

## PROFITING FROM RESEARCH AND DEVELOPMENT

### 2 News

How one start-up got the cost out of its product before it launched. What the latest international R&D Scoreboard figures say about trends in research spending. Plus innovation insights and news in brief

### 4 View from Europe

Europe needs to set goals and foster creativity in order to make its research more effective

### 5 View from America

What are the priorities of America's research managers in our rapidly changing world?

### 6 Is your R&D effective?

How to measure not just the output of your R&D, but its impact on your company as well

### 10 Reinventing Europe

Janez Potočnik, the new EU science and research commissioner, speaks exclusively to *IQ* about his vision for European research

### 13 Case study

How two Unilever venturers developed a product that looks set to make them dairy queens

### 14 Patents at your service

Many businesses are providing more services. But Europe's attitude to protecting the intellectual property of services is clouded

### 15 A day in the life of...

Andrea Cuomo, corporate vice president of advanced system technology at Franco-Italian semiconductor company STMicroelectronics

### 16 Back page bytes

Upcoming activities, catching up with recent events, more about EIRMA, contacts, credits...



## Science boost for skiing

An Austrian ski equipment company is working with a group of university researchers and a national technology transfer organisation to produce better skis, boots and bindings for niche and general markets.

ATOMIC Austria has collaborated with researchers at the Institute of Sports Science at the University of Salzburg for more than eight years, to better understand how skiers, snow and equipment interact.

In June Prof Dr Erich Müller, head of the Institute, applied to Austria's Christian Doppler Research Association to create an organisation that will improve the practical application of its basic research. Müller turned to ATOMIC to be the industrial partner it needed to meet Christian Doppler funding rules.

The partners have formed the Christian Doppler Laboratory for Biomechanics and Skiing in facilities at the University. Müller and his colleagues will continue as academics, teaching and undertaking basic research. The Christian Doppler Research Association will pay for extra staff to work exclusively in the Laboratory on basic and applied research. ATOMIC is contributing its ideas, tools and a steady stream of products for testing and development.

"It's a fantastic fit for Christian Doppler and for us," said Müller. "It means I can have extra staff without them having to do anything but work on research."

Michael Schineis, president of ATOMIC Austria, says the collaboration will help inject more rigour into the development of ski equipment.

"The ski industry is based on craftsmanship in developing the products and materials and there's a lot of gut feeling involved," he said. "What's important in this cooperation is getting access to external know-how at the very sophisticated level ▶

## Ski boost from p1

of their bio-mechanics work, and finding out how to use this to optimise our product.”

Schneis says skis, bindings and boots are usually developed independently. ATOMIC wants to develop all three together to better understand how they interact and what impact that has on performance.

“It’s all about increasing our competitiveness by getting more information so we can make better and safer products. We want to understand how different target groups, such as older women, ski.”

## New markets

ATOMIC is already working on a ski tuned to women’s needs.

“We think that for the 2005 or 2006 season we already have ideas of how women’s skis could be different from unisex skis,” Schneis said.

He says that since ski sales are seasonal it makes sense to introduce innovations in small steps so that they catch each sales season.

ATOMIC has also strengthened its own operation, building a research centre in its factory.

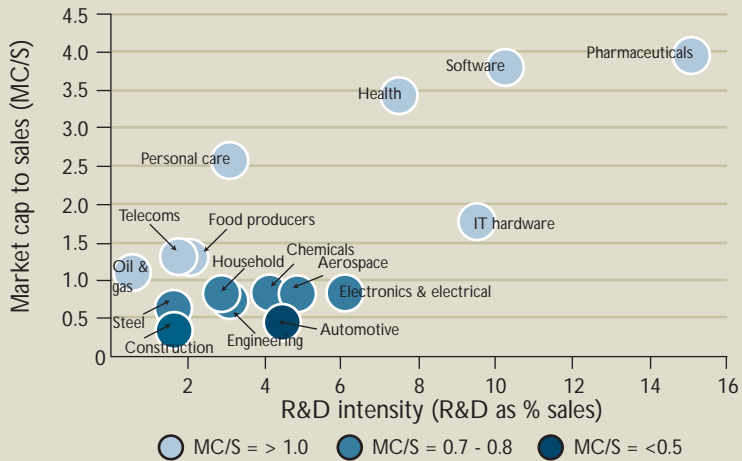
“It’s part of our strategy to be more systematic and take a more holistic approach,” Schneis said. He believes that ATOMIC’s involvement in the Christian Doppler Laboratory will be as much about basic science as about its application.

“At the end the outcome should not be a new product but more knowledge,” he said.

## Innovation insights

- The Christian Doppler approach is a model for strengthening basic science and accelerating its use
- Applied research can give companies an edge in craft-based industries
- A series of small innovations can provide a developing advantage
- Larger innovations can create new markets

International R&D Scoreboard shows that investing in research and development boosts the market’s perception of a company’s value



Companies that spend a large proportion of their sales on research and development tend to be highly valued on the stock market, according to the latest analysis presented in the UK government’s international R&D Scoreboard.

Although the correlation is strong, each sector is perceived differently by the stock markets. The pharmaceuticals sector, for example, spends a lot on research and is highly valued by the market. The software and IT hardware sectors have roughly the same research intensity and yet are rewarded with substantially different market capitalisation to sales ratios. It’s clear that research spending is not the only factor informing the stock market’s perception of a sector’s worth.

Personal care, for example, has a relatively high market capitalisation to sales ratio despite a relatively modest level of research intensity.

## Corporate profits are up but research spending trails

The profitability of the 700 companies that fund most of global industrial R&D has improved markedly between 2002 and 2003, according to the Scoreboard. But investment in R&D has been less buoyant and in Europe is flat.

| Factor                                      | International 700 | Europe | Americas | Rest of world |
|---|-------------------|--------|----------|---------------|
| Profits/sales (%)                           |                   |        |          |               |
| - 2002                                      | 4.0               | 3.9    | 3.4      | 5.1           |
| - 2003                                      | 8.2               | 7.2    | 10.5     | 6.9           |
| R&D (€bn)                                   | 290               | 104    | 115      | 71            |
| Change in R&D (%)                           |                   |        |          |               |
| - over one year                             | +2                | -1     | +4       | +3            |
| - compared to four-year average             | +4                | 0      | +9       | +1            |
| Change in R&D/sales ratio over one year (%) | -3                | -2     | -6       | -1            |

Source: UK Department of Trade and Industry.

Further information, including the full spreadsheets, can be found on the EIRMA web site at [www.eirma.asso.fr/scoreboard](http://www.eirma.asso.fr/scoreboard)

## Start-up gets costs out before spin-out

A European start-up is using the long-term experience gathered by its academic and industrial founders to enter a market that major semiconductor companies such as Intel and Philips Electronics have recently decided to leave.

