

# Interactive added value

New innovation models between  
industry and science



Andrea Frank • Simone Höfer (Ed.)

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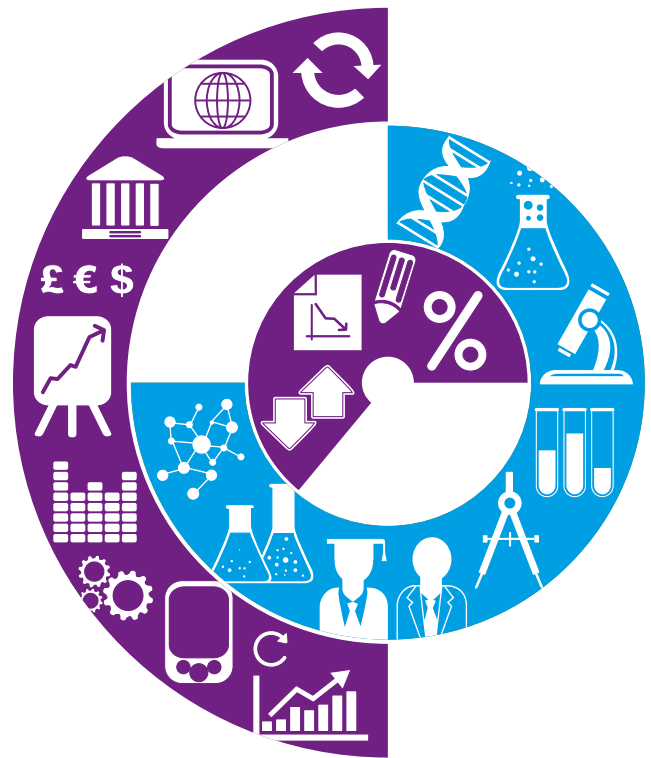


Federal Ministry  
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# Words of welcome



Today's business world is dominated by competitive pressures with increasingly tight deadlines and turnarounds. In order to remain competitive in the long term, it is vital for a company to develop and safeguard its potential for innovation. Because of this, the key question for companies is how to generate, share and develop new ideas in a way that speeds up innovation processes within the company and paves the way towards commercialising its know-how. Every company finds its own answer to this question – an answer in which new strategic forms and cooperation models also play an increasingly important role.

Companies have long recognised that their own research activities are no longer enough to improve innovation processes. What they need are strategies that open the company up towards new partnerships and ideas. Processes are no longer restricted to members of the company's own research departments or to its customers, but now involve external researchers and young start-ups from all over the world. The main focus here is on achieving a balanced interplay between research and development activities within the company on the one hand and research findings and customer requirements on the other. This is because new know-how tends to be generated more and more frequently in an application context.

The hands-on examples outlined in this publication illustrate the new ground that companies are exploring in their joint quest for innovation. Although universities and research institutions continue to play a central role, this cooperation comes in a diversity of new forms. Strategic partnerships and contract research are being forced to make room for open innovation models. After all, it is only through networking and collaboration that companies are able to recognise internal and external innovation sources and to tap into the know-how that they offer. This means that universities and research institutions are also confronted with new challenges in that they must adapt to the changing expectations of companies and seize the opportunities that the new scenario presents. At the same time, this calls for a political framework that actively promotes this process. This publication aims to serve as a catalyst for this.

Arend Oetker  
President, Stifterverband für die Deutsche Wissenschaft

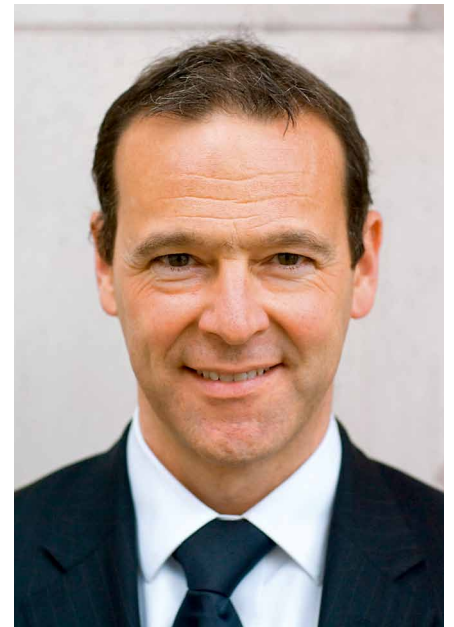


Linus Pauling once said the way to get good ideas was to get lots of ideas. Companies are increasingly looking for new ideas outside their boundaries – and they get them from scientists, customers and other businesses. To transform these ideas into innovation, boundaries need to be crossed – in terms of organisation, culture and scientific disciplines. Without a shared vision this is difficult to master.

The same is true for nations. In an increasingly globalised world, competitiveness of nations and regions depends ever more on knowledge and its commercialisation. Successful cooperation between science and business as well as international collaboration are an important prerequisite for this. While the UK is among the leading innovation locations world-wide, over 90 per cent of global knowledge is generated outside the country.

Governments face the challenge of having to stimulate growth but at the same time consolidate public finances. Innovation plays an important role in this – as drivers of growth and solutions to social and technological challenges. Industrialised nations try to work out how to improve their innovation performance, how to create incentives for business to invest, and how to remove barriers to innovation.

The UK government's new innovation strategy aims to improve the environment for innovation and investment. It also seeks to strengthen knowledge transfer, particularly between businesses and science. Governments designing measures to tackle the innovation and economic policy challenges depend on feedback from industry and science. This publication offers insights into the kind of contributions individual players – business, science, policy-makers – can make to create more successful innovation.



Simon McDonald  
British Ambassador, Berlin

# Introduction

Technological advances at breakneck speed, dynamic markets and increasingly globalised competition – these are all factors that force companies to rethink their innovation strategies. Although innovations cannot be planned as such, it is possible to increase the potential for innovation significantly by means of diverse cooperation strategies. More and more companies are breaking out of the mould of traditional cooperation forms to create new forms of joint innovation research that go far beyond the confines of contract research and strategic partnerships. The magic words here are networking, collaborative innovation and open innovation.

Companies are opening up their innovation processes to external partners and are working closely together with both in-house and external researchers, and with suppliers and customers. They network research and development – internal and external, centralised and decentralised – in order to combine the advantages of each approach. They use external know-how for themselves and commercialise their own innovations in other sectors. They invest in start-ups in order to stay close to new technologies from the outset, but in a way that involves fewer risks.

Open and networked forms of joint innovation research offer significant opportunities for partners in industry and research. They allow companies to generate new business ideas, to reduce development costs and to penetrate new markets for their own technologies. Similarly, innovation processes offer academic researchers direct access to their partner companies' research infrastructures and allow them to gauge which questions are currently of interest to industry. At the same time, open communication forms offer additional means of financing research and development in universities and research institutions.

However, joining forces for innovation research also entails challenges for companies, universities and research institutions. First and foremost, there is the question of how the partners deal with intellectual property. One conflict of interest that is a feature of many research cooperations is that, while the company is anxious to keep its findings under wraps, the scientific researchers are equally anxious to publish them. Because of this, partnerships can only be formed on the basis of mutual trust. The more open and flexible the forms of communication are, the more difficult it becomes to establish this trust.

Furthermore, new and open approaches to research cooperation call for a cultural shift on the part of companies and academic researchers. Established development processes that previously took place within the confines of the company now have to open up in order for external know-how to be channelled into its in-house technical development activities and for its own ideas to be shared with others. While this increases the potential for both sides to find new solutions, it also increases the risk of new development processes breaking down.



What does this mean in practice? Which new avenues are being explored by companies in different sectors and what do they say about their experiences? The aim of this publication is to explore this question. Taking a wide cross-section of sectors and countries, it presents very different types of partnerships in the innovation process as seen from the standpoints of both industry and scientific research.

The introductory chapter focuses on three different perspectives of the innovation concept. Jonathan Haskel illustrates the significance of intangible R&D investments for economic growth from the point of view of scientific research and compares the current situations in Germany and the UK. Cornelia Quennet-Thielen, State Secretary at the Federal Ministry of Education and Research, takes a look at the expectations and the role of politics, while Joachim von Heimbürg outlines the soft factors of successful innovation processes and their impact on company culture.

The core of this publication is an overview of different forms of innovation cooperation. Using practical examples and interviews, we examine the success factors, strengths and challenges associated with strategic partnerships, crowdsourcing models, corporate venturing and seed funding. We give the floor to company representatives from a wide variety of sectors and to researchers, venture capital investors and start-up entrepreneurs. Based on this kaleidoscope of experience, representatives from the realms of industry and science contribute their respective viewpoints to the innovation debate.

Looking ahead to the future, Hans Wissema and Allyson Reed outline the expected role of universities, companies and political representatives and the courses of action that they must take.





A light blue background featuring a stylized illustration of a microscope in the upper left and three test tubes in the lower left. The test tubes contain varying levels of liquid. The right side of the page is a solid light blue color.

# Setting the stage

- 1** Intangible investment and growth
- 2** Challenges posed by new forms of business-science cooperation
- 3** Successful innovation in business – a cultural challenge?

## 1

*Jonathan Haskel*

# Intangible investment and growth

How do UK and Germany compare?

## Introduction

Intangible investment captures the change towards a knowledge economy that many believe to be a key element of recent economic development. Counting such spending in “knowledge” or “intangible” goods complements the measuring of spending on tangible goods (such as machines, computers, buildings and vehicles) that has so far dominated the national economic statistics.

The classic knowledge investment that has been extensively studied is R&D. But it is important to realise that this is just one such investment in knowledge. Intangible investments have three major categories; computerised information, innovative property and economic competencies. Computerized information includes software and databases. Innovative property includes R&D, mineral exploration and exploration, creation of artistic originals, new products in the financial industry, and architectural and engineering designs. Economic competencies include branding/reputation, company-specific human capital<sup>1</sup> and organizational structure<sup>2</sup>.

The lead paper investigating this issue was by Corrado and Hulten who showed that intangible capital has been the most dynamic investment type in the US in the past 50 years. Tangible investment increased slightly from 11.1% of GDP in 1947 to 13.7% of GDP in 1985, and declined then to 10.0% of GDP in 2007. In contrast, intangible investment rose steadily from 4.5% of GDP in 1947 to 13.7% of GDP in 2007.

Since then a number of economists have used the same method and tried to document the same for Europe. This paper reviews what they have found, focusing on the UK and Germany.

## Inter-country comparisons for the whole economy

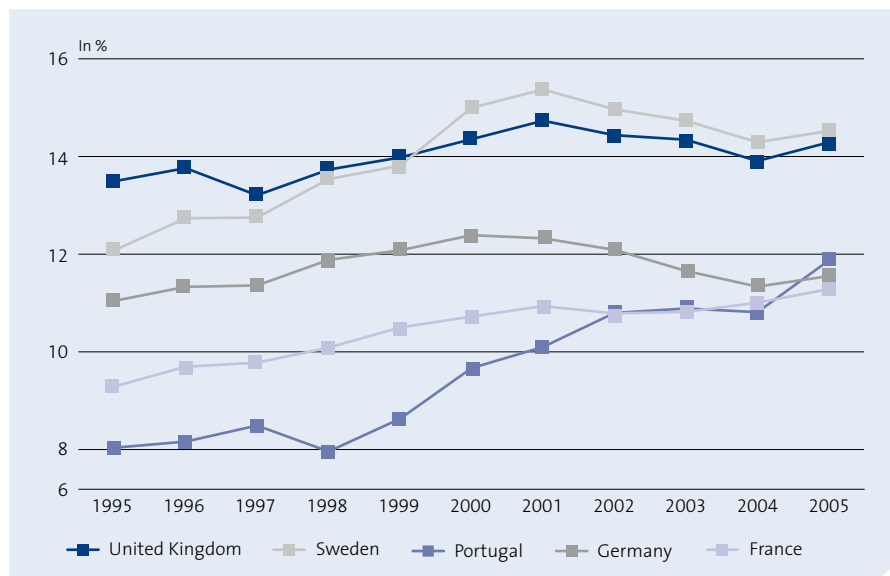
Let us first compare total intangible spending as a proportion of value added. Figure 1 presents total intangible investment in relation to market sector value added (MSVA) by country and over a ten-year period. The market sector is all industries but with some exclusions. First, we exclude health, education and public services e.g. police, military, since they are mostly state-provided. Second, we exclude real estate since that depends sharply on whether economies mostly own or rent residential accommodation. Third, we exclude a collection of poorly measured industries grouped under “community, social and personal” since this is a mix of various poorly measured industries from museums to recycling. Value added is adjusted for intangible spending but does not include value added in the real estate sector. After year 2000, all countries invest the 10% or more of their market sector value added, with Sweden and UK leading at more than 14%. Before 2000, only UK,



Sweden and Germany were above the 10% threshold, with the lowest ratio of 8% reported for Portugal in 1995. Note that Germany lags behind the UK for reasons we shall explore later.

