

Innovation & Technology Transfer

1/99

Protecting *the* Quality *of* Europe's Rivers

Innovation Management Techniques

Managing to Fulfil Europe's Technological Potential

Plus

- First Forum for Innovative Companies: role models for an innovative Europe
- Transferring medical technologies
- Substitutes for hazardous products

... and more

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Innovation @ Technology Transfer



The European Commission's Innovation Programme is under the responsibility of Edith Cresson, Member of the Commission responsible for Research, Innovation, Education, Training and Youth.

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Closer Partnership with SMEs

In November, accompanied by the Chairman of the Research Council Dr Caspar Einem, Austrian Minister for Science and Transport, I met a hundred company leaders at the First European Forum for Innovative Companies in Vienna. They came from the most diverse sectors, but all were committed to the adventure of innovation.

Some of the companies represented there have experienced exemplary growth in recent years. They now play a major role in international markets. The others are looking for the means and the methods to exploit their potential, in order in their turn to experience the expansion which is their aim.

Among the questions at the root of the debates between these entrepreneurs and the policy-makers at European, national and regional level were two which came up again and again. What are the main barriers to growth, and what are the means to overcome them? What concrete measures would speed the passage from start-up to maturity?

The Commission has also been reflecting on these questions over the past few years. It has responded with the Fifth Research Framework Programme, focusing on increasing the participation of small companies, both in research and in the commercialisation of its results. This participation should be doubled in the coming year.

I would like to stress at this point how important such meetings are, and express the wish to see them happening more often. The solutions offered by the Vienna delegates bear the mark of realism and experience, and will help us fulfil this commitment.

In conclusion, I would like to wish success to the European federation of innovative companies, launched at the Forum. It will be of tremendous value, both as a medium for the exchange of experience between such companies and as a channel for their views. This continues what brought us to Vienna - to do everything to bring about a lasting strengthening of European innovation policy.

Édith Cresson

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Directorate XIII-D
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Address
DG XIII/D-2, EUFO 2291, L-2920 Luxembourg
Fax: +352 4301 32084
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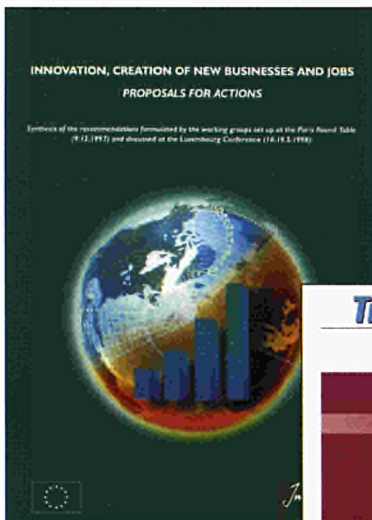
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Role Models for an Innovative Europe



The primary function of public authorities – European, national or regional – is to create the conditions in which entrepreneurs and investors can realise the economic value of Europe's technological capital, according to the First European Forum for Innovative Companies



The proposals presented to the Forum are detailed in 'Innovation, Creation of New Businesses and Jobs: Proposals for Actions', available from the RTD Help Desk (see page 28). A shorter version is available in the December 1998 Special Edition of *Innovation & Technology Transfer*, which also summarises the Forum's main conclusions



The Forum, held in Vienna last November, was the climax of a wide-ranging debate involving key actors from the worlds of business, finance, research and government. It gave leading entrepreneurs from high-growth European SMEs the opportunity to define policy measures which – by improving access to technological and business competences, to finance and to markets – would stimulate the creation and development of more such companies.

The consultation process had been initiated by Edith Cresson,

Member of the European Commission responsible for research and innovation, at the December 1997 Paris Round Table⁽¹⁾. There, leading entrepreneurs, investors, researchers and public authorities discussed ways to realise the full potential of new high-tech companies as a source of high-quality employment.

They established three working groups to determine key barriers and weaknesses, to identify examples of good practice, and to propose remedial policy actions. The groups reported back to the May 1998 Luxembourg conference⁽²⁾, whose participants focused on specific bottlenecks in the areas of competences, finance, and markets, and on possible ways of making the business environment more conducive to innovation and entrepreneurship.

Now, the time had come to convert the conclusions of this year-long exercise into concrete recommendations for action.

Action

"Political authorities must be prepared to listen, and the process by which measures are drawn up must be more participative and more user-friendly," said Mrs Cresson, introducing the proposed actions. These arose out of a dialogue with business people, investors and researchers, and the conference would help to refine and prioritise them. "I intend to take the proposals on which consensus is reached here into account in the

Fifth Research Framework Programme, and will fully support the Austrian Presidency when it presents them to the Council of Ministers in December."

She noted enthusiastically the first concrete implementation of one of the proposals – the formal creation, during the conference, of the European Federation of High-Tech SMEs (see page 5). Such bodies would establish a network of mutual support for Europe's most dynamic enterprises, she said. They would promote the entrepreneurial role models needed to foster a culture of innovation, and provide a channel for on-going dialogue between policy-makers and Europe's high-tech, high-growth businesses.

Innovate or Perish

Europe faced a stark choice, Mrs Cresson told delegates. "If it is to combat unemployment, maintain its industrial independence, and regain the creativity and enterprise on which its past economic and social success was founded, Europe must innovate. In the past two years, high-technology businesses have generated 40% of the United States' economic growth, and made a crucial contribution to its overall competitiveness. Europe meanwhile, which had five of the world's 25 leading computer firms in 1991, by last year had only one. Europe has a structural trade deficit in high technology products of over €10 billion per year. The stock market valuation

(1) See 'Innovation, Entrepreneurship and Jobs', edition 2/98.

(2) See 'Turning Mice into Gazelles', edition 4/98.

of the US chip-maker Intel is now twice that of all Europe's car manufacturers put together."

The consultation process of the past year had suggested a number of specific measures. These included the development of stock options as a cost-effective means of rewarding highly qualified staff, the improvement of the fiscal and social status of entrepreneurs, public-private partnerships for the creation of start-up capital networks linked to research centres, and the promotion of entrepreneurial skills and attitudes in schools and universities.

"The scale of state intervention is, rightly, shrinking," Mrs Cresson said. "It therefore needs to be more efficient, making better use of experience through improved co-operation and the dissemination of good practice. This is particularly the case in relation to innovation, business creation and technology transfer, which involve a large number of players, acting at local level."

Contact

J-N. Durvy, DG XIII/D-1
 Fx. +352 4301 34129
<http://www.cordis.lu/innovation/home.html>

Consensus

In the course of the two-day conference, a broad consensus emerged in support of certain priorities (see 'Key Conclusions', below).

Speakers and delegates were clear that public investment in academic research will continue to be an essential source of intellectual capital. But research should no longer be conducted in isolation from market pressures. Researchers should fund a greater proportion of their work through its commercial exploitation, working closely with entrepreneurs. New tax incentives should be introduced to encourage private investors to bear the risks of such commercialisation.

SMEs must be given greater access to public funding of close-to-market research – the mandatory channelling of 5% of all public research expenditures to SMEs was even proposed. But government's primary function is to establish a fiscal, regulatory and business environment in which the market itself will stimulate and reward innovation.

Too much direct public intervention tends to stifle innovation, distorting the market and creating dependency. Neverthe-

less, public funding can be of enormous value as a catalyst. For example, public-private partnership schemes to reduce the risks of early-stage investment in high-tech companies can stimulate venture capital financing of innovation.

Wide differences remain between the conditions for innovation in different Member States. The Commission's support for the reduction of regional disparities in access to venture capital and to professional benchmarking, intellectual property management and technology transfer services, and for the identification and dissemination of good practice, is still needed.

FP5 and Beyond

Spurred on by the European Commission, Member States are rationalising business regulation, a vigorous European venture capital industry is forming, and research institutes and private companies are beginning to do business together on a more regular basis.

It is to hasten the emergence of a new technology-oriented entrepreneurialism in Europe that FP5 has been structured to

optimise the participation of SMEs – both in research itself, and in the exploitation of its results. The horizontal programme 'Innovation and SMEs' will take central responsibility for SME participation, and for ensuring that work within each of the thematic programmes is geared towards innovation.

The Vienna Forum again raised Europe's expectations for its high-tech SME sector as a source of employment, competitiveness, and economic growth. Three case studies presented at the Forum are summarised on the pages which follow. As they demonstrate, it also set out the sector's own expectations – for recognition, for support, and for the freedom to flourish. ●



Key Conclusions

The need for on-going policy measures in support of innovation, at both national and EU levels, was broadly endorsed. Innovative enterprises are key contributors to economic growth and employment. The spread of good practice, and the testing and promotion of new approaches through pilot actions at Community level, remain high priorities.

There was consensus on a number of specific instruments and priorities, including:

- tax measures favouring the use of stock options by young, technological enterprises
- mechanisms at European level for the transfer of pension rights by researchers wishing to start new companies
- rapid improvement, at European level, of the system for the protection of knowledge – in particular the patent system
- renewed efforts to raise

awareness about intellectual property rights among entrepreneurs and researchers, and a scheme of 'small entity' fees to encourage their use of patents

- an Internet-based virtual college of entrepreneurship
- the facilitation of technology transfers to industry by universities and research centres
- improved access to economic and technological intelligence gathered by public bodies
- the establishment of a register of business angels

● a venture capital network of expertise, and an inventory of methods for the analysis of high-tech business plans

● a European initiative to showcase successful examples of local support for innovative companies, including industrial and university spin-offs.



Commissioner Cresson with Francisco Marin and other founding members, at the signature of the Federation's Articles of Association.

"Young high-tech companies find it hard to break out of their national markets," says Emmanuel Leprince of Comité Richelieu, one of eight associations of high-tech SMEs which have formed the first such grouping at European level. "The Federation's aim is to help them

The European Federation of High-Tech SMEs

become European companies, exporting to other Member States as the first step towards global competitiveness."

The Federation's founders represent nearly 1,500 SMEs in sectors such as aeronautics and telecommunications, but it hopes to represent 5,000 such companies by the end of 2001. Membership is open to both private associations and public agencies, but Francisco Marin of Aentec emphasises that the approach will be bottom-up. "Like our own organisations, the

Federation will be driven by entrepreneurs," he says.

Companies such as Aérospatiale and Siemens are also involved, and both men stress that the Federation is in no way against large firms. "SMEs have a lot to gain from working with market leaders," says Marin. "And they need SMEs' speed of response."

"We want to improve the synergy between them," agrees Leprince. "The Federation has already run 12 partnering events, leading to over 70 con-

tracts – many of them licensing or co-development agreements between large companies and SMEs. We would like to see the Commission doing more to promote participation in its research programmes by consortiums involving both large and small companies."

Contact

E. Leprince
 Tl. +33 1 46 04 55 03
 Fx. +33 1 46 04 55 38
 E-m. leprince@
 comite-richelieu.com

THE EXPERIENCE OF LEADING ENTREPRENEURS



Marc Lassus,
 Gemplus co-founder

Smart Operators

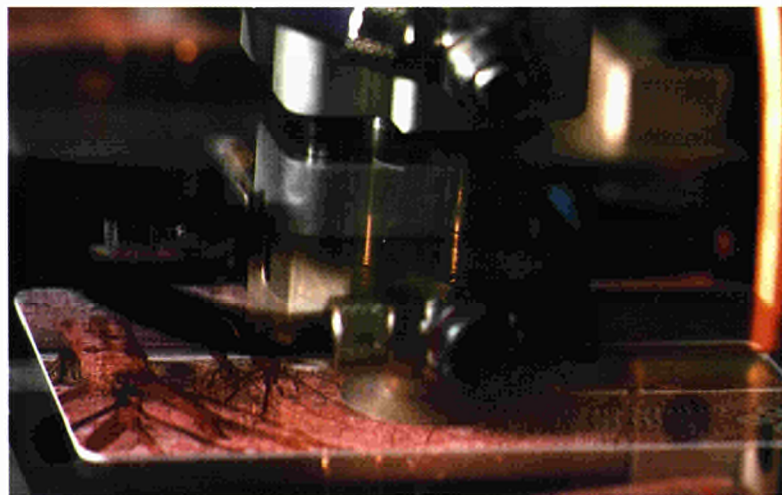
Taking globalisation in your stride, giving employees a share of the action, and building and trading intangible assets are some of the attitudes that have taken Gemplus to world leadership in smart card technologies within a decade. Co-founder Marc Lassus explains.

"We had a naive belief in our approach and in the future of the smart card, and we had a fighting spirit, but we had no personal fortunes, so the first thing we needed to do was to convince the financial establishment that we were a horse that was worth backing. We faced terrible difficulties, but they taught us an invaluable lesson," recalls Marc Lassus, co-founder of Gemplus, the world's leading manufacturer of smart card systems. "The first thing we learnt was that we needed to go international from day one. Back in 1988 when we started up, French banks were not comfortable with the idea of venture capi-

tal, so we sought backers from the UK and as far away as Singapore."