Staff at Ghent University's thin-film components group and at IMEC, an independent nanotechnology research centre based in Leuven, Belgium, have jointly developed a low-cost liquid crystal on silicon (LCOS) imaging element for projection TVs. It is built using chip-making techniques.

In August the two groups formed a company, which they called Gemidis, to commercialise the technology. In October both Intel and Philips withdrew from the LCOS market, citing the time and investment that it would take them to make a return.

### Riding the learning curve

Geert Van Doorselaer, co-founder and chief technology officer, said: "We already have nine years' experience of this technology and we have been able to drive costs down the learning curve in the facilities at Ghent and IMEC.

"Cost is the main issue, but our costs have matured over the past few years and will continue to decline due to our expertise in LCOS and that of the material suppliers and the component manufacturers."

Gemidis outsources the capital-intensive manufacturing part of its operation to a specialist semiconductor subcontractor, and the module assembly to another supplier. Both arrangements have provided opportunities to cut costs.

"We were able to negotiate good deals with the assembly providers," said Van Doorselaer. "Another thing we're good at is the transfer of new technology to manufacturers."

### Broad backing

IMEC and Ghent University are providing financial and technical support for Gemidis. Other funding is coming

from GIMV, a venture capital company; Fagus, a joint venture between the European Investment Fund and Fortis Private Equity; Baekeland-fonds, Ghent University's start-up fund; and its initial business partners.

Van Doorselaer says each backer has a stake of around 10 to 20%. Staff have also invested in the venture. The company has an initial valuation of €4 million and the initial investment is meant to fund Gemidis for 18 months.

The company now employs seven, six of them researchers who have transferred from Ghent or IMEC. Van Doorselaer says they are gradually making the change from being academic researchers to being part of a company.

"In the commercial world you have to make choices but you end up with something that can be made and sold and that you have to support and maintain," he said. "We have an advantage at this point because everyone is more focused on what they're doing and they understand you have to reach one goal, which is different to the academic world where goals are more diffuse."

True to his word, Gemidis is expecting to have its first product, an LCOS module for use in 768-line widescreen displays, in a few weeks. It then plans an HDTV version of the part for spring 2005 and a pipeline of other products to follow.

Mass production capacity of 5000 modules per month is expected to be available as of December 2004.

### Innovation insights

- Academic partners can drive products down the cost learning curve before they transfer the technology and its development costs into a commercial setting

- Don't believe that just because big companies withdraw from a market, small companies will be unable to make a living

- Organisations that employ academics need to help them adjust to corporate life

## IQ briefs

### Health research triples

Annual spending on health research worldwide has more than tripled in the past ten years to just under \$106bn, according to the Global Forum for Health Research. This is due to the emergence of private foundations and public-private partnerships as funding sources, and to a steep rise in spending by America's National Institutes of Health.

The US accounts for 49% of spending, followed by Japan at 13%, the UK at 7%, Germany at 6% and France at 5%.

[www.globalforumhealth.org](http://www.globalforumhealth.org)

### Seeking staff

People are the lifeblood of any research organisation, but white males still tend to dominate. To access other groups, companies need to ensure gender equality and value what people do more highly than how long they spend doing it. Creating organisations that encourage communication, provide modern role models and offer networking and mentoring schemes also helps. These are some of the conclusions of a recent study sponsored by the European Commission. Find out more about broadening your research team and enabling them to work effectively by accessing the relevant sections of the EIRMA website.

[www.eirma.asso.fr/effective](http://www.eirma.asso.fr/effective)

[www.eirma.asso.fr/women](http://www.eirma.asso.fr/women)

### Money for nothing

A US website called Community of Science claims to list \$40bn worth of unclaimed research grants. The subscription site offers a searchable database and a weekly email update on new sources of funding. It also lists the expertise of half a million researchers at 1600 institutions worldwide.

[www.cos.com](http://www.cos.com)



## Improving the effectiveness of R&D

Europe needs to set clear goals, foster creativity and learn to work in open partnerships, says Hans de Wit

Effective application-oriented R&D is all about reaching goals. It's a simple principle, but often difficult to put into practice. Goals have several dimensions, some of the most important of which are output, time and costs. Meeting goals becomes easier when they are realistic. So let's assume they are. How do we realise them effectively? This is an important question as the goals of industrial R&D become more complex and the pressure to reach them quickly grows. Goals are also increasingly being realised by multi-disciplinary teams embodying multiple cultures and sometimes, through open innovation, with external partners.

The effectiveness of R&D shows up in the value it adds to an industry or to society at large, in new or improved products and processes, the solution of societal problems or support for governmental policy. In short, the value of R&D is expressed as innovation. That value is revealed in various ways, such as intellectual property rights, new businesses or a paradigm shift in healthcare.

Effective R&D implies that the costs can be justified as an investment with a good return.

The multiplier is normally between five and ten in high-quality industrial research facilities. One would expect that this alone would prompt increasing investment in R&D, but it doesn't work like that. One reason for this is inadequate communication. We need more transparent metrics that express the value created by R&D in ways that convince even the most fanatical auditor.

The quality of R&D in Europe is high, on average. Our engineers and scientists stand out because of their broad education, which gives them a multi-disciplinary and creative approach to problem solving. Our cultural diversity is a further advantage when creativity is at stake.

As to innovation, R&D is only part of the story. Complex development has to take place to turn an idea into a marketable result, and usually this development does not

happen according to the familiar but now obsolete linear innovation model. Dealing effectively with the complex and often whimsical development process is crucial to the overall effectiveness of an innovation project. Researchers need to adopt a new mind-set. Management and institutions should follow suit.

Increasing the effectiveness of European R&D means starting with the goals. We need more creative ideas and better ways to choose which ones get taken forward in well defined R&D projects. We also need excellent project and programme management, and a professional IP management approach that meshes with the way open innovation works. We have to learn how to manage projects in which industry collaborates with public research organisations and other partners. This means learning how to deal with a scattered consortium, with a mix of cultures and various agendas.

Responsible partnering, based on trust and respect, will also be crucial. The scientist of the future will work in a variety of personal, professional and organisational networks: today's youngsters already think and act this way. Management has to accommodate this approach and optimise the organisation of R&D with it in mind, in order to gain a step change in effectiveness. The payback is that young scientists will be thrilled to work in environments tuned to this way of thinking.

Europe's main challenge will be to learn how to make best use of these positive aspects of its R&D environment, which can make a vital difference in this highly competitive world. The future belongs to the creative mind. Europe must foster its creativity and apply it as effectively as it can in order to compete. ■

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# What's next for US innovation leaders?

