other spot (office, car, etc), you could set heating in each room, close your shutters, check your electricity, gas and water bills, look into the baby's bedroom, check how your dinner is doing, programme your washing machine to start at off-peak times, etc.

The advantages for consumers are manifold: low energy costs afforded by energy management of the house or flat as a whole, improved security thanks to monitoring systems and cameras connected to your television set, the increased comfort of easier control over household facilities, and automatic warnings should abnormal situations occur (such as a fridge door being left open, a leaking washing machine, an appliance left switched on, etc.).

During the market take-off phase, consumers with high incomes and a high level of education are the most promising niche in the short term, for obvious reasons linked to economic and cultural barriers.

However, elderly and disabled people are those who stand to benefit most from home systems solutions. Integrating the various security and monitoring systems would allow them to lead an independent life at home. Stays in hospital, which are frequently long, expensive and disruptive, could thus be avoided. With this in mind, discussions and coordination involving all parties, including social security institutions, is essential to secure the initial training and investment needed for these groups. These two outlets would "pump-prime" the market and contribute to extending the benefits of home systems solutions to the population as a whole.

Standardisation – or the slow and painful gestation of a promising industry

Home systems became widely known as a concept during the 1980s and are now in the process of becoming reality. Between 1987 and 1992, European companies endeavoured to develop specifications under the Esprit programme. Their willingness to cooperate stemmed from the firm conviction that only agreement on a single technical standard could give home systems the impulse they need to get off the ground.

Standardisation would allow integration of all the various types of electronic facility in a home: domestic appliances (such as washing machines and fridges), other household electronic products (televisions, stereos, etc.), telecommunications (phones), meters, etc; these could then be managed at house level as part of an overall solution. But only when enough companies have reached agreement on joint specifications can components (microprocessors) be manufactured, followed by mass-produced, low-cost facilities. These specifications are the precondition for developing a genuine mass market. Without joint specifications leading to the adoption of a single standard, neither industry nor consumers will be able to benefit fully from the new opportunities offered by home systems.

Several associations bringing together a large number of companies and industries are seeking to reach agreement on a joint standard. One of these is the EHSA (European Home Systems Association), whose objective is to encourage and promote European industry in its efforts to develop new leading edge systems for the home of the future. The association is open to all businesses, be they large or small, technical or non-technical, manufacturers or service providers, architects or experts.

To meet this challenge, European companies have developed the HomeSystem specifications, with financial support from the Esprit programme. This is a means of communication for all facilities, not only in the home but also in schools, office buildings, hospitals and hotels. Modularity is one of HomeSystem's strong points. Another is the fact that it can easily be extended to integrate all new and existing equipment such as appliances, energy controllers, lighting, security equipment, telecommunications, public networks, etc. The control signals are transmitted through existing cable circuits such as electrical wiring, coaxial TV cables or telephone wires, thus avoiding unnecessary and expensive laying of new cables.

The HomeSystem specifications are rather like a working language. European manufacturers in the audiovisual, telecommunications and appliances sectors must learn to speak in a common tongue. In this respect they must learn to collaborate rather than compete – no easy matter.