Gemplus may have been forced to go abroad for money, but the silver lining was that the contacts it made during the search opened vital doors on the selling front. Given that the French smart-card market was already saturated by well-entrenched large firms, the newcomer grew fastest abroad, and opened its Singapore office two years in advance of its Paris one.

Today it is present in 27 countries, and half its 4,000-strong workforce, and 94% of its \$600 million turnover, are outside its home country. The company



Gemfast, Gemplus's manufacturing line for Sim Cards



Home banking and Internet access control via Gemplus' smartcard reader

even has two factories in China, located not to take advantage of low labour costs, but simply to serve the Chinese market.

"Nowadays, in the majority of sectors, there are no frontiers," Mr Lassus emphasises. "New entrepreneurs have to take a determinedly global approach from day one."

Stock – Not Optional

The founders' arduous tour of the finance houses also taught them that financiers like to back a team that has made a symbolic demonstration of its own commitment. "At that stage, whilst I had sold everything and put my own house on the line to found the company, some of my colleagues were expecting to draw a salary at the level they had been used to, and this turned out to be unrealistic," says Mr Lassus. The founders thus took the risk and put up 20% of the new company's equity, but quickly learnt another financial lesson: that in the high-tech start-up sector, risk requires reward.

They thus decided to put in place a system of stock options, and today, 30% of the company's capital is held by its directors and executives. And the company, conscious that its continued success depends on teamwork, wants to extend the

scheme to all employees. "With half our workforce outside France, we are competing in a labour market where lucky innovators can become millionaires overnight, so we need to offer stock options – in America, they're a religion. They mean that the people who work in the company can make a bet on their future success, a bet which is paid for by the stock market. It's a system which enriches not only individuals but society as a whole. In France nowadays both company and employees are taxed much too fiercely when stock options are granted." The sad fact of the matter is that it is cheaper for an innovative company to create jobs in the US than in most parts of Europe.

The Euro Opportunity

But Europe has proved that it can foster innovation. Gemplus was in just the right place at the right time to benefit from the boom in mobile telephony, which provides a perfect application for smart card technology. Through the quick thinking and collaboration among its telecoms manufacturers, utilities and regulators, Europe built world leadership in digital mobile telephones. But the lead is at risk of being lost, according to Mr Lassus. "The fact that

industry and regulators agreed on the GSM standard has given Europe a remarkable advantage," he says, "but having lost the battle, American firms are working hard to win the war by superseding it with a third generation standard. Europe must stand together against this threat. We must not let selfish nationalism hold back further collaboration. Speaking as a manufacturer and designer, I'd say that Brussels needs greater powers to enforce standards."

But Mr Lassus urges a more radical approach yet. "There are so many applications where a common European approach to common European problems could establish similar world-beating products. For instance accident victims could be treated much more quickly and effectively if they carried a card with their medical data and histories stored on it, and the time that lorry drivers waste negotiating border controls could be decimated if a smart card system were developed. The time to be acting is right now, when the euro is being introduced. We have an unmissable opportunity to create the world's first virtual currency."

Intellectual Assets

On the issue of intellectual property rights, the stock in trade of a high-tech company, Mr Lassus is less pessimistic. "It's true that it costs more to register a patent in Europe than in the United States," he agrees, "but we didn't let this hold us up. We have taken out over 300 patents, and from being a cost to us, this has turned into a saleable asset. At the start, we were buying technology licences, whereas nowadays we are selling them. We've turned a defensive tool into an offensive one." ●

Contact

Gemplus SCA
 Tl. +33 4 42 36 50 00
 Fx. +33 4 42 36 50 90
<http://www.gemplus.fr>

Scientists Make Good Managers



Sir Martin Wood, founder of Oxford Instruments.

Oxford Instruments preserves its strong corporate culture by recruiting high-flying scientists, looking after them, and training them to become good managers.

"When a biophysics professor comes to me from the university and complains that his brightest student has left to work for a merchant bank, I'm not too upset," says Sir Martin Wood, founder of Oxford Instruments, world leader in superconductors. "We need more scientists in all types of business, not just high-tech ones. The best MBAs build their business acumen on solid scientific qualifications. We can teach people business skills after they have some practical experience under their belt, or send them to business school when they're a bit less wet behind the ears."

Courses for Horses

The company he founded has prospered by attracting the right staff, and it is built around their needs. "We very rarely employ managers trained as such – we bring in good scientists and engineers who, if they want to, can learn to be good managers. Staff recruited as project engineers also have a hand in getting the order, and keep in close touch through producing, testing and commissioning it, and often installing it too. This gives our people a very good grounding in all aspects of business. Our customers appreciate talking to people who have a solid scientific base – in fact sometimes they even end up writing research papers together."

After a few years, the recruit might go on to work in one of

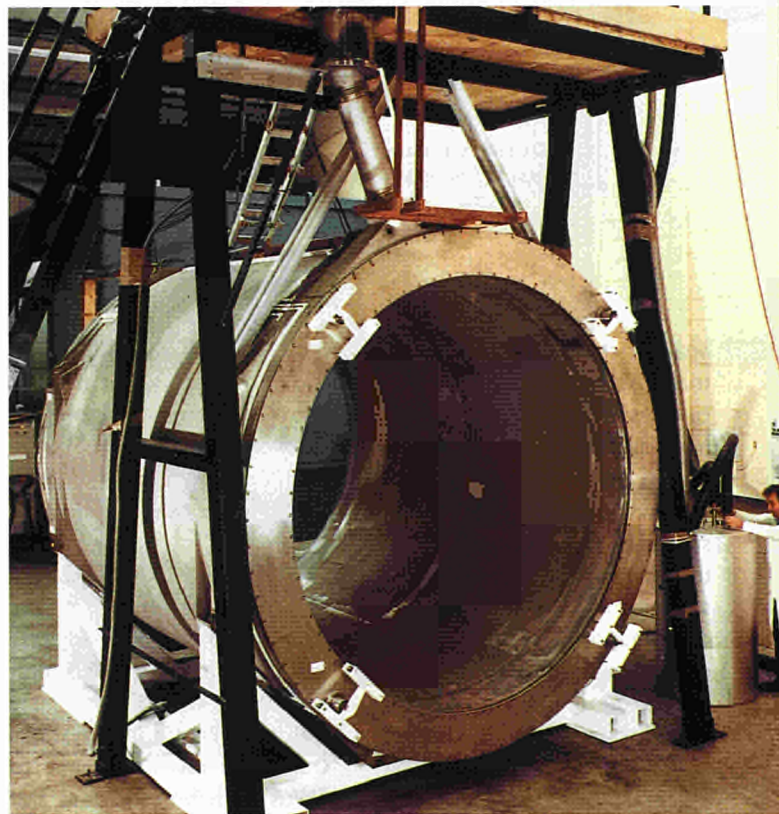
the company's overseas marketing offices for a while. Then at around 30 or 35 years old they might become head of a division or start a new group within the company. To train people for such posts, the company prefers to run internal courses, because then it can ensure that they are appropriate to the company's needs. But equally, and in contrast to the practice of many companies, if a scientist wants to stay close to research for ever, there are good career paths open to him.

Alma Mater

Oxford Instruments has also profited from its origins and history. "We understand where new science and new technology can be used to develop new products, and we do this



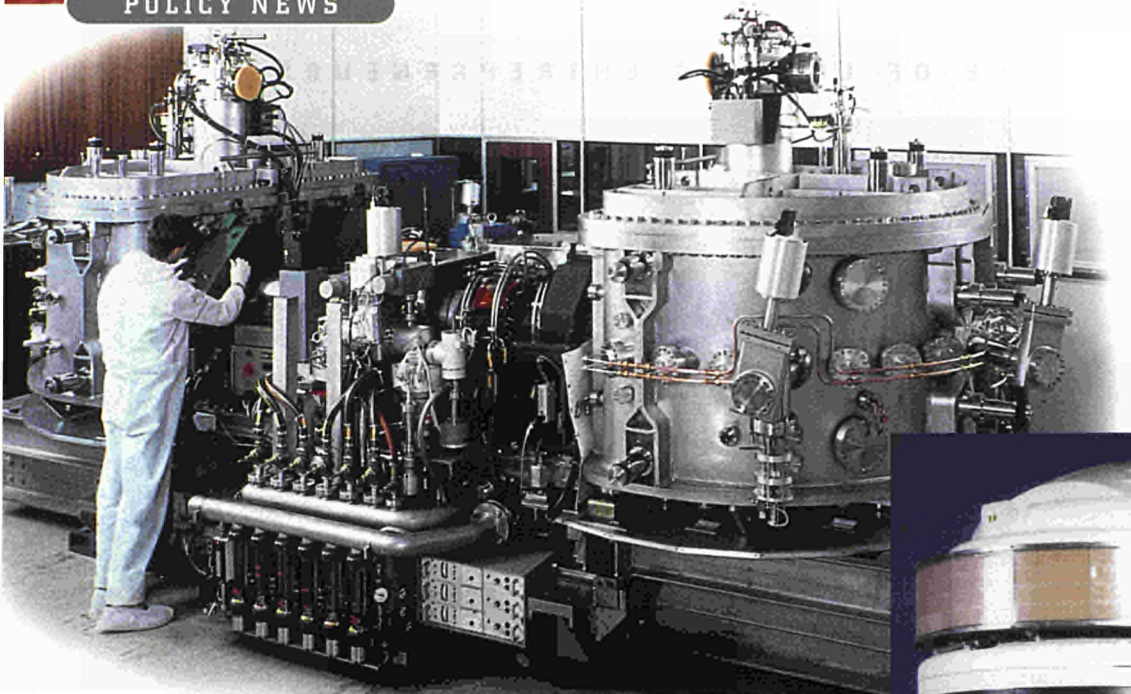
1962: Martin Wood tests his young company's first superconducting magnet.



The company's large Clea II superconducting magnet, now operating at Cornell University, USA.

by keeping good contacts with world-class laboratories," says Sir Martin. The company spun off from Oxford University itself, and so it tends to be the first port of call. And it is not slow to follow up the leads it gains from being part of the international scientific community. "We aren't afraid to create new spin-offs – indeed these can often become the most profitable business of the future."

Through following its highly-trained nose in this way, Oxford Instruments has grown to serve a number of different markets, not only in scientific research, but also in quality control instrumentation, environmental



An Oxford Instruments superconducting synchrotron, bought by IBM to help develop X-ray lithography techniques.

analysis, semiconductors, industrial process control and healthcare. As these different sectors have different economic cycles, this variety brings stability with it, as well as providing a constant source of new opportunities for the company's workforce. "Our staff are flexible, and with the combination of scientific and managerial expertise, they can switch emphasis easily," Sir Martin confirms.

Fair Shares

Sir Martin points also to more orthodox business virtues such as hard, intelligent work, persistence and commitment to delivering: "We often take on things that have never been done before. We may be a little late sometimes on groundbreaking developments, but we always deliver."

The culture extends to its ownership. "We're in no way a cooperative, but every employee who has worked for a full financial year receives shares in the company," he says. "Every year, a percentage of the profit goes to buy shares for the employee share scheme, and they are distributed in proportion to salary. Then after three years, if they sell

them, it is tax-free. But shareholding is more about the culture of long-term collaboration, and working together in a forward-looking firm, than any short-term motivating impact."

Window of Opportunity

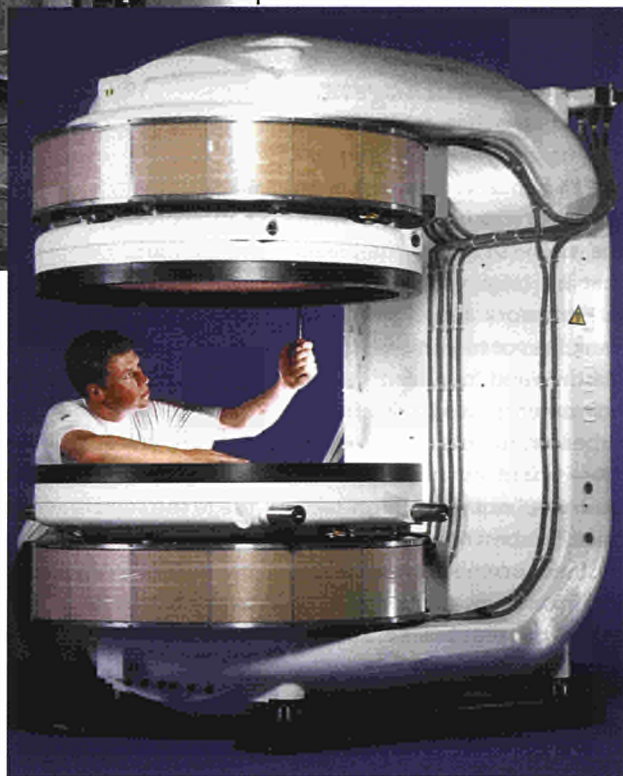
In this high-tech firm, the human resource is clearly the most important, but it is a public company, and investors have been known to voice concern. "Our major investors come to see us from time to time and say 'the technology is marvellous, but why aren't the margins equally marvellous?'," says Sir Martin. "We are pursuing some quite radical changes to become more efficient and to extract a better financial return for our R&D. But we have a group of pretty solid investors with long-term horizons, and they appreciate having a window on the scientific world through us."