American innovators must take a global view in response to a unique set of challenges, says Miles Drake



The US faces a set of challenges to its competitiveness that must be turned into opportunities, through innovation at every level of the enterprise, if it is to prosper.

In the energy domain, it appears we may be reaching Hubbert's Peak, the historical maximum in potential oil and gas production, just as demand accelerates as a result of China and India's burgeoning economies. For the environment, the recognition that global climate change is upon us is driving a quest for clean energy, which will demand new economic models of production and consumption. Ensuring sustainability will mean tackling issues including population growth and the divide between the developed and developing worlds, which is now being manifested in threats to our security.

Meanwhile information can now flow anywhere at almost no cost. The decreasing cost of computation is changing design, control and supply-chain management in ways that are only beginning to be exploited. The 'Wal-Martisation' of America is creating relentless pressure on productivity and changing the way products and services are introduced, because of the demands of this supply-chain economy. These factors are playing out in a new political context, where a seriously polarised America is undergoing a unique jobless recovery that is taking the economy into uncharted territory.

US companies need to recognise that the centre of gravity for research talent is shifting away from the US and Europe, to Asia. The flow of the world's best and brightest into US education is slowing, as security issues and the increasing attractiveness of local universities change the dynamic. US research organisations also face a demographic timebomb as the baby-boomer generation reaches retirement age, leaving behind a skills and experience gap that must be filled.

Innovation managers must do more with less, improve knowledge management and tap global sources of talent. Security concerns are creating a new context for innovation, as the government requires businesses to protect their value

chains. This will be a cost and an opportunity for product and service providers. The energy outlook will also drive innovation in the hydrogen economy, and through the search for improved nuclear, clean coal and alternative energy options.

So how should US innovation managers respond?

Companies based in the US must create market-facing innovation capabilities in Asia, to learn from and participate in the rapid expansion of China and India. International companies must both understand Asia's market dynamics, and be aware of the opportunities and threats that will arise as disruptive products and services are developed there and made available worldwide.

I see a huge opportunity for the US in tackling these issues. The US has a unique national diversity and an entrepreneurial capacity that is the envy of the world. Unprecedented global connectivity means we need to take a truly global perspective of our innovation assets (the information we have that can be turned into business value), and of our innovation capital (the people to do it). We need to improve innovation productivity to compete for the diminishing returns of fast-moving global markets. We can also thrive by making good choices to use innovation to address the dramatic issues that face the world today.

Our future competitiveness depends on building networks of global enterprises that focus on the life-enhancing innovations that will propel sustainable global growth. We need to match that effort with a world-class workforce at all levels that we can draw on for its unique talents and national perspective, while also making the most of the unique capabilities of other nations around the world. ■

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# Assessing the effectiveness of R&D

How can you tell what impact R&D is having on your organisation? Luke Collins investigates

It is important to assess R&D's contribution to meeting an organisation's goals, to ensure its work is aligned with strategy and its output is properly exploited. Measuring the impact of R&D is more complex than measuring its output. This article describes a way of doing this wider analysis. The technique can illuminate the role of R&D within an organisation, but is not a substitute for management.

How do you know if an organisation's research and development is helping it meet its goals? What happens if you set out to find out? And why should you even try?

R&D competes for corporate resources, yet the relationship between its work and the advantage the company gains is often hard to see. The lag between investment and reward can be long. The ideas may come from R&D, but turning them into profit involves the efforts of many others. These factors blur the link between the investment made and the advantage gained.

Yet the innovation that springs from R&D is vital to an organisation's continued prosperity. R&D matters, yet often has a hard time presenting itself as more than a cost.

Dr Nico Thijssen, director of processes at Corus Research, Development and Technology, told a recent conference on assessing the value of R&D that research managers should take responsibility for demonstrating its impact on an organisation. This will help senior managers understand the importance of including R&D in their strategic thinking.

Kari Ebeling, recently retired director of corporate R&D for UPM-Kymmene, agreed, saying: "The R&D function in a business is too valuable to be left only to itself. We must motivate our top management to provide good guidance for its projects."