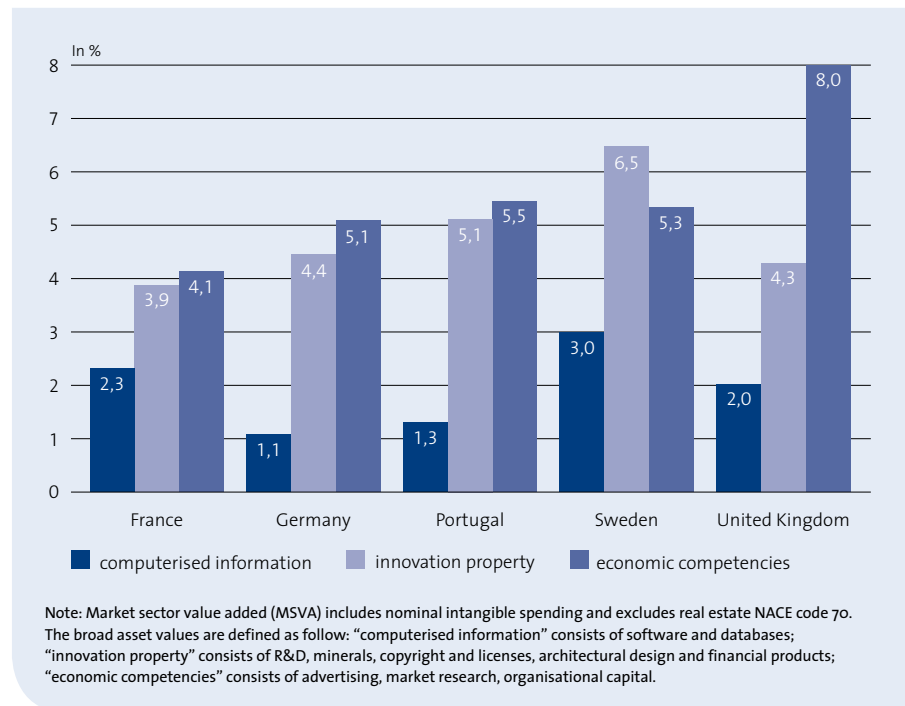
One reason for country differences might be due to different countries having different structures of intangible spending. Figure 2 shows the ratio of intangible investment to market sector value added (MSVA defined as above) but by broad asset evaluation. Following the Corrado, Hulten and Sichel (2005) classification of intangibles, we look at three assets: “computerised information”, “innovative property” and “economic competencies”. As the figure shows, in most of the countries, economic competence has the highest share of intangible investment immediately followed by innovative property with an average ratio of 6% of MSVA for the former and about 4% of MSVA for the latter. For the UK, economic competency spending is about 3 ppa points higher than in other countries, so reinforcing the suggestion of a mainly service-based economy. Computerised information is 1% of MSVA for Germany. On the other hand, Germany is relatively intensive in innovative properties. This very likely reflects the substantial presence of high technology R&D in Germany.

**Figure 1: Total intangible investment to market sector value added 1995 to 2005**



Note: market sector value added is adjusted for intangible spending and excludes real estate NACE code 70  
Source: Coinvest and Euklems

**Figure 2: Ratio of intangible investment by broad asset to market sector value added 2005**



Source: Coinvest and Euklems

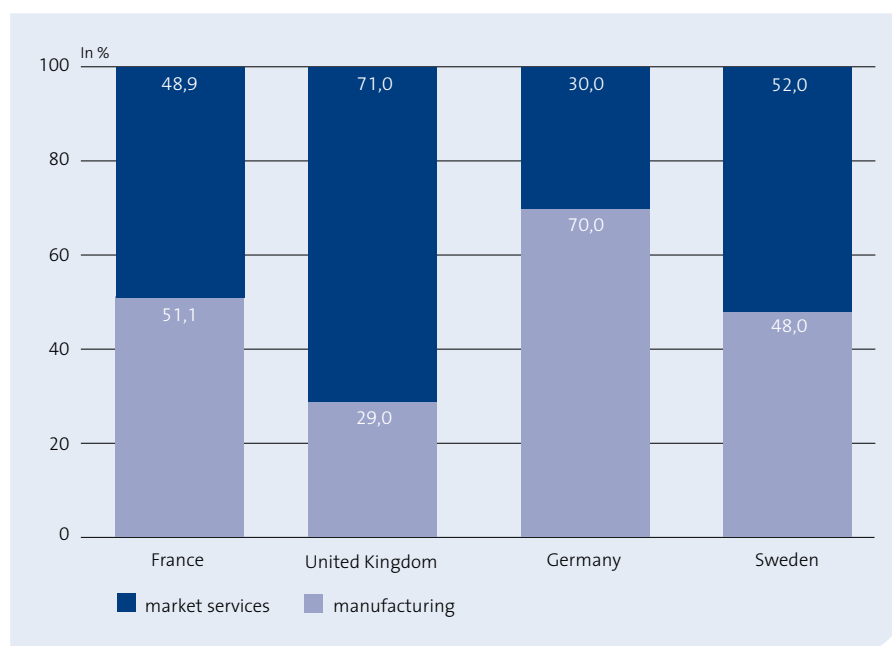
## Inter-country comparisons by industry

An interesting question is to see how the sector distribution of intangibles differs among countries. Figure 3 reports the shares of total intangibles investment in manufacturing and market services in 2005 for France, UK, Germany and Sweden. The snapshot reported by Figure 3 shows investment in intangibles almost equally shared between manufacturing and services in both France and Sweden (the first and last columns). In the UK, two thirds of total intangible investment is in market services leaving manufacturing with less than the 30%. A contrast to the UK is Germany, where manufacturing investment in intangibles accounts for 70% and market services for the remaining 30%. So this again suggests that intangibles are less widespread in Germany due to the relative dominance of the manufacturing sector there.

What about spending within these industries? Figure 4 reports the ratio between intangible and tangible investment by industry. In manufacturing, all countries invest more in intangibles than tangibles. UK intangible investment is more than twice that of tangible investment; with Germany having a ratio of slightly over one and a half. In retail investment, intangibles are about 50% of the investment in tangibles for all the three countries. In both financial and business services, the UK has a higher ratio of investment.

All this suggests that the reason for the higher intangible intensity in the UK compared with that in Germany is not so much that Germany has more manufacturing

**Figure 3: Industry intangible investment as a percentages of total intangible investment in 2005**



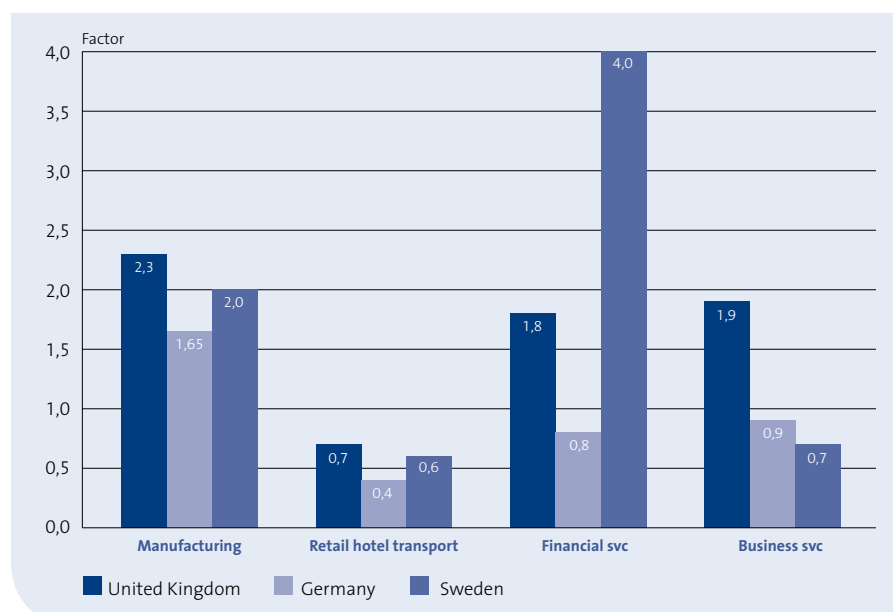
Source: Coinvest

than the UK, but rather that the UK is more intensive in all sectors. This may be related to higher multi-national presence in the UK or less restrictive employment regulation. Intangible investment is particularly risky and this may need firms to be confident of being able to release workers if the project does not work out. Thus employment regulation, if it raises “exit” costs, might inhibit intangible investment.

## Growth accounting

Growth accounting seeks to parcel out the contributions to labour productivity of (a) the growth of inputs and (b) the increased innovation in the way these inputs are used. So for example, we might ask: how have low-cost airlines increased their passenger numbers? One way is to buy more modern planes and hire more crew. This increases output by duplication. The other way to increase output is by innovation: using those planes and crew in an innovative way by using uncrowded airports, developing software to match spare crew with spare planes more efficiently, ticketless boarding etc. The tables below therefore split growth into the growth accounted for by growth (or deepening) of inputs (inputs of intermediate goods, tangible capital, human capital and intangible capital), and innovation. The innovation contribution is a residual, namely growth minus the contributions of the inputs and is often called total factor productivity (TFP) growth. Thus growth accounting tells us something about the details of how economies grow: do they simply use more inputs, or do they use them better (i.e. innovate). In the US, often held to be the benchmark innovative economy, around 45% of GDP is typically due to innovation, and the rest due to increased inputs.

**Figure 4: Intangible/tangible investment ratio by industry and by country in 2006**



Source: Coinvest

Figure 5 shows the contributions to total Labour Productivity Growth (LPG) in manufacturing, retail and financial business sectors for UK and Germany. In manufacturing, Germany has the highest LPG, followed by the UK. The key drivers of this high LPG in Germany are intermediate deepening, with TFP low and the contribution of intangibles similar to the UK. EUKLEMS data shows that the UK has less high-tech manufacturing than Germany and that branch of manufacturing might benefit disproportionately from TFP spillovers – which might explain why TFP is so high in the UK. Germany’s use of intermediates might reflect its close association with Eastern European countries.

Turning to retailing, the contribution of intangibles and TFP is very similar in both the UK and Germany. It is rather the labour quality that seems to be the key difference here. Finally, the last two bars show the contribution breakdown in the financial business sectors for UK and Germany. The UK has a lead in TFP and intangible contributions. German measured TFP is negative here and the intangible contribution very small. This might indicate measurement problems or unobserved restructuring in Germany.

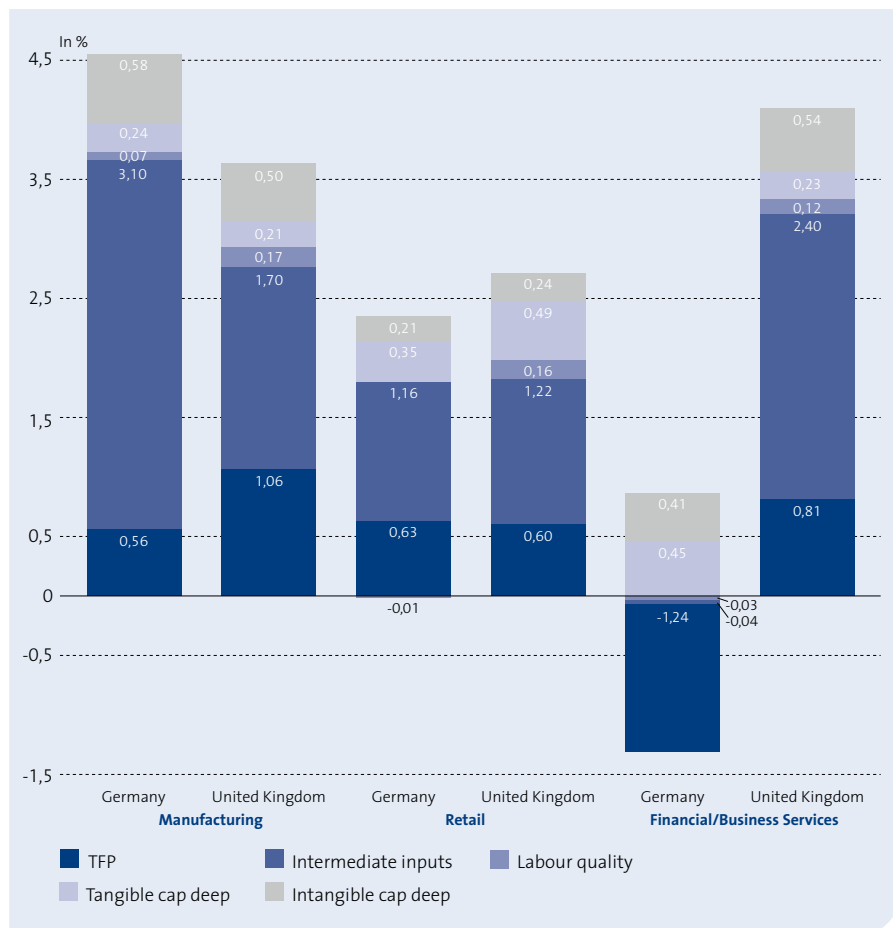
## Conclusion and policy implications

Our comparative findings are as follows:

- At an aggregate level, the UK and Sweden are relatively intangible-intensive at around 14% of market sector value added (excluding real estate, including intangibles) in 2005. Germany, France and Portugal are just over 10%. The UK invests relatively heavily in “economic competencies” while the concentration in Germany is more on R&D.