When he spun the company off from Oxford University's Clarendon Laboratories 40 years ago, it was a gradual process. Sir Martin continued working for the university for 10 years. He then had what he describes as a stroke of

absolute luck, when the discovery at the end of the 1950s of 'type 2' alloy superconductors, which can sustain a relatively heavy current, took the potential market from maybe 10 to 10,000 customers overnight. The firm blossomed, so that when several years later he went to banks and the venture capitalist 3i (Investors in Industry) for support, he was well received. The company paid no dividend for the first 15 years, but when it went public 3i's judgement was vindicated – it found it had made its best ever investment.

Sir Martin chaired the company till 1983. Nowadays, through his creations the Oxford Trust and Oxford Innovations, he is passing on his vision and experience to young entrepreneurs, schoolchildren

A recent whole body magnetic imaging system from Oxford Magnet Technology, an Oxford Instruments-Siemens joint venture.



and other research scientists who aspire to follow his example of switching into business. "Life was easy when I started," he says blithely. "I had contacts, experience, and no competition. Nowadays it's different. But I like small companies, and we've helped start up 100 of them – it's very interesting and a lot of fun!" ●

Contact

Oxford Instruments plc
 Tl. +44 1865 881 437
 Fx. +44 1865 881 944
 E-m. info.oiplc@oxinst.co.uk
<http://www.oxinst.com>

Success in a Spin

Having contacts in industry is crucial to getting a start-up off the ground, according to Egon Putzi, Chairman and CEO of SEZ Semiconductor.



SEZ Semiconductor CEOs
Franz Summitsch (left)
& Egon Putzi.

SEZ was established in 1986 by Egon Putzi and Franz Summitsch, both originally from Austrian chipmaker AMS.

"I was basically in charge of process engineering for AMS's microchip manufacturing, while Franz was in charge of developing production equipment," Putzi recalls. "In the mid 1980s we had a new idea for the wet etching process, which is used to clean the silicon wafer at several stages of the chip production process."

After a few months spent investigating the technique at AMS, which could see the potential benefits of the technique, the pair left to form their own company.

Garage Workers

"We basically started with nothing – we had no capital other than our own, and spent the first few years working in our garages," Putzi continues. "There was not even a market for the process – we had to invent that too."

Their process, spin etching, is now an unqualified success. At its heart is a simple principle – spinning the wafer during the etching process. This simple-sounding change brings about a number of process improvements – one side of a wafer can be etched without having to protect the other side, for example, and process control and performance are both improved.

SEZ has built this technique into an entire family of technologies which they hope will capture a slice of a multi-billion dollar market within the next few years.

But how does one develop such a technology in one's back-

yard? "With difficulty!" Putzi answers. "It took years to get to the stage where we were asked to provide a prototype. We survived those lean years by doing consultancy work and providing custom technology to the industry, developing our own technology whenever we had the time."

"We worked on getting the industry interested in our ideas from the beginning, constantly banging on doors, and our experience in the industry meant that a few opened. Certain people saw what we were doing, recognised the potential and provided us with some of the equipment we needed – wafers, and so on. The process was so unique – they were covering their bases, ensuring that they were kept informed about our progress, in case it turned out to be useful. Eventually, we got the call."

Explosive Growth

That was in the late 1980s, when Siemens ran across a production problem and asked SEZ for a prototype of their process. At this stage the nascent company had applied for their first patents, which unlocked support from the Austrian government, and were talking to their first source of private finance – their local bank.

It took over seven years for the company to lift itself into financial security. "It was a constant struggle – whatever money we made we reinvested in technological development. We were always in debt, and facing cash flow problems. I only started breathing easier in 1994, by which stage we were employing around a hundred people." By



SEZ Semiconductor's Spin Etcher for 300mm wafer processing. Right: inside the process chamber.



then, SEZ had a significant number of patents around the world, and had sold enough of its equity to venture capitalists to finance the consolidation of the company.

The company has been in full expansion ever since, and went public in 1996. The past five years have seen net sales increase six times in value and the number of employees has tripled to around 300. They have become an internationally prominent supplier to

the semiconductor industry. SEZ Holding Ltd, which is listed on the Swiss Stock Exchange, has opened companies in the United Kingdom and the United States, and formed joint venture affiliates in Japan and Taiwan as well as alliances in France, Korea and Singapore.

"We basically created a niche market, dominated it with our technology and rode the back of the massively expanding semiconductor industry," Putzi explains. "That niche is now worth over one hundred million dollars. But you cannot build a company on one technology alone."

Consolidation

So, while the spin-etch process still provides a good 80-90% of SEZ's income, the company has

spent the last 1-2 years consolidating its position.

An entire family of products is now appearing, all based on the spin-etch process. Protected by around 30 world-wide patents, these technologies are targeting the entire wet etching market, estimated to be worth around \$1.5 billion. Putzi is hoping to capture 15-20% of this market in the next 3-5 years.

"The biggest problem we faced was a classic vicious circle – we needed money before we could get financial support," he says. "We need more venture capitalists who understand technology. A venture capital operation set up by a bank is not good enough. Far too many of them spent six months trying to

analyse our process before giving up and saying 'No'. There has to be more trust between the people with the ideas and the people with the money."

While critical of the technical expertise of the venture capitalists he saw in the early 1990s, he does concede that the situation has improved. "Venture capital has become more international – there are firms from America, Germany, the Netherlands and more here in Austria, and private people are getting involved in them. Also, banks and governments are becoming somewhat more understanding.

"But the key problem remains. No one is prepared to take on and finance people in the situation we found ourselves in in 1986 – good

ideas, but no money. You still need to have reached a certain size, to have developed a technology, before a European bank or venture capitalist will look at you. How many companies like ours would have appeared if this was not the case?" ●

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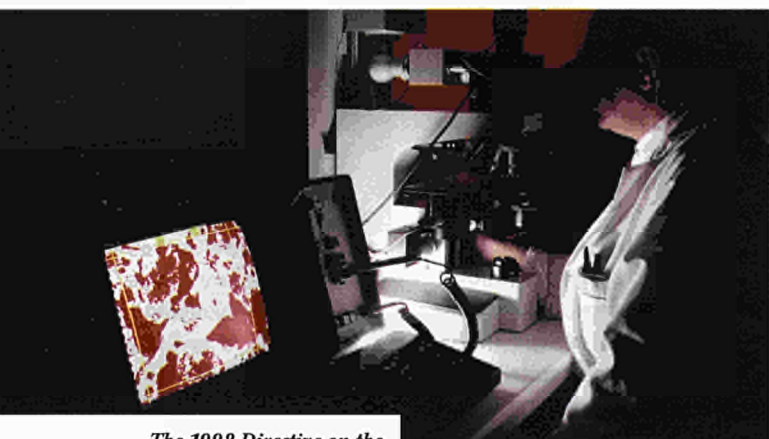
SEZ Semiconductor
 Tl. +43 424 220 4
 Fx. +43 424 220 421
 E-m. klackenbucher@sez.at
 http://www.sez.com/

INTELLECTUAL PROPERTY RIGHTS

Boost to Biotech



Legal protection for biotechnological inventions has finally been accepted by the European Parliament and the Council of Ministers after ten years of debate. The way is now open for Europe to catch up with the United States on biological innovation.



The 1998 Directive on the patentability of biotechnological inventions will provide new impetus in Europe to this fast growing market.

A recent conference, organised by the European Parliament, welcomed a new Directive (98/44/EC) on the patentability of biotechnological inventions. The Directive provides clarity about the conditions for obtaining patents

and the rights conferred, and reflects a clear ethical dimension. It is not possible to patent:

- plant or animal varieties;
- any essential biological processes for production of plants or animals;
- a discovery concerning any element of the human body – including gene sequences.

Fast Growing Industry

Biotechnology is already growing fast in Europe, with major applications in the food, environment and, particularly, health sectors. In the decade from 1995, annual growth of 14 per cent is forecast, while employment is expected to quadruple to between 1.4 and 1.6 million.

According to Bruno Hansen,

Director, Life Sciences and Technologies (DG XII), the European Commission has been trying to foster the same entrepreneurship found in the US biotechnology industry. A major objective is to promote small biotechnology companies – training and assistance to find funding will both be offered. The LIFT help desk for financing innovation, to be set up in 1999 by the Innovation programme, will play an important role.

The Fourth Research Framework Programme (FP4) has had a particularly successful biotechnology programme. The forthcoming FP5 will place even more emphasis on biotechnology, under the Thematic Programme 'Quality of Life and Management of Living Resources'. But better

management of intellectual property rights is a priority – reflected in the establishment of the IPR help desk⁽¹⁾ by the Innovation programme.

Major Achievement

"After 10 years, the EU Directive is a major achievement," says Brian Ager, director general of EFPIA (the European Federation of Pharmaceutical Industries Associations). Harmonisation will provide the confidence necessary to embrace new technologies, and encourage innovation in health care⁽²⁾. "We need effective European policies in the race with America. Intellectual property protection is vital if

we are to build on previous research. No protection means no innovation."

Brian Yorke of life science company Novartis echoes EFPIA's view. "The Directive does not give us all we wanted, but it gives us certainty," he says. But he highlights the need to make EU patents compatible with the global proposals of the World Trade Organisation, outlined in the TRIPS (trade-related intellectual property rights) agreement, and with the sustainable biodiversity requirements of the Rio Summit.

The Future

The protection of biotechnological inventions is now a reality in Europe. The Directive has to be transposed into national law by the Member States not later than 30 July 2000.

One concern is the lack of a period of grace in Europe for the novelty of an invention. In the US, novelty is only affected if any disclosure is made more than a year before the request for patent protection. In Europe,

once any disclosure has been made, it is no longer possible to obtain patent protection. Both the European Parliament and the Commission are examining the need for a period of grace. ●

(1) See 'Stand Up for Your Rights', edition 5/98.

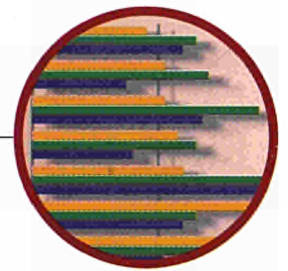
(2) See Dossier 'Biotechnology: Is the Tide Turning in Europe's Favour?', edition 3/98.

Contact

D. Vandergheynst
DG XV
Tl. +32 2 295 69 23
E-m. dominique.vanderghenst@dg15.cec.be

S M E S I N F P 4

Small Companies Play a Bigger Part



A new study confirms that the Research Framework Programme is attracting large numbers of SMEs to take part in transnational research for the first time – the barriers to participation are being lowered.

The European Commission's research programmes give small and medium-sized enterprises (SMEs) "the chance both to internationalise their network of business and research partners and to improve their technological base," according to the independent study "SME Participation in the 4th European Union Framework Programme for Research and Technological Development".

The report examines both SMEs' direct participation in collaborative research projects, and their involvement through the special technology stimulation measures for SMEs (TSME) – the Exploratory Awards which support the preparation of research proposals, and the Co-operative Research (CRAFT) scheme, under

which groups of SMEs engage third parties to carry out research on their behalf.

Overall, 64% of all SMEs participating in the Fourth Framework Programme (FP4), and 78% of those taking part in CRAFT projects, are newcomers⁽¹⁾.

Benefits and Barriers

The costs of launching a project vary widely – from close to zero for SMEs lucky enough to find partners willing to do all the work involved in preparing a proposal, to more than 100 person days for project leaders, the study found. Nevertheless, the overall satisfaction rate amongst the SME participants is very high – almost 96% intend to participate again in the future.



Co-operating with others – whether their intended partners are other SMEs, research centres or large enterprises – is often a barrier for SMEs considering taking

part in EU research. Nearly half of all participating SMEs had never previously worked with any of the other members of their project consortium.

SMEs are also heavily dependent on external sources of information and advice in preparing research proposals. Overall, research centres and universities, private consultants and more experienced project partners remain the preferred sources of this support. But the EC-supported networks of Innovation Relay Centres, CRAFT National Focal Points and Euro Info Centres also play a significant role, especially for SMEs preparing to take part in CRAFT projects, or using an exploratory award.

As the Figure shows, the checking of draft proposals and the clarification of official documents were the services most often sought by SMEs. The pre-screening of proposals was a service not offered by all the research programmes under FP4. Where it was available, the service was highly valued by SMEs, and significantly reduced problems of ineligibility and of incorrectly completed proposals.