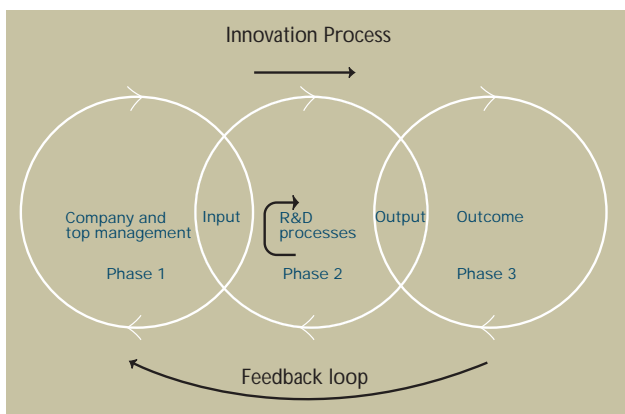
## Driving the feedback loops

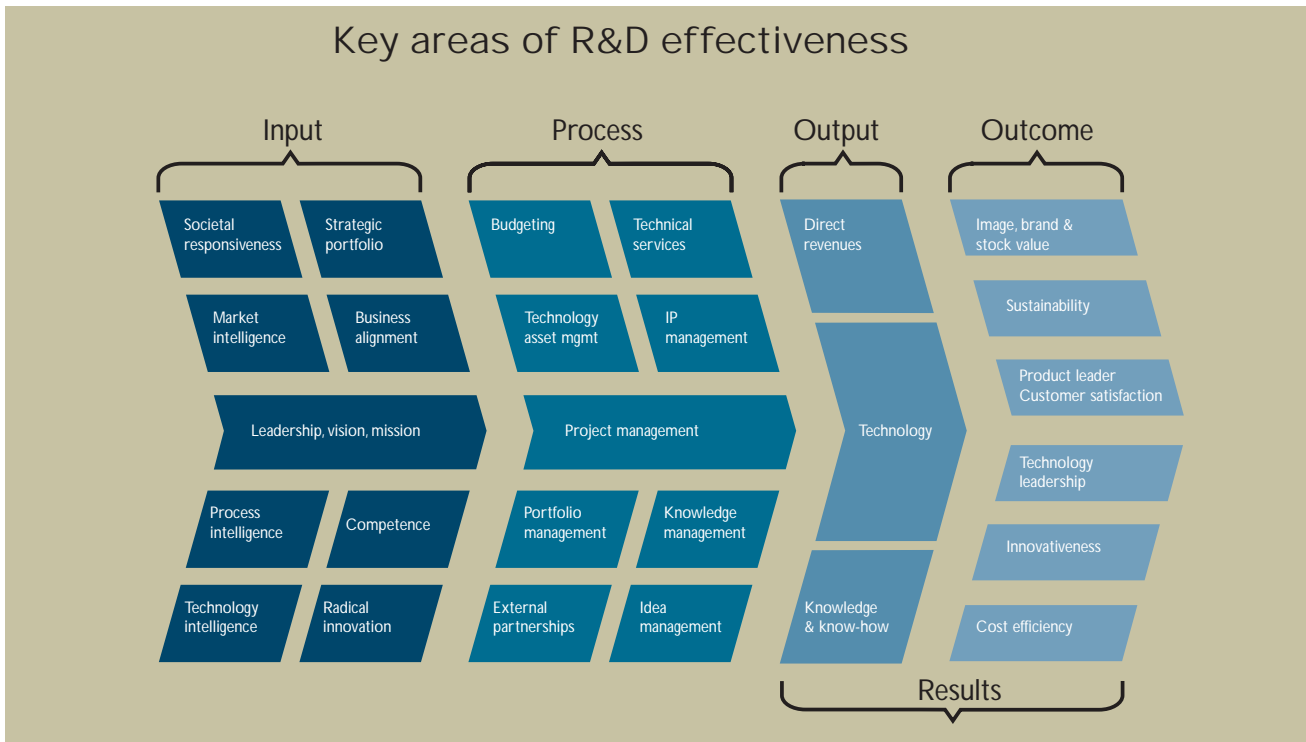
Which brings us neatly to our second question: what happens if you set out to discover how well R&D is helping an organisation reach its goals? The effort to find out often prompts discussion and analysis that questions the role of R&D, how its work fits with the organisation's strategy and whether its output is properly applied.

A classic view of R&D management (left) splits the task into three phases. In the first phase, strategic inputs from management guide the choice of work to be carried out in the second, process, phase. This second phase provides the research's output, which is often combined with the outcome of its application in a third phase called 'results'.

A structured analysis of the relationships between these phases provides a model that can help organisations understand if they are guiding their R&D efforts properly, how good the R&D function is at producing results and the value of doing the research at all. A team of senior research managers has developed this model to provide the detail and rigour needed to address the key questions of R&D effectiveness.

Thijssen has used this 'EIRMA model' to assess R&D at Corus, to see how each of the business units uses it. He found that some business units had not told R&D the directions they wanted to go in.





Dr Peter Cartwright recently became science and technology director in the core products business of Dow Corning. He took on the role after working in research, sales and operational management, and used the EIRMA model to help him understand the research function he now runs.

"This assessment tool was absolutely fantastic for me to start the role with," he said. "The best thing about it was the debate it engaged people in."

### Assessment techniques

Various techniques already exist to highlight how well or badly a research organisation is delivering its output, but few accurately reflect how well its strategic research direction has been chosen or how effectively the output has been put to work. Internal measures, such as the number of patents filed each year, can be distorted, for example by filing many small variants to make up the numbers. This measure alone also fails to say whether generating these patents makes strategic sense.

This is a common mistake. Olli Vuola, former director of new projects at TeliaSonera, pointed out: "The EU mistakes spending for performance. What does this tell us about performance? Nothing. It's an input only."

"I have heard it said many times: you need only one metric and that is new product sales," he added. But Vuola says that this tells you nothing about the success of, for example, IT research centre Xerox PARC, whose invention of the graphical user interface, the laser printer and Ethernet networking has radically reshaped computing.

Xerox was slow to apply the work, leaving rivals to capitalise on its inventions. Xerox argues the money it made

from laser printer patents paid for Xerox PARC many times over. But the outcome could have been much better if Xerox had made better use of PARC's output.

"If you want to measure R&D output you need to measure the R&D function," said Vuola. "If you take Xerox, they had world-famous output but what was the business outcome?"

### The EIRMA model

Which brings us back to our first question: how do you know if an organisation's research and development function is helping it meet its goals? The EIRMA model recognises the difference between the output of the research function, and the outcome achieved from having that output.

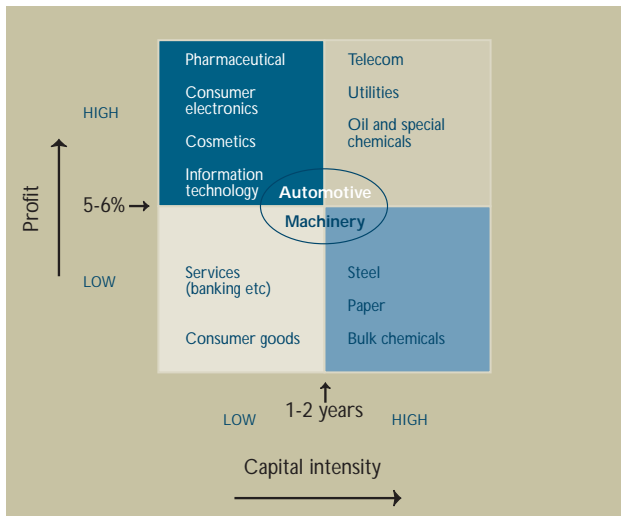
Ebeling said: "The most important output of the R&D function is knowledge. The effectiveness of R&D depends very much on how this knowledge is applied in the company, how it can be used to deliver positive outcomes for the company."

Graham Copping, director of GPC Consulting, points out the importance of not confusing research efficiency (the extent to which an organisation produced the desired output with the allocated resources) with research effectiveness (the impact of that output on the organisation that paid for it).

The model therefore sets out to help organisations think about how well their R&D operations deliver the outputs they are asked for, how well they provide them with strategic input and how well they apply their output.

The first step in developing this more ambitious model was to decide on a set of key factors that could define how well





an organisation was performing in each phase of the research process. A total of 27 of these ‘excellence indicators’ were chosen, nine for each phase (see diagram on page 7).

It didn’t take long to realise that different sets of indicators would be relevant to organisations in different circumstances. It also became clear that senior management would have difficulty digesting a research assessment described using 27 factors.

Fred van Ommen, who is responsible for innovation excellence at Philips Electronics, said: “You don’t need a large set of indicators. The important thing is that they are based on your strategy.”