- Intangible investment in the UK is 30% in manufacturing and 70% in services. For Germany it is the opposite and in Sweden and France, it is about 50%/50%.
- In manufacturing, intangible investment exceeds tangibles in all countries. In finance and business services the reverse is the case, but in all cases the UK seems to be a particularly intensive intangible spender relative to Germany.
- For industry-by-industry growth accounting, we have the following:
  - Manufacturing: Germany has a higher LPG than the UK. The key drivers of this high LPG in Germany are intermediate deepening, with TFP low and the use of intangibles similar to the UK. The high TFP in the UK is consistent with the UK having relatively low technology manufacturing that might benefit disproportionately from TFP spillovers.
  - Retailing: The contribution of intangibles and TFP is very similar in both the UK and Germany.
  - Financial and business services: The UK leads in TFP and intangible contributions. German measured TFP here is negative and the intangible contribution very small. This might indicate measurement problems or unobserved restructuring in Germany.

Figure 5: Components of labour productivity growth 2006



Source: Coinvest



What we can draw from this main result is that German TFP and the contribution of intangibles are lower than in the UK. There are a number of points. First, whilst productivity growth is desirable, there is no particularly desirable reason to achieve it via tangibles or intangibles. So the manufacturing growth in Germany via intermediate deepening is, by itself, not a cause for concern. However, economists typically argue that growth via the addition of tangible inputs is subject to diminishing returns. The main example here is the centrally planned Soviet Union, where growth slowed down as there was no innovation, but merely the addition of more and more tangible inputs such as steel mills, machines etc. So it could be that the UK simply has a comparative advantage in the use or production of intangibles, but in the long term Germany would probably want to be moving into a more intangible-based growth. Second, quite a lot of UK advantage seems to come from more spending on economic competencies, in particular organisational capital. This has not been well measured and hence there is more work to be done here. Third, Germany still maintains a considerable advantage relative to the UK in R&D. One view is that this might be an optimal response to the “spillovers” inherent in intangible investment. This view is that country A can let other countries invest in knowledge goods knowing that country A can perfectly well copy the knowledge so gained and get it for free. A more nuanced view, however, is that country A requires educational and research capacity before it can carry out such copying. This could be maintained via R&D investment for example. This suggests that Germany might be following a quite sensible model.

Finally, we might ask why Germany seems to have less investment in intangibles overall. Other work, e.g. Corrado, Hulten and Hao, suggests that labour market flexibility might help to foster intangible investment. In addition, a higher ranked university system might make intangible investment easier to undertake in the UK via close access to sources of knowledge. It might be that an inflexible labour market, that makes it expensive for firms to experiment with new forms of knowledge capital, may be ill-suited to a knowledge-based economy.

#### Footnotes

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- 1 Company-specific human capital is used here to mean skills and qualifications that are particular to the firm and so represent sources of value that firms are willing to invest in and benefit from. General human capital, such as schooling, that can be used anywhere in the economy, will benefit workers rather than firms and hence is intangible investment, but not by private firms, which is what we consider here.
- 2 see Corrado, Hulten and Sichel, 2007, 9.

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# 2

*Cornelia Quennet-Thielen, State Secretary at the Federal Ministry of Education and Research*

## Challenges posed by new forms of business-science cooperation

How the German innovation system will remain successful in the long term

Better cooperation between business and science is becoming increasingly important in order to address the challenges of tomorrow and beyond and to make use of the opportunities presented by science and technology. This has been a major aim of research and innovation policy in Germany and Great Britain for many years. Both countries are going to great lengths to keep building new, wider bridges between companies, universities and research institutions. Many forms of cooperation have become successful models.

Innovation cycles are becoming shorter and shorter. Pressure is further increasing to provide research-intensive goods and services ever faster and at a lower cost. New, high-powered competitors are emerging in global technology and innovation markets. Knowledge-based economies like the ones we have in Europe have a particularly strong need for skills, creativity and innovative ability, which are the drivers of economic growth and employment. We must overcome national patterns of thinking and jointly address new issues. One of these new issues concerns changes in the way the business community views public-private partnerships. "Publicly" developed and available knowledge is clearly becoming more important for innovation processes in companies.

Within the framework of its High-Tech Strategy for Germany as well as the Initiative for Excellence and the Pact for Research and Innovation, the Federal Government seeks to further enhance freedom and incentives for scientific and business initiatives. At the same time, the Federal Government has increased its funding for science, research and development to 16 billion euros in 2011, five billion euros more than in 2005.

This commitment is showing results: Companies and research institutions are closely networked in Germany. 50 per cent of all companies in Germany that enter into collaborations do so with universities, and about 20 per cent with non-university research institutions. Germany is the world leader when it comes to third-party funds raised by universities from the private sector. An increasing number of higher education and research institutions are considering cooperation and utilisation in research and development processes and regarding them as central elements of their mission. The result of this networking is also reflected in the economic development. Germany holds a leading position among industrialised countries, with 45 per cent of its value added stemming from research-intensive products and services. Close networking between business and science is one of the mainstays of the German innovation system according to the analysis of the Commission of Experts for Research and Innovation.

In view of this successful record, one of the central questions is: What forms of national and international cooperation will we need in the future to be able to use



sources of new knowledge more rapidly and effectively? Approaches like open innovation, including crowdsourcing, are interesting new ways of minimising innovation risks and going beyond the limits of companies. They allow companies to assess the innovation potential of a product or service idea at an early stage of the development process.

Another important trend is the joint establishment of long-term partnerships to develop unused synergies in public and private research. At the Federal Ministry of Education and Research, we have launched the new “Research Campus” funding initiative this summer to mobilise such medium to long-term public-private partnerships between science and business (see info box). We thereby want to trigger strategically oriented research collaborations between business and higher education or public research institutions at one location over a period of up to 15 years. We invite the private sector – including foreign companies with German affiliates – to participate in the competition. I look forward to seeing which of the newly planned or emerging Research Campus models will be selected by the independent high-level jury in early summer 2012.

Despite all the new developments in the innovation sector we must not forget that innovators should take on board all those who will ultimately have to use these new technologies, products and services in their everyday lives. It is therefore important to discuss such developments with the general public and to involve them in weighing up the different options. The opportunities and challenges presented by the upcoming turnaround in energy policy are a striking example. The BMBF is currently organising a public dialogue on the subject of emerging technologies in which the public as a whole in Germany can discuss these issues with experts and decision-makers working in politics, business and society.

Strategic partnerships depend on diverse new incentives. The “Deutschlandstipendium”, a scholarship for German students, is one of them. It provides businesses and entrepreneurs with an opportunity to get to know young high achievers at an early stage and arouse their interest in the company.

### BMBF funding initiative

The German Federal Ministry of Education and Research wants to promote the establishment of reliable, long-term public-private partnerships between science and business at one location under the new “Research Campus” initiative, which forms part of the High-Tech Strategy. The initiative provides for project funding for five to fifteen years as well as for exchanges of experience in order to facilitate a more rapid implementation of new forms of cooperation in the German research environment. The Research Campus will be based on a win-win partnership on an equal footing based on lasting trust and equal representation. The partners themselves will define the structure of their Research Campus. Partners are expected to make substantial contributions. A competition will decide which specific Research Campus models will receive funding. In particular, the BMBF wants to support Research Campus models aimed at several industry partners. The involvement of innovative small and medium-sized Companies is encouraged.

[www.forschungscampus-deutschland.de](http://www.forschungscampus-deutschland.de)

## 3

*Joachim von Heimburg*

## Successful innovation in business – a cultural challenge?

How does the company culture influence innovation processes?

What is innovation? Everybody seems to know – if you google innovation you get 230 million hits. So everybody knows what innovation is but everybody seems to mean something slightly different when talking about innovation.

There is a lot written and talked about vectors of and tools for innovation – knowledge, partnership, venturing, crowd sourcing – in short the bones and muscles to make innovation work. However, there is another, “softer” aspect of innovation, the climate, the expectations, the emotions – in short, the cultural context in which innovation will flourish – or not.

What is innovation in business? Lots of people think about invention and innovation as being two sides of the same coin – but nothing could be further from the truth.

Invention is the domain of R&D – the product of R&D activities. At the start of the year, every R&D manager guarantees management one thing – that he’ll spend the R&D budget. By the end of the year he will have patent applications, specifications, problem solutions, new processes and products to show for it. To summarise, invention turns money into knowledge.

So what is innovation? Innovation in business is about producing value for the business by changing the way value is created. New processes and products, patents and specifications are needed to achieve this. In other words, innovation turns knowledge into money.

These definitions have a couple of important consequences.

- Not every invention is an innovation. These are those patents sitting on the shelf and collecting dust – inventions which did not produce any innovation.
- Not every innovation requires an invention. It just requires a novel way to use existing knowledge to create value for a business, be it by adapting, adjusting or altering. A good example is the first iPod – an innovation in the music market. But Apple did not invent anything significantly new to make it work.
- In order to create value for the business, several functions and groups have to collaborate. So, innovation cannot be the job of one single department. R&D is not the sole owner of innovation. It’s everybody’s job!

Innovation is a process. A company does not have to wait for a young Edison or a clone of Steve Jobs to sign up to become more innovative. Like any other process, the innovation process can be planned, managed and improved. The normal vectors of process management have to be taken into account, such as strategy, organisation, capability, processes and tools. Then this should be straight forward. This should be like the Total Quality process – reloaded. An innovation consultant just needs to train the organisation to become more innovative. So here a quote from a



website of an innovation consultant on how it should work: “Engaging people in innovation is hard work; however our clients have realized that following a simple process reduces the difficulty. If you want your employees to engage in innovation activities and help them understand WHAT YOU MEAN by Innovation, and WHY it is important, then show them that everyone is innovative, just with different approaches.”<sup>1</sup>

Maybe it is not so easy. However, the consultant makes a very important statement: people are already innovative today! They do not have to be taught to become more innovative.

So tell the people what you mean by innovation, why it is important and encourage them to get started. Does this approach work? Obviously not, so why does this not work? Where are we missing out?

Let me share some insights: In one of the companies I worked for, I did a survey amongst employees on innovation – what is innovation, how to do it, etc. Two answers struck me:

- Question: Is innovation important for your company? Two thirds of the respondents said “yes”.
- Question: Who is responsible for innovation? Two thirds of the respondents said “not me” (you could literally feel the “Good that somebody else is on the hook here”).

Where are we missing out? If everybody can be innovative, what is the difference between being innovative and not innovative? It’s the smell of the place – the culture of the place. So we need talk about company culture. What’s the culture of your company? Does it drive innovation or does it get in the way of innovation?

Let’s start with a definition of culture: “The sum total of values, norms, assumptions, beliefs and ways of living built up by a group of people and transmitted from one generation to another.”<sup>2</sup>

What does company culture do in business? Here’s my definition: It defines what counts and how things are really done in that company. In short, it drives decisions when the boss is not around. What happens when the boss is around and takes decisions? He drives culture! Top Management shapes the culture of the company by the examples they set and the decisions they take. Not by what is written on a website or in a mission statement. But it is hard work and takes time – it takes years. Another important insight: You cannot delegate changing culture. If you do, your people will conclude that you are not serious and will not follow your direction.

Imagine you are the CEO and you are committed to changing the culture of your company to become more innovative. Who or what is going to be your biggest barrier? Probably you yourself. Your people will watch you like a hawk to check whether you stay true to your commitment to innovation. You'll shape the culture even if you do not plan to do it. Here are a few typical CEO statements:

- The earlier this pays out, the better!
- Don't take any unnecessary risks!
- Keep me posted!
- This is an R&D (Manufacturing, Marketing.....) idea.
- Don't bother me with details!

These all are run-of-the-mill management statements – I have heard them umpteen times. Of course you want more innovation, but what's wrong with

- Get your money back fast.
- Better safe than sorry.
- I like to know what these young guys are doing. They do not have a lot of experience and I may have to intervene.
- This project is easy. Let's leave it to the marketing specialist and have done with it.
- I need to keep the whole picture in mind. I cannot afford to be bogged down in the nitty-gritty.

Sounds like good, solid no-nonsense management, right?

But what are the culture messages you are sending to the organization by following these principles? This is what your organization hear you say

- The earlier this pays out, the better
- Implement fast. Make only incremental moves.
- Don't take any unnecessary risks!
- Avoid risk – do not fail.
- Keep me posted!
- Boss wants control. Don't venture too far.
- This is an R&D (Manufacturing, Marketing.....) idea
- This is not my project.
- Don't bother me with details!
- Unconventional (complex) projects do not fly.

With these statements you are framing the innovation culture of your company. You limit it to short term, low risk, incremental moves. You are perfecting the steam engine in the face of the petrol car or the fax machine at the dawn of the Internet. Yes, building a steam engine consuming 10% less coal is innovative but is this the type of innovation you want and need?

This may actually work in a successful company for some time. But it will not ensure that you can sustainably create value in a changing business environment. Think of the steam engine, Polaroid, the fax machine. They all became obsolete by a change in business environment they could not react to by incremental moves. Now you probably think "This is not fair. I'm not behaving in this way all of the time. First I need to achieve my annual goals, so a healthy level of short term, low risk, incremental moves is in order. And I want more innovation too!"

A truly innovative culture needs to be open to both types of changes – small and

large. And people are biased. When they have the choice they go for the small change, particularly if they see themselves encouraged by the boss. Remember Mark Twain: “So the CEO needs to drive bigger changes more strongly than business as usual in order to get more innovation.”