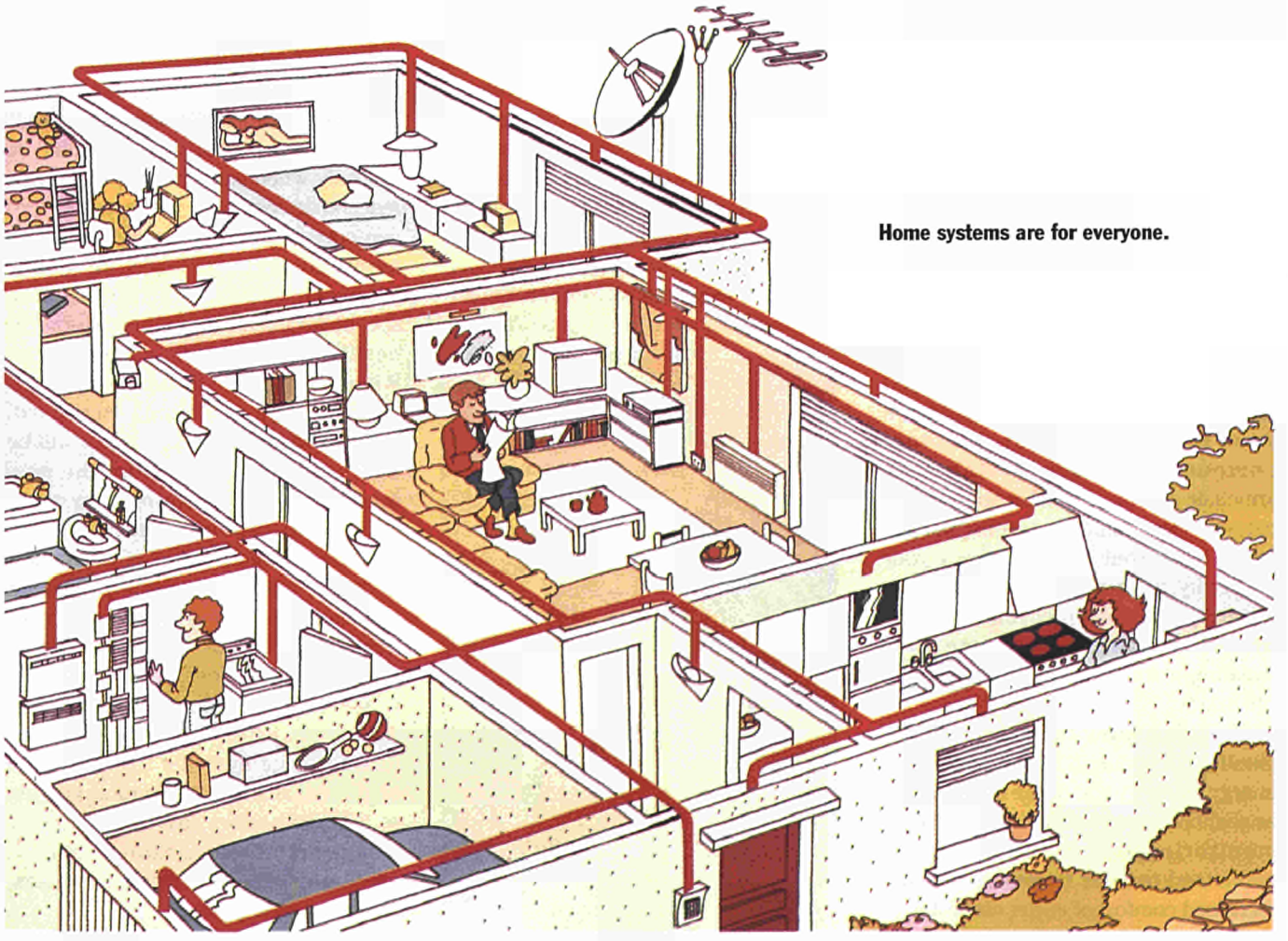
Nevertheless, as is often the case in promising markets during the initial development phase, other associations are also suggesting their own specifications at global, European and national levels. Discussions are under way to harmonise market strategies and ensure interoperability of the various solutions, particularly within the CEN/CENELEC standardisation organisation. Industry is expected to reach consensus on the most technically and economically viable solution in the near future. Generally speaking, industrialists see the value of working together to increase the size of the market, thus increasing the profits of all players and contributing to new job creation (particularly in services, installation and maintenance).

