Innovation & Technology Transfer

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Stockholm Summit

Knowledge – the Only Frontier

Plus

- Dossier - incubator financing
- Innovation and job creation
- Software patentability
- New action helps SMEs to participate in EU research

... and more

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CONTENTS

Employment – Is Innovation the Key?

In the longer term – outside the fluctuations of the economic cycle – the answer is undoubtedly yes. By bringing entirely new markets and new industries into existence, innovation has been responsible for the steady growth in employment experienced by Europe and other regions over the past 100 years.

At smaller scales, however – within individual firms, or over periods of less than ten years in specific countries or sectors – the answer is not so clear. New technologies may lead to the loss or displacement of jobs, before they create new ones. And an increase in the knowledge content of jobs reduces demand for unskilled labour as it boosts demand for better-qualified workers. The effectiveness of enterprise policy depends in large part on the accuracy with which these interactions between employment and innovation are measured and predicted.

A new Innovation Policy Study on job creation in innovative small and medium-sized enterprises concludes (page 16) that both product and process innovation boost employment, while their impact on skill levels is smaller than it is in larger firms. In the field of industrial research, meanwhile, skill shortages in Europe appear to be caused by under-investment, which is driving many qualified researchers to cross the Atlantic in search of work. The European Commission's European Technology Assessment Network recommends (page 6) fiscal measures to lower the cost to firms of employing such staff.

These measures are not primarily a means of increasing employment, of course. But by raising skill levels in Europe they will facilitate innovation – and this, in the long term, will create new jobs.

Innovation & Technology Transfer

Innovation

Innovation & Technology Transfer is published six times a year, simultaneously in English, French, German, Italian and Spanish, by the Innovation and SMEs programme, part of the European Commission's Fifth Research Framework Programme. The Programme promotes innovation and encourages the participation of small and medium-sized enterprises (SMEs) in the framework programme.

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Boost for Biotech

Endorsing plans to use the new Framework Programme as a means of constructing a European Research Area, the European Council placed renewed emphasis on 'frontier' technologies – biotechnology in particular.

At its meeting in Stockholm at the end of March, the European Council emphasised four main points in the areas of research, innovation and enterprise:

- **Reducing barriers to entrepreneurship** – The public sector should increase efficiency and cut red tape in order to enhance the productive and innovative capacity of the European economy. Statistical requirements on small businesses should be minimised.
- ***e*Europe** – Despite real progress in the take-up of internet technologies, Europe is still not fully exploiting their potential in areas such as e-government and e-commerce. Key legislative and policy requirements include harmonised application of telecoms rules, a supportive framework for 3G mobile communications, substantial research in the field of wireless technologies, and rapid roll-out of the '.eu' top-level domain.
- **Research and innovation** – The proposed structure of the Sixth Research Framework Programme 2002-2006 (FP6)[1] will help to establish a more co-ordinated, strategic approach, as required by the increasingly interdisciplinary nature of research in emerging technological fields. Special support for small and medium-sized enterprises (SMEs) should be continued. European Investment Bank support for research through its Innovation 2000 Initiative[2] is welcome, and should be stepped up. Member States should continue to develop economic incentives for investment in research and development, and exchange their experiences. The first European Innovation Scoreboard will be published in June 2001[3], and the first research benchmarking results by the end of the year.
- **Frontier technologies** – New measures are required to strengthen the competitiveness of Europe's biotechnology sector in order to exploit its potential. Meanwhile, a single, affordable Community patent[4] is urgently needed to encourage innovation and risk-taking – and the slow progress in implementing the Commission's proposals for such a patent is a major concern.

'New and ambitious'

In its submission to the Council, the European Commission noted the critical role which innovation, enterprise and knowledge would play in Europe's future competitiveness.

The gap between EU and US spending on research and development by both private and public sectors has widened from €40 billion per year in the mid-1990s to €75 billion by the end of the decade. Meanwhile, the most promising new areas of scientific and technological know-how are being opened up primarily between, rather than within, traditional disciplines. At a time when coherent European effort is especially needed, EU research has remained fragmented. Resources have been wasted on duplicated programmes, while in some sectors investment in research has been made less attractive to the private sector by constraints on competition.

President Prodi briefs the press in Stockholm.

The Commission also noted the skills shortage which currently affects European research[5], and is linked to problems of mobility. It called on governments to help industry find ways of making research careers more attractive, and proposed a specific strategy to stimulate the mobility of researchers within the European Research Area. ●

(1) See this edition, page 4.

(2) See 'A New Gateway to Innovation', edition 1/01.

(3) The results of a first Innovation Scoreboard exercise were published as an Annex to the Communication 'Innovation in a knowledge-driven economy', see special edition of November 2000.

(4) See 'Single EU-Wide Patent within Reach', edition 6/00.

(5) See this edition, page 6.

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http://www.europa.eu.int/comm/stockholm_council/index.htm

A New Framework for European Research

Designed to support the creation of the European Research Area, the Commission's proposed new Framework Programme for research and innovation in Europe places particular emphasis on increased co-operation, both across the EU and in the global context.

Commissioner Busquin has set out a radical framework for EU research 2002-2006.

On 21 February 2001, Research Commissioner Philippe Busquin presented the Commission's proposals for a new Framework Programme for research and innovation in Europe (2002-2006). Designed to further the goals set out in the Commission's wider initiative for the creation of a European Research Area (ERA), the new programme aims to focus funding on those areas in which the greatest European added value can be achieved.

The Commission is proposing a budget of €17.5 billion for the five-year period 2002-2006 – an increase of 17% on the previous Framework Programme (FP5). This is justified in light of the widening gap between European spending on research (1.8% of GDP) and that of its main competitors, the United States (2.7%) and Japan (3.1%)(1).

The problem is not just the amount of money being spent on research in Europe. If Europe is to become "the most competitive and dynamic knowledge-based economy in the world" – the goal set by the Lisbon Council of March 2000 – then the current fragmentation of research efforts needs to be addressed. "In a context of budgetary difficulties, with the constraints of globalisation and the objectives of enlargement, it is vital and urgent that we share our resources and co-ordinate our efforts more effectively," Mr Busquin stressed.

Focusing efforts

The new Framework Programme will concentrate on a limited number of priority research areas, defined following a wide-ranging consultation. The seven priority areas selected are:

- genomics and biotechnology for health
- information society technologies
- nanotechnologies, intelligent materials and new production processes
- aeronautics and space
- food safety and health risks
- sustainable development and global change
- citizens and governance

The overall structure of the programme comprises three main blocks of activity which reflect the principle objectives of ERA – 'integrating research', 'structuring the European Research Area' and 'strengthening the foundations of the European Research Area'. The Commission is also proposing to streamline administration by introducing new methods of funding. Support to projects within the priority themes will be provided through:

- **networks of excellence** – common programmes of activities between national and regional research entities, leading to increased networking and the creation of 'virtual centres of excellence' on a European scale
- **integrated projects** – large-scale activities conducted by public-private partnerships which help mobilise significant resources around precisely defined objectives
- **participation in research programmes carried out jointly by several Member States** – the first use of the possibility offered by Article 169 of the Treaty

Larger-scale, longer-term projects will be encouraged, and consortia will be given greater flexibility to adjust objectives during the lifetime of the project to meet new research opportunities and needs. Particular attention will be paid to the importance of developing Europe's human resources and increasing its attractiveness as a home for world-class research. This will include actions to support greater mobility of researchers, encouragement to young scientists – especially women – and a special emphasis on international co-operation.

Promoting innovation

The need to promote innovation and technology transfer in Europe is central to the new Framework Programme. Under the heading 'Structuring the European Research Area', €300m has been allocated to the theme 'Research and innovation'. This will be used to support a wide range of activities which are aimed at stimulating innovation, the dissemination of research

results and the setting up of technology businesses.

Innovation is also a central consideration under the 'Integrating research' heading, where projects will be required to include activities aimed at promoting the effective transfer and exploitation of the knowledge produced. Small and medium-sized enterprises (SMEs) will continue to benefit from special measures. At least 15% of the budget for thematic projects is to be earmarked for SMEs – up from 10% under the previous Programme. In addition, specific research activities have been developed to help SMEs boost their technological capacity.

Finally, under the third heading, 'Strengthening the foundations of the ERA', support will be given to activities intended to bolster research and innovation-stimulating policies both at national and European level. This will include support for policy benchmarking and for work to improve the regulatory and administrative environment for innovation.

The Commission's proposal will be discussed at the next Research Council on 26 June, and a final text should be adopted by the middle of next year. The first calls for proposals under the new Programme should be launched by the end of 2002. ●

(1) Commission Communication 'Towards a European Research Area', COM(2000)6 of 18 January 2000.

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- **The text of the Commission's proposal, as well as further information on the debate surrounding the new Framework Programme, can be found at http://www.cordis.lu/rtd2002/fp-debate/cec.htm or on the Research DG website at http://europa.eu.int/comm/research/index_en.html**

FRAMEWORK PROGRAMME

EU Research - Adding Value?

In recent years, additionality has become a central criterion in evaluating the role of publicly funded research and development programmes. But it is important to avoid a simplistic application of this concept in assessing the impact of EU intervention.

The concept of additionality was originally developed in the early 1980s to help justify public support for private-sector research. The aim was to demonstrate that public funds did not substitute corporate investment in research and development, but were in some way additional to it.

Dr Terttu Luukkonen, Director of the VTT Group for Technology Studies in Finland, has carried out extensive research on the role of the EU's Research Framework Programmes in supporting companies' research efforts, looking particularly at the concept of additionality. She argues that the current use of additionality is based on simplified assumptions and does not adequately assess the impact of public programmes.

Trivial pursuit?

Luukkonen has developed a classification of public research programmes based on a cross-evaluation of their perceived 'strategic value' and 'additionality' (see table). 'Ideal' research is defined as strategically important work which would not have been carried out without government funding for reasons of uncertainty, risk or cost. In this case, the added value of public support is clear. On the other hand, research which companies do not consider strategically important enough to carry out without external funding is defined as 'trivial'.

Luukkonen points out that longer-term projects are often regarded as trivial because their commercial outcome is uncertain. She argues, however, that such trivial projects may in fact turn out to be strategically important, and are crucial to expanding our knowledge base. "These are often capacity-building ●●●

"The concealed value of intangible effects" – Dr Terttu Luukkonen, VTT Group for Technology Studies.

Strategic value	Additionality high	Additionality low
high	Ideal	Substitution
low	Trivial	Marginal

Classification of RTD support according to additionality and strategic value.

projects which may open up new areas of economic exploitation in the future," she says. "If research policy places too much emphasis on ideal additionality, it risks a dangerous short-termism."