What should top management do to foster an innovation culture? What does promote an innovation culture in a company? Let's look at the culture of a typical manufacturing company. For such a company success is producing a lot of products with high quality at the lowest possible cost. This means you want

- Reliable and robust manufacturing processes. Predict & Repeat!
- As few distractions as possible: keep the wheels turning and don't take risks. They may result in downtime and quality issues. So minimise risks!
- Never have to stop production because of a mistake. Very visible and very painful. Never fail!
- Inventions but without distracting production. Let's make sure that things are really ready before we deal with them for good. Delegate inventions to R&D and keep them in the labs till they are really, really ready. This produced a lot of great inventions. But it creates the silo culture – the “this is not my job” attitude. But innovation is everybody's job.
- Activity. No action, no product. So activity becomes a value. Busy people are good people. But are they productive and creating value?

Is this a company culture in which innovation flourishes? To an extent. But we are talking here about which culture will promote more innovation. This culture encourages the status quo and creates barriers to change. So it will not drive more innovation than it already produces.

How do you change this culture to drive more innovation? How do you live a culture of innovation?

Here a couple of thoughts:

- Become open to change. Create a learning culture which encourages challenging the status quo. Then drive implementation.
- Any change carries risk. Accept it and reward managing risk – not avoiding risk.
- Accept failure as part of learning. In fact you only learn when the results of an action are not what you have predicted. Some people call this failure – I call it unexpected outcome. Thomas Edison was once asked what he had achieved during the last week. His answer: I found 2000 ways how not to build a light bulb. This is not failure – this is learning how to build a light bulb. But fail early and cheaply – not in a full scale plant. A sign that you are succeeding in improving the innovation culture: People share their failures – because they are insights.
- Keep R&D focused on creating knowledge and inventions but make innovation everybody's job.
- Do not worry about activities – only results count. Do not worry how you solved a problem; make sure you solve the problems relevant to your customers and your company.

But always remember: Your people, in particular your operational managers, will watch you like a hawk. They will check all the time to see whether you stay true to your long term commitment to innovation. The last thing operational managers like to do is risk the delivery of committed short term operational goals for the sake of more innovation – remember their bonus is at stake!



**Figure 6: Living a culture of innovation**

Predict + Repeat	➔	Learn and Adapt
Minimize Risk	➔	Manage Risk
Never Fail	➔	Fail Early + Cheaply
Invention (R&D)	➔	Innovation (All)
Activities	➔	Results

To conclude, let me summarize my key points:

- Your people are creative and many are ready to innovate.
- Your organization may limit their potential to innovate.
- Company culture is an important factor in this.
- Top Management, and only Top Management, sets the culture – often without being aware of it. They can change culture in a way that it fosters innovation.
- Top Management needs to motivate operational managers to integrate innovation into their daily operations.
- All this requires personal, long term commitment. It asks for leading by example, creating a learning culture, accepting failures as part of learning, involving everybody in the innovation process and rewarding results, not just activities.

#### Footnotes

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- 1 Quote from the website of DeSai Group, [www.desai.com](http://www.desai.com), highlighting by author.
- 2 From the website of Ideachampions, [www.ideachampion.com](http://www.ideachampion.com).



# Innovation in practice

- 1** Strategic partnerships
- 2** Seed capital and corporate venture capital
- 3** Crowdsourcing and open innovation

## 1

*Andrea Frank*

# Strategic partnerships

Joining forces for long-term research

Strategic partnerships between industry and scientific research are important components in a company's research strategy. The days in which companies conducted in-depth fundamental research themselves are long gone. Strategic partnerships are long-term, institutionalised forms of cooperation between the public and private sector. They are not dedicated to solving individual problems, but rather serve as jointly operated research infrastructures geared above all towards cooperation in the field of pre-competitive research. In this way, they set themselves apart from traditional contract research or short-term product development. One example of this is the E.ON Institute for Energy Research, a strategic partnership between RWTH Aachen University and energy giant E.ON AG, which is not concerned with further developing individual technologies used by the company, but rather with fundamental research on energy science. A second example is Telekom Laboratories, a cooperation between Deutsche Telekom AG and the Technical University of Berlin on future communication technologies which have the potential to be of commercial interest only in the long term.

Universities and research institutions are important research partners for industry. Financially speaking, the interface between industry and research is in good shape. In 2009, 19 per cent of companies' external expenditure on research and development (R&D) went to universities and research institutions. Around €1 billion in external R&D expenditure was channelled into universities, with a further €900 million allotted to state research institutions.

Cooperation between industry and science comes in many different forms and is subject to ongoing change. Nonetheless, strategic public-private partnerships remain a central model for joint innovation research. They offer advantages for both sides and pave the way for long-term interdisciplinary cooperation on central research questions. Companies are expanding their research expertise – particularly in the case of basic research – and are spreading risks and costs over several partners. For their part, universities and scientific institutions are developing research infrastructures and additional sources of financing and are being given access to relevant industry questions. The importance of the contribution made by strategic partnerships to generating innovation is also reflected in public sector funding initiatives. These use financing incentives – both within Germany and internationally – to promote long-term research cooperation in the form of public-private partnerships. Prime examples of these include the “Leading-Edge Cluster Competition” or the “Research Campus – public-private partnership for innovation” funding initiative launched by the Federal Ministry of Education and Research (see page 19).

Strategic partnerships are faced with the same challenges as any other cooperation project. Central questions include: How do I find the right partners in universities or research institutions? How do I deal with intellectual property? How do I find focal



points for joint research and strike the right balance between product development and commercialisation interests on the one hand and scientific freedom on the other.

For small and medium-sized companies (SMEs), the challenges thrown up by cooperation projects are especially great. This is because, unlike large corporate groups, they often lack the capacity for sounding out strategic partners. Susanne Kunschert, Managing Partner of Pilz GmbH & Co. KG, recalls her own experience: “SMEs feel that it is difficult to communicate with universities – who do they talk to? That is the first problem. The second challenge concerns patents – how can a company use a patent to secure market leadership? Finally, most staff at universities are financed by large third-party projects – small and medium-sized projects are therefore less attractive but still of central importance for SMEs.” This is where regional and specialist networks come in. Geared above all to the needs of SMEs, these networks make it easier to establish initial contact and to enter into cooperations. They also provide a forum for companies to share their experiences with one another and with representatives from the academic community.

Irrespective of the concrete design of the cooperation, there are a number of general success factors that hold true across the board. Successful strategic partnerships all have the following:

- Partner-like dialogue on equal terms
- Jointly formulated, long-term objectives
- Management bodies with equal representation allowing the interests of both parties to be taken into account sufficiently
- Transparent structures and decision-making processes
- Joint financing and usage of research infrastructure
- Clear rules on dealing with intellectual property, which take into account partner interests as regards maintaining secrecy and publishing scientific findings.

The following chapter gives an overview of very different models of strategic partnerships. In the various portraits, companies and scientific researchers report on their strategies and experiences with strategic partnerships and on the strengths and challenges of their respective models.

Jürgen Lehold

# Trust and transparency

Lower Saxony Research Centre for Vehicle Technology (NFF)

The Lower Saxony Research Centre for Vehicle Technology (NFF) is an interdisciplinary centre affiliated with the Braunschweig University of Technology. It was founded at two locations: MobileLifeCampus in Wolfsburg in cooperation with Volkswagen AG and at Braunschweig Research Airport – with a view to establishing Braunschweig as a leading, internationally visible region in the field of vehicle technology research. In this way, it makes a contribution towards safeguarding the innovativeness and future viability of Lower Saxony as an automotive centre. Together with the Hannover Centre for Production Technology (PZH) and the Energy Research Centre of Lower Saxony (EFZN), the NFF forms a strategic alliance under the aegis of the Niedersachsen Institute of Technology (NTH).

## *Bundling expertise*

The NFF currently consists of 13 member institutes. In addition to eleven academic chairs at Braunschweig University of Technology, the research expertise is supplied by the University of Hanover and the German Aerospace Centre (DLR). Working on a project-oriented basis, the non-university research institutions in the region and other professors at Braunschweig University of Technology pool their expertise with that of partner universities in the state of Lower Saxony.

Four NFF members are based at the MobileLifeCampus location in Wolfsburg, together with Volkswagen Group Research's Driver Assistance Systems research group. The future NFF headquarters at Braunschweig Research Airport will serve as the base for seven NFF members and joint experimental facilities and will also house a project centre for interdisciplinary research cooperation.

NFF's research programme is based on the "Metropolitan Car" vision, which focuses on developing vehicle-related technologies and usage models with a view to meeting the individual mobility requirements of people in urban areas. This involves an end-to-end analysis of the usage requirements in four defined scientific target areas, a process that makes the research concept unique so far. The four target areas are: "The intelligent vehicle", "The low-emission vehicle", "Flexible vehicle concepts" and "General conditions and mobility concepts".

## *Networking partners*

The partnership between Volkswagen AG and the NFF is based on sharing content, personnel and physical facilities. The close exchange relating to research questions and possible solutions creates a constant stream of new ideas for joint projects. The basis for this is a personal and trusting relationship, which makes it possible to jointly discuss and implement new approaches, particularly in innovative fields of research. Physical proximity – for example through the NFF's aforementioned base in the MobileLifeCampus – promotes this development while forming the basis for carrying out joint projects in "project centres". For Volkswagen AG, the added value lies above all in being able to initiate joint projects with the NFF based on straightforward and transparent processes.

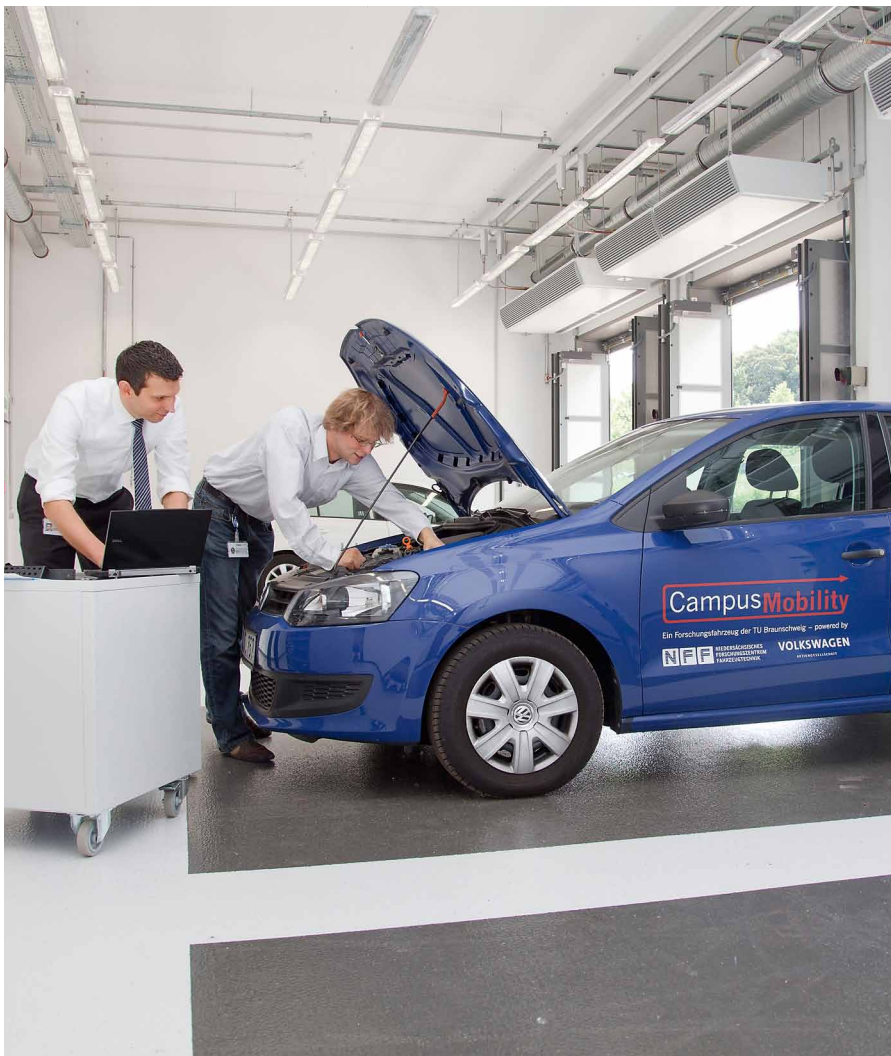
The wide range of topics covered by the NFF also permits a diverse cross-section of projects, from vehicle technology to business models. The NFF office assists the partners in finding the suitable NFF institute for any given specialist area. The conditions for a cooperation between the NFF and Volkswagen AG are clearly set out in a master agreement, which allows projects to be initiated quickly at any time without the need for extensive consultation. The challenges consist in particular of ensuring a rapid, transparent

exchange of information between the partners. To this end, it is necessary to constantly align and coordinate research questions with potential project partners.

### *Fostering trust*

Cooperation between science and industry is often challenged by a lack of trust and transparency. Through their partnership, Volkswagen AG and the NFF have succeeded in establishing a firm basis for trust between players on both sides across research areas and across different levels. At the same time, they have laid the foundation for developing transparent processes – this was done by negotiating a master agreement, but also by setting up the NFF office, thereby making it possible to minimise the cost of preparing and developing mutually beneficial projects.

[www.nff.tu-bs.de](http://www.nff.tu-bs.de)



The NFF is conducting research on intelligent vehicles and new mobility concepts.