### Seven steps to effective assessment

- 1 Focus your assessment of R&D effectiveness by considering how well R&D is aligned with strategic goals and how well its results are used
- 2 Characterise the business you are in, in terms of capital intensity and profitability
- 3 Understand where your organisation wants to be in each of the markets it addresses: a leader, a fast follower or graceful exiter
- 4 Consider the excellence indicators suggested by the EIRMA model for the combination of profitability and capital intensity of the business under analysis. Select those indicators that make sense in terms of your preferred market role and any special circumstances
- 5 Score the organisation on each of the chosen excellence indicators. If possible use many assessors from many roles to gain a rounded view
- 6 Use these quick results to decide where to do more detailed assessments using relevant performance indicators
- 7 Feed the results back into the organisation at all levels, from informing board-level strategy to motivating individual performance

Bengt Nilsson, director of corporate R&D for Tetra Pak, says it’s important to choose the measures carefully so you can use them in the business as tools: “Don’t let the finance people rule you, because finance measures are not the kind of thing you can communicate to other parts of R&D.”

### Simplifying the assessment

Two factors were used to simplify the assessment of R&D effectiveness. The first was to ask companies what competitive role they wanted to play in a market: were they setting out to lead it, to be a fast follower of an established player, or simply planning a graceful exit. The second was to consider the relationship between an organisation’s profitability and its capital intensity (left).

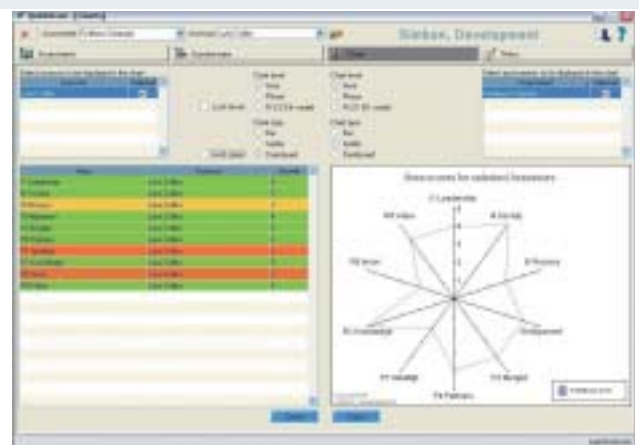
Companies in the upper left-hand corner of the diagram can be highly profitable without needing large capital investments. Conversely, those in the bottom right-hand corner of the diagram demand large capital investments and deliver limited profitability. It makes sense to use a different set of criteria to assess organisations operating in each of these conditions.

The model’s developers chose ten excellence indicators for organisations in each quadrant, partly in order to reflect their differing abilities to implement radical R&D results within their existing operations.

“It is easy to implement radical R&D results in a non-existing business,” said Ebeling. “The lower the capital intensity the easier it is to carry out radical change in research.”

One of the more valuable things about using this model is the thinking it provokes. An organisation could consider its research in the context of the capital intensity and profitability of its sector, and the competitive role it wanted to take in the market, placing itself in a three-dimensional version of the quadrant diagram. The appropriate excellence indicators for a company that wants to lead a highly capital-intensive sector will be very different from those for a company that wants to maintain a position in a less capital-intensive sector. This analysis can help work out the appropriate indicators.

One of the most valuable things research managers can do with the model is to work out quickly where to focus a more



detailed analysis. An initial score for each excellence indicator can be worked out by referring to a scoring grid. The grid relates how clearly the objectives for each indicator are set out within an organisation, to how well those objectives are supported with enabling tools.

For example, an organisation will only score five out of five for its ability to use technology intelligence when it sets out to provide the best technology intelligence for R&D planning. To do this it needs to have the resources and processes set up to gather technology intelligence, perhaps through a technology unit, strategic academic contracts and regular conference visits. An organisation with such a clear objective to gather technology intelligence and a strong infrastructure to do so is likely to have an up-to-date library of intelligence that can drive its technology roadmaps.

"This method gives one a very good opportunity to evaluate the whole R&D process and find out which of the three research phases is best and which needs more follow-up and training to become so," said Ebeling.

Such a quick yet detailed way of assessing key aspects of the R&D process can then be followed up by more specific work using separate performance indicators for each area that needs improvement. Again it is important to choose these performance indicators wisely: there may be organisations for which the number of patents filed in a year is actually a good measure of its effectiveness, not just its output.

## Next steps

The value of the EIRMA model was demonstrated when Cartwright applied it within Dow Corning and got good feedback for its logical and methodical approach. He likes the way it can be used to enable various departments to assess each other, delivering a rounded view that is not overly

influenced by any one voice. But it is not a substitute for management.

Arjan Van den Hoogen, department manager at Corus Research, Development and Technology, said: "The model does not do the thinking for you. The model helps you structure your thinking."

Jac Goorden, management consultant with Simbon Innovation Management Solutions says a good way of thinking about the model is as a dashboard: "You don't drive a car by looking at the dashboard. You check on the dashboard for things that might be coming up.

"Understanding R&D effectiveness is critical but complicated and not all of that complexity will go away by having the right tool," he warned. "Measuring is not important if no-one is analysing the results."

Goorden has produced software called QuickScan (screen shot opposite, bottom right) that embodies the model. It makes it simpler to decide which excellence indicators an organisation should use and then leads users through scoring each indicator. It can support many assessors, storing any comments they want to make alongside each assessment and then providing an average score for each indicator.

"Before we had navigation systems in cars I used to think that speed was the most important indicator," said Goorden. "Now it is Estimated Time of Arrival." ■

## Further reading

The assessment model was developed by members of an EIRMA working group, drawing on their combined 600 years of research management experience. Around 500 days of their time went into producing the model and the documents that describe it in detail, which are available to EIRMA members at [www.eirma.asso.fr/assess](http://www.eirma.asso.fr/assess)



"Don't let the finance people rule you"

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"Research managers are responsible for demonstrating its impact"

*Nico Thijssen*



"The EU mistakes spending for performance"

*Olli Vuola*

# Reinventing Europe

Janez Potočnik spoke to *IQ* about the challenges faced by the European Commission

It's a critical time for European research. A new Commission is just starting work, charged by its president, José Manuel Barroso, with reinvigorating Europe's efforts to recast itself as a globally competitive knowledge-based economy.

Progress on implementing this plan, known as the Lisbon Agenda following its endorsement by the European heads of states at a meeting there in 2000, has been slow. Wim Kok, the former Dutch prime minister who was asked by the Commission to analyse its progress, used his report in November 2004 to issue a stark warning.

"The Lisbon strategy is even more urgent today as the growth gap with North America and Asia has widened, while Europe must meet the combined challenges of low population growth and aging," he wrote. "Better implementation is needed now to make up for lost time."

Incoming president Barroso is committed to reinvigorating the agenda, appointing a team of what he calls "reform-minded commissioners". His approach reflects a growing commitment within the Commission to link research policy to the needs of industry and economic growth.