The Future

The findings of the study have been taken into account in designing the corresponding measures in the forthcoming Fifth Research Framework Programme – both the horizontal programme 'Innovation and the Participation of SMEs',

and within each of the four Thematic Programmes. The new features envisaged by the Commission are the creation of a single entry point for SMEs, the strengthening of the network of national contact points for information and assistance, and more flexible arrangements for exploratory awards and CRAFT.

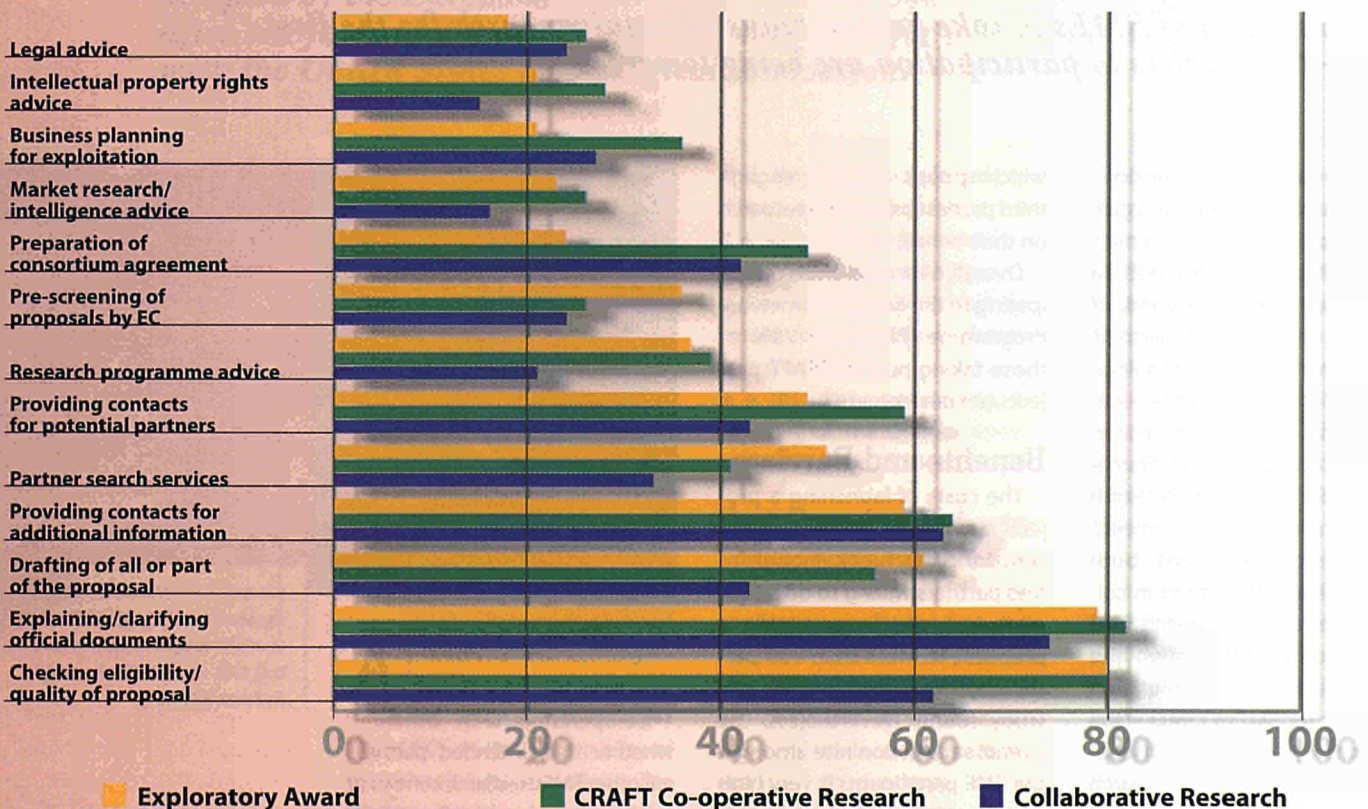
The full report is available online in the CORDIS document library (http://apollo.cordis.lu/cordis/EN_DOCSI_search.html). ●

(1) See also 'European Research – Strength in Depth', edition 6/98.

Contact

DG XII SME Co-ordination Unit
 Tl. +32 2 295 71 75
 Fx. +32 2 295 71 10
 E-m. sme-helpdesk@dg12.cec.be

First-time SME participants: use of different types of external assistance in proposal preparation



Cleaner Water

To meet the demands of European Directives on clean water, integrated water management is an environmental priority. A recent conference reviewed progress on a number of EU projects, with the aim of developing common procedures for wastewater control.

Over the past 20 years, the European Union has adopted a series of Directives concerned with improving water quality, particularly for rivers. To support compliance, five separate Innovation projects – on software, telemetry and modelling techniques – are helping to establish common procedures for integrated water management. They will also contribute to the Thematic Programme 'Preserving the Ecosystem' under the Fifth Research Framework Programme.

Progress in this cluster of projects was reviewed at the recent integrated modelling user group conference, IMUG 98, in Brussels. The intention is not necessarily to define the best single solution but rather to examine the different approaches possible, and to involve many people at all different levels – from equipment producers to local authorities – in the decision-making process.

Two key projects are Urban Pollution Management – UPM, and Real Time Control – RTC. Both depend on extensive data collection and computer modelling of total catchment areas. A third main project⁽¹⁾ deals with the development of a water management model using satellite-based radar monitoring for real-time flood forecasting.

Wider Use of UPM

The UPM project⁽²⁾ set out to promote the technique's wider European use as a means of integrated river-catchment manage-

ment. The objective is to adapt and transfer cost-effective solutions for environmental protection and improved river quality.



Currently, sewer overflow and outfall discharges from treatment works are specified without considering the behaviour of the total river catchment. The UPM procedure proposes the use of models to measure the real impact of urban pollution from sewers and sewage treatment systems on the water receiving the discharge. This makes it possible to develop efficient solutions to meet environmental standards.

Aquafin, responsible for sewerage in the Flemish region of Belgium, is co-ordinating the project. "The framework is based on the British UPM manual," explains Bérengère Huberlant of Aquafin. "It is believed to be unique in providing a methodology for assessing water pollution in rivers. The intention is to see how the procedure can be applied in countries with different climatic conditions."

The three-year project involves pilot studies in Belgium, France, Ireland, Italy and Portu-

gal. Aquafin is involved in the Belgian study to develop an integrated model of the sewer network, river systems and sewage treatment works around Tielt. Initial results are promising. In the next step, the models will be used to assess the impacts of industrial streams and storms.

Technical support is provided by United Kingdom hydraulics consultancy HRW Wallingford. The pilot studies have all been provided with HRW ISIS software for river modelling and Wallingford Software's Hydroworks tool for sewer modelling. HRW provided guidance and training for all the pilots, and is working directly with Dublin Corporation on the Irish study. Here, the focus is the effect of an urban stream on the water quality of the River Tolka during periods of wet weather.

HRW started sewer-system modelling in the early 1980s. It co-ordinated an EU project⁽³⁾ involving pilot studies in eight countries modelling sewer systems to evaluate rehabilitation requirements, on which the current project builds. "We are possibly the largest physical modelling laboratory in Europe," says Richard Kellagher of HRW.

The Wallingford Procedure or its equivalent of modelling and verifying sewer networks for analysis in sewerage rehabilitation has already become a standard tool in Belgium and Ireland. Another project⁽⁴⁾ encourages its wider use, particularly in Portugal, Spain, Greece and Italy.

Innovation

The Innovation Programme In Brief

The Innovation programme implements the Third of the four Activities of the Fourth Framework Programme (1994-1998). Run by DG XIII/D, the Innovation Programme encourages the exchange of research information and the absorption of new technologies by European companies.

In the Fifth Framework Programme (1999-2002), the corresponding programme is entitled 'Innovation and participation of small and medium-sized enterprises (SMEs)'.

Contact details for the new programme will be published in the next issue of Innovation & Technology Transfer.

Innovation Home Page
[Http://www.cordis.lu/innovation/home.html](http://www.cordis.lu/innovation/home.html)

(1) IN206001

(2) IN103401

(3) Under the SPRINT programme, a predecessor of the Innovation programme.

(4) IN20567A



Aquafin, co-ordinator of the UPM project, was closely involved in the Belgian pilot study in the catchment area around the Tielt sewage treatment plant

Real Time Control

RTC technology for urban drainage systems was launched to offer cost-effective solutions for a wide variety of urban drainage problems. The current Innovation project⁽⁵⁾, co-ordinated by WRC in the UK, is intended to increase awareness of the technology.

A second project⁽⁶⁾ involves use of RTC in integrated planning and management of urban drainage, wastewater treatment and receiving water systems. The project is being led by the Danish Hydraulics Institute with the technical support of WRC. Six European cities – Barcelona, Bordeaux, Genoa, Gothenburg, Oldham and Venice – are participating in the project, as well as several smaller ones, providing feedback from users at local level

on the suitability and applicability of the modelling techniques.

Sink or swim

The Venice lagoon is a major urban and industrial area suffering from both subsidence and water pollution. A major project to place tidal gates at the ends of the three major canals in Venice will inevitably affect the self-cleaning process of the lagoon, increasing pollution.

So an integrated approach to wastewater treatment is essential, particularly in the most polluted areas, such as that around the Fusina wastewater treatment plant. This suffers discharges from local industry and run off from the neighbouring agricultural area. The first stage of a pilot project⁽¹⁾ involved setting up telemetry systems and calibrating models. Complete integration of the models will

provide a comprehensive management tool for cleaning up the lagoon.

(5) IN20564A

(6) IN10187I, see 'Technology – the Healthy Alternative', edition 2/98.

Contact

- B. Huberlant
Aquafin nv
Tl. +32 3 450 45 11
Fx. +32 3 450 48 24
E-m. berengere.huberlant@aquafin.be
- R. Kellagher
HR Wallingford
Tl. +44 1491 83 53 81
Fx. +44 1491 82 59 16
E-m. rbbk@hrwallingford.co.uk
- G. Haesen
DG XIII
Tl. +352 4301 33 594
Fx. +352 4301 34 129
E-m. guido.haesens@lux.dg13.cec.be

MEDICAL TECHNOLOGIES

Improving Physical and Economic Health

Industrial restructuring is accelerating in Saxony, one of Germany's new eastern states. Now the Innovation Relay Centre network is helping a regional cluster of young medical technology companies to gain access to markets and research expertise in other parts of the European Union.

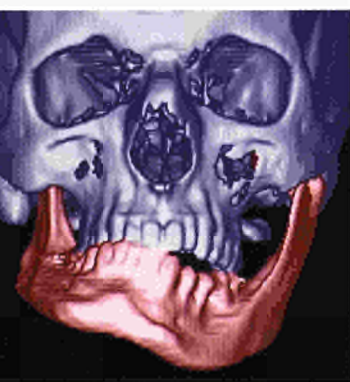
One morning in 1992, as he shaved for work, an engineer at a systems house in Saxony was struck by an extraordinary thought. The mirror emitted light in such a way as to produce a three-dimensional image of his face. Why could a computer monitor not be made to perform the same trick?

By 1996 he had built a prototype and a new company, Visureal, was formed to develop a commercial product. This was

launched in 1998 as the Holotron, which employs a patented technology based on the parallax effect to display lifelike 3-D images. Vertical strips of ten different images are tiled on a high-resolution screen, which is viewed through a perforated matrix in such a way that only one image can be seen. As the viewing angle changes, a different perspective of the subject is revealed.

"Doctors find it much easier to make diagnoses and plan surgical

interventions when they can examine a bone or an organ in 3-D," explains René de la Barré, Visureal's project engineer. "Initially, we are targeting the ultrasonic and angiography markets, where the need for improved imaging is greatest." The Holotron is well-suited to telemedicine, and is already being used with great success by a network of ten cancer clinics in Saxony and the Czech Republic, with other projects under development.



Ten slightly different 2-D X-ray tomography images of a genetically damaged human jawbone have been converted by the Holotron's special graphics controller. Colours are generated by the viewer software.

Regional Innovation Strategy

Visureal is just one of over 50 innovative medical technology companies supported by the Innovation Relay Centre Saxony from its offices in Leipzig, Chemnitz, Dresden and Görlitz. "The sector is of real strategic importance to the region," says Henning Penzholz, the IRC's Manager. "Saxony's first-rate academic base of research institutes and universities has produced a relatively high concentration of spin-off companies. These are still very small, and the scientists who run them lack business experience, but they offer an excellent opportunity to develop regional role models of successful transnational co-operation."

The sector's prominent position in Saxony and Saxony-Anhalt's Regional Innovation Strategy⁽¹⁾ has led to the establishment of a regional network of medical technology companies. The scientific infrastructure is also being further developed – with 45% funding from the European Regional Development Fund, a major new biotechnology research centre and business incubator has recently been built in Halle, for example⁽²⁾. The IRC adds an important European dimension to the support offered by the network of regional enterprise agencies.