The importance of economic and social information

Fabulous markets are opening up to European companies working in the home systems field. SIGMA Consultants forecast that the market for the new products and services will reach 2 billion ECU within five years. However, it is still difficult to predict with any degree of accuracy which of these will prevail in the medium to long term. The development of multimedia and mobile telecommunications could change their environment very rapidly. Companies are primarily seeking markets for the substitution of existing products, whereas consumers are on the look-out for products and services better adapted to today's fashions and lifestyles. The issue is how to bring together supply and demand in a short space of time. In this emergence phase which is typical of new markets, several problems hinder growth: identification of solvent demand from potential users, standardisation, availability of components and basic development tools, identification of the right marketing approach, organisation of distribution networks, etc.

These markets are already tangible; many corporate product catalogues feature integrated or semi-integrated systems and home systems sections, while "household" home systems products are given substantial promotion. SGS-Thomson, the European semi-conductor producers, already sell a carrier modem and have expressed their intention to play a leading role in the home systems components market. In France, thousands of subsidised housing units are already equipped with basic collective home systems solutions.

Finally, some market segments are developing rapidly (e.g. blocks of flats and specialist housing). The growth of these markets is expected to accelerate over the short term, driven by a more favourable economic environment and pro-active moves on the part of some of the main market players such as large energy distributors. For instance, EDF (Electricité de France, the French electricity generator and distributor) is



Home systems are for everyone.

coordinating the Esprit project for the development of the components and development tools needed to design home systems products and services based on the HomeSystem specifications.

In the first half of 1994, the European Commission carried out a survey as part of the development of the Esprit programme's working plan for 1994-1998. The exercise covered four major topics: the development of the home systems market, key success factors, applications and standards. The responses highlighted a number of interesting aspects:

- The home and buildings automation markets dovetail and could share generic technologies and standards. If the market is to develop, sound business alliances are needed to integrate complementary knowledge and spread risks. The conditions for home systems to become a mass market are expected to be achieved from 1998 onwards.
- Cheap components and standardisation are indispensable. The development of general, user-friendly supply, coupled with aggressive marketing plans, could promote growth.
- Energy management, security, heat management, ventilation and air conditioning are the most obvious applications in the short term.
- Owing to the presence of incompatible specifications at both global and European level, convergence is the most appropriate way of reaching a single standard.

Although the first generations of components and development tools are already on the market, a fully optimised solution should become available around 1998. A *de facto* standard is then expected to dominate, thus allowing a mass market to develop.

Via Esprit and the new information technology programme, the European Commission is supporting research projects aiming to provide the interoperable building blocks required, thus acting as a catalyst to promote the efforts of the various market players, including users. It promotes activities which seek to achieve interoperability and convergence among currently available specifications, the development of components and products using these components, and the completion of pilot applications, particularly in the field of multimedia technology development.

Calls for proposals will be published at regular intervals to support European industry's activities in the home systems field. The most recent call, published on 15 December 1994, was due to close on 15 March 1995. It aims to encourage the formation of consortia with the objective of participating in projects which are in line with the working programme developed jointly by industry, users and the Commission. The documents relating to this call for proposals can be obtained from the Esprit information desk.

Home systems are a crucial issue – an economic issue for industrialists in the sector, and a social one in terms of quality of life for private individuals (particularly elderly and disabled people) and for employment in Europe, since prospects in this field are particularly bright. ■

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Four main development stages:

1987-1992:
Development of specifications

1992-1994:
Development of components and completion of pilot projects

1995-1998:
Growth and optimisation of the components on offer
Development of products and services
Establishment of a single standard

1999-2000:
Gradual development of a mass market

Computerising the heart of the market

The electronic auction

TIME IS MONEY – and the speed and accuracy of today's electronics bring ever greater advances in communications essential to modern business and industry. One particular application of electronics has also come to the aid of centuries-old industries not necessarily associated with high technology, such as the fishing industry, the fresh fruit, vegetable and flower trades and the dairy industry, helping them keep up in the race to remain competitive.