Network benefits

A survey of participants in the Third and Fourth Framework Programmes(1) suggests a relatively high level of 'ideal' projects in terms of additionality – 45% of industrial survey respondents would not have undertaken the work in the absence of EU support and felt that the work conducted was of high strategic importance.

But the 'trivial' and 'substitution' categories may conceal important areas of European added value which lie less in the research results themselves than in less tangible effects related to networking, transnational collaboration and critical mass. Of the industrial survey respondents, 33% said they would have done the research anyway, but with smaller budgets, reduced objectives, fewer partners and over longer timescales. These results are endorsed by a recent Innovation Policy study, 'European Innovative Enterprises'(2), which found that firms often value participation in EU projects more as a way to extend their technical and commercial networks than as a basis for research as such.

Luukkonen concludes that the added value of European research does not necessarily lie in the funding of research which would not otherwise have been carried out – its simple 'additionality'. Instead, this added value may arise from its capacity to change the way in which research is carried out in Europe. ●

(1) Five-Year Assessment of the European Union Research and Technological Development Programmes, 1995-1999, Appendix III. The reports are available at http://www.cordis.lu/fp5/5yr_reports.htm

(2) EUR 17024 - the report is available on written request to innovation@cec.eu.int

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HUMAN RESOURCES

Tax Less, Put Innovation to Work

European industry employs too few researchers. A report by ETAN warns that this situation may worsen as worldwide competition for research staff increases. Europe must do more to encourage the take-up and retention of a resource vital to the realisation of a knowledge-based economy.

The Commission-funded network, ETAN(1), promotes debate in Europe between science and technology researchers and policy-makers. The recent 'Report on the promotion of employment in research and innovation through indirect measures'(2), produced by an ETAN expert working group, looks at tax credit schemes for industrial research.

The often cited 'European paradox' – its poor conversion of scientific excellence into commercial products – is of increasing concern. EU industrial researchers account for only 0.2% of the workforce, compared to 0.6% in the United States. This workforce is also growing much more slowly than in the US where increases in science funding will raise demand by 40% by 2006. This increase – equivalent to total EU research employment – will be a powerful driver for skill-emigration across the Atlantic, where the EU is already a heavy investor in research(3).

Future graduate supply will barely match Europe's own needs. If it is to become a leading 'knowledge economy', a policy response is urgently required, the report says, and proposes fiscal measures to lower the cost to firms of employing such staff.

Ladder of proposals

Analysis of best practice worldwide yields a variety of proposals for research tax credit policies at European, national and regional levels. Flexibility is essential to allow incentives to be adapted to regional needs – an important feature in view of regional disparities and enlargement.

● Europe-wide, ETAN proposes best practice dissemination and promotion in the less-developed regions to encourage networking and cross-fertilisation. It also suggests rebates to Member States'

VAT contributions as an incentive to improve the climate for investment.

- At national level, options include direct grants, tax credits on profits and tax credits on personnel costs. The latter is highlighted as especially beneficial to new, technology-intensive SMEs in the early, pre-profit phase. A mix of schemes is recommended, adaptable to particular regional and sectoral needs and supported by complementary measures such as carry-over of credits and differential rates for less-advanced regions.
- For the regions, the report presents typologies of firms and administrations – checklists that support the choice of appropriate strategies for regional industries. It highlights the ability of large R&D-intensive firms and universities in a region to drive horizontal networking. Technology 'laggards' among SMEs in traditional industries should be particularly targeted – employing just one bright graduate can have a strong impact on the take-up of innovative practices in such firms, unlocking growth potential.

Commitment needed

"Strong commitment at national level, and support from the EU, is needed to ensure these schemes feed through into real innovation and wealth creation," emphasises Bill Wicksteed, the working group's rapporteur. A final suggestion is for wider downstream aspects to be encouraged – in future, the target should not simply be research but research and innovation. ●

(1) European Technology Assessment Network.

(2) ISBN 92-828-8001-X.

(3) See 'Nothing Succeeds Like Success', edition 3/00.

The ETAN working group's rapporteur, Bill Wicksteed.

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IPR FOR SOFTWARE

Patent Pending?

Current European laws on the patenting of software are both inconsistent and unclear. Consultation by the European Commission ahead of a new Directive on the subject has sparked fierce debate. But do the present regulations really need to be changed – or just to be explained?

The purpose of a patent system is to maximise the benefits to society of inventive activity. Without the incentive of a temporary monopoly on the sale of new drugs, for example, pharmaceutical companies would not invest billions of dollars in research programmes whose success is always uncertain. In return for this monopoly, they must publish technical details of their inventions, enabling others to build on the state of the art.

If the patent system is well designed and well administered, everyone wins.

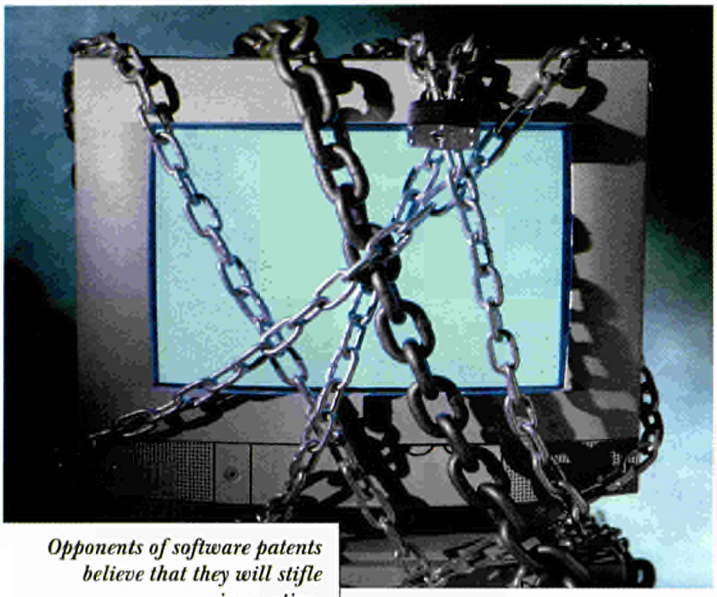
Through the looking-glass

But in the relatively new and rapidly changing field of computer software things are not quite so simple. Competition and innovation depend on the ability of new entrants to protect their intellectual property – whether it is embodied in lines of programming code or in physical products. On the other hand, some believe that software patents stifle innovation by making it too easy for first-movers to establish dominant positions in new fields, thanks to the network effects which characterise this market. (If your customers all use one e-business solution, there is pressure for you to use it too.)

Opponents also argue that stronger protection is unnecessary. They point to the success of 'open source' products like Linux as evidence that innovation is possible without such protection. However, software patents might contribute to the creation of new companies – venture capitalists are certainly more likely to invest in a software company with a strong IPR position. And Europe may be disadvantaged by differences between its patentability rules and those in the United States. European firms may be less inclined to protect their innovations in the US if they cannot do so in their domestic market.

Playing by the rules

The precise definition of what is patentable is a key issue to be resolved by the future Directive. The European Patent Convention explicitly excludes business methods and computer programs 'as such' – unlike US patent ●●●



Opponents of software patents believe that they will stifle innovation.

●●●

law, under which both are patentable. However, EPC rules *do* allow a product involving a computer program to be patented, provided that it is 'of a technical character' as well as being both new and inventive. Under specific conditions, recent case law even allows patents on programs themselves.

The widespread belief that software is not patentable in Europe is therefore unfounded. Thousands of such patents have been granted by national patent offices and by the European Patent Office. But the practical application of EPC rules varies widely between Member States. The resulting confusion has discouraged use of patent protection by European software developers – especially small and medium-sized enterprises (SMEs).

According to a recent report(1) 175,000 software developers in over 20,000 companies create added value of DM50 billion a year in Germany alone, so the issue is a serious one. Last autumn, the Commission's Directorate-General for the Internal Market conducted a consultation exercise to inform the new Directive, which is intended to remove ambiguity and legal uncertainty(2).

The need to harmonise laws on the patentability of software throughout the Community is clear. But should this harmonisation be based on current EPC rules, should it adopt a more relaxed stance in line with US law, or should it tighten current exclusions? Responses from industry, the software community and others display sharply differing views, and the Commission's own position will be based on a thorough analysis of these submissions. Some aspects of the topic will also be discussed at the Patinnova 2001 conference to be held in Cardiff in October(3).

Fear, uncertainty and doubt

In parallel, the Commission's Enterprise DG has conducted its own study on patent protection of computer programs. It investigated how software companies, and SMEs in particular, currently protect their intellectual property, their reasons for employing these strategies, and their awareness and understanding of their options.

The report confirms that SMEs seldom patent their software, relying instead on secrecy, speed to market, encryption and other technical means, and the much weaker protection afforded by copyright. The main obstacles preventing greater use of the patent system by SMEs are the complexity and cost of obtaining patents, and of subsequently defending them. Many feel that the technology is changing so quickly that the time required to make a patent application is better spent developing their next product. They also doubt whether patents would really give them any competitive advantage over large, established rivals.

The study discovered widespread ignorance and confusion about the current position on the patentability of software. It concludes that public authorities need to redouble efforts to improve awareness of IPR issues among SMEs. The study team itself has produced a new guide, 'Your Software, and How to Protect It', which sets out the issues and the options in simple terms(4). ●

(1) 'Analysis and Evaluation of the Software Development Industry in Germany', by the Fraunhofer Institute ISI, available in German at http://www.dlr.de/IT/IV/Studien/evasoft_abschlussbericht.pdf

(2) The consultation paper, 'The economic impact of patentability of computer programs', together with many of the responses, is available at http://europa.eu.int/comm/internal_market/en/intprop/indprop/index.htm

(3) Further information about Patinnova will soon be available at http://www.cordis.lu/patinnova99/home.html

(4) Copies of the study on SMEs and software protection, and of the accompanying awareness brochure, are available from Manfred Schmiemann at the European Commission (see Contact).

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Flying the Innovation Standard

Standards and regulations may not make the most exciting reading, but a recent study has found that they play an important role in the diffusion of new technology into the market place – and that this mechanism makes a significant contribution to economic growth.

Standards play an important part in ensuring safety and improving quality, but they are rarely thought of as sources of innovation. But a study of the economic benefits of standardisation by the Fraunhofer Institute for Systems and Innovation Research (ISI) in Karlsruhe shows that standardisation not only contributes to national economic growth but also increases international competitiveness. The research was supported by the standards institutes of Germany, Austria and Switzerland as well as the Federal Ministry of Economic Affairs and some major German companies.

In their assessment, the ISI researchers, together with Dresden Technical University, surveyed 700 companies in various sectors, as well as global statistics and economic growth. The team looked at many potential contributors to growth in the business sector, including the scale of production, capital employed, patents and foreign licences granted, and the stock of standards and technical regulations. They found that in the period 1960-96, 1% of Germany's gross domestic product and one-third of its economic growth were attributable to standards.