"Many of these companies were established to serve a regional market," says Penzholz. "Following reunification, they have struggled to survive in the face of stiff competition from western Germany. At first, they saw the IRC only as a route to participation in EC-funded research programmes. Now they are beginning to recognise the need to find business partners in other Member States – not only for research, but also as a means of acquiring new technologies, and of marketing and distributing their own products. Our links to the companies are strong, and we are well-placed to provide the information, training and advice

they need." The IRC is, for example, helping Visureal to find European distributors, as well as partners for the development of new applications, and of larger, full-colour displays.

Reusable Biosensors

Senslab is a five-person company, founded by Dr Bernd Gründig in 1995 to commercialise a range of reusable biosensors for medical, environmental, food processing and biotechnology applications. Using an innovative self-adhesive gel to bind enzymes to the electrode surface, the sensors are operationally stable for up to a month, and each can make several thousands of measurements. Whether employed in the field – using Senslab's hand-held devices – or for the continuous monitoring of process or experimental parameters, the sensors' reusability gives them a key advantage over current products, in terms of convenience and of cost.

Like Visureal, Senslab is looking for partners with established distribution networks, as well as for co-operation partners for the development of new products. A number of contacts have already been made through the IRC, and although these have not yet produced a commercial agreement, both Gründig and Penzholz are committed to continuing the search.

Theme Tune

IRC Saxony's capacity to broker commercial deals with technology partners in other Member States is strengthened by its

membership of the Medical Technology Thematic Group. In November last year, it hosted the Group's fifth meeting in Leipzig, on the occasion of the Innovation 98 Fair.

With new members from Finland, Sweden, south Germany and the Czech Republic swelling the number of active members to 11, the Group devoted much of the meeting to the practical task of technology transfer brokerage. Existing leads were followed up, and a number of new technology offers and requests were presented – in person, in the case of the local companies Visureal, Senslab, and Fischer Analysen Instruments.

"The Group encompasses a very broad range of technological interests, from diagnostic devices to telemedicine, and from imaging to medical information systems," says Sophie Mavor of IRC North England, who has chaired the Group since it was established in 1996. "But each member serves a region with a significant concentration of medical technology companies. Many have chosen to devote particular attention to this sector, and in some cases to employ staff with a specialised scientific or technical background. The Thematic Group enables each of us to work with colleagues who share the same sectoral focus, and who are therefore most likely to provide opportunities for concrete technology transfer activities."



Senslab's pocket-sized measuring device, fitted with one of the company's reusable enzyme sensors for multiple field measurements of glucose, lactate, alcohol or other substances.

(1) See 'Marrying Innovation and Regional Support', edition 5/98.

(2) See 'Formula for the Future', edition 5/98.

Fast Track

A two-day meeting in a distant part of Europe requires a large investment of time, but none of the Thematic Group's members doubts its value. The IRC network's CORDIS-hosted databases⁽³⁾ allow technology offers and requests to be broadcast to all its members. But the opportunity to present them in person to colleagues who have strong links with companies directly interested in the technologies concerned offers a 'fast track' to technology transfer.

"I am especially pleased that the Group is still attracting new

members," says Mavor. "The challenge now is to maintain the momentum between meetings. Knowing other members of the Group personally certainly helps. Rather than waiting for a response via the network, we are much more inclined to phone one another directly when we receive a relevant offer or request. And in the near future, we hope to start holding video-conference meetings." ●

⁽³⁾ See 'Network Intelligence', edition 6/98.

Contact

- **H. Penzholz, IRC Saxony, AGIL**
 Tl. +49 341 1267 469
 Fx. +49 341 1267 464
 E-m. agil@rzaix530.rz.uni-leipzig.de
 http://www.uni-leipzig.de/~tz/firmen/agil/irc.htm
- **S. Mavor, IRC North of England, RTC North**
 Tl. +44 191 516 4400
 Fx. +44 191 516 4401
 E-m. sophie.mavor@rtcnorth.co.uk
 http://www.rtcnorth.co.uk/irc
- **R. de la Barré, Visureal Displaysysteme**
 Tl. +49 374 214 8426
 Fx. +49 374 214 8413
 E-m. visureal@iz-plauen.de
 http://www.visureal.de
- **B. Gründig, Senslab**
 Tl. +49 341 235 4001
 Fx. +49 341 235 4001
 E-m. senslab@aol.com

INNOVATION PROJECT



Painting Lessons for Old Masters

Introducing a new product can be difficult, even when the one it replaces involves known dangers. Paint is one of seven areas in which recent substitution campaigns have been analysed to highlight key issues and to identify promising strategies.



The Dutch government, employers and trade unions have organised a massive programme of training to ensure that painters understand how to use the new water-based products.

In theory, everyone should welcome a safe replacement for a product which is acknowledged to be hazardous to workers, end-users or the environment. But in practice, availability is rarely enough to ensure rapid adoption – cultural and psy-

chological factors are involved, and market dynamics and the regulatory framework play a crucial role.

Two earlier Innovation projects, Subprint and Sumovera⁽¹⁾, successfully promoted the adoption of new products in the print and construction industries, as replacements for traditional ones containing volatile organic solvents. Now Sphere+⁽²⁾, launched in December 1997, is examining these and substitution programmes in five other fields, to identify both good and bad practice, as an aid to the optimisation of future campaigns by policy-makers in government, industry and trade unions. With academic partners in Germany, Spain and Denmark, the project

is co-ordinated by Kees Le Blansch of Dutch consultant B&A Group.

European Conference

The results of the analysis will be presented at a European conference, to be held in Amsterdam, the Netherlands on 22-23 April (to register, see Contact). The project will also produce a booklet, a CD-ROM and a web-site, to ensure that the lessons learned are made as widely available as possible – not least to future research or technology transfer projects with an environmental or health and safety aspect.

Indeed, with its focus on the methodological, organisational, social and economic aspects of

⁽¹⁾ See 'Technology – the Healthy Alternative', edition 2/98.

⁽²⁾ INAMI 0698

the innovation process, rather than on its technological content, Sphere+ represents a new type of Innovation project – and one which may be more widely used in future. By analysing the non-technological parameters which affect any innovation process, and by defining good practice, such projects can provide a solid basis for the spread of a new innovation culture in Europe.

Carrot and Stick

Solvent-based paint is hazardous to health and to the environment. Chemical solvents cause skin irritation, eczema and breathing problems, and their neurotoxic properties can even lead to brain damage. They are also flammable. Despite these problems, they are still very widely used in the professional painting sector.

“We looked at the introduction of water-based paints in Denmark and in the Netherlands,” says Dr Le Blansch. “There are significant differences in the structure and working practices of the paint trade in the two countries. But it is clear that in both cases certain elements were necessary before widespread substitution could take place. In particular, there must be either strong market demand or clear regulation, and preferably both. Large manufacturers will not actively market water-based paints unless there is a real threat to their existing product ranges.”

Le Blansch insists that voluntary substitution is possible. In three of the cases studied in Sphere+, manufacturers have responded positively to environmental, consumer or trade union concerns by adopting a new standard. The Swedish TCO 92/95 label for PC monitors, for example, has spread across Europe

more or less spontaneously.

But voluntary substitution tends to be slow and can fail entirely. In the Netherlands, high-quality water-based paints developed by smaller producers met with little success until a campaign by the house-painters’ trade union persuaded the government to introduce a legal ban on the interior use of solvent-based paint. “A few large customers specified water-based paints, and one or two painting firms did adopt them voluntarily,” says Le Blansch. “But in general painters were concerned about quality – no one wanted to be the first to use a product which was perceived as inferior.”

Re-Training

The poor reputation of water-based paint was unfounded – but still formed a huge barrier to substitution. “Timing is critical,” Le Blansch explains. “If a substitute is introduced before it can fully compete in terms of quality, or before the people who will use it have the knowledge and skills to do so properly, it may never recover from a negative image based on early experience. In the Netherlands, the real problem turned out to be not the paint itself, but the way it was applied.”

The new Dutch legislation will come into force in 2000, and a very large programme of training – organised and funded by the painting sector employers and trade unions, with support from the government – is now in progress. The social partners are almost always important players, but both may have vested interests in maintaining the status quo, according to Le Blansch. Environmental groups, consumer organisations and academics often play a key catalytic role.



Application of water-based paint is demonstrated to members of the trade.

But legislation – either national or European – remains the surest guarantee that hazardous substances will be phased out rapidly and with minimal disruption of the market. “Legislation simplifies everything,” he says. “Manufacturers know what they must do. Confusion among end-users is avoided. And employers’ organisations and trade unions can help their members to adjust, in the confidence that early substitution involves no risk of economic disadvantage.” ●

Contact

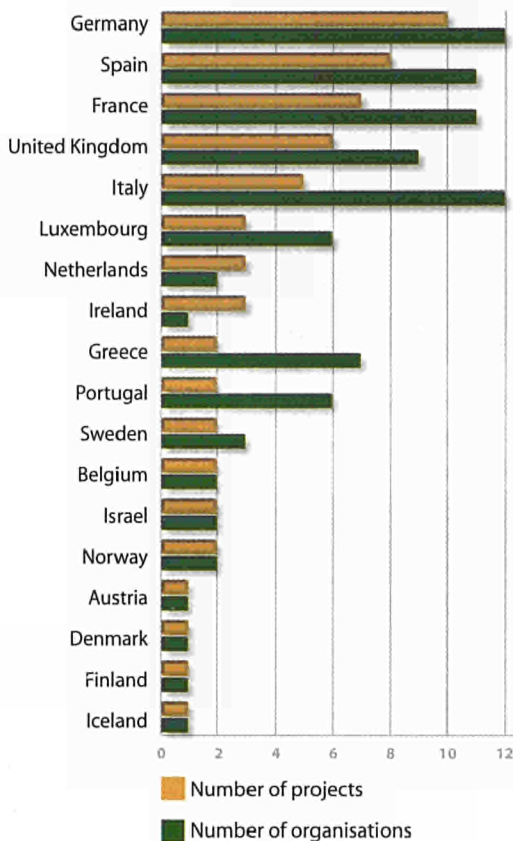
K. Le Blansch, B&A Group
 Tl. +31 70 302 9574
 Fx. +31 70 302 9501
 E-m. sphere+@bagroep.nl
<http://www.bagroep.nl/sphere>

Managing to Fu Technolo

In today's fast-changing world, survival depends on the active management of technological change. Lack of appropriate skills and systems, especially among smaller companies, impedes the exploitation of new technologies.



Figure 1: IMT projects and contractors, by country



(1) For further examples, see editions 5/98, 1/98, 5/97 and 4/97.

(2) AAMM 028

(3) The Third ACCESS Conference on IMTs, London, 19-20 November, organised by PERA Consulting.

(4) Integrated Design Expertise Applied to SMEs, PRO 04/77

L launched in 1995, the Innovation programme's action line Promotion of Innovation Management Techniques has given much-needed impetus to European efforts to fill this worrying gap.

A number of Innovation Management Techniques (IMTs), devised by academics and applied in multi-national companies, were already well known. A few, such as Total Quality Management (TQM), were being promoted to the wider business community. But most remained unknown to the majority of small and medium-sized enterprises (SMEs), and unsuited to their needs.

New, technology-based companies hold the key to innovation in Europe – and make a contribution to economic and employment growth disproportionate to their size and number. But few can afford the time to master complex management techniques, or the

money to pay external consultants to adapt them specially.

Make it Simple

Unlike larger firms, SMEs' business processes are flexible, and their lines of communication short. What they need is straightforward methods which will help them to foresee their technological needs, to identify and implement appropriate solutions, and to market the resulting product innovations.

To be useful to a small company, an IMT must make limited demands on managerial time, must be easy to explain to company staff, and must rapidly produce demonstrable benefits. Ideally, its introduction should be supported, relatively cheaply, by a well-trained consultant, experienced in working with SMEs and with a good grasp of the technological area concerned.

Developing Regional Capacity

Innovation agents and consultants play a vital role in introducing IMTs – both to researchers and technology suppliers, and to technology users.

The Innovation programme has supported 23 two-year projects⁽¹⁾, each designed to promote the application of IMTs in SMEs by building national or regional capacity to deliver innovation management support, through subsidised pilot schemes. It has also supported six projects aimed at stimulating the transnational exchange of good practice between innovation agencies and consultants in different regions.

"Each of the 23 promotional projects

started by identifying and, in some cases, adapting tools suited to its target client group," explains José-Ramon Tiscar of the Innovation programme. "They selected and trained a group of consultants, and established performance standards against which delivery of the IMTs could be measured."

The projects are now in the process of carrying out a limited number of short innovation consultancy assignments in SMEs. These 'live' assignments provide an opportunity to test

Ifil Europe's gical Potential

both the tools and the recruitment, delivery and evaluation systems employed by the project promoters. "Our hope is that this will enable them to develop a market offering which can be continued and replicated without further EC support after the end of the project," says Tiscar, "either on a fully commercial basis or with support from regional funds."