Oskar Juhlin, Maria Holm, Kristina Höök and Annika Waern

# A model for strategic innovation of next-generation mobile services

Mobile Life VINN Excellence Centre

Mobile Life serves as a neutral arena for industry partners to meet, discuss, and identify core issues, and then collectively carry out practical and experimental research on these issues – in the domain projects as well as through the Centre’s innovation system. The Centre makes use of innovative ways for securing relevance and participation of all partners in the research. A core issue is also to go beyond the focus of each participating industry in developing its own business models, to look at the role of users as consumers of mobile services, i.e. mobility experience services, which provide better means for exploring and engaging with the world as experienced through various forms of movement. Also, the innovation of the next generation of mobile services with commercial potential will not always follow from the development of new technologies using innovation systems that have historically been prosperous for European industry.

Mobility experience services are considerably more complex than “anytime anywhere” mobile internet applications when it comes to fitting them into the application context. This means traditional methods for evaluation might not be suitable. Instead, studies and evaluations must be done in real-world settings rather than in lab environments.

We argue that designing such services is complex and demanding both from a user experience perspective, as well from a technical point of view. Industry must also develop sustainable business models and market ecologies, in a world where the connection services grow invisible from a usage perspective. Designers must learn to work with an entirely new landscape of materials, developing services that do not just exist ‘in the cloud’ or on phones, but exploit the tight and intricate connection between people and their activities, and places and things. Here industry benefits from collaboration, not only internally, but also from collaboration with academic researchers.

## Strengths

The long life span of the Centre is its key feature that distinguishes it from other types of industry-academic collaborations. The Centre will be funded over a 10-year period, which enables first the opportunity to research on long term issues, and second to build long term relations between the partners.

The extended funding period enables the setting up of various forms for industry involvement in the centre. This includes most importantly collaborative projects and internships. In addition, centre partners benefit from their involvement in seminars, hands-on workshops, brainstorming activities, etcetera. Industry partners are given the first option on commercializing centre results. In the Centre there is a natural flow of technology, design insights and infrastructure between all the partners as we build mobile services together in concrete, applied projects. An additional advantage is the close connection between the Centre and the international mobile and ubiquitous computing research community, which allows the Centre to act as an informer and mediator between international cutting-edge research and the Swedish industry.

To ensure successful research results, the Centre involves the highly qualified Swedish researchers in mobile services, as well as highly ranked international researchers, and the research departments in some of the most important telecom companies. It is based at Stockholm University in the Kista area, where there already exist strong educational programmes in many IT areas. This secures the inflow of well-educated master- and Ph.D. students. In Kista we also find KTH’s School of Information and Communication Technology (ICT), the Swedish Institute of Computer Science (SICS), and Interactive Institute.



Mobile services will continue to change our future.

Several of the industry partners have advanced research and development departments in Kista.

To ensure that the results provide strategically relevant knowledge, the Centre activities are based on a strong theoretical foundation (embodied interaction), a well-defined methodology (user-centred development) and an important domain with large societal importance and commercial potential (mobile life).

### Challenges

The Mobile Life Centre has a set of goals to fulfil. If we look at the funding of the Centre, three stakeholders can be identified. The first is Swedish Society, from the perspective of VINNOVA seeking results from the Centre that will spill over to the society in the form of actual market growth. The metrics for these results a number of spin-offs and patents as well as publications and networking activities. Secondly, university and research partners are seeking results through high quality publications that will reflect on the organisation's academic strength nationally as well as internationally. Finally, the industry partners in the Centre that are looking primarily for more soft and qualitative results such as knowledge transfer, inspiration and possibly spin-ins. They identify results as research that can inspire new product development and, in a long-term perspective, influence the strategic choices made by a company. Therefore, the centre must strive for societal and industrial as well as academic relevance.

At the same time, the management literature teaches us that a company should choose one strategy in order to achieve competitive advantage. A combination of strategies will risk the company 'getting stuck in the middle' and possibly not succeeding with any of them. For an academic centre, we can use the model in a slightly different way: as the centre pulled between serving society, industry, or the academic world.

Our way of avoiding such a problem, which would lead to poor results, chooses a type of focus where the goals of academic results are most aligned with industry's demand for innovation. This is the area of strategic innovation. It is required that the Centre has a major and long-time impact on research in mobile services, the related industry and society as a whole. Therefore we focus on providing strategic innovation to our industry partners over a three to five-year period.

However, as the lifetime is entering its second half decade, it must also start to foster more short-term innovation and exploitation. The focus on strategic innovation fosters a focus on strategically relevant research prototypes, that provoke ideas and allow us to explore novel usage models, which are not always viable products in themselves. Very often, these provoke ideas that are simpler, more ready-to-market, and worthy of promotion as commercial products, but cannot be pursued further as strategic research activities. The Centre needs a way to support the development of such ideas into something akin to a commercial beta version. It is only when the idea is at the beta stage that it is ready to take the next step, and can be presented or put on the market. It is in this early stage of idea development and implementation that we have identified a gap in our innovation system, which hampers medium and short term innovation. Here we will develop the Centre's innovation system by extending our innovation models using organisational features that combine long-term activities with medium and short-term ones.

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

### VINN Excellence Centres

VINNOVA is a Swedish Governmental Agency for Innovation Systems. The aim of this innovation agency (established in 2001) is to increase the competitiveness of Swedish researchers and companies by investing in needs-driven research and the development of effective innovation systems. Each year VINNOVA invests 220 million euro. Each investment by VINNOVA generally requires co-financing, which doubles the annual investments to around 440 million euro.

An important part of VINNOVA's activities consists of increasing university – industry cooperation in the Swedish innovation system. The VINN Excellence Centers are one funding initiative to serve this objective. It provides a forum for collaboration between the private and public sectors, universities and colleges, research institutes and other organizations that conduct research. The Centres deal with both basic and applied research and they work to ensure that new knowledge and new technological developments lead to new products, processes and services. Today VINNOVA is funding 18 VINN Excellence Centers among them the Mobile Life Centre.

## “We believe in well-balanced partnerships founded on trust”

Dieter Jahn, Senior Vice President, Science Relations and Innovation Management at BASF, talks about the challenges and opportunities presented by partnerships with universities.



*Based in Heidelberg, the industry-on-campus cooperation CarLa (Catalysis Research Laboratory) is one of the first of its kind in Germany. You have described it as a successful model.*

Although CarLa is just one element of our research and development work, we feel that it is a very important one: It increases the diversity of our research projects and fuels our highly innovative and academic approach to research. Because of this, BASF has now set up additional innovation centres along the same lines outside the company. The CarLa model has essentially already been applied to BELLA (Batteries and Electrochemistry Laboratory) at the Karlsruhe Institute of Technology (KIT) and talks are currently being held with another university.

**What exactly does this cooperation make possible?**

It takes the healthy spirit of cooperation that has existed for years with the universities in question and raises it to a

new level. This means that we are taking a conscious step forward together and seeing how this closer, more long-term cooperation can benefit both parties. The physical proximity permits a very intensive exchange between BASF researchers and the universities, which serves to simplify everyday research activities and generate new momentum. The aim of these efforts is not only to secure innovative patents for BASF and research results for the universities, but also to solidify the regional focus of research such as catalysis in Heidelberg and battery research and electromobility in Karlsruhe. Ultimately, it also aims to maintain and build upon Germany's reputation as a leading centre for chemical research.

**How can both partners benefit?**

The cooperation should be set up in such a way that both parties have a very real benefit. One-sided arrangements – for example when industry simply channels money into a university and channels out

its entire know-how – are doomed to failure, particularly in the case of long-term cooperations. BASF has no interest in such set-ups. Our longstanding experience of working together with others has shown us how to build a well-balanced partnership founded on trust. In the case of CarLa, the research topics are discussed in steering committees with an equal number of representatives from each party. Voting battles are unthinkable here – after all, our interests must be in harmony with those of the researchers. The conflict of aims – whereby the scientists wish to publish the research while our company wants to patent it – is resolved by filing a patent very quickly. If patents bear fruit at a later stage, the university is naturally granted a fair share. We inform the university beforehand which topics have potential for application.

**You deliberately recruited talent from outside Germany for the twelve positions in the CarLa laboratory. Why?**

Almost all twelve post-docs are from abroad – six are financed by BASF and six by the university with funds from the federal state of Baden-Württemberg. The CarLa concept is a magnet for foreign talent, who then proceed to join our expertise network. Whether they go on to pursue a career in industry or academia is of secondary importance since they frequently remain part of our network. Interestingly enough, applied research is an especially attractive area for young scientists. We also see this with our Harvard model. Some of the up-and-coming sci-

entists went so far as to change working groups to be able to take part in our research projects. In this case, for instance, the subject was biofilms, a major problem in medicine.

***Is the main focus of your Harvard model on talent or patents?***

The two belong together. For BASF, it is important to maintain a presence in this highly innovative and creative environment. Harvard really does attract the cream of the crop – as can also be seen from the extremely promising patents that we have already generated via the Harvard model. Naturally, we are also interested in recruiting scientists from there. If we aim to get these on board for our research locations here in Germany, the chances are better with European students than with their US counterparts, who prefer to look for a position in their own country.

***How did the Harvard model come about?***

In 2007, our Harvard colleagues approached us to see if we would be interested in stepping up our previous cooperations and further institutionalising them. We then agreed on the general conditions and jointly identified two key research areas we wanted to support with a maximum of US\$ 20 million over five years. The young Harvard scientists are not paid directly by BASF, but we help to finance their work. Our decision-making process was very fast, flexible and straightforward, which was appreciated at Harvard.

***Is there not a conflict of interest between seeking to file new patents and undertaking research in a virtually public-sector environment?***

When we take our research work to universities, it goes without saying that this work is more visible, transparent and high-profile than it would be if we were to conduct it within our own walls. Because of this, we also consider very carefully what to research externally and what to research internally. Having said that, the benefits of our industry-on-campus cooperations exceed by far any potential disadvantages. As well as this, companies that engage in long-term, basic research run little risk of losing important know-how.

Corina Niebuhr

## European Community for new ideas

*EIT ICT Labs at TU Berlin*

In 2011, employees at the new European education and research cluster EIT ICT Labs moved into their offices in the renowned Telefunken Tower on the campus of TU Berlin (Berlin University of Technology). Also known as KIC (Knowledge and Innovation Communities), this research cluster was initiated at EU level within the newly established European Institute of Innovation and Technology (EIT) (see info box). The idea is that Europe's leading researchers at universities, institutes and in companies should no longer have to operate at a distance from one another but could work side-by-side instead. This in turn would allow them to foresee the most exciting developments of our time and to launch them as innovations on the market.

To date, the structures for this have been largely absent: systematic cross-border networking of knowledge in the relevant specialist areas, joint visions and roadmaps for the innovation fields of tomorrow, closely coordinated international study programmes, no barriers for the mobility of students and researchers, harmonised legislation and conditions for start-ups and patents.

### *Top research cluster*

The EIT ICT Labs now have the task of developing these structures especially for the area of information and communication technology and establishing a research and education culture fuelled by innovation and entrepreneurial initiative. The cluster consists of five "co-locations" in Berlin, Paris, Helsinki, Eindhoven and Stockholm. In addition to TU Berlin, the project includes other leading European research institutes such as the Swedish Institute of Computer Science (SICS), the French National Institute for Research in Computer Science and Control (INRIA), the Technical Research Centre of Finland (VTT) and the German Research Centre for Artificial Intelligence (DFKI).



At EIT ICT Labs, researchers and their industrial partners work closely together – for example on developing smart health bikes.

This consortium also includes the major players in the European IT industry such as Siemens, Deutsche Telekom, Nokia, SAP, Sony Ericsson, France Telecom and Philips Deutschland. The force behind this community is illustrated by figures cited by Wolfgang Wahlster, DFKI Professor and German representative from the EIT ICT Labs: the cluster bundles around 75 percent of all European research budgets for IT research, which amounts to €20 billion annually. As the co-location centre, TU Berlin is the hub of German activities, and the Berlin-based partners are also responsible for the area of Innovation for the entire European network.

While EIT ICT Labs employees in the Telefunken Tower work on the structures of the cluster, the focus at TU Berlin is on identifying – together with the other European co-locations – projects that would fit in with the EIT label. According to Sahin Albayrak, Professor of Agent Technologies at TU Berlin and co-founder of Deutsche Telekom Laboratories (T-Labs), the idea is for the cluster to network and coordinate leading research and to launch the resulting innovations on the market without delay, rather than innovating for the sake of innovation. TU Berlin, for example, holds a leading position throughout Europe in the field of Intelligent Living. As Albayrak explains: “The EIT ICT Labs now enable us to establish this basic knowledge as standard beyond German borders far faster than was previously the case”. Building on this, each location can generate further innovations with the aid of regional business cooperation. The Professor compares the Labs to one of the most exciting research puzzles of our time – one on which all European co-locations are working jointly and coordinated – each from its own perspective and with its own special profile. He believes that, once the structures have been developed and established, they will significantly increase Europe’s potential for innovation. The process is flanked by newly-defined European Masters degrees with special modules devoted to innovation and entrepreneurial skills.

The EU budget for EIT ICT Labs – initially around €100 million over five years – is seen as start-up financing and is to be supplemented in the ratio 1:4 by the partners’ own funds and by further national and regional funding sources. EIT projects are only recognised when they have at least one co-partner from the realms of business in addition to researchers from at least two co-locations.