"Standards are at least as important as patents," asserts ISI's project officer Dr Knut Blind. "They act as catalysts for the spread of innovations into the market." The study found a positive correlation between patent applications and new technical regulations, especially in innovative fields.

Ahead of the game?

It can take at least five years for a standard to be agreed with industry and brought into force. In fast-moving fields such as IT and telecommunications, a standard would be superseded in much less time. At the Lisbon summit in spring 2000, the European Council asked the Commission to simplify the regulatory environment and bring in more flexible approaches to match the speed of technological change.

The Commissioner for Enterprise and the Information Society, Erkki Liikanen, outlined possible streamlined mechanisms in a speech to a conference on alternative regulatory models held in Brussels in February 2001. They include self-regulation by industry, negotiated agreements between private and public sectors, and co-regulation – the alternative approach that applies legislative rigour to the flexibility of self-regulation. "A negotiated agreement can be considerably faster to implement and more flexible in the face of rapidly-moving technological innovations," Liikanen affirmed.

"One problem with informal self-regulation is lack of transparency," comments Blind. "We do not know what is agreed upon in industry consortia." However, as industrial sectors collaborate to set up their own standards in formal standardisation development organisations, there is a growing trend toward publication. A prime example of this mechanism is the GSM standard that allows cell phones to be used throughout Europe. It was set up rapidly by the European Telecommunications Standards Institute (ETSI). Indeed, Blind believes that the growing use of European standards and regulations will one day limit the usefulness of national standards. ●

Standardisation leading to innovation – advanced GSM mobile phones from Ericsson.

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Hard Issues - No Soft Option

An exclusive focus on technical issues risks ignoring wider barriers to innovation. Effective collaboration between many players is the key. Addressing organisational and societal obstacles releases innovative potential – as over 400 Innovation project participants with widely differing profiles are currently showing.

Innovation

The Innovation/ SMEs Programme In Brief

Part of the EU's Fifth Research Framework Programme, the 'Innovation and participation of SMEs' programme promotes innovation and encourages the participation of small and medium-sized enterprises (SMEs) in the framework programme. The Programme Director is Mr G.C. Grata (Innovation Directorate, Enterprise DG).

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Innovation typically conjures up an image of a new technology passing from the realm of research into the commercial sphere, to provide benefits in the real world. But as Guido Haesen of the European Commission explains, "This simple linear model, with a technology provider in one Member State supplying end-users in others, does little to improve the wider capacity for innovation." Traditionally, efforts to support technology transfer have focused on 'hard', technical issues. They have also tended to deal only with those organisations taking part directly in the technological transfer itself.

The importance of 'softer', non-technical barriers – once viewed as extraneous or even irrelevant – has gained increasing recognition. In reality the innovation process affects a far wider range of organisations than just those directly involved. Innovation is about people, not just technology. Aptitude and ingenuity will always be major factors in the process.

Knowledge transfer 'platforms'

The Innovation and SMEs programme's action line 'New Approaches to Technology Transfer'(1) has progressively abandoned the traditional, linear view in favour of a systemic approach. Starting in the Fourth Research Framework Programme (FP4), support has increasingly been targeted at complex innovation structures, aiming to establish a culture within partner organisations of identifying and addressing likely obstacles.

A number of non-technical barriers can hamper effective technology transfer and adoption, including inadequate management capacity, bad communication, and poorly understood end-user requirements. "Lack of long-term strategies or responsiveness to change are also big problems," Haesen continues. Projects which have systematically addressed these pitfalls in parallel with more conventional technical work have derived substantial practical benefits in terms of the speed, range and sustainability of the resulting innovation.

In FP5, even more ambitious objectives were set. Priority has been given to establishing and developing specific 'platforms' to facilitate the uptake of innovation – not only within regions, sectors and along supply chains, but also across the traditional boundaries separating them.

This involves organisations which may never before have thought of themselves as part of an innovation system. In fact, the inclusion of users, public authorities, trade unions, and other non-profit organisations can actually be the catalyst for change. The need for good research remains central to innovation. But as the recent European Commission Communication *Innovation in a knowledge-driven economy*(2) makes clear, this alone is not enough. In line with this view, FP5 Innovation projects have wider goals.

United by common problems

As a further facilitating mechanism, individual projects which share similar kinds of problem may form groups that bring together many different organisations and technologies. Knowledge transfer becomes the vehicle for investigating and addressing convergent non-technical barriers, and for the development of methodologies and structures to overcome them.

The broad spectrum of sectors and skills represented amongst the group members creates significant shared learning opportunities. "So much knowledge is locked up in companies. This is a way to bring it out," says Karin Pettersson, co-ordinator of the Rehabcon project (see box). Lessons drawn in respect of methodologies and systems, can then be disseminated to appropriately targeted audiences – and not just within, and between, the organisations directly involved. The same knowledge and tools can also be cascaded to other networks, and into entirely different socio-economic environments.

Thinking out of the box

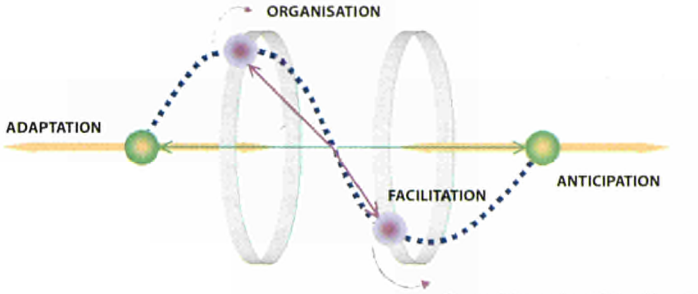
What kind of common issues do the groups address? Fundamentally, they have to do with discontinuous, rather than incremental, innovation. They stimulate a culture of 'thinking differently' in both policy and process.

Additionally, they promote the creation of high-level intra- or inter-company innovation infrastructures, developing competences which enable enterprises to grow in new dimensions. Four dimensions of innovation can be tentatively identified as a means of locating projects within innovation systems – 'adaptation', 'anticipation', 'facilitation' and 'organisation' (see figure).

Adaptive projects extend the commercial exploitation of pre-existing technologies, tackling common barriers to wider uptake and adoption. These consortia will concentrate on incremental changes and expanding their codified knowledge. By contrast, **anticipatory** projects explore the scope for novel products or the development of new markets, increasing in-house competences by codifying tacit knowledge.

Each project, considered as an 'innovation system', oscillates between the adaptation of existing competences and the anticipation of future developments within their sectors and beyond. Where some form of change is necessary to aid innovation, facilitation and organisation offer a complementary approach.

Facilitation applies to initiatives which drive this process by actively stimulating the change required in the wider socio-economic environment. Where change itself needs management, **organisation** is the common interest – co-operative partnerships and links to other ●●●



Source: F. Fernandez, J-C. Venchiarutti and G.Haesen, European Commission

(1) See also 'Innovation's Spreading Ripples', edition 3/00.

(2) COM(2000) 567 final. The full text of the Communication was published in the November special edition of Innovation & Technology Transfer. *It can also be downloaded from http://www.cordis.lu/innovation-smes/communication2000/home.html*

'Organisation' – the Rehabcon project

The Rehabcon project(1) is part of the 'Translating obstacles into opportunities' platform, which addresses the major barriers represented by the limited knowledge or lack of involvement of the very parties most likely to be affected by innovation. Recognising this industry's natural reluctance to embrace change, the consortium sets out to 'adapt' knowledge of the available techniques for the repair and maintenance of concrete structures.

Community-wide environmental concerns and the drive for sustainability already ensure that almost half of the construction industry's activities involve the repair or upgrading of existing infrastructure - and this proportion is predicted to rise further in coming years. Many standards exist for new structures, but the same is not true for old ones. Those responsible for concrete structures will have to find better strategies for their maintenance and improvement.

In producing guidance to address this problem, the project's partners are trying to increase the involvement of other players – seeing these organisational aspects as a central part of the problem-solving process.

For example, it has already emerged that improved assessment methods alone will not guarantee the adoption of the recommended changes. Owners of concrete structures are primarily concerned with the economic and commercial implications of their strategies for long-term management of these assets. To facilitate the transfer and implementation of knowledge regarding the available concrete repair technologies, end-users also need additional practical guidance to help them understand what is available.

Knowing when repair is necessary is vital explains the project co-ordinator, Karin Pettersson of the Swedish Cement and Concrete Research Institute. "Users must be able to select the most appropriate method, against a defined system of performance criteria. We integrate all the options in a tool that indicates when repairs are needed and which approach should be used."

As a result, those who meet the costs of renovation work know that their interests have been taken into account - and much of their resistance to change evaporates.

(1) Project IPS-2000-0063 – Strategy for maintenance and rehabilitation in concrete structures.

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competences are essential factors in building a strong innovation culture.

Cascading benefits

As the concept of 'innovation systems' gains wider acceptance, a firm base for efficient, ongoing knowledge-transfer will be created. In turn, this will help generate an ethos of continuous progressive innovation within enterprises. Increased understanding of the way in which the various limiting factors act will lead to generic tools and methodologies for overcoming bottlenecks. Finally, by engaging the broader components of the innovation system, the model becomes self-perpetuating, encouraging repetition and replication across a wider front.

"The Innovation projects represent a test bed to demonstrate that sharing knowledge, far from diminishing commercial competitiveness, can produce significant benefits in global markets," explains Haesen. ●

Thinking out of the box – discontinuous innovation demands a culture open to new approaches.

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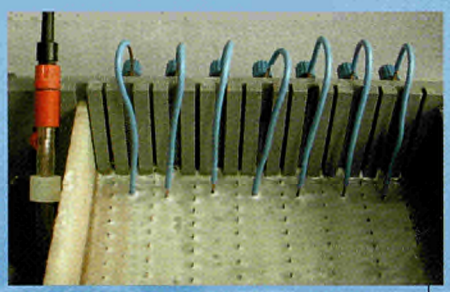
'Adaptation' – the Enviredox project

Like Rehabcon (see previous box), Enviredox[1] is involved in adapting existing knowledge to the organisational capacities of its partners – although in an entirely different technological context. Dealing with waste management, this project shares the need to raise the level of involvement and awareness of parties who are, or may be, affected by innovation.

The treatment of waste is a highly sensitive subject, particularly when it involves incineration, which is unpopular amongst the public in many regions. There is widespread support, particularly in the industrial sector, for developing alternative approaches to the whole question of waste management. But while technical appraisal can demonstrate the commercial advantages of a new system, other factors may hold the key to its wider acceptance.

The social and political acceptability of whatever approach is chosen is every bit as important as its technical competence and its attractiveness to industry. Each alternative option identified must be examined in terms of its risks, cost-benefits and performance – and the 'adaptation' aspect of the innovation must not ignore the need to win public support.