By March 1999, over 900 SMEs will have benefited directly from the pilot assignments. Perhaps more importantly, more than 300 consultants will have received formal training, and the 90 organisations involved as contractors – few of which had previously designed or run IMT schemes – will have gained practical experience, in addition to the skills, tools and contacts developed during their projects.

Open for Business

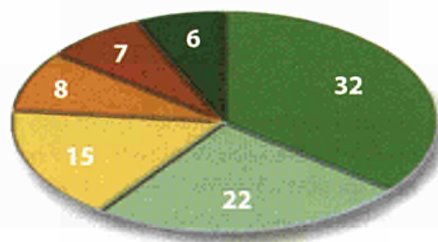
Last November, one of the transnational projects – Access⁽²⁾ – organised a major dissemination event in London⁽³⁾, giving the growing community of IMT practitioners an opportunity to review the work of the past two years. "We have made real progress, right across Europe," Tiscar told delegates, while making clear his personal belief that continued efforts at EU level remained necessary.

Other conference speakers highlighted the increasingly critical role of effective innovation management. "Small companies have to make the space for reflection and planning," said John Bessant of Centrim, a partner in the Temaguide project (see Read . . . Learn . . . Innovate). "The real challenge is to bring IMTs to the average SME. They find it extremely difficult to innovate – but must do so if they are to survive. Companies which are closed to innovation will soon be closed forever. They have to learn to think more strategically. They have to learn new ways of communicating and working. They have to learn to manage innovation. The function of IMTs is to facilitate learning."

Great IDEAS

Presenting the results of the IDEAS⁽⁴⁾ project, Declan Lyons of Enterprise Ireland also stressed the importance of company learning.

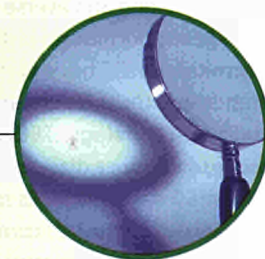
Figure 2: IMT contractors, by type



- National and regional bodies promoting innovation
- Research and technology centres
- Universities and business schools
- Design centres
- Other
- Consultancy companies dealing with innovation

CONTEXT

What Are IMTs?



Innovation is not an event – it's a process. It consists not just of invention, but of seeing invention through to market deployment. It involves not only the one-off installation of new plant, but the continuous management of technological capacity in order to meet current and future customer needs.

Innovation requires change, and people find change difficult. Innovation Management Techniques (IMTs) offer methods and tools for managing different aspects of this change. The specific areas covered include:

- diagnostics – assessment of technological and innovative capacities and failings
- project management and development – a rational, step-by-step approach to the investment of resources in premises, plant, research or marketing
- technology watch and IPR management – monitoring and management of the technological gap between the company and its competitors
- Total Quality Management (TQM) – company-wide deployment of resources in pursuit of quality

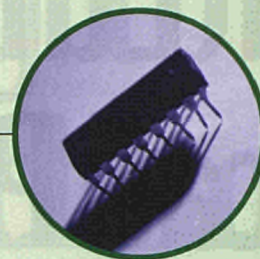
- benchmarking – comparative assessment of key performance indicators against defined standards for the sector
- the marketing of innovation – orientation of product innovation towards the needs of defined customer groups
- business process re-engineering – radical realignment of physical and administrative structures with processes rather than functions
- product design and development – integration of considerations of manufacturability, cost, quality and marketability at the design stage
- creativity tools – mobilisation of the innovative capabilities of all personnel
- value analysis – cost reduction through a focus on customer perception

Many such tools were originally developed for large companies. To be useful to SMEs, IMTs must be simplified, in order to produce rapid results. Wherever possible, they should be suitable for use by the company itself – though initial training and support from specialist consultants is usually necessary.

CASE STUDY

Technology Alone Is Not Enough

In Portugal, an Innovation Management Techniques project has served as the pilot for a national innovation support scheme.



"Portugal's innovation system is at an early stage of development," says Catarina Selada of the Instituto Tecnológico para a Europa Comunitária (ITEC), in Lisbon. "The company data needed to shape effective sectoral or regional initiatives is unavailable, while companies themselves tend to be small, inward-looking and averse to innovation."

With support from Irish and Dutch consultants, ITEC has developed a comprehensive technology and innovation audit methodology, TEC+, which it is using to conduct diagnostic consultancies in 50 selected SMEs in the rapidly growing automotive component and plastic mould manufacturing sectors.

The project⁽¹⁾ has three aims – to stimulate improvement in the competitiveness of the audited companies, to gain better understanding of the innovation support needs of key industrial sectors, and to test the TEC+ methodology as a tool for intervention by Portugal's national network of innovation agencies.

Five Dimensions

The methodology examines the five 'critical dimensions' of innovation capacity – general characteristics such as size, market and products; technologies currently employed; resources, skills and systems for technology management; company structure and strategies; and interaction with the external environment. Each dimension is analysed in detail, and assessed using specially developed indicators – scored on a scale of 1-5 against simple qualitative statements.

"The output from this process forms the basis of an action plan containing specific recommendations," Selada explains. "But

in future the methodology could also be used – by the company itself or by business support agencies – to benchmark its innovation capabilities against other firms in its sector."

João de Deus & Filhos, a leading Portuguese automotive component manufacturer specialising in the design and

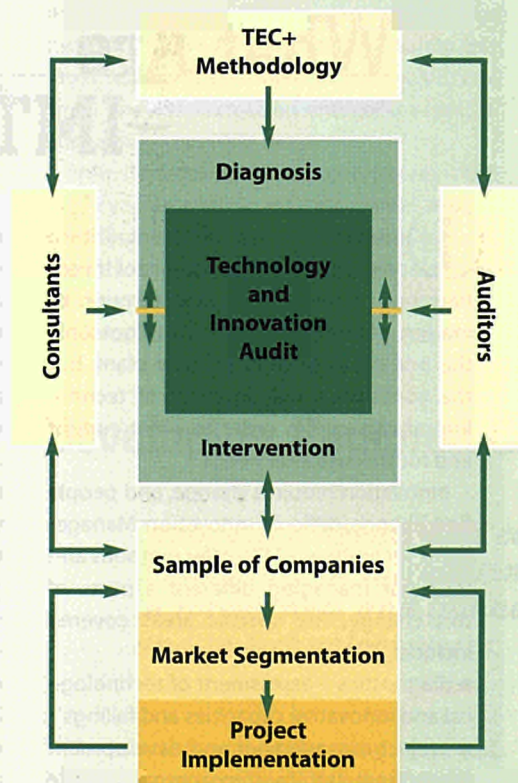
final workshop, with a view to launching concrete projects to address the problems identified."

National Programme

In João de Deus's case, these problems are likely to be relatively minor – the company's R&D spending is well above the average in Portugal, and it recently appointed a specialist to manage its developing technology needs.

The overall picture painted by the TEC+ audits is less positive, however. "Companies in both the sectors we looked at are using competitive technologies," says Selada. "But they are failing to maintain and exploit this advantage fully. They tend to focus on the production function, at the expense of elements such as product development, marketing and distribution."

For Portugal's innovation policy, this kind of information is vital, enabling support to be concentrated where it is most needed. ITEC has submitted to the Ministry of Economy proposals for a national programme of technology audits, in which it hopes to train 60 consultants, and to carry out 150 audits in a range of key sectors, over the next two years.



production of car radiators, participated with enthusiasm. "The members of the product development department worked closely with the audit team at each stage," Selada recalls. "They will jointly present the recommendations at a

(1) PRO 036

Contact

C. Selada, ITEC
 Tel. +351 1 711 6000
 Fax. +351 1 716 6008
 E-m. cselada@itec.pt

The project's consultants helped a cluster of ten Irish companies to apply a product and process development audit and implementation technique. The results were impressive – one company reduced its product costs by 30%. But Lyons played down the significance of such one-off step changes. "IMTs are of real value only when they change the way a company operates," he said. "The greatest lasting benefit to the SMEs has been the creation of cross-functional teams."

The pilot companies paid only 25% of the real cost of the consultancy. "Now they have seen the bottom line benefits, they would pay the full cost of continuing support," says Lyons. "The question is, how to introduce the service to other companies." The case studies generated by the IMT project will help Enterprise Ireland to market the scheme, which Lyons hopes it will continue to subsidise from its own resources, perhaps asking companies to pay 50% of the real costs.

Innovation Management – the Future

The tools, the skills to deliver them, and the schemes to market them – in all three areas, the exchange of regional experience remains essential.

At least six of the IMT projects, including TEC+ (see Technology Alone Is Not Enough), have already succeeded in persuading national or regional agencies to fund follow-up programmes. It is clear that the on-going exchange of experience between Member States will be a significant factor in the establishment of similar programmes in other regions. Agencies and individual practitioners can learn from one another, both about specific tools and techniques and about schemes for their delivery to SMEs. But policy-makers, too, find the successes of other regions extremely persuasive.

The Access project itself has done much to establish channels for such interchange. Its series of seminars and conferences – of which the London event was the last – has created a cohesive network of European innovation management professionals. The Access website (see Contact) will continue to serve as the primary source of information related to all the EC-funded IMT projects and events, at least until the end of 1999. And the project is currently completing the classification of IMTs used in its ten partner countries, as a first step towards the standardisation of their application – vital for the rapid spread of good practice to new practitioners and new regions.

Clear Need

IWT, the Flemish Institute for the Promotion of Scientific-Technological Research in Industry, is one of the Access partners. "Our region has little experience of large-scale IMT programmes," says Alain Deleener, Senior Scientific Adviser at IWT. "The need among Flemish SMEs is clear, but they have

to be convinced of its value. To sell the service effectively, we need regional success stories."

Under an earlier EC project, IWT stimulated the use of one tool in 30 SMEs, and Technology Innovation Flanders (TIV) is currently delivering a series of technology watch and ideas generation consultancies. Participation in the Access project also allows IWT to gain experience indirectly, by monitoring the success of schemes in other regions.

"Consultants in different parts of Europe have developed a wide variety of tools," Deleener says. "Now the time has come to identify and apply the most successful of them." IWT hopes to be in a position soon to recommend the launch of a regional programme in Flanders, but in any case expects to start using selected IMTs in its own day-to-day work, speeding their adoption in the region by training external consultants.

Spread the News

Wolfgang Gessner of the Innovation Relay Centre (IRC) North Germany believes that the IRC network may provide a vehicle for the future diffusion of IMTs. "Many IRC host organisations have participated in IMT projects," he pointed out at the Access conference, "and several of the tools address topics which form part of their normal work with SMEs. And IRCs have good links to regional networks of companies and consultants."

But IMTs are of value not just to companies. Research institutes can also benefit, as the Commission itself is demonstrating. Its Joint Research Centre is running a 6-month programme of entrepreneurship training for its



Delegates at the Third Access Conference on Innovation Management Techniques.

scientists and engineers, and innovation management forms a fundamental part of the curriculum.

IMTs are winning acceptance as a key element in the development of a European culture of innovation. But Mr Tiscar believes that efforts to stimulate their use are still needed at EU level. "The Fifth Research Framework Programme represents a significant modification of the European Union's research strategy, in favour of more innovation-oriented goals," he says. "Research itself is necessary, but not sufficient, for innovation – for example, a better grasp of industrial design, and of the marketing of innovation, are also needed.

"The smooth progress of new technologies from the research laboratory to the marketplace depends crucially on the innovative capacity of Europe's SMEs. But that capacity in turn depends on the climate for innovation established by public bodies. There is still scope for the cross-border diffusion of good practice to add value to regional initiatives."

Contact

- J-R. Tiscar, European Commission, DG XIII/D-4
Fx. +352 4301 32100
E-m. jose.tiscar@lux.dg13.cec.be
<http://www.cordis.lu/imt/home.html>
- Access: T. Heimer, VDI/VDE-IT
Tel. +49 3328 435 255
Fx. +49 3328 435 216
E-m. heimer@vdi-vde-it.de
<http://www.iwt.be/imt/>

CASE STUDY

Working Knowledge

In the Netherlands, four different tools are being tested – each adaptable to the needs of individual companies.

"Small and medium-sized enterprises are focused on their own business problems and opportunities," says Jan Willem Bot of Syntens, a publicly-funded innovation and business support agency with 350 consultants based in 15 offices across the Netherlands. "Their interest in the theory of knowledge management is zero."

Bot is responsible for the development and pilot delivery of the Knowledge Analysis Method (KAM) – one of four Innovation Management Techniques which Syntens is testing in the IMT-NL project⁽¹⁾. In line with the highly practical orientation of Syntens' client companies, it is simple, direct and quick – and is delivered at nominal cost.

Designed to mobilise the accumulated experience of the SME's senior personnel, KAM relies not on complex analytical methods but on the skills of the consultant. The client is guided through a clearly structured three-stage process, designed to identify and prioritise bottlenecks in the company's acquisition and use of the knowledge required for competitiveness in its chosen markets. The process leads to the development of a straightforward action plan for the elimination of major bottlenecks.