### *Open innovation*

Even at this early stage, companies are very interested in exploring the ins and outs of “open innovation” within the EIT ICT Labs with a view to converting ideas and IT technologies into products, services and new companies even faster than before. Reinhold Achatz, Head of the Central Research Departments at Siemens, explains that his company wants to contribute its expertise above all in two areas which it sees as growing in importance from a research and business perspective: “Firstly, in mastering the complexity of distributed and linked ‘embedded systems’ and secondly in the Internet of Things and the Internet of Services, where our focus is on eEnergy, eHealth, eMobility and eServices.”

It remains to be seen how European cooperation will develop in the future. Sahin Albayrak believes in the advantages of sharpening TU Berlin’s profile and does not feel that there are any potential conflicts of interest with the other European co-locations: “Generally speaking, the wheat and the chaff are separated very quickly once all the facts are laid out on the table and discussed.” The cluster offers all participants insight into the diversity of research cultures available – an enormous pool for new ideas.

[www.eit.ictlabs.eu](http://www.eit.ictlabs.eu)

### EIT KICs

Europe’s top research is being linked more closely through the systematic efforts of the European Institute of Innovation and Technology (EIT), which was initiated by the European Commission in 2008. The Institute is currently regarded within the European Union as a pilot project for an innovative funding instrument. With three “Knowledge and Innovation Communities” – KICs for short – its integrative approach includes the entire innovation chain: from master programmes with an entrepreneurial orientation to systematically designed industry-academia research cooperations and closely coordinated joint research visions. The knowledge triangle of education, research and business is seen as the catalyst for a significantly higher number of European innovations. The primary objective of the KICs is to market these quickly. The main areas upon which they focus are seen as a fertile ground for promising innovations: sustainable energy (KIC InnoEnergy), the future of the information and communication society (EIT ICT Labs) and climate change, protection and adaptation (Climate KIC).

## 2

*Gordon Murray*

# Seed capital and corporate venture capital

Start-up capital for young companies

Businesses and governments alike have both woken up to the fact that a strong entrepreneurial drive is an essential component of a successful economy and nation. For both developed and emerging nations, new and young businesses are the key providers of net employment growth. Thus, despite their small size, small and medium-sized businesses (SMEs) have in aggregate a disproportionately positive effect on the supply of new jobs. For the most promising young enterprises, often working in areas of the New Knowledge economy, they also can have a major impact on the future competitiveness and innovative capacity of the economy. It is for these reasons that governments of every political hue are alike in their promotion and encouragement of entrepreneurship among their citizens including students and scientists as well as entrepreneurs and business persons. The future appears increasingly to be dictated by enterprises characterised both by their youth and their ability to change how we as consumers behave – both radically and globally.

Yet, these nascent Young Innovative Companies (YICs) often find access to early stage finance extremely difficult. Their value is all in their future, and their assets – brains, experience, intellectual property – remain intangible and are thus often poor collateral. Regardless of their potential, such businesses are rarely in receipt of substantial bank debt during their formative years. They are more likely to get ‘patient capital’ from family and friends. However, spurred on by the huge potential and impact of the very best of such businesses, particularly in the USA with its treasure trove of Silicon Valley, Route 128 and other world-class, technology hubs, the venture capital or risk capital industry has evolved specifically to invest profitably in such highly attractive but speculative young businesses. Venture capitalists have been early funders in spectacular companies from Apple, Microsoft and Genentech to Amazon, Skype, eBay and Facebook.

It is the early recognition and nurturing of YICs with their novel and often disruptive technologies and business models where seed capital and corporate venturing can play such an important part. Seed capital is the earliest stage and most risky investment activity with its focus on identifying and backing exceptional growth businesses often still at the ideas stage and where stable revenues and full management teams are no more than the ambitions of an untested entrepreneur. Not surprisingly, given the improbability of finding the next Groupon, LastMinute.com or Skype, seed capital is very thin on the ground and government support has been critical in ensuring very early stage entrepreneurial finance exists in meaningful quantities.

Corporate Venture Capital (CVC) can either act as a source of finance and support that complements, substitutes for or ‘follows-on’ from seed capital as rapidly growing firms demand more and different sources of start-up and development finance. CVC may be defined as where a parent company or corporation emulates the investment structures, processes and behaviour of a Venture Capitalist firm by setting up



a specialist unit to invest in novel and unfamiliar ideas, technologies and business models originating from both outside and inside the parent company, for purposes of strategic and/or financial gain.

It is ironic, but it is their youth and the fresh eye that entrepreneurial YICs cast on existing and future markets and opportunities that are so attractive to large and established corporations. As Martin Sorrell, Chairman of WPP noted “Every CEO wants the power of a global company with the heart and soul of an entrepreneurial company.” The YIC can give the corporation an alternative view on new opportunities that may on occasions embody a greater understanding of changing market dynamics than that of the established business. For example, the idea of every manager having and controlling his/her own personal computer was considered sci-fi nonsense by established main-frame and super-computer providers prior to the 1980s. Which main board directors of the then dominant ICT companies had ever heard of Steve Jobs and Apple, Bill Gates and Microsoft?

Regardless of their potential, both seed capital and CVC have had ‘challenging’ histories. Identifying next generation technology and the mould-breaking entrepreneurs who will bring about such disruptive changes has never been easy. Further, the cultures of corporations, financiers and entrepreneurs have rarely been completely miscible. As such, the relationship between entrepreneurs and their investors has often been fraught and occasionally totally destructive to all parties. But, at its best, an investment relationship combining entrepreneurial talent with venture capitalists’ and CVC managers’ professional experience can be hugely effective in accelerating the introduction and growth of a major new enterprise. The entrepreneurial team contributes new ideas leading to novel products/services and the discovery/reinvention of new markets; the venture capitalist provides risk capital and the skill-sets to nurture and promote the managerial and operational skills of the nascent company; and the corporate venture unit can add a key understanding of technologies and markets coupled a global reach and, perhaps most critically, the credibility and imprimatur of an established and successful large business. All these diverse and complementary resources can have an important and valuable ‘certification effect’ on the YIC.

Seed capital and Corporate Venturing have an important role to play in a world characterised by the increasing role of innovation and knowledge-based industries. Brain-ware probably always has been – and will remain – the most valuable of all economic resources. Critically, its nurturing and management should likewise be seen as an art form rather than a science. We continue to live in ‘interesting times’.



Josef Richard Wunsch

# Targeted investments in innovative ideas and technologies

BASF Venture Capital GmbH

Corporate Venture Capital for BASF is one of the many tools within the BASF Group for addressing and exploring the rapidly changing technology environment with an emphasis on emerging technology fields. BASF Venture Capital GmbH (BVC) takes minority stakes in start-up technology companies which are active in areas of strategic interest to the BASF Group (material sciences/chemistry). The strategic objective of such an investment is to open a new window on technology and facilitate an intense exchange of know-how between BASF and the respective portfolio company in both ways. While BASF explores technology areas developed outside of its in-house competencies, BASF supports the start-up with co-development expertise, scale-up engineering, improvement of marketing strategies and the opening of sales channels across its global network for the benefit of the portfolio company. Joint-development agreements are usually put in place in order to cover all relevant legal aspects and generally provide a solid framework for this cooperation for the benefit of both parties. In parallel, BVC pursues financial target returns comparable to those of other Financial Venture Capital funds.

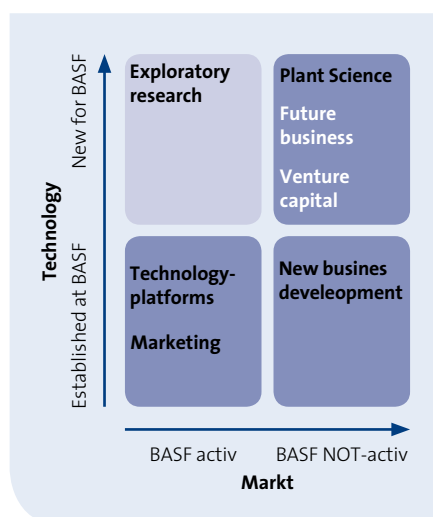
## Strengths and challenges

Applying this outside-in Venture model, BASF can leverage its extensive know-how and research for the benefit of the portfolio company as well as for itself and so increase its chance of early success and finally create value for all parties involved.

As BVC invests in technology alongside the technology platform of BASF Groups as well as its Growth Clusters, i.e. Industrial & Green Biotech, Energy Management, Nanotechnology and Raw Material Change, BASF's strategy is always apparent whenever an investment is made. As the respective business or research department is usually involved, an intensive cooperation between the start-up company and BASF is fostered.

Nevertheless, conflicts of interest may occur between financial and technological targets when a potential investment makes sense from a technological and strategic perspective but attractive financial returns are not likely enough or the business model is not sound.

**Figure 7: The BASF venture capital model**



## Impact on BASF research

BASF's exploratory research pursues developments that are new from a technological perspective but focuses on markets in which BASF is currently active. BVC complements these developments by addressing technology segments that are new to BASF in terms of both technology and market perspectives. BASF Group must innovate, not just through its in-house R&D expertise but also in close cooperation with entrepreneurial start-up companies developing disruptive sciences in order to keep its leading technology position in the marketplace. The corporate venture activity is complemented by its BASF Future Business (incubator), New Business Development and existing R&D technology initiatives (see chart).

## Recommendations for innovation partnerships of businesses and science

In order to establish a reliable basis for a cooperation that involves several legal entities/ organizations it is crucial to sign a JDA that covers all relevant legal and business aspects such as patents, licences, resources, profit sharing the case of commercialization etc.

Investment documents must be state-of-the-art and every party's strategic and business focus must be considered. Every investment opportunity at BVC requires the endorsement of an operating or R&D unit stating that the start-up's technology is of strategic

relevance to its own innovation strategy. Thus, purely financial driven investments are excluded.

Despite the strategic nature of such an investment, BVC's investment criteria require a strong technology and future market position for the start-up to be successful, even without a BASF interaction, in order to fulfill the financial objective of BVC.

[www.basf-vc.de](http://www.basf-vc.de)

## *“We can use our resources more effectively now”*

### Interview with William F. Kirk, CEO, Advanced BioNutrition Corp.

#### *What influence does BASF VC have on the strategy of your company?*

BASF plays an important role on the Board in reviewing and improving strategy. This is important as it helps Advanced BioNutrition (ABN) to focus on a few core elements rather than trying to do too many things at once. It allows resources to be allocated to key priorities and personnel to be deployed appropriately. As well as this, the investment gives Advanced BioNutrition Corp. a valuable connection to the operational divisions of BASF. This in turn opens up a quick channel for assessing new market segments for ABN's product line.



#### *What advantages does the cooperation offer you?*

Advanced BioNutrition Corp. receives financing, contributions to strategy development, networking, and a potential exit strategy. Financing is critical for getting

a start-up to the point of break-even and positive cash flow. Networking is crucial for being able to open doors at major corporations around the world. The Venture Capital Arm of BASF has been very supportive on the strategic as well as the financial front. We are currently working on a number of joint business opportunities in which Advanced BioNutrition Corp. provided the encapsulation technology for certain BASF products. Due to their financial objectives they also value relationships with ABN's other accounts and provide support to us in this regard as well.

Bradley Hardiman

# University supports young entrepreneurs

*Cambridge Enterprise Seed Funds*

The beginnings of the Cambridge Phenomenon, one of the most productive technology clusters in the world, can be traced back to 1960, when Tim Eiloart and David Southward founded Cambridge Consultants. Over the past 50 years, 5,000 new technology and service companies have been founded in the area; of which 1,400 still exist today.

Of course, the Cambridge Phenomenon would not have happened without the University of Cambridge. University people and ideas are at the core of the cluster's success, and the University is doing its part to help its entrepreneurs succeed.

Cambridge Enterprise is the University's commercialisation group, and is made up of three overlapping business units: technology transfer services, consultancy services and seed fund services. Cambridge Enterprise Seed Funds (CESF) provides financial support to new companies based on University research, proof of concept, business development and company start-up. CESF invests in new companies at one of more of the following three stages:

- Pathfinder – up to £ 15,000 to develop a business plan, conduct market research
- Seed – up to around £ 100,000 to build a company capable of attracting smart follow-on money and management
- Follow on – up to £ 250,000 in any one opportunity

## *University funding programmes*

Cambridge Enterprise manages three evergreen seed funds on the University's behalf: the University Venture Fund, the University Challenge Fund and the University Discovery Fund. Investment decisions are made by an Investment Committee and an equity stake is taken in return for investment. CESF is one of the most successful seed funds in the University sector, with an average of £ 75 of follow-on investment for each £ 1 invested.

For the University to fulfil its mission, to perform for stakeholders, to play its part in growing the economy, to show that it is achieving results with taxpayers' money and to be a true world leader, it needs to be successful at creating new ventures around University innovation.

The true impact of Cambridge spin-out companies is not solely financial, however. The University's mission is to contribute to society through education, learning and research at the highest levels of excellence, and CESF supports that mission by assisting young companies which are based on University research.

Cambridge spin-out companies are having a real and profound impact on lives the world over: from diagnosing and treating patients, capturing and managing clean energy, to developing next-generation electronics and nanotechnology.