A consultative approach will help the principle developed by the Enviredox project to achieve widespread application in standard industrial electrochemical equipment.

Consultation with the relevant parties at a series of specially convened fora provides the way to assess the acceptability of potential methods of disposal. It may also produce lessons about direct public participation which will be valuable in other sensitive areas of technology transfer.

(1) Project IPS-2000-0035 – Technical and methodological implementation of a BAT to treat special industrial residuals with urban waste depuration techniques.

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'Anticipation' – the Esplanade project

The aim of the 'Enterprise towards the future' platform, to which this project belongs, is to pool shared experience about the integration of long-term strategic perspectives by small and medium-sized enterprises (SMEs). To compete effectively in rapidly changing global markets, SMEs must employ systematic, formal planning procedures as the basis for their own development strategies. Most existing tools are either too expensive for SMEs or inappropriate to their particular needs. Often, the time and resources required to use them are simply beyond the means of companies of this size.

One way around the problem is to establish structured alliances, in which a variety of partners each contributes a specific skill, so that all members of the group benefit from pooling their expertise. Like all FP5 Innovation projects, this exercise can be very broadly inclusive – involving not only SMEs but a wide range of other types of organisation.

Esplanade itself(1) is inclusive in precisely this way, transferring the defence sector's 'dual use' planning methodology to a civilian context, as Dr Jacquie Walton, the project co-ordinator, explains. "The military is very used to dealing with both long- and short-term planning. It has to make decisions based on what it anticipates will be needed in 30 years, as well as the immediate demands of operational support today. We are taking the same techniques into a wider commercial arena."

The consortium's experience of scenario planning and data searching will enable it to network effectively with other partners knowledgeable about SMEs in key market sectors. In this way, the partners hope to obtain a strategic overview of developments in areas of major socio-economic relevance such as medicine and pharmaceuticals, biotechnology, renewable energy, waste management, water treatment, robotics, and textiles.

(1) Project IPS-2000-0028 – Exploitation of scenario planning and data-searching expertise.

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'Facilitation' – the Regional Competences project

This project(1) is the European extension of an initiative which has been successfully piloted in Sweden. There it was used to address the skill and competence base of a specific region, whose innovation culture underwent a radical change as a result.

The project aims to encourage the creation of a favourable regional, social and business environment by targeting key factors in emerging knowledge and competence. Promoting flexible development within these areas, it provides a customised base for continuous improvement and innovation. In accordance with the systemic philosophy of the whole 'New Approaches to Technology Transfer' action line, it addresses not only SMEs but also other types of organisation. The objective is to develop the integrated methodologies and knowledge needed to facilitate and strengthen sustainable development paths.

By anticipating at an early stage possible gaps and opportunities, overall regional competitiveness should also be enhanced. Greater strategic technology transfer awareness will lead to more systematic co-operation between SMEs with complementary competence profiles, as well as with other political, economic and social players.

Regional innovation systems involve not only SMEs but also large firms, universities, public authorities and others.

Significantly, the project aims to adapt existing tools and procedures for the identification, validation and integration of competences at individual, company and regional levels. The establishment of a codified approach to verification provides SMEs with a measure of comfort, both in respect of their own skills-base and that of potential collaborators. In addition, the need for training to establish expertise in linguistic, cultural and sectoral adaptation is also addressed.

Overall, Regional Competences represents a major step in establishing large-scale systemic mechanisms for the identification and eventual elimination of many of the non-technical barriers on innovation.

(1) Project IPS-2000-0062 – Regional competence databases and networks, for intellectual capital management and innovation in SMEs

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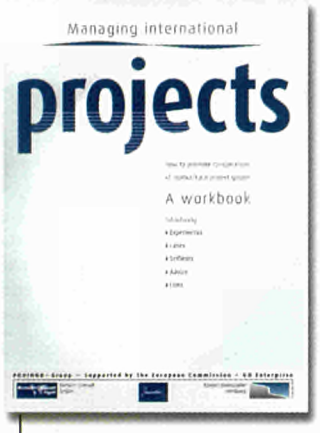
Learning the Language of Knowledge

Technology transfer – the transnational articulation of new knowledge – is more often impeded by divergence in the cultures of the parties involved than by purely technical issues. Now, a workbook offers practical assistance which will help international teams avoid many common problems.

Funded by the Innovation and SMEs programme, the Proinno project[1] was designed to reduce misunderstandings and aid efficient co-operation in European projects. *Managing International Projects*, a booklet available in English, French and German and also on CD-ROM, arose from the project's central goal of developing methods to support international technology transfer.

The book's subtitle: "How to promote co-operation of multicultural project groups" neatly encapsulates its approach, which focuses on some of the non-technical aspects of the innovation process. Since progress in such international projects can often be blocked by issues unrelated to the actual matter of the technology itself, the workbook provides a valuable and intensely practical guide to help minimise the risk of this happening.



An aid to the transnational articulation of new knowledge – a practical guide for cross-border innovation partners.

Building competences

The book comprehensively examines issues of intercultural competence and cultural differences in the context of international co-operation. It includes lessons drawn from real experiences, extensive case studies, and comprehensive discussion of the essential factors for success, as well as self-test exercises.

Encouraging readers to re-examine their own mental approaches to management, teamwork and the resolution of conflict, *Managing International Projects* identifies and explores the range of essential competencies necessary for successful multicultural collaboration. One of its strongest features is the analysis and advice offered regarding the linguistic difficulties which can bedevil international exchanges. Issues such as uneven language skills, the dangers of an assumed 'common' language, the pitfalls of differential interpretation and the need for communication awareness are dealt with in a sensitive but authoritative manner.

Team awareness

The wider aspects of cultural understanding and intercultural sensitivity are clearly described, and the workbook presents a strong case for establishing reliable relationships and an awareness of the team as a whole. Beginning with the fundamentals of project planning, team building and co-ordination, it widens the discussion to examine broader issues of social networking, the tolerance of ambiguity and organisational culture, investigating formal rules, contextual strategies and other aspects of group management.

The greatest value of this workbook lies in the many questions it poses, which invite readers to examine their own approaches and modes of thinking. Sometimes collected into structured self-tests and at others incorporated in the text itself, this feature is a valuable aid to understanding.

The workbook is thus more than a mere guide to international project management. It serves as a fundamental primer in multicultural awareness, opening the way to an understanding of where multinational teams commonly fail – and how they can be made to succeed. ●

(1) Project INAMI0606 – Promoting European innovation culture. See 'The Challenge of Change', edition 5/99.

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- **Copies of *Managing International Projects*, in English, French and German versions, are available from: Krewer Consult GmbH, Proinno Fx. +49 681 374 932 http://www.krewerconsult.de/ ISBN 3-928110-02-0; price €50 (on CD €100)**

Sowing the Seeds of Enterprise

The three member cities of the Pyrenean-Alpine Network of Entrepreneurial Liaisons (PANEL) are cultivating a breeding ground for new entrepreneurs. Good communications and increasing awareness lie behind a transnational approach to help find them financial backing.

PANEL is one of four PAXIS networks dedicated to generating new, innovative small and medium-sized enterprises (SMEs). The PAXIS pilot action, which sprang from the first European Forum for Innovative Enterprises held in Vienna in 1998, is now supported by the European Commission's Directorate-General for Enterprise as part of the Innovation and SMEs programme(1).

The three PANEL members – Barcelona, Milan and Munich – have much in common, particularly their similar size and economic standing within their respective countries. They began working together in September 2000, exchanging knowledge and expertise in order to support the creation of new enterprises.

The Munich region, with 13,000 new business start-ups each year, is represented in the PANEL network by GründerRegio – an umbrella body bringing together institutions from the worlds of science, business and finance.

Preparing the ground

Following the second Forum in Lyon in November 2000, PANEL members met again in Milan in January. They finalised a common questionnaire to send to young start-up companies in order to find out their real needs. "We plan to contact about 500 companies in each of the three regions. We want feedback on their location and how we can offer them support – how we can be of use. That is the only way of learning how to build an appropriate support structure for them," says Jürgen Vogel of GründerRegio, PANEL's co-ordinator. "We sent the questionnaires mainly to companies located in incubator centres or technology parks. At this early stage, we can develop close relationships much more quickly within these centres."

"We are also collecting details of all kinds of organisations supporting young companies in our regions," Vogel continues. "Nobody has done this in a systematic way before. We get some addresses from chambers of commerce, city councils, and a few entrepreneurial associations. But our database is still being built from a lot of fragments. One of our worst problems has been that no single national institution has responsibility for Europe-wide economic contacts."

Future fruit

In future years, PANEL hopes that regular delegations of entrepreneurs, contracting parties, and support agency staff from each region will visit and learn from the others.

A large part of PANEL's present task is to create awareness of the project among venture capital companies and finance houses. The network hopes to convince them that it can ultimately become a steady source of potentially profitable new businesses in which they can invest.

Three 'entrepreneur weekend seminars' are planned for 2001. Different economic fields will be covered at each venue – information technology in Barcelona, multimedia in Milan, and life sciences in Munich. "We will select speakers from among respondents to the questionnaire," Vogel explains. "We will invite a mix of financiers, new entrepreneurs, and local support organisations. Of course, we can provide them with contact addresses and information about sources of funding from the European Union. But the best thing we can do is to bring them all together and hope that the chemistry works!" ●

(1) See 'The Innovation Connection', edition 6/00 and 'Achievement and Optimism', edition 1/01.

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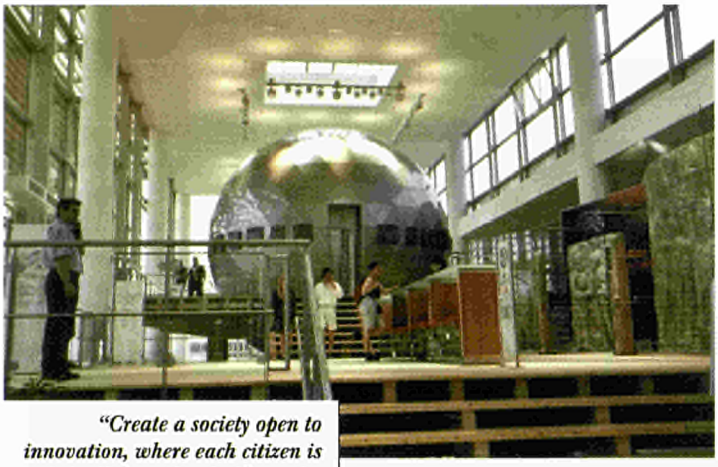
Innovation – Just the Job?

A current Enterprise DG study has found that in small and medium-sized enterprises (SMEs) innovation of any kind boosts employment, while the impact on skill levels may be smaller than previously believed.



"Create a society open to innovation, where each citizen is a potential creator, implementer and user of innovation," says the European Commission.