Bottom-Up

The 'bottom-up' approach adopted by KAM characterises Syntens' work, according to Dr Emile Louzada. "We always try to start from the needs of the company," he says. "IMTs, of course, address strategic rather than immediate needs, which is why we offer KAM as a low-cost service. In our experience, SMEs are unwilling to make more than a token contribution to the costs of consultancy, unless it promises an immediate return."

Louzada views IMT-NL not primarily as a programme of business support, however, but as an opportunity for the development of Syntens' own products and meth-

ods. "We are only carrying out 24 pilot assignments," he says. "We chose to develop, adapt and test a variety of tools, as a way of improving and demonstrating our capacity to deliver Innovation Management Techniques."

The training of a core group of in-house and external consultants forms an important part of the project. And when the pilot assignments are completed, the experience will be assessed as the basis for dissemination of the results – both among Syntens' network of practitioners, and to the bodies which fund its work.

"It is still too early to tell which of the four IMTs will be most useful as standard innovation support tools," Louzada says. "But we have already rolled out KAM nationally, using training methods developed in the EC project. The Technology Calendar method, adapted for SMEs from a tool developed by the Fraunhofer Institute for Production Technology, also looks promising. This helps companies to plan the introduction of new technologies in a systematic way."

Whatever the results of the final assessment, Louzada looks forward to presenting them to the Netherlands' Ministry of Economic Affairs and others. "We will certainly seek support for the further development and more widespread application of IMTs," he says. "This could take the form of a specific programme for the delivery of one or more IMTs, possibly targeting companies of a particular size, or in a particular sector."

(1) PRO 076

Contact

E. Louzada, Syntens
Tl. +31 70 356 76 76
Fx. +31 70 356 76 99
E-m. egl@syntens.nl

PUBLICATIONS



A professionally designed multimedia CD-ROM is an excellent means of presenting an Innovation Management Technique, especially if it includes examples of its application in real companies.

Read . . . Learn . . . Innovate

The Innovation programme's Innovation Management Techniques action line set out to promote the exchange of well-developed tools between innovation support specialists, and their dissemination to the SME community itself. The action line and several of its component projects have already produced publications which do much to support these aims.

1. Innovation Management Techniques in Operation – Building Competitive Skills in SMEs; 140 page book (English)

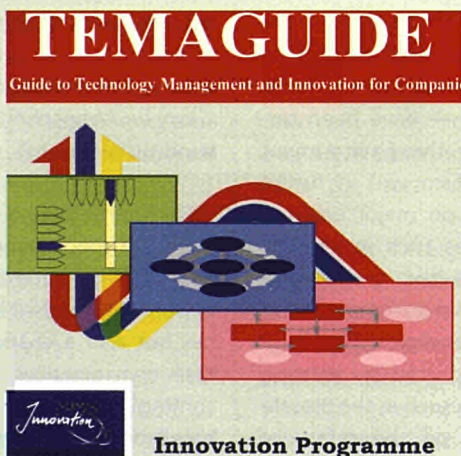
This book presents ten proven and well-developed IMTs of broad application, selected from among those promoted at national level by the 23 Innovation programme projects. Aimed at consultants and other intermediaries as well as at SME managers, it does not attempt to provide all the information needed to apply the techniques described. Instead, it offers a valuable overview of tools whose effectiveness in helping SMEs to improve their competitiveness has been clearly demonstrated. Contact details and a brief description is supplied for each of the 23 projects themselves, from which further information on specific techniques is available.

2. Integrating Design into R&D; 97 page booklet (English)

Does integrating design into the research and development of new products from the outset make it more likely that the commercial exploitation of this effort will be successful? The answer given in this report, based on a specially commissioned study, is an emphatic 'Yes'. The authors found that in Europe design-R&D linkages tend to be weak, particularly in SMEs. They describe the barriers to improved integration, and key mechanisms for overcoming them, supported by detailed case studies of companies which have 'got it right'.

3. Temaguide – A Guide to Technology Management and Innovation for Companies; 168 page book, and CD-ROM (English)

This publication, principally directed towards more experienced technology managers and technologists, presents a clear model of innovation in business, a set of tools to assist in specific technology management activities, and detailed case studies illustrating problems, needs and solutions in typical companies. The Temaguide model – based on a cycle of scanning, focusing, resourcing, implementing and learning – is designed to be applied either systematically, in anticipation of future requirements, or in a flexible and responsive way to meet new and urgent requirements.



TIPPS

Transnational Innovation Pilot Programme



An Approach to
Continuous Innovation

4. TIPPS – An Approach to Continuous Innovation; 59 page booklet, and CD-ROM (English)

The TIPPS project has tested its method in 60 SMEs in Ireland, the United Kingdom, Greece and Spain. Using simple language and straightforward questionnaires, it leads the SME through a six-stage consultant-assisted process, designed to produce an easily implemented action plan, and to leave the company with the skills "to manage change, rather than to fear it", without further support. The booklet contains all the necessary materials, while the CD-ROM contains an attractive multimedia presentation of what is involved, and of the kind of results that can be expected.

Contact

- 1. and 2.: J-R. Tiscar, European Commission, DG XIII/D-4
Fx. +352 4301 32100
E-m. jose.tiscar@lux.dg13.cec.be
- 3.: M. Zahera, COTEC
Tl. +34 91 559 0881
Fx. +34 91 559 3674
E-m. manuel.zahera@cotec.es
- 4.: R. McSherry, Enterprise Ireland
Tl. +353 1 808 2525
Fx. +353 1 837 9338
E-m. mcsherry@forbairt.ie

FP5 — First Calls Likely mid-March

On 17 November, the Conciliation Committee of the Council of Ministers and the European Parliament reached agreement on the budget for the Fifth Research Framework Programme (FP5) for the period 1999-2002. A global research budget of €14,960 million has been agreed, representing an absolute increase of 4.61% compared with that of FP4. Council and Parliament had six weeks to confirm the agreement definitively but, assuming no further hitches, publication of the first calls for proposals could be expected in February or March, according to DG XII (research).

FP5, structured around four thematic and three horizontal programmes, has been designed to focus resources on a limited number of priority objectives, selected in the light of Europe's social and economic needs. The aim is to achieve critical mass in areas in which national efforts alone are insufficient.

Key research players will be closely involved in the management of FP5 through the European Research Forum (ERF) — which replaces the two previous consultative bodies IRDAC and ESTA⁽¹⁾ — and through 17 External Advisory Groups (EAGs), each of which will be attached to one or more of the 22 key actions. Increased SME participation in the research effort is also planned, with 10% of the budgets of the specific programmes devoted to SMEs.

(1) The Industrial Research and Development Committee, and the European Science and Technology Assembly.

S. Gosden,
DG XII Communication Unit
Fx. +32 2 295 82 20
stephen.gosden@dg12.cec.be
<http://www.cordis.lu/fifth>

New Institute for Health and Consumer Protection

The European Commission has introduced a series of significant changes to the structure and management of its Joint Research Centre (JRC).

The JRC serves the European Union as an independent reference centre in the fields of science and technology. The changes will have a direct impact on the content and coherence of its activities. They will improve its ability to provide scientific and technical support to European political decision makers, and allow better co-ordination of the activities of its various institutes.

In response to a long-term need, the Commission has established the Institute for Health and Consumer Protection (IHCP) within the JRC. To date, activities in this field — the evaluation of risks caused by dangerous chemical products, for example — have been carried out by the Environment Institute, which will in future concentrate on major environmental issues such as climatic change and the greenhouse effect, water management, and renewable energies. The IHCP will be supported by existing JRC activities such as the Biosafe programme on the safety of biotechnology products.

The Institute of Advanced Materials, which was previously managed partly in Italy and partly in the Netherlands, will in future conform to the rule of 'one institute, one site'. A management unit has been established within each of the JRC's Institutes, in order to increase their autonomy and improve their responsiveness to the research needs of other Directorates-General of the Commission.

JRC: F. Dezeure
Fx. +32 2 295 35 65
E-m. freddy.dezeure@cec.be
<http://www.jrc.org/>

Joint Research Centre Secondment Programme

The JRC is inviting applications from industrial scientists and staff from other research bodies to work within its institutes on specific scientific projects, for limited periods. Several of the JRC's most highly respected research groups will be opened in this way under the programme, which has the overall aim of accelerating the flow into industrial application of technologies and know-how developed by the JRC.

Seventeen areas of work are opened in the programme, including:

- European Microwave Signature Laboratory
- Centre for Reference Materials and Chemical Reference Measurements
- Technology Watch
- Beam Tubes of the High Flux Reactor
- European Reference Laboratory for Atmospheric Pollution
- Industrial Hazards

For participating organisations, the programme will offer not only a superb training opportunity for their key personnel, but also a chance to align their own practices with forthcoming regulatory changes based on the JRC's work, at an early stage. By agreement, transfer of intellectual property rights from the JRC to the secondment partner can be included in the arrangement.

JRC: F. Dezeure
Fx. +32 2 295 35 65
E-m. freddy.dezeure@cec.be
<http://www.jrc.org/>

Improved Co-ordination of Europe's Industrial Research

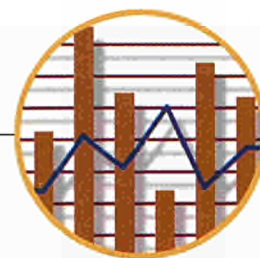
A two-stranded strategy has been adopted to improve the co-ordination of industrial research carried out under the Eureka research co-operation initiative and the EU's Fifth Research Framework Programme (FP5).

The first strand, which responds to the growing scarcity of major, strategic projects in the Eureka portfolio, involves new guidelines designed to make the launch of strategic cluster projects easier and faster. They allow a project to be launched as soon as it has political backing, but give the participants a year to finalise details, define sub-projects and find funding from industry and public agencies.

The second strand, developed by the EU-Eureka Joint Working Group (JWG), aims to promote co-ordination between Eureka and FP5. The JWG has drawn up a list of Eureka projects, either ongoing or under preparation, to which FP5 could contribute. A series of workshops will enable industrialists, national Eureka funding agencies and EU programme managers to discuss major projects which could be jointly financed. The overall aim is to ensure a closer integration of industrial needs and public funding priorities, and to help industry to target sub-projects more precisely at the different national and European funding agencies.

Eureka Secretariat
Tl. +32 2 770 0950
Fx. +32 2 770 7495
E-m. eureka.secretariat@es.eureka.be
<http://www.eureka.be/>

Larger Slices of PIE for Local Industry



Across all industrial sectors, more and more businesses depend on software, either as a component of their products or to support essential business processes. Efficient software development is already vital to competitiveness, and its importance will continue to grow.

Since 1993, the European Commission's ESSI programme – the European Systems and Software Initiative – has supported 500 projects designed to improve the quality and cost-effectiveness of the software development process, by speeding up the spread of the skills and technologies on which best practice relies.

In particular, nearly 400 Process Improvement Experiments (PIEs) have been conducted. Here, an individual company – typically, a small software house – introduces an established procedure or technology for the first time, under controlled test conditions and within the context of a real software project. The experience is intended to benefit not just the company itself but also the wider European software development community, to whom the results of the experiments are disseminated.

Expert Co-ordination

May 1998 saw the launch of 18 ESSI PIE Nodes, or Espinodes, with a two-year remit to support regional clusters of active PIEs. "Because the scheme is targeted at SMEs, the administrative overhead of running a project has deliberately been minimised. But many small companies still find the proposal writing, monitoring and reporting a real problem," says Bernhard Kölmel of Forschungszentrum Informatik Karlsruhe (FZI), which runs the Improve Espinode, covering southern Germany and Austria.

"The additional project management support offered by the Espinodes will make a real difference to the performance of the PIEs, and to the empirical measurement of their results. We believe this to be the key to the improved industrial take-up of the advanced technologies and methods concerned – both regionally and across Europe."

Like the other Espinode hosts, FZI is itself a leading exponent of software best practice, with its own state-of-the-art software engineering department, and has a clear grasp of the software process improvement (SPI) needs of industry in its region. Unlike other host organisations, however, FZI has already performed a PIE support function for over five years.

"We have provided technical and administrative support to regional PIEs since ESSI started in 1993," Kölmel explains, "and before that, to a group of similar projects funded under a national programme." The experience has enabled the Improve Espinode to get off to a flying start.