One of the many challenges associated with supporting very early-stage companies is that it is difficult to run a seed fund and make a return at the level which institutional investors expect – which is evident from the fact that venture capitalists are shifting their investments to later and later in the funding cycle. The gap between early stage funders, such as Cambridge Enterprise and business angels, and later-stage funders such as venture capitalists is wide – and getting wider.

The combined funds held by the Venture Fund, Challenge Fund and Discovery Fund are not enough to enable continual investment in new companies, due to the long time period from investment to realisation, and the large sums of money needed to fund high technology companies.



With the Cambridge Enterprising Seed Fund, the university is investing in innovative business ideas.

So how do we expect these companies, which play such an important role in our society and economy, to get off the ground when venture capitalists are retiring to the relative safety of later rounds, and friends, family and angels are struggling due to the economic climate?

In 2008, as part of its 800th anniversary campaign, Cambridge launched its own philanthropic seed fund: the University of Cambridge Discovery Fund. Our aim is to raise a £ 5 million fund which will transform Cambridge Enterprise's ability to commercialise University innovation and provide a world-class service to its researchers. £ 1.6 million has been raised to date.

### *Funding – in the public interest*

One of the strengths of this model is it brings a third type of funder to the table, and allows early-stage companies to have access to funding at the very earliest stages of their new venture. Dissemination of research results through licensing or spin-out creation is one of the University's core values, and the Discovery Fund is an important resource to help the University achieve this goal. This unique programme gives donors the opportunity to support the impact of the remarkable research at the University through a renewable resource that has the potential to be applied many times over.

The challenge with this model is to convince potential donors to view supporting new companies as a charitable endeavour. Starting new technology companies is an expensive and time-consuming business, which does not seem like an obvious fit for the philanthropically-minded individual. But when one considers the societal impact which Cambridge spin-outs either have now or can have in the future, and the dire lack of early-stage funding available to them, the importance of funds such as the Discovery Fund becomes clear.

[www.enterprise.cam.ac.uk](http://www.enterprise.cam.ac.uk)

# “We help new companies over the first financing barrier”

## Interview with Michael Brandkamp, Managing Director of High-Tech Gründerfonds.

*In Germany, “seed funding” is seen as a difficult business.*

It is true that there is a “seed capital gap” for fledgling companies with high capital requirements. In spite of this, High-Tech Gründerfonds regularly succeeds in helping start-ups from all sectors to bridge this “valley of death”. As much as 70 per cent of our follow-up financing funds now come from private investors. Involving established companies in the financing of new markets is therefore an approach that clearly works. The necessary trust is there. This being the case, a second fund is now being launched which is not only being financed by public-sector institutions such as the Federal Ministry of Economics and Technology and the Kreditanstalt für Wiederaufbau (KfW – German Development Bank), but also by strong companies.

*Can you explain the reasons for your success?*

Investors worldwide realise that pure financial products are often riskier than they were said to be. The risks in high-tech sector are at least transparent. This is another reason why the German export industry – and in particular the high-tech segment – is once again a magnet for foreign capital. 2010 was the first time



that foreign players invested more funds in the companies financed by High-Tech Gründerfonds than German venture capital companies. However, large and mid-size German companies are also developing their own corporate venture subsidiaries in order to have even faster access to new technologies. Private investors who succeeded in developing and selling companies themselves are also investing in start-ups. This is where entrepreneurial spirit comes into play in different ways. Because of this, we see High-Tech Gründerfonds as a unique national network in which institutional and private investors – “business angels” – interact and coordinate their efforts.

*Which areas are currently “in”?*

White biotechnology is still a megatrend. Enzyme engineering companies such as Leipzig-based c-Electa are raising extensive venture capital and joining forces with larger companies. Life science, material science, chemical technologies,

microsystems technology and internet business are still important. The transfer of retail business to the internet seems to be irrevocable. Even the most unlikely products are now sold by digital means. An extraordinary example is the Misterspex online shop in Berlin, where customers can adapt their glasses virtually and have them delivered. Even though the idea seemed hardly realistic just a few years ago, it is now being accepted by the market.

*How would you describe High-Tech Gründerfonds’ funding philosophy?*

First of all, we evaluate the business idea and its underlying technology. Then the management quality and the concept for implementing the idea. If the company is short on business know-how, we support the management team with our own experts. Four groups of experts are involved in the actual selection process, all of whom must be convinced. These include the “investment managers”, who are especially well acquainted with the technology and the market. Then there are the technology appraisers – these include university professors, independent investment committees and in-house specialists from project backers such as vdivide-IT. Sector experts make up the final group: managing directors of corporate ventures, venture capital representatives, research scientists or successful entrepreneurs with well-known start-ups to their credit. The financial reasons for an investment are a crucial factor for all four groups, as only ideas with a sound financial basis will ultimately succeed economically. In other

words, it is not only the industrial investors who ensure that the fund is geared primarily towards the market. Our public-sector backers are also well aware that our aim is not to drain funds as quickly as possible. There is no point in funding even basic research into fascinating technology if the commercial idea is not based on solid ground.

***How can start-ups work together with larger companies without losing control?***

Start-ups explore new ground that large companies are not equipped to explore. On the other hand, joint research undertakings between large and small companies promote start-ups. As well as securing funding, start-ups that team up with market leaders can also draw on their experience regarding how the market works and what it needs. Above all, it can make sense to leave the distribution of a new product in the hands of a large partner who can bring it to the market efficiently through its own channels. After all, many large potential customers are loath to buy a new product from a still-unknown start-up company. Department heads have reservations as they have no knowledge how long the start-up supplier will be around and whether the new product will remain on the market. For this reason, it is often advisable to couple start-ups with a major distribution channels.

***How do you increase the number of start-ups coming from universities?***

Not easy. I have known talented people working at technology transfer interfac-

es in universities who gave up. In many cases, the administrative structures at German universities are too complicated. This being the case, the potential for increasing the number of start-ups from universities still depends very much on the perseverance and entrepreneurial bent of individual professors. Anyone who has seen what leading universities abroad have achieved will not be affected as much by the administrative logic of German universities. Professors like Karl Leo and Gerhard Fettweis at the Dresden University of Technology have drawn on their experiences in the USA to make a name for themselves with outstanding start-ups in Dresden. They provided their assistants with ongoing support in their entrepreneurial development and motivated them to view filing patents as being every bit as important as publishing scientific findings. Investors pay attention to this sort of thing. Which ultimately leads to start-ups like Novaled AG, Heliatek GmbH and Signalion GmbH.

***How do you envisage the future?***

We have observed that, in Germany too, successful company founders remain active at an entrepreneurial level after they have sold their own start-up, i.e. they reinvest their money. This gives rise to cycles that benefit all concerned and could ultimately lead to a business ecosystem that generates overriding system effects – by many networks coming together to offer advantages to promising start-ups. With successful company founders investing their money in, for example, venture

capital companies or overseeing start-ups themselves as “business angels”, this could lead to a new culture for which High-Tech Gründerfonds already provides an overarching platform today.

[www.high-tech-gruenderfonds.de](http://www.high-tech-gruenderfonds.de)

# “Companies should grow organically”

Thomas Kamps, Managing Director of ConWeaver, looked to High-Tech Gründerfonds to help finance the growth of his company.

*For an earlier start-up, you were involved in negotiations with investors from the southern Chinese province of Fujian.*

That was an exciting experience. In China, investors have a completely different relationship with company founders. There is a far greater emphasis on the interpersonal aspect over there. In the course of many discussions, they verify whether you are the right kind of person for the network. There is also a high risk for anyone who brings a new face into the “family”. If the investment turns out to be a dud, they also stand to lose considerable credibility. Because of this, when Chinese investors examine a potential project, they look at far more than just the figures. “Is it a good team?” “Do I think they are up to it?” You have to be patient and wait until your new partners believe that you can actually do what you have set out to do. In return, you are given access to excellent networks – in China, unlike Germany for the most part, people working in the venture capital scene have close ties with management in manufacturing industry.

*Shortly after ConWeaver GmbH was founded, you hesitated a little before teaming up with High-Tech Gründerfonds.* In 2008, we had begun developing this spin-off, which originated in the Fraunhofer IGD in Darmstadt, and a number of promising discussions had already taken place with High-Tech Gründerfonds. Two



years later, after we had ascertained that we needed more capital for scaling sales but also for developing new technical components, we decided to work together with the fund. The negotiations were quick to bear fruit – after all, we already had our first major customers and several new products under our belts. That was a good feeling.

*You enjoy negotiating from a position of strength.*

In my view, companies should grow organically wherever possible. Personal experience with my first start-up brought it home to me how important it is for founders always to be aware of what they really want. Otherwise they reach a point where the investors start interpreting their objectives and telling them what to do. Needless to say, this is not how High-Tech Gründerfonds operates. However, working together with the fund also gave us access to its excellent networks, which in turn brought us in contact with important new customers. The mentor network is also excellent. One managing director – a prominent figure in his sector – helped us to hone our business plan at several stages of development. This was extremely helpful. These mentors are not only qualified but have a very real interest

in whether you succeed; they keep in contact and ask you about it.

*How does the fund see to it that new customers are acquired?*

The annual fund conference – known as “Family Day” – is extraordinarily helpful. On the first day, the managing directors of almost all the 700-plus companies in the fund’s portfolio interact with one another, sharing their experiences and getting to know one another. At the same time, workshops are held on subjects such as exit strategies, SEO optimisation and start-up financing. The second day is devoted to networking with the business angels, the representatives from industry and the European venture capital scene. Panels of investors report on their own success stories, while companies introduce themselves by means of pitches and presentations. These two days give rise to a whole series of successful financing rounds.

*What do you have planned next for ConWeaver?*

We have now reached the stage where we can accelerate our growth. To do so, we are injecting an initial investment of €1 million. This money will be coming from major partners from the VC industry, but there are high-worth private investors who are also interested.

# “We need to identify strong, exciting technologies early on”

Taking the example of the ConWeaver start-up, Markus Kressmann, Senior Investment Manager at High-Tech Gründerfonds, explains why high-risk investments are essential for the hub of innovation that is Germany.



*It is no secret that venture funds specialise in high-risk investments. What opportunities did you recognise in ConWeaver?*

In 2008, the Deputy Director of the Fraunhofer IGD in Darmstadt drew our attention to a highly innovative technology. ConWeaver is developing a “semantics search engine” – language-based software that is suitable for automatically integrating complex company data and for intelligent search options at a multilingual level. In other words, ConWeaver offers a semantic search solution for companies whose everyday work involves understanding complex knowledge-based processes.

*How would you define High-Tech Gründerfonds’ investment criteria in general terms?*

Particularly in Germany with its singular focus on research, it is important to recognise early on when strong, exciting technologies emerge in individual research units or in SMEs. These technical innovations, combined with founder know-how and the resulting competitive advantage, certainly constitute the most important investment criterion for gaining a foothold in the market. ConWeaver is also a good example of this. What we found

there was a market-ready technology with an abundance of new application possibilities, developed in a renowned research institute – and a German one at that. We were also won over by the technical and market expertise of the team behind the start-up, is also important.

*“Seed funding” is defined by the risk associated with investing in a company at a point in time when there is no experience to draw on with regard to its long-term performance.*

That is correct. As a high-tech start-up fund, we come on board as investors at a very early stage, meaning that many essential aspects for a venture capital investor still have to be finalised or validated. An exciting scenario for venture capital investors, for example, is when a company has proven the value of its business model and now wishes to step up advertising efforts or to invest in sales and distribution. Wherever necessary, we at High-Tech Gründerfonds make our know-how available: How are licence sales regulated? How can the company’s market entry be optimised? In certain cases, we also validate the business model in order to increase the value of the company, particularly with a view to an “exit”, i.e. selling the company. To this end, we frequently

enlist the services of external specialists and experts.

*Was this kind of measure also necessary with ConWeaver?*

Not really, because ConWeaver was already very well positioned by the time we invested in it. The main problem here – at least from our point of view – was that the founders did not want any financial support from us initially. People who start up companies are often afraid of going “cap in hand” to venture capital investors and of being treated as such. They are also afraid that investors might end up with too great a say. Because of this, some start-up entrepreneurs prefer to pass up lucrative growth opportunities. Financing cannot work like this. We see ourselves as a partner and are looking for a partnership on equal terms. Due diligence must pass muster on both sides.

*Finally, how important is the exit strategy for investors?*

It goes without saying that at some point all investors would like to sell their investment for an attractive profit. Exit planning is geared very much towards the business model in question. In the software field, for instance, a crucial factor is whether sales are generated from one-time licences or from recurring services. However, the market timing is still important here as well. If there is a general slump in share prices on the stock exchange, it is obviously harder to sell a company – or to sell it for anything close to what it would fetch in a positive stock exchange environment. One thing you should bear in mind: selling because you have to sell is the worst option of all – and this goes for investors too.



## 3

*Roland Harwood*

# Crowdsourcing and open innovation

Harnessing the knowledge of the masses

In recent years we have seen the rapid rise in popularity of crowdsourcing which is defined as the act of outsourcing tasks, traditionally performed by an employee or supplier, to a large group of people or community through an open call or challenge. Many companies such as Procter and Gamble, Bayer HealthCare and LEGO, are embracing crowdsourcing as a better, cheaper and faster way to innovate. And yet crowdsourcing itself is part of a much wider trend towards more open innovation which involves proactively innovating in partnership with those outside your company by sharing the risks and rewards of the outcome and process.