The Innovation Policy Study[1], which is being carried out by the Austrian Institute for Small Business Research (IfGH), analyses the impact of innovation on the creation of jobs. Two interim reports discuss the relationship between innovation and employment in all European Union Member States, as well as Norway and the United States. They are based on a comprehensive literature review and analyses of various empirical data.

The next stage in this project, due for completion by September 2001, will analyse the views of public and private sector agencies implementing innovation policy or delivering services for SMEs. In addition, selected case studies of employment creation in innovative SMEs will be presented.

Productivity and employment

Product innovation, which generates new demand, normally increases employment. But it is widely believed that process innovation leads to job losses by enabling companies to achieve the same output with fewer resources – among them, labour.

The study's findings confirm current thinking that product innovation has a positive effect on employment in both SMEs *and* large enterprises. The effects of process innovation on employment in large enterprises are not clear, but in SMEs it appears to lead to the creation of new jobs. This conclusion runs counter to the prevailing view, but can be explained. Global market forces operating in Europe usually hit large firms harder than SMEs, which often operate in niche markets. Larger firms are therefore more likely to use process innovation as a means of reducing costs, especially labour costs. In contrast, SMEs tend to introduce new processes hand in hand with new or improved products.

The conclusion is further strengthened by the finding that those SMEs with both new products and processes demonstrate the greatest employment growth. There appears to be no difference with regard to the effect on employment between SMEs introducing either new products or new processes alone.

Organisational innovation

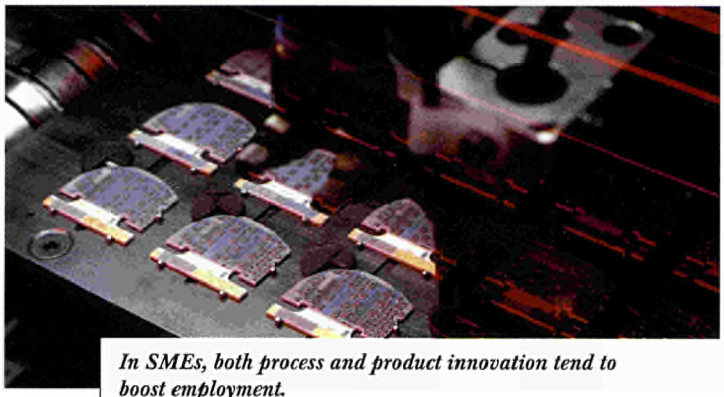
Organisational innovation usually involves the restructuring of either internal or external working relationships – as a result of change in workers' responsibilities, or the purchase of external goods and services, for example.

But its results are hard to evaluate, and previous studies have focused mainly on technological change. Innovative activities within SMEs are varied and interlinked – organisational, technological, and environmental innovation may take place at around the same time, for instance. Often, they are also of a highly informal nature. These two factors make it very difficult to measure their individual impact on employment. But organisational innovation within SMEs is likely to be a significant factor contributing to increases in productivity – and may therefore also affect employment.

"We regret that there are virtually no studies in Europe investigating the effects of organisational change on employment," says Sonja Sheikh of the IfGH. "This is very important, particularly for SMEs. Competitiveness demands good organisational structures. Unfortunately, only a few results from the United States show this to be a major factor influencing job creation."

Innovation and skills

Few studies compare the impact of innovation on the skill structure of an SME's workforce, either. Those reviewed here seem to show that the introduction of new technologies is to some extent complemented by an increase in the proportion of highly



In SMEs, both process and product innovation tend to boost employment.

skilled labour, both in manufacturing and services. There is also evidence that demand for highly skilled workers – and the shedding of low-skilled staff - increases with the size of the innovative enterprise in question. New jobs for university graduates were found to be relatively much more common in large firms than in SMEs. But as yet there is no theoretical model that accounts for these effects.

The overall impact of innovation on employment involves a number of opposing forces, and the underlying mechanisms are complex. Often, the most innovative SMEs are also high risk, and more likely to fail – and of course in these cases everyone loses their job.

A significant conclusion is that both product and process innovation in SMEs create new employment. However, in small enterprises it is quite likely that other factors such as leadership, energy, and entrepreneurial spirit often outweigh the impact of both product and process innovation on creating employment.

The second key finding is that job creation for highly skilled labour tends to increase as innovative enterprises become larger. If true, the emphasis on upgrading skills in SMEs needs to be balanced by the consideration of other important factors, including organisational innovation.

These initial results suggest a need to target innovation policy more specifically on certain types and size classes of enterprise within different industries. ●

(1) Innovative SMEs and the Creation of Employment.

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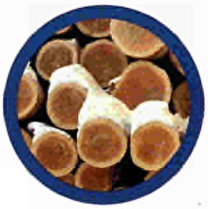
MECHANICAL ENGINEERING



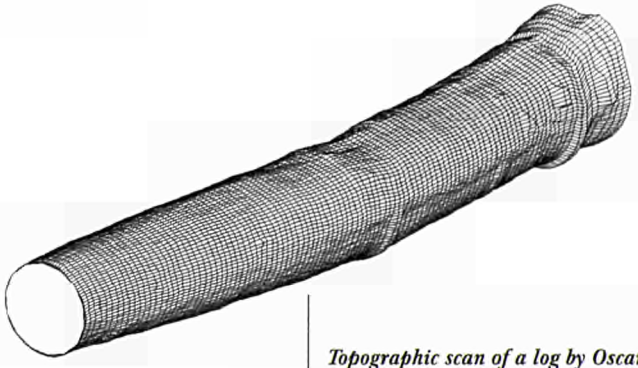
Log-Cutting Logic

In a traditional sawmill, even the most experienced operator wastes some wood. A new intelligent system for small sawmills optimises the cutting to get the maximum value from each log. It will improve the profitability and competitiveness of hundreds of European SMEs.

Many European sawmills are medium-sized enterprises, and their largest operating cost is their raw material – wood. So they depend very heavily on skilled workers to get the most out of each log and minimise waste.

At the start of the sawing process, logs are assessed and 'opened' on a log carriage. This stage is critical, as decisions taken here determine how much wood the sawmill will be able to extract from each log. It takes a long time to train a log carriage operator to saw up a log in the most profitable way. Even a trained operator has to make constant calculations and snap decisions – and if he becomes less accurate towards the end of his shift, wood is wasted and money lost.

Etablissement Darré et fils SA, a French SME hardwood sawmill, wanted a more cost-effective way to saw railway sleepers ●●●



Topographic scan of a log by Oscar's laser-based measurement system.

The Oscar system installed at the premises of Darré et fils SA, one of the six SME partners in the CRAFT project.

●●●

and flitches. Daniel Darré asked Ciris Ingénierie, a process engineering company specialising in wood, to design a system based on exact log measurement and computer-based decision-making. But even the combined resources of the two companies were insufficient to manage a project of this scale. So with five softwood sawmills in France, Spain and Portugal, Darré put together a CRAFT project(1) which enabled them to engage Ciris to work on the problem for the partners.

An Oscar for CRAFT

Within two years, Ciris designed and built an innovative log-sawing system called Oscar. "We realised that some of the operator's know-how can be analysed in a logical way and used to improve sawing efficiency," says marketing manager Béatrice Rivalier. "If measurement of each log is automated as the basis for optimised cutting decisions, the operator can focus on other issues such as grade assessment and machine control."

Oscar has two main components. First, a laser-based system scans the log as soon as it is clamped on the log-carriage, measuring up to 30,000 points to create a detailed three-dimensional picture of the surface, with all its defects. Computer software compares this shape with the required products and selects the optimum sawing pattern. "The computer may try up to 20,000 different solutions to find the best answer," explains Rivalier. "It can then place the first cut accurately so that the 'opening face' is neither too large nor too small, but exactly calculated to maximise the mill's profit."

Operators can override Oscar's choice for grade reasons. Recent trials compared the performance of sawmill operators working with and without Oscar. Those who decided on their own where to make the first cut often over- or underestimated the width of the opening face. The trials showed that Oscar produced 4-8% more value from each log.

"Oscar helps us get the most out of the logs and lets operators concentrate on what they do best. It is a fantastic new partnership," confirms Darré.

Marketing the system

Ciris has offered Oscar at cost price to the SMEs of the CRAFT project consortium, and has continued to work with them to refine it. The system is suitable for all existing sawing patterns, both hardwood and softwood – flooring and packaging products, flitches, planks and sleepers.

"The potential market in Europe is large," says Rivalier. "We know that, outside the large-scale wood industry in Northern Europe, most European sawmills have moderate log inputs, so investment budgets are critical to them. Thanks to the CRAFT project we can offer our system at a very competitive price compared with North American technology, making it more attractive to SMEs. In most mills the cost of leasing it would be less than the additional profit it produces."

The automation introduced by Oscar also contributes to the sawmill's management information system. It can count the logs sawn each day and calculate the volume in every grade – useful to determine production costs and to monitor operator and sawmill performance. A blade deviation control system can also be added, with feedback to the operator who can decide to reduce the feed rate or change the blade. Oscar reports on the efficiency of each blade, improving performance in this area too.

"Our reporting system is the most comprehensive and efficient on the market. This kind of daily information will certainly enable SME sawmills to increase their profitability. It is a real breakthrough," claims Rivalier.

Ciris – itself an SME – delivers a complete turnkey package with Oscar, including installation, operator training, and maintenance if required. "It has been designed as a full service concept that can also include financing. Our customers can use modern technology on existing machinery to build up a new competitive edge," comments Jean-Pierre Olgiati, Ciris Executive President.

The company estimates that up to 700 sawmills in Europe alone would benefit from Oscar – and there are many others in North and South America, New Zealand and Australia. The system is appearing at the biennial wood show Ligna, in Hanover on 21-25 May. ●

(1) Project BRST-CT95-5020 – Southern European log sawing optimisation thanks to machine scanning and computing technologies.

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Marriage for Life

A network of expert organisations in 27 countries is bringing small and medium-sized enterprises (SMEs) in the life sciences together with suitable partners for European research projects. Establishing the necessary national and transnational co-ordination mechanisms is a major goal.

A series of new Economic and Technological Intelligence (ETI) projects, carried out as part of the Innovation and SMEs programme's SME Specific Measures, aims to improve European competitiveness by assisting smaller firms to analyse and exploit market trends – where appropriate, by participating in transnational research and innovation projects.

'Partners for Life', one of the first ETI projects, is helping groups of two or more SMEs in the fields of biomedicine, biotechnology or agro-industry, with similar technical profiles and without adequate in-house research facilities, to find the partners they need.

The biggest

With an overall budget of €4 million, Partners for Life is the largest of the 53 ETI initiatives launched during 2000. The network consists of contracted organisations in each of 18 European countries. Nine others, mainly from central and eastern Europe, are participating without EU funding. Most of the 18 contracted partners have already taken part in earlier national-level programmes to assist SMEs.