"Computerised selling" is the key – this has revolutionised the turnaround time for highly perishable goods at auction, which forms one of the major means of trading for these products, giving rise to electronic auctions throughout the European Union. Moreover, such auctions can help in the pursuit of openness or 'transparency' in trading practices, because by their nature electronic auctions are 'transparent': the bidding process is a visible one and automatically recorded. Indeed, as the EU and member states governments are increasingly concemed by the lack of openness in many transactions, there is growing interest in the use of computerised auction systems because they are seen to be fair and allow every buyer an equal opportunity.

The origin of the idea is not in fact a new one – simply a new development of a much older piece of technology: the

mechanical auction clock. The earliest such clocks originated in the Netherlands at the beginning of the 20th century and the leading manufacturer was Van den Hoom & Wouda. The computerisation of the mechanical clock was a logical development, and the first computerised selling systems were produced in Holland and Belgium in the 1970s. Locally produced systems are also to be found in certain other parts of the world. In Australia, for example, the Sydney Fish Auction is computerised, and so are several cattle auctions in Canada.

As technology developed, computerised systems have become more sophisticated. An increasing number of auctions offer remote buying, saving the buyers the time and cost of travelling to market, and also facilitating faster distribution.

Major benefits

The major benefits of computerised auctions are usually identified as speed, transparency and instant paperwork.

■ **Speed.** This has vastly increased, and indeed, were the auction sale dependent solely on the electronic system, it would be even faster, but it is still governed by the slower speed of human reaction. However, in markets where several clocks are running simultaneously selling different lots, the speed of sales has become astonishing in comparison to previous practice. At the flower auction in Aalst, Belgium, lots are sold at peak times on each of three clocks there every three seconds, which is equivalent to 3,600 lots per hour. Where speed is essential the Dutch auction falling price system is preferable, as only one bid is necessary

■ **Transparency**. This is the second major benefit. In a traditional non-computerised auction it is virtually impossible for the auctioneer to be certain which of a large number of buyers has bid first. He has only one pair of eyes, and however experienced, he cannot physically look at everyone at the same time. Using a computer bidding system which reacts in milli-seconds, every buyer has an equal opportunity. Nevertheless – to dispel misleading visions of computers displacing the time-honoured figure of the human auctioneer – it should be emphasised that the computer remains simply the tool of the auctioneer who controls the sale, and not the other way round.

■ **Instant paperwork.** In many traditional auctions it takes hours after the sale to complete the essential invoicing and administrative paperwork, – a tedious process, both time-consuming and costly. With a computerised system, a floppy disc can be transferred to the accounts computer immediately after the sale or, for an even faster response, a simultaneous link can be made to the auction computer throughout the sale.

In addition, the data stored within the system can be accessed to provide dynamic information on a host of subjects such as sales volume, average prices, performance against quotas and graphic displays. Examples of commercially interesting optional refinements include a warning flashed – in confidence - to the auctioneer if a buyer exceeds his credit limit, and a key supplied to buyers and sellers which will obtain a print-out of all transactions they have made at the auction. Each key is unique to its holder and others cannot access the same information.

Hardware requirements

One of the basic principles in the development of a Schelfhout auction system (see contact address, page 25) is that a maximum of standard hardware is always used. Special tailor-made hardware features are developed by a team of hardware engineers. The basis of each concept is a standard PC network with Novell network software. This allows a great part of the maintenance of the auction system to be done by a local technical partner.

If the customer requires it, spare parts for the special hardware cards can also be delivered to the partner so he can service the complete system, thereby considerably reducing servicing times and costs.

As the auction system is often described as 'the heart of the market', it is essential that the sale should be able to operate under all circumstances. Therefore the SCS concept includes a large number of backup facilities that make the system very reliable:

■ Back-up power units and transformers are installed to intercept loss or instability of the mains voltage

■ The network server has a duplicate or a hard disk mirroring system to protect its data

■ The crucial interfaces also have duplicates so should an interface break down, its function can be taken over by another one

■ All communication passes through universal patch systems so if a vital module fails, a less important module can take over its function.