## Fresh plans

In June, the Commission announced six new strategies for strengthening European research, including European centres of excellence, technology initiatives and increased competition in basic research. It wants to underpin these by making Europe more attractive to researchers, improving the infrastructure, and coordinating national research programs. The Commission's plans also aim to create a European Research Area, a 'common market' for research.

This all costs money. The Commission wants to increase EU spending on research from €19.2 billion now, to €40 billion for the budget period from 2006 to 2013. This more than doubling of support for research depends, of course, on the member states accepting the overall budget. It is also



backing the formation of a European Research Council to drive excellence and competition in basic research.

Another part of the Lisbon agenda is for the total European Union investment in R&D to match that of the US and Japan, up from today's 1.9% of gross domestic product to 3%. With most of the extra spending to come from the private sector, achieving this increase depends upon the Commission and the member states having a solid understanding of the conditions that will make it possible and the political will to ensure these conditions are achieved.

## New commissioner

The man charged with taking these initiatives forward is an economist who has most recently been working to help Slovenia, his home country, join the EU.

Janez Potočnik, commissioner for science and research, has personal experience of the discipline, having worked in Slovenia's Institute for Economic Research for five years and later directed the government's Institute for Macroeconomic Analysis and Development.

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**"I am the product of a well organised governmental research action"**

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Potočnik is proud that his academic career was backed by a government initiative that recognised the importance of a skilled workforce in industrial R&D departments to Slovenia's international competitiveness.

The *2000 Young Researchers* programme, launched in 1985, set out to renew the staff in research institutes and universities, to educate staff for the industrial sector and to promote postgraduate education and training.

"To put it bluntly I am the product of a well organised governmental research action," said Potočnik.

The Slovenian government says the programme's aims were largely achieved. More than 2000 graduates were supported through postgraduate education; the age mix of Slovenia's research community improved and a strong base of junior researchers was established. But only 10% of the PhDs entered industrial R&D, reflecting the issues faced across eastern Europe following its political, economic and industrial restructuring in the 1990s.

### Tackling the Innovation Paradox

Slovenia's need to attract well educated people into industrial research is matched at the European level by the need to link the research that occurs in the region to industrial innovation. Part of Potočnik's job will be to address this European Innovation Paradox.

"We have the basic results but innovations are somehow lagging behind," said Potočnik. "It is probably the most difficult equilibrium for which one needs to try to find an answer.

"It is clear that the technological platforms and technological initiatives will be a step in the right direction. It is also clear that the public money has a correlation with private funds, which follow. This correlation is relatively high; obviously the public money triggers private investment."

### Making research pay

Industrialists will need a more encouraging investment climate if existing companies are to increase their spending on R&D and new companies are to choose to do their research in Europe. So what can Potočnik do for them?

"What you can do is to try to create improved incentives and conditions," he said. "Whatever you are doing in the public sector you have to have one eye on how this will work in the private sector. I think the technological initiatives are probably one of the most promising tools, because they seat all the stakeholders at the same table. If industrialists are sitting with researchers, the banking sector and government, the probability that you will get something resulting in innovation is higher.

"Research exchange actions financed by the Marie Curie Program [which supports training, mobility and career development for researchers working under the Sixth Framework program] are also clearly part of that.

"Of course this is not all the Commission does," he

**"If industrialists are sitting with researchers, the banking sector and government, the probability that you will get something resulting in innovation is higher"**

added. "It establishes conditions for all companies, although maybe primarily for the small to medium-sized enterprises (SMEs). And you have tax incentives, state aid systems and so on. If the conditions create an environment in which the work itself is effective, then the probability increases that companies will stay and do research here."

Another of Potočnik's ideas is to use the upcoming seventh Framework Program to back research that benefits several sectors.

"One could ask which research is the best at improving conditions in a number of sectors. Where we could have potentially good results through research or innovation in horizontal sectors is, for example, in nano-technology, information technology or biotech," he said.

### The European Research Council

Potočnik is backing plans for a European Research Council (ERC) of senior scientists to coordinate basic research, despite the key issue being how to couple links between basic science into industrial innovation.

"When talking about ERC I think it is very important to underline the autonomy of researchers to decide on the substance. But I am quite confident that researchers, even when they are thinking about future research, have in mind how that research could be applied in industry," he said.

He questions whether it makes sense for the ERC to welcome senior industrialists, to help tackle the European Innovation Paradox by making a more explicit link between basic science and those who can apply it.

"One can see how this would be appreciated, but we have to be clear that it is their decision," he said. "We have to have in mind that the division between basic and applied research is artificial. It is very difficult to draw the line. Basic research is applicable in the long run. If we don't have basic research then we might find ourselves on a one-way road and it would be difficult to go back, so a balance is crucial."

### Supporting SMEs

Potočnik is keen to see the Commission support SMEs.

"SMEs are a special issue," he said. "Why? Their importance and their potential for GDP growth is high. Practically 99% of all companies are SMEs. Only 3% are doing research but they have a high innovative mix. According to the figures, 44% of SMEs are innovating, so their problems should be addressed in a specific way.

"First of all I would highlight conditions. The second thing is definitely simplification and rationalisation of research proposals. If research proposals are relatively difficult and time consuming, that is killing for the SMEs.

"SMEs and small research teams will benefit most if we could succeed with simplification. We have quite a lot of research actions in favour of SMEs but it is clear that some





**“I believe that integration in science and research will not be as easy as political integration”**

are better than others. The Networks of Excellence are relatively difficult for SMEs to enter while integrated projects are more useful for them.”

### **Integrating the skills of new member states**

Potočnik says a lot has been done to access the skills of new member states through the fifth and sixth Framework Programs, which created conditions that enabled what were then accession states to participate. Going further won't be easy, though.

“I believe that integration in science and research, especially participation in programs, will not be as easy as political integration,” said Potočnik, “because when you discuss foreign relations you sit at the same table and you are all equal and that is it. When we are talking about research programs you need to have experience, you need a good basis, good teams, good knowledge. Only then can you participate equally. This takes time and money and that is why it is so important that we encourage the new member states and we create equal conditions for them.”

### **Global competitiveness**

One very good reason for accessing the skills of the new member states is to improve Europe's global competitiveness in basic science and its application. So how can that be done when knowledge is increasingly mobile and sought after?

“Of course one needs to fight against a brain drain, but I think the major issue to tackle must be the circulation of

researchers. So we should try to attract researchers from other continents and let ours travel, at the same time creating the best conditions for their return,” said Potočnik.