By its completion in May 2003 the project aims to establish direct contact with 50,000 SMEs, and to undertake individual technology assessments for about 3,500 of them – leading to around 700 expressions of interest and 500 actual CRAFT, research or demonstration projects. Three major international brokerage events are planned for 2001, at which SMEs will be helped to find partners and researchers through a targeted approach.

Co-ordinated action

Partners for Life is being co-ordinated by the Austrian Bureau for International Research and Technology co-operation (BIT), a non-profit company based in Vienna.

"We work transnationally," explains Sabine Herlitschka at BIT. "Each of the 27 partners is in touch with hundreds or even thousands of SMEs within its own country, and helps to identify researchers and SMEs interested in involvement at European level. But many countries have an inadequate database of SMEs in the life sciences, so the mass of data we are creating will also be very useful in the future."

E-mail communication between the network's members is proving very rewarding. "By operating with just one key contact in each country we have established a very effective means of starting the partner search for a specific SME. Successful searches initiated by a simple e-mail request are being carried out very quickly," says Herlitschka.

A successful project

One of several successful projects, led by the Austrian biotechnology company Hämosan, is examining the potential for various processes used to remove the infective agent that causes BSE in cattle. The nine other partners come from Belgium, Finland, Germany, the Netherlands, Scotland, and Switzerland.

An Austrian-led SME partnership is examining options for removing the agent that causes BSE in cattle.

"At first we thought we might be too small a company," says Hämosan's co-owner, Angelica Reichel. But an information event on funding opportunities surprised us. BIT helped us to prepare a proposal which was selected for funding. Without the CRAFT project, we would never have come into contact with partners such as the Finnish Red Cross." ●

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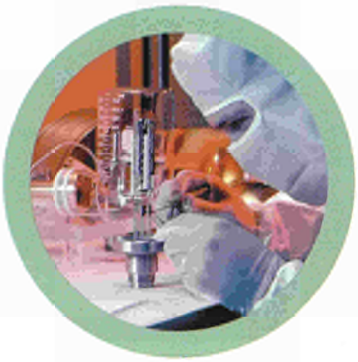


New technology companies, spin-outs from European univer increasingly benefiting from the protected environment offered offer mentoring, business and management training, sub support. A recent forum examined the ways that good pr contributes to the success of spin-outs, and espe

'Research to Reality', a conference organised by the European Commission's Enterprise DG in Luxembourg this February, examined the role of incubators in the development of new companies set up to exploit the results of research. The event was part of the Innovation and SMEs programme's FIT policy exchange project, which aims to disseminate good practice and develop lasting links among its three components – finance, innovation and technology.

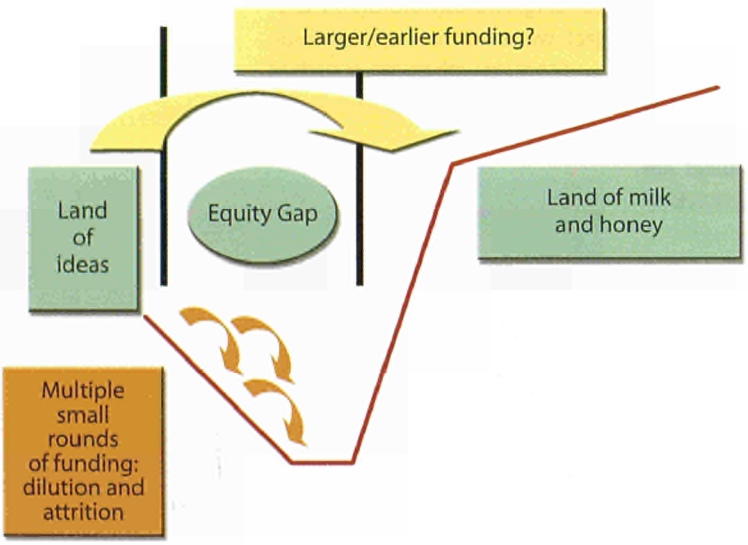
More specifically, the conference highlighted the findings of a FIT study, carried out by Bannock Consulting, which investigated the financing mechanisms available in Europe for converting innovative research from universities and other centres into business start-ups.

Each FIT project addresses a particular aspect by analysing the present position and defining good practices. It then brings together key policy-makers in workshops on the selected theme, and disseminates the resulting recommendations through training seminars, publications and publicity campaigns. The Luxembourg conference was the third part of the FIT exercise on start-up financing, and followed a survey of good practice in incubator financing which began in January 2000, and a practitioners' workshop in May 2000.

1. Good Practice in Spin-Outs

European spin-out companies employ a wide range of approaches to obtaining finance. Good business practices can significantly improve their performance.

Figure 1: The 'valley of death' between conception and fruition



Source: Douglas Robertson, University of Nottingham

Outlining the results of the FIT financing survey, Olivia Jensen of Bannock Consulting drew attention to the combination of factors needed to support what the study terms the 'conversion' process – from promising research results to commercial development.

Publicly funded research can reach the point of proof of concept, but proof of market potential is needed before early-stage investment by private venture capitalists can be achieved. Increasingly, institution-based incubators are providing services to help bridge the gap between idea and realisation – which can take the form of a shortfall in information, legal protection or business expertise as well as of finance (Figure 1). They can offer training, management skills, legal advice, subsidised office and laboratory facilities, and also equity financing and loan financing. Facilities provided for a start-up by one university were estimated to have saved the company €250,000.

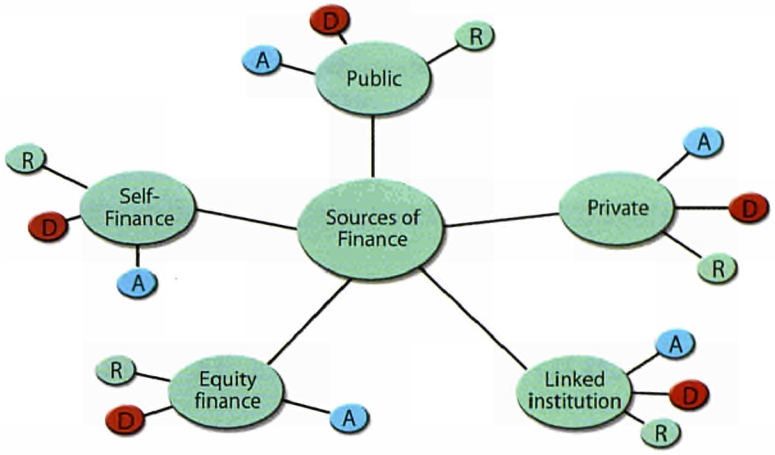
Upbringing

sities and research centres, are by incubators. These commonly sidised premises and financial actice in technology incubation cially their search for finance.

The private and the public

In the United States, private-sector financing of spin-out programmes predominates, with a strong entrepreneurial culture and good networks of contacts between researchers and financiers. In contrast, the Israeli system of 24 university-based, publicly financed incubators is well developed and demonstrates effective exchanges of technological and business expertise. Spin-out activity in Europe is also usually on a much smaller scale, with each research centre typically supporting only around 20 projects, and generating only six spin-out companies each year.

Figure 2: Five main sources of finance for spin-out companies



Source: FIT survey of spin-off and spin-out of exploitable RTD results and the role of micro-financing, 2000

Each possible source of finance has its own advantages (A), disadvantages (D) and now recommendations for good practice (R). Most companies choose several sources after balancing the pros and cons.

The survey revealed five major sources of finance for spin-out companies during the incubator stage (Figure 2). Half of the companies studied had used multiple sources, with half of the total finance on average coming from the public sector. Working from the main advantages and disadvantages of obtaining finance from each type of source, the study drew up recommendations for good practice in each area (Figure 3). ●●●

Figure 3: Advantages, disadvantages and best practices in relation to different sources of incubator financing

Source	Public	Private	Linked institution	Self-finance (royalties)	Equity finance
Comments		Venture capitalists, corporations, business angels	Science park, university	20% of spinout programmes are self-sustaining	Used by one third of EU programmes surveyed
Advantages	Access to capital, revenue	Multiple sources	Reliable, existing relationship	Reliable income	Chance of high returns
Disadvantages	Restrictions, compliance costs	Restrictions on independence, commercial pressures	Obligations, restrictions	Aligning incentives	High risk
Best practice recommendations	Use smart money	Build multiple partnerships, attract investors	Go for clarity in relationship, retain independence	Balance mixed objectives	Be realistic when planning timescale and level of returns; aim for large enough and liquid enough fund; ensure independent decision-making

Source: FIT survey of spin-off and spin-out of exploitable RTD results and the role of micro-financing, 2000

Good business

Effective management of spin-out programmes comes from sound conventional business practice – not always readily compatible with basic research. Key goals are:

- transparent criteria for selection of projects for spin-out and investment
- clear procedures for allocating resources
- clear milestones linking achievements with tranches of financial support
- awareness of entrepreneurial practices among researchers
- adequate incentives for achievement
- co-operation with national and international financial and business partners

2. Attracting Venture Capital

Venture capital (VC) companies are showing increasing interest in young spin-out companies, particularly in high-technology sectors.

The late 1990s saw a dramatic increase in venture capital initiatives in Europe (Figure 4). Widespread low interest rates and increasingly profitable returns on investment in young companies contributed to this trend, while reform of European national pension schemes will also enlarge opportunities for investment.

As well as private equity financing for later stage development, the 3i venture capital fund, for example, also invests in new, fast-growing companies – typically in technologies such as IT, telecommunications, biotechnology, new materials and medicine. The fund's key investment criteria are a professional business plan demonstrating a competitive advantage in an attractive market segment, a qualified and experienced management team, and realistic planning of timescale and costs.

CASE STUDY

It Looks Good, but Will it Work?

For Nottingham University, its Research Business Unit's success in licensing research results is an important source of revenue.

The Research Business Unit at Nottingham University is responsible for all aspects of the commercial development of research results generated by 1,100 academics and a €115m budget.

Its record of attracting finance from outside the university is impressive. Between 15 and 30 licences are sold each year, 17% of research income comes from industry, and 35% of its projects involve an industrial partner. Annually, up to five new spin-off companies are created.

Changing emphasis

Outlining the thinking behind Nottingham's achievements, research business development director Douglas Robertson defines two very different approaches to generating spin-offs employed by the university. The first, which may arise almost by accident, concerns projects with strong academic interest but producing only modest earnings and with limited prospects for growth – what Dr Robertson calls "nice little earners".

In contrast, high-growth spin-off companies are planned with a view to securing significant financial returns. These may be developed with support from university incubator facilities, university investment, planning for full intellectual property protection, and the early injection of external commercial management expertise, with the aim of an early stock market flotation or trade sale. From a purely commercial perspective, the low-growth spin-off represents a waste of the university's investment. However, this can easily be outweighed by the spectacular returns from just one or two high-growth spin-offs over a ten-year period.