Software requirements

Based on standard modules, the user interface is tailor-made to meet specific customer requirements. To obtain a

Simultaneous tele-auction room at Veiling Haspengouw, Sint-Truiden, part of a circuit linking 12 Belgian markets and which is in turn linked to the Dutch tele-auction circuit.

perfect software package, a functional analysis is worked out together with the customer, and the software is designed in-house using the company's team of graduate software engineers. During the installation phase the project engineer responsible can make small adaptations to the system at the customer's request. As the project engineer follows the development of the system closely, he is able to make modifications at each level.

Types of computerised auctions

Local: local auctions are basically computerised versions of the traditional mechanical, open outcry or 'shout' auctions, but provide greater speed, efficiency and information. The buyers are present, they can inspect the merchandise, see the auctioneer and speak to him if necessary.

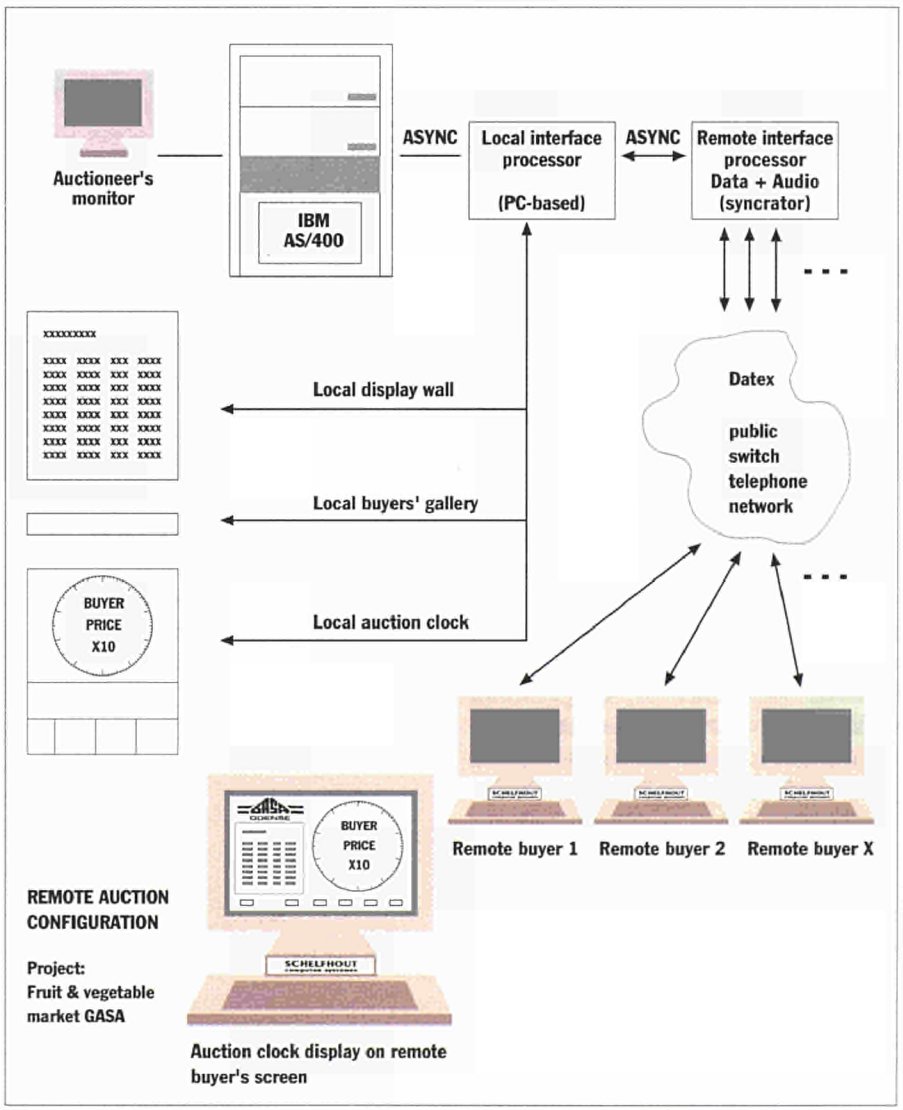
Tele-auction: Sales information is transmitted to all markets that are part of the network, and identical information is displayed on one clock at each market. One market is selling the products of the other linked markets. Buyers can bid remotely from their local market for goods on sale at the other markets which are part of the same circuit.