“Competitiveness is not just about economics, but also quality of life,” he added. “Of course one wishes to be competitive in the purely economic sense and when economists talk about competitiveness it is quite clear what they mean. When the people who don't believe in economics talk about the quality of life, they know what they are talking about. But in the end we are all talking about the same thing. Unemployment is about quality of life, a higher growth rate is about quality of life. It is very important that we understand not only that money matters, but also the other things. Are the cars running on the roads, is the infrastructure good, can you get to your job, is the air that you are breathing good for you? These are all part of the equation.

“You can't hide the fact that all over our world people are living differently and that living conditions could and should be better. I think the most difficult issue for Europe is how to compete with parts of the world where people will work for practically nothing. It is difficult, but I am confident that with knowledge, with more communications, with the fact that the world is getting smaller, these differences will get smaller.”

### **Back to money**

The underlying issue for European research policy is money. Potočnik would like research spending to increase even further than the budget proposal suggests, by seeing its aims incorporated into national agendas.

“We shouldn't look only at the EU budget, because the EU budget is relatively small compared to national budgets overall,” he said. “But the European budget is important because it gives a sign of the direction in which we would like to go.”

He believes a European budget that shifted from redistribution towards development would send an important signal to national governments.

“I think this is a major message that should be taken on board in national budgets,” he said. Potočnik recognises it's unlikely that national governments will follow the Lisbon Agenda slavishly, but at least there would be better alignment and a related increase in R&D spending.

“That's why we need an agreement on the budget,” he said. “Conditions now are much better than a few years ago because there is a growing awareness of how important research is, where we are lagging behind, where we can catch up.

“I think we have to ride that horse because now is the perfect time.” ■

**“Competitiveness is not just about economics, but also about the quality of life”**

# Setting out to build a dairy empire



A two-year-old spin-off from Unilever's research laboratories is already looking for fresh finance to grow its business.

CréaVite was formed in May 2003 by Dr Renoo Blindt (left) and Dr Bronwyn Elliott (right), of Unilever's Colworth House research lab, to commercialise a quick-setting dairy product for the food industry.

CréaVite Fraiche can be used to make desserts and quiches, saving chefs time and money. It is in trials with food service companies and regional distributors.

## Venturing forth

CréaVite won start-up financing from Unilever Ventures and the founders in February 2004. It now employs 10 and is seeking external finance to fund growth.

"In April 2002 this was just a Friday afternoon project," said Elliott, now technical director.

The idea for the product emerged in 1999 and Elliott spent three years trying to interest a Unilever business unit in it before turning to Unilever Ventures (UV). CréaVite was one of 80 projects that applied for UV funding, surviving

a series of assessments to become one of three to win development money. Each was then re-assessed before getting spin-off funding.

"It's a really good model for taking forward ideas that no-one in research and development would have taken anywhere," said Elliott. "To think we have tons of product in a warehouse in Bristol is amazing."

## In development

Mark Muth, a director of Unilever Ventures (UV) and its representative on CréaVite's board, says UV has been able to act as a cheerleader for the company, as well as providing a commercial perspective and some financial discipline. But it doesn't run the company.

"It's counterproductive to micromanage these companies. We have to find the right management team and we're still on the board and at the end of a phone. But we're not going to make money if we think we're going to run them," he said.

Muth also says it is important to see UV as the venture capital arm of Unilever, rather than its corporate venturing operation.

"Other corporate venturing units try to set up as standalone companies but we're fairly unusual in that we take the next step and cede some control and equity ownership."

## Trial by customer

"When we first trialed CréaVite Fraiche with food service chefs, they applied it in much broader ways than we had thought of," Muth said.

The product is a liquid that sets rapidly once it has been heated to 80°C. Some chefs have used it in the opposite way, to make sauces for ready meals that can be set to hold the meal in place during transport.

Muth says many of these unexpected uses came from smaller companies with more to gain from taking on a new technology.

"We're now also working with smaller companies that seem more entrepreneurial and fleet-footed and more anxious to sell our product."

He says this makes the choice of early customers very important.

"One does, as a small supplier, feel under pressure to do a deal to get sales traction," Muth said, "but we can mitigate issues, such as demands for exclusivity, by making it subject to certain conditions."

"The innovation process is a matter of listening to customers and what they want," he added.

"Commercial success will come if we can develop the right relationships with customers." ■

## Innovation insights

- Some innovations may fare best outside the organisation in which they were created
- Large companies can have successful spin-offs if they have the discipline not to micromanage them
- Customers are the best judges of the value and utility of an innovation
- Choice of partners is critical to early product feedback and adoption

# Patents at your service?

It's time to sort out how to protect the service sector's IP

The economies of most developed OECD countries are shifting from a manufacturing to a service base. Manufacturing companies, whose investment in research and development has made them the most active seekers of patents, are following the trend by increasing their service activities. But as our economies move to a service basis, what role will intellectual property rights (IPR) take in this increasingly important sector?

Interest in innovation within the service sector is growing. According to the European Commission's third Community Innovation Survey, covering 1998 to 2000, the service sector is more innovative than previously thought. IPR is used differently here from in manufacturing, with more reliance on copyright, about equal use of trademarks and design registrations, and less use of patents.

This is changing. Interest in patent protection for services has been growing for years. Patents are being granted for incremental improvements, the scope of patent claims has broadened, computer software is being included and most litigation cases are judged in favour of the patent holders, especially in the USA. There has also been a dramatic increase in the number of applications for 'soft' patents, for example in data processing and computer programs related to finance, business practice, management and cost/price determination.

A milestone in the patenting of such business methods came in a US court case between State Street Bank & Trust

Co and Signature Financial Group Inc, which determined that 'anything under the sun that is made by man' is patentable. In Europe, the traditional view is that patents protect technical inventions and so business methods are unpatentable. The European Commission appears eager to maintain this view. It produced proposals for a directive on the patentability of computer-implemented inventions in February 2002, in order to clarify the legislation and stop soft business-method patents.

According to research by the Fraunhofer Institute on patents in the European service industries, again for 1998 to 2000, only a few European service companies apply for patents. Of these, the most active are R&D and telecommunications service companies, especially those involved in electronics and telecommunications technology.

Patent indicator research is well established in the manufacturing industry, but there aren't many publications on using IPR indicators to measure innovation in the service sector. My study into the feasibility of using patent indicators to measure

service innovation shows a bubble in the number of applications from the sector, in the US and Europe, in 2001. This indicates growing interest in applying for patents from beyond manufacturing industry, an interest that appears to have slowed since 2001. Closer analysis, however, reveals an upturn in service-sector applications in 2004.

One drawback of the study, made by using classification as an indicator for the service sector, is the large number of business-method patents filed by manufacturing industry. Changes in the numbers of business-method patents are therefore governed more by changes in the patenting strategies of these companies, than by changes in the patenting activities of service companies.