Commercial potential

Universities and other research centres need to assess commercial potential as part of the research process.

Robertson outlines a business model designed to increase both the idea-flow and the deal-flow, which he explains as introducing commercial assessment from early research stages. It should cover appraisal of the intellectual property involved, a thorough review of patents and literature, and an outline market assessment. At this stage commercial advisors should be able to decide whether the project has commercial potential or not, and what interim targets to set. Robertson calls this the "go/no go milestone". Once proof of principle has been established, specialist external consultants are needed to assess the market.

In seeking financial support, the local environment is important but should not be limiting. Potential spin-offs should explore possibilities for support from serial entrepreneurs and business angels. "Universities and research centres should not be afraid to champion change and lead from the front – for example, by seeking out venture capital deals from regions and other countries," says Robertson.

Despite the reluctance of some of the research community to adopt business incubation methods, both EU and national policy is already reflecting this changing emphasis. UK universities now pursue three parallel 'missions', which include exploitation of results alongside the traditional aims of research and teaching. Some universities also have their own early-stage investment funds. "Should they now consider whether to use some of these funds to support their own start-up companies beyond the start-up phase?" asks Robertson.

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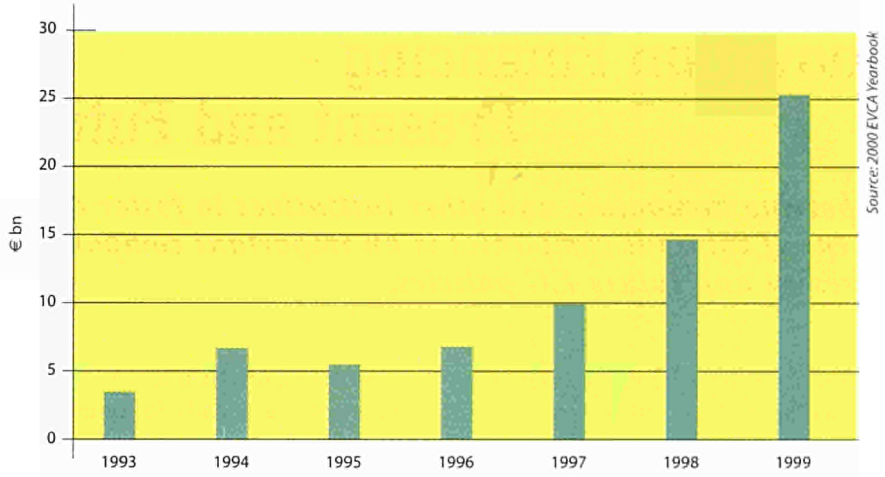
Think global, invest local

Amadeus Capital Partners, based in London and Cambridge, and a member of the Commission's I-TEC network, was founded in 1997 to fill the early-stage funding gap in the UK, and now works particularly with new high-technology companies, for example in wireless and optical components. So far, says chief executive Anne Glover, Amadeus has invested about €135m in 34 companies, and investment activity is growing by over 40% per year. However, she points out that while high-tech venture capital is increasing in Europe, it is far larger in the US. Glover stresses that although the companies that VCs finance target global markets, investing in early-stage technology is essentially a local activity.

From the venture capital funds' point of view, the prospects for early-stage investments are good – management skills are improving, larger deals are becoming possible and in fields such as wireless Europe has gained a clear lead. But funds specialising in high-tech need to be exceptionally well informed about their target sectors, and there are still too few experienced technology investors.

Prospects are also good from the viewpoint of the research organisations, with many forms of capital now available and technology attracting attention from experienced VC managers. But only the biggest ideas will attract finance, and embryo companies should be prepared to add product engineering and marketing to their development plans at an early stage.

Figure 4: Venture capital investments in Europe (€ billion)



Market trends have led to a dramatic increase in European VC initiatives over the last few years.

Legal constraints

The Fraunhofer Patent Centre in Munich supports inventors by financing the patenting process and assisting with commercial exploitation. Increasingly those it helps are primarily interested not in licensing their patents to industry, but in starting their own businesses. National and federal laws make it almost impossible for universities and other public sector bodies to take equity in start-up companies based on inventions which it has helped to finance. At the same time, venture capital funds are reluctant to invest in start-ups that must make heavy royalty payments for patented key technologies.

To overcome this problem, in May 2000 the Fraunhofer Patent Centre set up a new seed support company, Ventratec. It handles start-up deals and supports the fledgling companies by licensing their inventions in exchange for equity. It also helps to identify potential start-up projects, and assists them in obtaining venture capital and identifying strategic partners.

3. Networks and Barriers

Strategic alliances between research institutions and enterprises can overcome many obstacles to the successful exploitation of research results.

Encouraged by experience, and by the support of EU programmes (see 'Innovation Financing – Present and Future'), research centres are increasingly establishing networks to foster the development of young companies. Once they achieve critical mass, such networks make investment in spin-outs more attractive to venture capital funds, and create a platform for further links with industrial end-users of the spin-outs' technologies. Across Europe, new industrial liaison, business incubation and legal, business and intellectual property protection advice services, as well as new loan and investment funds, are stimulating spin-out creation.

Collaboration is the key

Philip Ternouth of the Manchester business incubator KM Ventures argues that the key to successful development is finding the right collaborators, both business partners and venture capitalists. "Most companies work with different partners during the various stages of product development, manufacture and supply. The networks can be shaped, and reformed, according to market demand," he says.

SensAlyse, for example, started as a group of only two research workers developing technology from the Department of Clinical Biochemistry in the university's school of medicine. The product they devised was a sensor able to analyse key components of wine. It was developed from technology originally aimed at the real-time measurement of blood glucose. The opportunity to develop it for use in the wine sector came through a contact made by Manchester University's technology transfer company, Vuman, with the Institut National de Recherche Agricole in Alsace. ●●●


© SensAlyse

Support from Manchester University's technology transfer company enabled SensAlyse to make the leap from the world of medical research into the international wine-making market.

Innovation Financing – Present and Future

Supporting incubators and other initiatives to foster development of spin-out companies is an important component of present and future EU policies.

Present EU instruments for financing innovation, outlined by Marc Verlinden of the DG Enterprise Innovation Policy Unit, are concerned with four aspects:

- Improving the **supply of venture capital** – the European Investment Bank (EIB), the European Investment Fund (EIF), the European Commission's Growth and Employment initiative
- Increasing the **capacity of venture capital funds** – Innovation and Technology Equity Capital (I-TEC), Seed Capital Initiative (CREA), Eurotech Data
- Support for **networking organisations** – European Venture Capital Association (EVCA), European Association of Securities Dealers (EASD), European Business Angel Networks (EBAN)
- Identification and exchange of **good practice** – Innovation Policy Scoreboard, FIT policy exchange project, Round Table of Bankers

The initiatives make complementary contributions to the generation of new companies. The hard cash provided by the lending and investment initiatives of the first objective are complemented by those addressing 'soft' issues – for example, helping embryonic companies to develop into independent, productive and self-sustaining entities (Figure 5).

EU investment in the future

Hard cash will certainly be available under the EIB Innovation 2000 initiative. Spending of €12-15 billion over the next three years is pledged for training (especially in IT skills), research, and information and communications infrastructure. Help for SMEs is a vital component, particularly for upgrading IT equipment, and to encourage the development of new innovative firms, for example in incubators and science parks. Further venture capital of €1 billion will also be made available under Innovation 2000, via the EIF.

A new support initiative from the European Commission, Gate 2 Financing (G2F) is a system of professional networks, enabling the four key groups of players affecting business spin-outs to exchange experience and best practice[1]:

- early-stage venture capital companies
- incubators, accelerators and technical seed funds
- industrial liaison offices
- business schools and entrepreneurship trainers

G2F's networking and investor information services and a web portal for exchange of opportunities on a pan-European basis were launched in March 2001, while the networks are due for launch in June[2].

(1) See 'A New Gateway to Innovation', edition 1/01.

(2) Further information is available at http://www.cordis.lu/finance/

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Stronger together

Building research alliances like this can be an effective solution to one of the main barriers to effective exploitation of research results. A small research group is very unlikely to have access to all the know-how needed to develop fully the potential of its research.

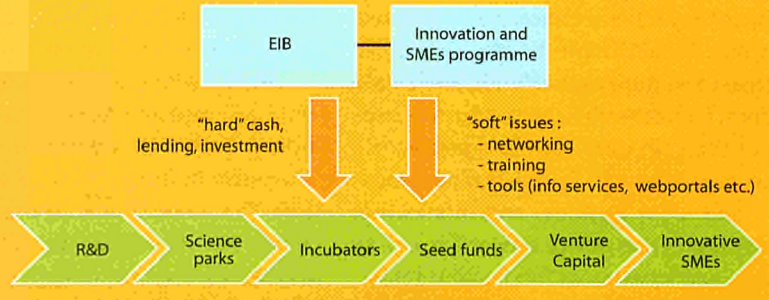
According to Cathy Garner, Director of Research and Enterprise at Glasgow University, networking can offer solutions to problems of missing research expertise, limited market access and limited development finance. Alliances can be used to enhance bargaining power, especially in relation to venture capital funds, attracting investment and sharing the burden of intellectual property protection.

4. Benefits of Good Practice

Current efforts to promote good practice should make a material contribution to improving European competitiveness.

The dissemination of good practice is especially important because most spin-out companies are active in highly innovative sectors such as information technologies, software and biomedical sciences, where public sector support and venture capital investment is focused. Here, improved management and greater clarity of business plans has the greatest potential to sharpen the performance of new companies.

Figure 5: Complementarity of instruments



Both hard cash and soft, supporting measures contribute to the evolution of successful innovative SMEs from basic research.

Source: European Commission DG Enterprise

In more doubt is the linked question of whether these efforts will preserve the pool of European expertise by reducing the drift of highly qualified research workers towards the US[1]. Possibilities for research funding as well as its application are increasingly being sought globally, not just within a country or within the EU. However, improved competitiveness, possibly linked with other changes on the regulatory side such as better intellectual property protection through the new Community patent, may encourage European researchers to stay. ●

(1) See also this edition, page 6.

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CASE STUDY

Unispin - Networking at its Best

Eight partners in six countries use regional Unispin workshops to share experience and promote spin-off companies.

Participants in a Unispin workshop at the University of Linköping.

Unispin began as an Innovation project in 1997. It originated from the existing spin-off programmes of Twente University (the Netherlands), Linköping University (Sweden) and the Dundalk Institute of Technology and the University of Ulster (Ireland and Northern Ireland)[1]. As Peter van der Sijde of Twente University explains, "All three programmes were successes in their own countries. We set out to identify the similarities, as the basis for a blueprint of a successful spin-off programme."