Simultaneous auction: Each market sells its own lots simultaneously with the lots of the other markets linked to the same circuit. In principle this means that at each site the number of auction clocks is equal to the number of markets that are inter-linked.

Remote auction: Remote buyers bid from their homes or offices and thus avoid spending time and money travelling to the market. All the remote buyer needs is a personal computer and a standard telephone link to the market. With the flower trade, in some markets the goods remain with the producer until they are sold, at which point they can be delivered direct to the buyer, rather than having to be transported physically to and from the market.

Futures sales: A recent development is the provision of a futures market whereby buyers may bid for produce several months ahead of its availability. The option is similar to that used for commodities, such as oil and metals, and its main purpose is to provide price stability. The system was designed for the Scottish Milk Marketing Board in Paisley, Scotland and offers futures sales from 2 weeks to 1 year of delivery for raw milk.

Diagram showing the remote circuit configuration of the Danish fruit & vegetable market Gasa Odense: at present 48 buyers are connected from Denmark, Sweden and Norway



Some solutions for perishable goods

Schelfhout has designed selling systems for various types of perishable goods whose value depends on fast tumaround times.

Selling fish

White fish buyers invariably wish to inspect the lots for freshness, size and quality as they lie boxed in the market halls, usually in the sequence the vessels landed their catch. At many auctions the auctioneer and the buyers walk their way through the markets as the lots are sold. Moreover, at some large UK fish auctions, several sales take place simultaneously in different parts of the market. To accommodate this special requirement of mobility, two alternative moving computer clock systems have been developed, an auction clock on overhead rails (for example Scheveningen) and an auction clock mounted on a customised vehicle, the Moby-Clock (for example Zeebrugge).

The Moby-Clock vehicle is powered by electricity to avoid polluting the marketplace and is recharged overnight. In order for buyers to be able to place their bids, buyers are equipped with small hand-held transmitters, which are

also recharged ovemight.The clock surround displays a variety of information relevant to buyers, including details of the next lots, the number of boxes comprising each lot, details of the current lot, species, quality, name of the vessel and the successful buyer's name.

Selling vegetables

To date, Schelfhout has delivered 23 systems for auctioning vegetables in Belgium, France, the Netherlands and Denmark. The auction at Gasa Odense, the largest fruit and vegetable market in Denmark, offers a remote facility to buyers both in Denmark and throughout Scandinavia. Unlike most white fish buyers, vegetable buyers are happy to buy on specification and do not therefore need to travel to the auction to inspect the products. Gasa Odense's objectives were:

- to make it possible to participate in the auction without having to be present in the auction room
- to give the trade improved information on the availability of fresh Danish fruit and vegetables
- to ensure that the price structure was maintained on the basis of the immediate supply and demand situation
- to improve the efficiency of the transportation and distribution of goods, thereby ensuring fresher fruit and vegetables for the consumer.

The Schelfhout solution was a network consisting of a personal computer and a printer at the address of the purchaser connected with the Datex-network and the ordinary telephone network. The Datex connection takes care of the data transmission between the auction computer at Gasa Odense's Fruit and Vegetable Department and the personal computers of the purchasers, and allows the purchaser to follow the sale. The telephone connection takes care of the audio transmission and allows the purchaser to communicate with the auctioneer and tell him the quantity he wants to buy.

A sophisticated synchronisation protocol provides that through a minimum of data communication all clocks displayed on the remote buyers' screens are running almost simultaneously. The synchronization ensures that the purchaser who stops the clock at the highest price will be the one who is registered as purchaser of the goods. Remote buyers and those actually in the auction room therefore have exactly the same opportunity to win the bid.