A key question is whether Europe is losing its competitive advantage by deferring patent protection for the service sector, or whether patent protection policies in the US have gone too far. The European Commission presented a proposal for a directive on the patentability of computer-implemented inventions to the European Parliament on 24 September 2003. With 64 amendments suggested by the European Parliament so far, the directive's purpose has become clouded.

There is no clear answer yet as to what role IPR protection should take within the service sector. But with many European economies becoming increasingly dependent on service industries, it's an issue that urgently needs resolving. ■



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## Andrea Cuomo

Corporate vice president, advanced system technology, STMicroelectronics

Andrea Cuomo runs the advanced system technology group at semiconductor company STMicroelectronics (ST). The Franco-Italian business had revenues of \$7.23bn in 2003, and spent \$1.24bn on research and development.

Cuomo's role is to understand the emerging needs of the global market, and then to develop the system-level technology that meets those needs and guide it into products. His group also acts as a hub where the needs of the business, its customers and partners can meet and be aligned with technologies being developed internally and externally, for best effect.

Unsurprisingly, Cuomo spends a lot of his time networking within the business, with customers, external technologists and even competitors.

"The job means networking between R&D centres, teams, customers and people I know," said Cuomo. "Ideas usually come from talking to people and understanding what they need and what the rest of the world is doing."

Cuomo says he needs this kind of contact to understand the kinds of technologies that ST should be researching and developing in order to remain competitive, information that formal activities such as conferences can't bring.

"I have very little faith in such formal activities. They normally bring you what everyone else is looking at," he said. "You seldom find the real thing at such events, and especially not the reason why the change should happen. And often, at that point, it is already late to invest."

Cuomo wants to discover issues that will create discontinuities in his customers' businesses, so that ST has time to work out how to solve them or how to delay their impact.

"If you're not leading, you're late," he said. For example, ST started its work on ultra-wideband wireless networking technology in 1999, four years before its importance became widely recognised. "If we hadn't started the work that early, we'd be nowhere today."

More recently, Cuomo says, he has just discovered the 'why' behind current interest in running communications based on the Internet Protocol over wireless networks.

"I now have an understanding as to why this is happening and therefore what problem we should set out to fix," he said. "But it took a lot of time to get this understanding."

Not that he is sharing what he has discovered.

"If you can solve the core problem that drove people to change their

networks, then you may have a unique business," he said. His role now is to introduce this hard-won knowledge into the business, ensuring that research is working on the right core problems and that product development teams will know how to exploit that work. Cuomo also tries to promote new research directions internally, so that the rest of the business understands the work and can be called upon to help if necessary.

His next challenge is to find a better way to understand the kinds of added value that consumers will pay for, rather than just accepting as their due. "The question is, if I give my son an nGage [wireless games machine], will he spend his money on playing the games or just go down the disco?"

Projects started within the advanced systems technology group can take anything from one to eight years to come to fruition. So how does Cuomo measure the effectiveness of what the group is doing?

"The only measures of innovation are by bookings and billings and margin," he said. But he does allow himself one softer indicator of his group's success.

"The best thing I ever find in this job is when one of my colleagues says 'I did that', because that means that they have taken ownership of our work," Cuomo said. ■

### >> Upcoming activities

#### New paradigms for R&D

Business R&D has been under pressure to deliver results for the past decade. This has created a trend towards shorter-term support activities, tighter project management and evaluation, increased outsourcing of R&D and growing collaboration with external researchers. The importance of managing research and technology as part of the global value chain also continues to grow.

An EIRMA meeting in January 2005 will discuss how these trends can improve research effectiveness. How much improvement can one company achieve and how much depends on public policy and national economic performance? And is what we call research changing, as businesses increase the service content of what they do?

*Find out more at [www.eirma.asso.fr/paradigm](http://www.eirma.asso.fr/paradigm)*

#### Understanding research globalisation

The location of a company's R&D depends on its history and future plans. Globalisation is being driven by market development, product complexity, standardisation and the need to provide and be close to concentrations of talented people, institutes and companies.

EIRMA is supporting two studies to understand the relative importance of these factors. The first, funded by the US-based Kauffman Foundation and supported by sister organisations such as the Industrial Research Institute, concentrates on company perceptions gained through telephone interviews with CTOs. Simultaneously, the OECD member states are preparing background information on R&D internationalisation. Results are due in 2005.

*Find out more at [www.eirma.asso.fr/global](http://www.eirma.asso.fr/global)*

### << Catching up...

#### The business environment in eastern Europe

Do Poland and other former eastern European states offer a rich source of research and technology transfer capacity? Delegates from research and technology organisations in 13 countries met in October 2004 to find out and to learn how to put the capacity to good effect.

The meeting revealed the importance of awareness and trust to effective collaboration. The key issue is where to find the right partner. Once this has been recognised, steps can be taken to overcome the waiting-room mentality, where each partner waits for another to approach them first. This allows both parties to communicate their requirements and capabilities and so enables better match-making.

*Find out more at [www.eirma.asso.fr/eastern](http://www.eirma.asso.fr/eastern)*

### ≡ About EIRMA

**"The best management development happens when experienced managers come together to learn from each other, to discuss common concerns and visit each other's companies"** – *Financial Times*, 31 March 2004

The European Industrial Research Management Association (EIRMA) is an independent, not-for-profit organisation, which aims to enhance innovation through more effective market-oriented research and development. Unique features of the Association include the networking and personal contact that the *Financial Times* recommends. It's been offering this forum for 40 years.

EIRMA provides a platform for discussing ideas and exchanging practical experience. Its activities support companies in benchmarking and improving their innovation processes through well managed and well organised research and development. These activities establish EIRMA as a natural first point of contact for policy makers and others seeking the business community's insight.

EIRMA's web site provides further information on the items featured in IQ, other key aspects of research and innovation management and records of recent meetings and all publications.

*Find out more at [www.eirma.asso.fr/about](http://www.eirma.asso.fr/about)*

### >> Look ahead

#### In our next issue

- How issues such as sustainable development and business ethics relate to R&D management
- Responsible partnering: what are the best ways to work with universities and public research organisations?
- The former president of America's NASDAQ stock market tells us how to turn technology into wealth

The March issue of *IQ* will examine these questions and look at companies that are handling them well.

#### Events

- Business area R&D process for shortening time lines
- From project to multi-project management
- The state of R&D in the United Kingdom
- Bringing ideas to market
- Portfolio planning

*For full details, visit [www.eirma.asso.fr](http://www.eirma.asso.fr), which offers records of EIRMA meetings and reports*

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