Unispin's approach to helping research centres develop a spin-off programme involves weighing university and regional policy against knowledge and best practice in spin-off programmes. Having developed a programme, a university, research laboratory or other centre can use its expertise to support individual spin-off companies.

Workshop programme

During its 36 months as an EU project, Unispin ran four workshops – in Twente, Rome, Linköping and Dundalk. Each brought together not research workers, but university-industry liaison officers and policy-makers – people in a position to influence the development of research rather than to carry it out. The workshops allowed participants to exchange experience and to examine methodologies for setting up new businesses.

The key factors for the success of a spin-off programme emphasised by the workshops have been:

- a research centre willing to share knowledge with entrepreneurs – as Van der Sijde comments: "If you're in an ivory tower, forget it."
- a champion at the policy level to make changes
- a research centre interacting with the local community

Van der Sijde thinks that working in small groups of five or six people is ideal, because in an hour everyone in the group can discuss many of the issues they face at home. "In most cases," he says, "some kind of approach or solution can be found because others in the group have encountered the problem before."

A questionnaire sent to participants in the four workshops some 18 months later, in 1999, showed that while Unispin set out to cover 30 regions, it attracted representatives from 68. Of these, 18 had already set up spin-off programmes and about 50 spin-off companies had been generated. More programmes have developed since then, including the Enterprise Fellowship Scheme of the University of Warwick Science Park, a spin-off programme for three universities, with plans to expand to eight. The Wales spin-out programme, covering all 11 universities in Wales, was another outcome. "You need total commitment from university policy-makers, from researchers, from regional contributors like regional development agencies, innovation centres, and from informal investors," says Van der Sijde. "That takes time."

Moving on

After completing the original Unispin project, the partners have continued with the workshops. Since 1999, the format has been taken to Prague and Cardiff as well as to Twente and Dundalk again, with the next workshop planned for Barcelona in May. Together they have attracted well over 200 participants from 17 countries.

(1) The partners in the Unispin consortium were University of Twente, Dundalk Institute of Technology, University of Linköping, University of Ulster, TII, Van der Meer & Van Tilburg innovation consultants, BTC-Twente, Consorzio Catania Ricerche.

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Capitalising on Content

As more and more content-based dotcoms plunge into the red and even internet giants like Amazon and Yahoo! report profit warnings, the European Commission's new eContent programme gets under way.

© 2000 Universal Pictures - Photo: Phil Bray

Converging worlds – last year, French company Vivendi was the world's leading water distributor. Today, as Vivendi Universal, it is the world's second largest media group.

One of Europe's key assets in the emerging internet economy is its first-class content producers – including broadcasters, publishers and film-makers. Moreover, according to Roberto Cencioni of the EC's *e*Content programme, Europe's ability to translate and localise content across different languages and cultures will be a key source of competitiveness when supplying this content to the world market.

There is just one problem. No one is making any money out of web content. The last year has seen dotcom after dotcom go out of business, while major traditional content producers such as Disney and News Corp scale down or even abandon their internet units. Even Yahoo! is seeking new revenue streams as it watches advertising revenue dwindle.

According to Eric Scheirer of Forrester Research, speaking at the Milia 2001 conference in February, the advertising model *will* sustain classic content business – but not for another two years. Many delegates were sceptical. In any case, few SMEs will survive that long.

So is there any hope for content-based internet companies at all, or will advertising and e-commerce revenue need to be supplemented with something else? And if so, what?

Will consumers pay?

One thing is clear – most consumers will not pay for most web content. "Consumers feel that they already pay for web content, because they pay for web access," noted Ron Geller of Sony Pictures Digital Entertainment at Milia. "Very few companies successfully charge via pay-per-use or subscription models, other than for financial services and pornography."

This is the key lesson of the past few years. Most web content is originally created for offline consumption – within the pages of a newspaper, through a radio or on TV. "People just don't think this content is worth paying extra for on the web. They'd prefer to watch TV on TV, or read a newspaper on the train," said Geller. "Consumers will only pay for web content which is 'close to the heart' – sex, money, health, entertainment, ego."

'Glocalise' with *e*Content

So what should Europe's content providers do? "Personalise and localise," according to Per Haugaard, spokesperson for Erkki Liikanen, European Commissioner for Enterprise and the Information Society. "Immense opportunities exist for tailoring added-value services to each individual's language, culture and location. This is unique to the internet and next-generation mobile services."

This is the thrust of the *e*Content programme's current call(1), along with wider deployment and exploitation of public sector information. The call was published in mid-March for both definition and demonstration projects, as well as for accompanying measures addressing new market players, best practice and sharing of expertise. Only the demonstration projects have a deadline – June 15.

"The internet allows companies to trade with the world, but no one will buy if they don't 'glocalise', or be local, globally," says *e*Content's Roberto Cencioni. "New strategies, alliances and technologies are required – technologies which Europe, with its cultural diversity within a single market, is uniquely placed to both develop and use." ●

(1) The web pages of the eContent programme are at http://europa.eu.int/comm/information_society/econtent/index_en.htm

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NAROSSA 2001 + brokerage event

10-12 June, Magdeburg (Germany)

In conjunction with the Narossa trade fair on renewable raw materials, firms will have an opportunity to present their latest products and research results. The brokerage event will focus on production, plant biotechnology and plant breeding, materials, industrial products, energy use and services. The Innovation Relay Centre Lower Saxony is preparing a catalogue presenting company profiles and their offers and requests for innovative technologies, which will be distributed during the event or can be requested by e-mail.

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IASP World Conference on science and technology parks

10-13 June, Bilbao (Spain)

The theme of the 2001 IASP Conference is 'Science and Technology Parks in the Knowledge and Digital Economy', and the main objective is to make an overall assessment of the role to be played by science parks, incubators and universities faced with the challenges and opportunities of the knowledge society and digital economy.

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EGII – managing the mosaic

13-15 June, Potsdam (Germany)

The topics covered by the seventh European Commission geographical information and geographical information systems workshop will include:

- local to global, common reference system, data policies, metadata and standards
- visualisation, virtual reality, spatial analysis, spatial data services and interoperability
- mass market, specialised market, business to business, business to client
- mobile GIS, wireless technologies, integration

Participation from partners in projects funded by the Fifth Research Framework Programme is especially encouraged.

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EAEC 2001 – Technology transfer day

21 June, Bratislava, (Slovakia)

To accompany the European Automotive Congress, the technology transfer day targets top automotive industry managers from EU and associated countries, government representatives, subcontractors, users of specialised tools and research institutions.

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Critical Infrastructures

26-29 June, Delft (Netherlands)

Transport, telecommunications, and supply and distribution infrastructures have become vital to the functioning and security of society. The systems required to provide these vital services are subject to rapid institutional changes, technological innovation, and increasing demand for both sustainability and quality of service.

The Fifth International Conference on Technology Policy and Innovation will consist of plenary, paper, and workshop sessions as well as exhibits. Plenary sessions will feature invited lectures by eminent speakers, paper and workshop sessions, in five tracks, will include short presentations and panel discussions.

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Innovate 2001

27-29 June, London (United Kingdom)

The success of the BBC Tomorrow's World International Invention Fair has for the past two years given inventors and innovative companies an opportunity to present their ideas to the business community and public. This year, a new event will be more targeted towards the business community, with the aim of encouraging exchange of ideas between innovative manufacturers and multinationals, as well as links and joint ventures with universities and research institutes. Large numbers of companies from the UK and the rest of Europe are expected to exhibit their new ideas and projects.

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Nanotechnology – 'Meet the Investors'

September, London (United Kingdom)

Individuals with ideas for nanotechnology-based businesses, new companies, and companies requiring more finance, are invited to submit business plans by the end of June for consideration for funding by a group of investors. The ten best investment prospects will be able to make their pitch to the investment community for large-scale funds, at this special event to be held in London in September.

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Renewable Energy for a Competitive Europe

4-6 October, Wels (Austria)

This international technology brokerage event, organised by the Innovation Relay Centre Austria and the IRC thematic group for renewable energy, aims to bring together companies, research centres and universities active in the fields of thermal solar, photovoltaic solar, bioenergy, wind energy, geothermal energy and project financing.

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Design for Living – the European City of Tomorrow

KI-NA-19-381-EN-C; ISBN 92-828-9632-3; €7

This European Commission publication describes EU research activities in the field of urban sustainability, and explains the Key Action 'City of Tomorrow and Cultural Heritage' to a general audience. It examines the context and goals of the Key Action's four themes – city planning and management, cultural heritage, the built environment and urban transport. It also introduces its objectives and working methods to potential participants in the research programme.

Entrepreneurial and Business Angel Financing Annual subscription €50

Published by the European Business Angel Network (EBAN), this quarterly journal replaces the highly successful EBAN newsletter. It will cover all aspects of private equity financing for entrepreneurial activity – from legal and tax issues to company valuation and exit strategies. EBA Financing aims to supply 'informal investors' and venture capitalists with practical information on new developments, as well as reviews of relevant books and articles and notices of interesting events.

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EIB Innovation 2000 Initiative progress report

During the first year of the European Investment Bank's 'Innovation 2000 Initiative' (i2i), which supports projects promoting EU innovation, entrepreneurship and information technologies received significant boosts, according to the report. But the EIB is still familiarising itself with the R&D sector.

The EIB approved 26 projects worth over €2.5 billion, many in objective 1 regions in Spain, eastern Germany and Greece. Financing is targeted towards five areas – human capital formation, research and development, information and communications technology networks, diffusion of innovation and the development of SMEs and entrepreneurship. In this last area, two programmes providing EIF guarantees for microcredit lending were launched in the framework of the EU's Multiannual Programme for SMEs.

Contact
http://eib.eu.int/pub/divers/i2i_en.pdf

The Commission's Annual RTD report for 2000

The latest annual report on EU research activities covers a period in which research policy became more ambitious and assumed a higher political profile. It describes initial response to the Communication 'Towards a European Research Area', and reviews the launch of the Fifth Research Framework Programme. The "massive" response to the first calls for proposals "is encouraging especially as it reflects significant participation by countries in the pre-accession phase which are now associated with the Framework Programme", the report says. It highlights the special efforts made to encourage participation by women, to comply with fundamental ethical principles, and "to reconcile the need for consistency and administrative rigour with ease of access".

Contact
http://europa.eu.int/comm/research/report2000.html

Note

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Joint ESA/EC Document on a European Strategy for Space

Europe has to use space development as a tool to attain its major economic environmental and security goals, according to this report commissioned by the European Space Agency. 'We can no longer see space and space policy as separate from other European activities,' says the report. Recommendations include a closer relationship between ESA and the European Union, and using ESA developments as potential businesses.

Contact
http://ravel.esrin.esa.it/docs/wisemen_report.pdf

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