Electronic auctions in Scandinavia

Norges Sildesalgslag (NSS) was the first organisation in Norway to use a computerised auction for selling fish. Using the old system, skippers at sea radioed details of their catch to NSS in Bergen who in turn faxed details of their catches to buyers throughout Norway. The buyers were allowed 1 hour to fax tenders for their preferred lots. The tendered bids were then laid out on a large table so that they could be compared and the highest bids identified. Next, the results were faxed to the buyers.

The computerised system was introduced at the beginning of the 1992 mackerel season, with as its main purpose the reduction of time-consuming work for both NSS and the buyers. Busy auctions with 25 vessels and 25 buyers which previously might take 3–4 hours can now be handled within 30 minutes.

The Schelfhout system creates a competitive auction where both offer and bid meet in an ideal situation: fishermen are guaranteed the best prices for the lots and buyers can more easily control their supply of raw materials. It also offers the buyers more information and includes the automatic integration of the sales results into an efficient computerized invoicing system. Another substantial benefit is that buyers are linked to the auction and place bids for selected catches via their standard PCs which are connected to the system through telephone sockets. Buyers can therefore bid from wherever they choose. In addition, specially designed software facilitates the electronic transfer between the relevant parties of the large amount of paper information generated, supported by the PC network initiated by the auction system.

The global village

In addition to the European Union and its member states wanting greater transparency and efficiency, there is also potential for auction systems in Eastern Europe and the developing world. Despite the software sophistication of computerised selling systems, they are simple to operate and invariably ensure that the producer obtains the best possible price. This would benefit many Third World economies where the distribution chain is too long, and help to reduce the risk of corruption.

Future auctions may be on a world-wide basis linked by satellite and thus further the marketing chain from producer to consumer. In brief, with ever-improving communication systems the concept of the global village comes ever closer. ■

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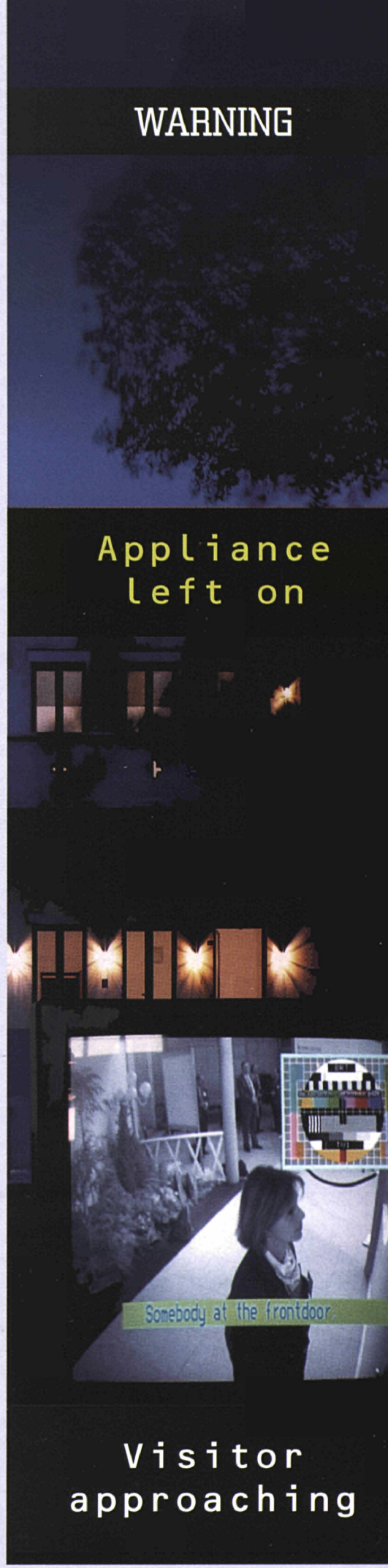
Moby-Clock at the La Rochelle fish market, France

Catalogue number CD-AK-95-001-EN-C



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