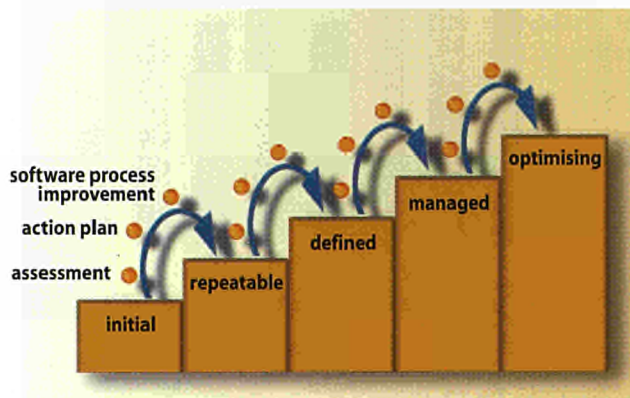
Added Value

The role of the Espinodes is much broader than simply to help individual PIEs directly, though this remains a key function. They also attempt to broker the exchange of experience among their own PIEs, and between these and PIEs in other regions, in order to realise synergies, and to avoid reinvention of the wheel. Lastly, they promote

links with other companies in their areas which might benefit from the technologies concerned.

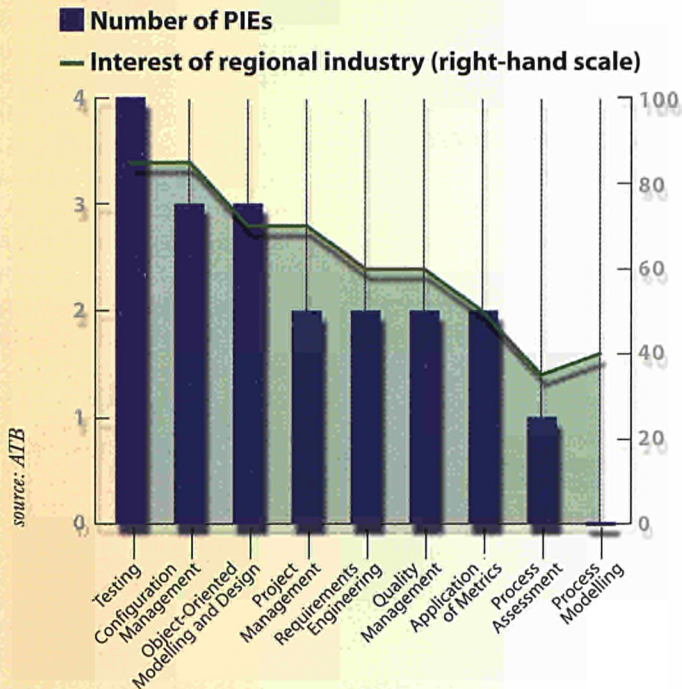
"Our first six Espinode seminars attracted nearly 500 companies," says Kölmel with pride. "We try to make it easier for them to attend by running the events in the evening. We tempt them by including hot topics like Java, as well as SPI, and we make sure they have an opportunity for informal discussion over wine after the presentations are finished."

The firms which have already expressed a concrete interest in making use of the PIE experience include both small software engineers and some of the largest companies in the region. "One very big company with its own in-house software department is trying to improve the co-ordination of the development process," says Kölmel. "It has been having trouble introducing new procedures, and now wants to use the example of some of



The Software Capability Maturity Model describes five stages in the maturity of software process management. The Improve Espinode helps companies to follow an evolutionary path from ad hoc (initial) to mature, disciplined (managed or optimising) software development processes.

PIEs and industrial interest in SPI in north Germany



Spi-Node-Ng found a close correlation between the topics addressed by PIEs in north Germany and the interests of regional industry.

the PIEs to push through the necessary change. The small software houses, on the other hand, are more interested in specific technologies which they would like to adopt themselves."

Strong Correlation

Further north, the Spi-Node-Ng – run by Bremen's Institute for Applied System Technology (ATB) – has also had early success in securing the active participation of local industry. "We surveyed more than a thousand companies to determine which aspects of SPI were of most interest to them," says Dragan Stokic of ATB. "To our delight, we found a good match with the range of topics covered by the seven PIEs attached to our node."

Top of the list was software testing – the subject of three of the northern German PIEs. "All three are trying out new procedures designed to cut the time required for testing, while at the same time maintaining or

improving code quality," Stokic explains. "One aims to reduce software errors by 50%. Other companies, including a number of manufacturers, will be following their progress very closely, and we are optimistic about the local take-up of successful results."

The PIEs themselves are working together enthusiastically. "They were quick to recognise how much they could gain from one another," says Stokic's colleague Uwe Kirchhoff. "All three are involved in business software, and would have been reluctant to exchange product development information. But PIEs are concerned with the development process rather than the software itself, so there is no direct competition – just a very strong shared interest."

FZI's Improve node has a similar cluster of PIEs – in this case, addressing configuration management topics. "As much as anything, it is a question of attitude," says Kölmel. "Their approach is very open. They are not trying to invent everything themselves, and have embraced the opportunities offered by the Espinode to learn from one another's experience, and from ours."

Impact Measurement

Both host organisations agree that the measurement of PIE results needs to be improved. "It is a question of costs and benefits," says Stokic. "Small companies in particular worry about the costs of software development. That slows down the adoption of advanced tools. We

have to be able to show clearly which tools are suited to which applications, and what the business impacts of their use are likely to be."

"Especially in SMEs, SPI is driven by management," adds Kirchhoff. "Our experience, over a number of years, is that in order to stimulate the take-up of advanced methods and tools you need to be able to demonstrate the potential for real financial benefits."

FZI is working closely with Socintec, which runs the Spanish Espinode, to develop a new impact measurement methodology. "It is extremely difficult to evaluate the success of a particular process improvement," says Kölmel. "Even in the United States, where SPI started more than a decade ago, there is almost no empirical data. But you cannot expect business managers and software engineers to do SPI unless you provide convincing evidence of its technological effectiveness and time-cost efficiency. Case studies are important, but you also need empirical results." ●

Contact

- **Espinode:** J. Bacquet, DG XIII
Fx. +322 296 83 64
E-m. joel.bacquet@cec.be
<http://www.cordis.lu/esprit/src/stessi.htm>
- **Improve:** B. Kölmel, FZI
Tl. +49 721 9654 864
Fx. +49 721 9654 609
E-m. improve@fzi.de
<http://improve.fzi.de>
- **Spi-Node-Ng:** D. Stokic, ATB
Tl. +49 421 220 9240
E-m. dragan@atb-bremen.de
<http://www.atb-bremen.de>

Spotlight on European Research

ISBN 92-828-2588-4; €15

Available in English, French, German, Spanish and Italian, this new Innovation programme publication contains illustrated two-page articles about 50 research projects. The articles, selected from those published recently by the VIPs scientific press service, present interesting examples of recent research conducted under the Brite-Euram, Biotech, Joule and Innovation programmes, among others.

VIPS, designed primarily as an aid to science journalists, is available on-line via the CORDIS homepage (<http://www.cordis.lu>).



Clarification – EPO Interactive Training Package

An announcement, in edition 4/98, of the European Patent Office's CD-ROM interactive training package gave some readers the impression that the package was free. In fact, the price is 450 Deutschmarks.

Contact:
C. Oenhausen, EPO
Tl. +43 1 52126 251
Fx. +43 1 52126 2492
E-m. oenhausen@epo.e-mail.com

Content and Commerce-Driven Strategies in Global Networking

Main report – €70; CD-ROM – €40; both – €80

Electronic commerce is creating both huge opportunities and enormous threats for European industry, this report concludes. By 2002, it predicts, over 80 million Europeans will be regular network users, and transactions worth 5% of EU GDP will be conducted via electronic networks. Both businesses and governments need to act quickly if they are to meet the challenges of the network revolution.

This study, also referred to by the acronym Condrinet, was funded under the INFO2000 programme and carried out by the Gemini Consulting Group. It analyses the transformation of European and world markets into 'network economies'. Concentrating on the role of content in driving forward the development of the electronic marketplace, the study offers strategic recommendations for the multimedia content industry, and for EU policy actions on content, for the period 1998-2003.

An executive summary is available free of charge, or may be downloaded from the Condrinet website.

Contact:
INFO2000 Central Support Team
Fx. +352 401 162 234
E-m. info200@echo.lu
<http://www.echo.lu/condrinet>

Freshwater: A Challenge for Research and Innovation

EUR 18098 EN

The effective management of Europe's water resources is essential for its agriculture and industry, and for the health and quality of life of its citizens. 'Sustainable management and quality of water' will form the first key action of the Thematic Programme Preserving the Ecosystem under the forthcoming Fifth Research Framework Programme, with a substantial budget.

This short document, based on the work of the Task Force on Environment-Water since its establishment in 1996, sets out the priorities for research and innovation in the area of freshwater management and use under ten principal action lines. The document has contributed to the definition of the key action, and will provide a clear and transparent reference point for researchers interested in contributing to it.

Contact:
B. Schmitz, DG XII
Fx. +32 2 296 31 93
E-m. bruno.schmitz@dg12.cec.be

Digital Communications – export opportunities for European companies

This report, only available electronically, presents the results of a recent survey on export opportunities in European digital communications. It gives a detailed overview of the world-wide introduction and deployment of European digital mobile technologies and services – the cordless and wireless loop, cellular telephony and paging – and assesses further opportunities and constraints for their export, focusing in particular on the next generation of digital mobile systems. It concludes that continued support for technology and standardisation research is required, in order to reproduce the successful introduction of GSM in the early 1990s.

Contact:
<http://www.ispo.cec.be/infosoc/telecompolicy/en/Study-en.htm>

1998 Status Report on European Telework

EUR 18098 EN

The European Commission's annual report provides an overview of telework activities under the Fourth Research Framework Programme (FP4). Those supported through the EU's Structural Fund programmes Leader and Adapt are also covered, and the report notes that during 1998, the volume of funds from these sources exceeded that from FP4 for the first time. Progress on the implementation of the TEN-Telecom guidelines for trans-European telecommunications networks is also dealt with in the report.

Individual country reports on the status of telework cover all the EU Member States, while a brief overview of the situation in the countries of Central and Eastern Europe, and the USA, is also provided. A final section examines the outlook for telework, focusing in particular on FP5.

Contact:
ACTS Central Office
Fx. +32 2 295 06 54
E-m. aco@bxl.dg13.cec.be
<http://www.eto.org.uk/twork/tw98/index.htm>

Launching the Fifth RTD Framework Programme

25-26 February, Essen (Germany)

The launch conference for the Fifth Research Framework Programme (FP5), which will cover all the research, technological development and demonstration activities of the European Union for the period 1999-2002, is aimed at current and potential research project co-ordinators, and decision makers from science and industry.

FP5 is unique in providing a medium-term strategic planning horizon for European research. In order to meet the challenges of the transition to a 'knowledge-based society', it will differ from its predecessors both in content and operation. The intention is to move away from research for its own sake, and towards research focusing on current socio-economic problems – that is, research with the potential to accomplish the changes expected by the general public.

The conference will have six main elements:

- explanation of the research programmes of FP5, highlighting new features
- presentation of the services and expertise of the Joint Research Centre
- workshops on participation (for example, 'How to submit a proposal')
- presentations of particularly successful research projects
- exhibition of research programmes and projects, enabling delegates to meet current participants, potential partners, and Commission officials
- a cyber-café and electronic bulletin board system allowing delegates to make contacts and look for partners

Until 29 January 1999, the registration fee is €100. After that date, it increases to €125.

Contact:

European Commission, Joint Interpreting and Conference Service
Fx. +32 2 295 37 36 or +32 2 296 49 92
E-m. 5pc.essen@scic.cec.be
A full programme, and the registration form, can be downloaded from:
<http://europa.eu.int/comm/dg12/fp5/conference.html>

European Internet Fiesta

19-21 March

Co-ordinated by the European Commission's Information Society Project Office (ISPO), the fiesta aims to involve a wide range of people in a display of the best of Europe's Information Society and Internet ideas. Contributions are welcomed from all sectors and age groups. Examples of last year's activities

include an Internet demonstration by children for grandparents, an explanation of the Internet to local government officials, and discussions on the impact of the Internet on society.

Contact:

E-m. info@internet-fiesta.org
<http://www.internet-fiesta.org/>

Note

Publications are free unless otherwise stated. If specific contact information for obtaining a publication is not supplied, and there is a price listed in euros, then the publication can be purchased from the sales and subscription office in your country of the Office for Official Publications of the European Communities (Eur-OP). Addresses can be found in most EC publications, on the WWW (<http://eur-op.eu.int/en/general/s-ad.htm>) and by contacting Eur-Op (fax: +352 2929 42759).

COORDINATION '99: Coordination models and languages

26-28 April, Amsterdam (The Netherlands)

The third international conference organised by the Esprit Coordination project will provide a forum for researchers interested in theoretical models, languages, and implementation techniques for co-ordination.

Research has focused on problems with software systems which have been developed over a long period of time, and have become difficult to understand and maintain. It aims to find software solutions for making large applications manageable by providing a clean separation between individual software components and their interaction within the overall software organisation – making large applications more tractable, supporting global analysis and enhancing the reuse of software.

Contact:

P. Ciancarini, Universita di Bologna
E-m. coord99@cs.unibo.it
<http://www.cs.unibo.it/~coord99/>

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