Why share risk? Innovation is risky and typically fewer than 1 in 100 new technologies or ideas that are invested in ever make an adequate return. With innovation it is also notoriously difficult to measure return on investment. The expense and the odds against success are why sharing risk is a good idea. Why share rewards? Firstly, because offering a prize, a business contract or other reward will get firms better quality ideas from more experienced contributors. Secondly, innovative outsiders usually have lots of other good ideas that can be traded in the future so it's best to keep them coming back. A mature, open innovation strategy can never be about getting something for nothing.

## Open Up Your Innovation Process

Open innovation typically starts with either an unmet need, around which you build a competitive marketplace, or a network, around which you build a collaborative community. Either a firm publishes a challenge or brief to the outside world. Alternatively, firms can also begin by seeking out potential partners and forming a productive relationship without a specific need. The source of new ideas and technologies is often smaller suppliers but it can also be other firms, universities or consumers. The partners then co-develop innovations and the most promising will be brought to market through a variety of collaborative business models e.g. licensing deals, joint ventures or acquisitions.

Open innovation can take many forms. We are starting to see a new language develop and new methods for innovating with others. One of the under-appreciated aspects of open innovation is how flexible the business model can be. Companies new to open innovation tend to react defensively at first: "How can we protect our intellectual property"?

But is this Intellectual Property protectionism really necessary?

There are a range of progressively open business models with all sorts of approaches that include and transcend intellectual property. We begin with traditional in-house



Corina Niebuhr

## Exchanging know-how between academic research and industry

*Bayer HealthCare's open innovation model Grants4Targets*

Developing new drugs is a complex process that can take anything up to twelve years. One of the first tasks is to find so-called “targets”, i.e. molecules in the body to which a drug can bind, thereby allowing it to take effect in treating the illness. Identifying targets is an important step in developing drugs and, at the same time, a considerable challenge. There is great demand for specialists with an extensive knowledge of disease-induced changes at molecular level and also for suitable models for testing such approaches. The pharmaceutical industry aims to overcome this challenge together with innovative external partners, which calls for new forms of cooperation between universities or research institutions on the one hand and the pharmaceutical industry on the other.

Bayer HealthCare is tackling these challenges, among other things, with its new open innovation programme “Grants4Targets”. This innovative approach is based on a crowdsourcing concept, i.e. drawing on global expert knowledge to find answers to specific questions. Grants4Targets is founded upon the basic idea that many specialists all over the world are researching cancer, cardiovascular diseases and gynaecological indications and are developing valuable ideas for targets as a new approach to treating these conditions. However, these ideas frequently fail to gain a foothold in actual drug research.

Through the Grants4Targets platform, researchers can now showcase their target ideas and apply for the chance to work together with Bayer. The competing ideas are assessed by means of an internal evaluation process. If researchers are selected for a grant, they can explore and test the idea in cooperation with Bayer HealthCare without having to compromise their scientific freedom.

### *Added value for both parties*

The company offers participants the prospect of access to research funds, experience, special technology and other important factors. Helmut Haning, Head of Global Innovation Sourcing: “As well as financial support, the programme involves an intensive exchange of know-how, whereby we make available our expertise in the field of pharmaceutical research and development and also offer to conduct experiments ourselves. This ensures added value for both parties.”

For their part, the researchers want to help to treat diseases faster and more effectively, meaning that the crowdsourcing concept has met with great interest. Since the programme was launched at Bayer HealthCare, some 500 target ideas have been submitted, of which 70 have already received grants. A third of the ideas originates from Germany, a third from other European countries and a third from outside Europe, for instance the USA and Asia.

Bayer HealthCare also explores how such a cooperation can be of maximum benefit to both parties. The Grants4Targets innovation model already sets itself apart with its straightforward, internet-based experts, its lack of red tape and pool of possible experts, and its lack of red tape and short processing times. This means that researchers only need to submit a short project description with a small amount of additional information via the Grants4Targets internet portal by a specified closing date. Just eight weeks or so later, Bayer will let them know whether they have been accepted for a grant.

Every project approved by the initiative is also assigned to an experienced Bayer researcher, thus incorporating it in the company's research process. Helmut Haning emphasises the importance of this aspect when it comes to feeding the ideas into the research pipeline at the end. Open and regular communication is another important aspect.

Generally speaking, the programme offers financial support in two categories: support grants (€5,000 to €10,000) for targets that are interesting but not yet well researched and focus grants (€10,000 to €125,000) for well-developed ideas that are already suitable for inclusion in a drug development process. In both cases, the patent rights remain with the researchers who submitted the original idea and Bayer alone decides which ideas are to be used and for what purpose.

However, crowdsourcing approaches such as these have their fair share of problems to contend with. As Helmut Haning explains: “A general problem with this kind of innovation model is filtering information, i.e. finding out which ideas are actually relevant and promising”. In order to simplify this process, the Grants4Targets website already explains in great detail which indications are of interest for Bayer HealthCare and outlines its expectations as regards ideas and partners.

[www.grants4targets.com](http://www.grants4targets.com)

## “There must be a strategic fit between the objectives of each party”

Interview with Monika Lessl,  
Head of Alliance Management  
Global Innovation Sourcing at  
Bayer HealthCare.

*How does Bayer initiate and oversee the projects that it undertakes together with university research institutes?*

In the case of our Grants4Targets initiative, academic research definitely contributes new ideas – especially new ideas regarding the causes of diseases. Here at Bayer, we have the know-how to explore these hypotheses and to use them to develop medication. External scientists from all over the world submit ideas via the Grants4Targets platform. The project proposals are then evaluated by our in-house specialists during a review process. Since launching the programme,



we have received some 500 target ideas, 70 of which have already been allocated grants. Generally speaking, a key factor for any cooperation is that the expertise and know-how of both partners complement each other, giving rise to some-

thing new that neither of the partners would have been capable of achieving alone. Each partner should be able to contribute its own strengths.

*What is important in order for “open innovation” to work?*

Establishing trust through intensive interaction, certainly. If the parties see things differently, this should be discussed openly and the objectives of the cooperation clearly defined. Naturally, the cultures that exist in industry are not the same as those that exist in academic research institutions. Nonetheless, both parties ultimately have the same objective – in our case, to develop new treatment options for patients. Before embarking on a new cooperation, it is important to formulate clearly what is expected of each partner. There must be a strategic fit between the objectives of each party. This strategic fit is the key to a successful cooperation.

# “Successful cooperations are built on the strengths of industry and scientific research”

Interview with Stefan Knapp,  
Structural Genomics Con-  
sortium (SGC), University of  
Oxford.

*What do excellent academic groups and start-ups expect from scientific collaboration with business partners and companies?*

Academic and industrial laboratories have different strengths and weaknesses. Apart from financial support, collaborations with industrial partners should be synergistic by building on the strength of both disciplines. Many aspects of drug discovery such as medicinal chemistry are not well developed in most academic laboratories. In contrast, academic laboratories have often developed excellent cellular and in vivo assay systems, have profound knowledge of the underlying biology of a certain disease and have easier access to clinical samples. An interesting collaboration combines these capabilities efficiently.

*What were your first experiences with Grant4Targets?*

The Grant4Targets programme offers a rapid and very efficient process for funding a collaborative project. The project that has been funded in my lab led to a



multidisciplinary research projects and would motivate the “scientific crowd” rather than single independent groups. In order to maintain the rapid pace of Grant4Targets applications, such projects would be best positioned as pre-competitive research programmes.

regular and frequent exchange of ideas with my collaborators at Bayer. This not only guaranteed that the project has stayed on track but also provided interesting new ideas.

*What can be learned? What can be improved? In brief: what could motivate the “scientific crowd” to get involved?*

The Grant4Targets programme offers an excellent opportunity for academic groups to fund well-defined research projects. The turnaround from application submission to funding decision is certainly among the quickest that I have ever experienced. This means that it would be difficult to improve this process further. However, an interesting aspect that is, to my knowledge, not covered by the programme would be the funding of smaller international networks of research teams. This would enable more comprehensive

# “It's important to be open and honest when communicating”

Ideas-broker Michael Bartl, CEO of Hyve AG, talks about contests, internet communities and cooperation between companies and researchers.



*Your company manages open innovation processes on behalf of industry. How do you approach this?*

First of all, we research which online forums and web communities deal with subjects and ideas that could be interesting for our customers' product development. You can take an observational approach or contact the community operators directly. It is important to be open and honest when communicating the possible ways in which the community can be involved in a company's product development.

Following this, we use idea contests and crowdsourcing methods to activate the creative mass. If necessary, we set up our own communities for new subjects. In this way, a creative group can be supervised by people from our agency for months while they discuss specific tasks and develop ideas within a contest framework. If required, we also develop suitable software for this purpose.

*What motivates creative people to get involved in a process like this?*

For many participants, social recognition within their own peer group is still a very important factor. They are anxious to show who they are and what they can do. In isolated cases, winners of these competitions – designers for instance – have even been offered jobs with the company that initiated the contest in question. If, for instance, a company agrees to develop the best idea from an innovation contest into a product, this can motivate talented participants in the same way as new incentive systems involving licences.

We have also observed that a good group can remain motivated for months on end if the company agrees to award the prize to the best idea to emerge from the contest. Ideally, two prizes should be offered: one for creativity, chosen by the community itself, and another one for the

idea with the best “strategic fit” for the company, i.e. the design that fits best with the company's objectives. Through joint learning effects such as these and further follow-up activities, companies give themselves the opportunity to build up a motivated creative community – and the reality conveyed by this community can be more important for the company than reality as seen within the company itself.

[www.innovation-community.de](http://www.innovation-community.de)

Justin S. Bryans, Jonathan McGee

# *The wealth of ideas from academic sources is inexhaustible*

*MRCT's Call for Targets campaign*

**M**RC Technology is a UK-based charity involved in both technology transfer and drug discovery. They house the Centre for Therapeutics Discovery based in North London where a team of about 60 scientists is working in collaboration with academics to translate academic science towards assets suitable for partnering with the Pharma and Biotech sectors which in turn will advance the products to clinical benefit.

It is clear that over the past five years the landscape within the Pharma sector has changed significantly with many companies shrinking research capability and focusing more on development. Recently there have been several major site closures, especially in the UK (Pfizer, AZ, Merck, GSK), and there appears to be a move to shift much of the research base of Pharma companies to Asia in a drive to reduce costs.

However, it is felt that the academic sector across Europe could go a long way to filling the research gap that is appearing in many Pharma companies' pipelines. The academic sector represent a vast pool of highly talented and knowledgeable researchers, many of whom have a keen interest in translational research and making a difference to health-care. Indeed, the retrenching of Pharma represents a massive opportunity for academics to get involved in many areas of drug discovery traditionally held as the preserve of Pharma, for example assay development, screening, pharmacology, medicinal chemistry, DMPK and antibody generation and humanisation.

## *Access to the right resources*

The only real impediment to academics launching a sustained challenge in this field is access to the full spectrum of resources required for undertaking early stage drug discovery. Without access to this translational resource, research stagnates and doesn't therefore attract Pharma buy-in and investment, budgets get cut, drugs don't get developed and, ultimately, patients suffer.

MRCT's Centre for Therapeutics Discovery (CTD) is a facility targeted specifically at providing academics with the tools to undertake high quality, drug-discovery projects. It is staffed by 60 highly trained staff, many from industry, specialising in all areas of early stage drug discovery from assay development through to screening, pharmacology, medicinal chemistry and antibody engineering. It provides a one-stop shop for academic researchers to move their projects from basic biology to potential clinical candidates via close collaboration with CTD scientists and, ultimately, to partnering the asset with industry. MRCT has a commitment to work on the best science, wherever it comes from, to develop new treatments for unfulfilled medical needs. As such, they have long realised the need to reach a wide range of academics to access top quality science and to reach across international borders to achieve this. MRCT believes it is offering an attractive proposition to academics including:

- MRCT is a charity and a not-for profit organisation and as such any intellectual property from the academic that forms the basis of a collaboration is retained by the academic.
- Any IP arising from a collaboration, is jointly owned.
- As it is a true collaboration the academic will retain some control over the project.
- MRCT provides its services free of charge to the academic
- Although MRCT is not a funding body itself, it has strong links to and/or knowledge of funding streams, for example those offered by the Medical Research Council and the Wellcome Trust.
- MRCT has an excellent worldwide network of Business Managers for marketing any assets from the project.



Highly qualified employees use MRC technology to research new active substances.

- There will be a revenue share back to the academic and their institution on successful partnering.

### *Internet platform for researchers*

To access projects, MRCT devised its “Call for Targets” campaign encouraging academics to submit proposals via a website. Initial focus was on worldwide journal advertising (Nature) with online banner advertising, and it was felt that it would be deemed successful if 10 new projects entered MRCT’s research collaboration pipeline.

The website received more than 1,000 unique visitors, the largest number from any one institution being 30. To date MRCT has received 149 project proposals with the most coming from the UK (72%) but others coming from the USA, Germany, Canada, China and New Zealand amongst others. Gratifyingly, to date 34 new projects have been started, surpassing the success criterion by almost 250%. Awareness of MRCT was created within the academic sector and the campaign was nominated for an industry award.

From this initiative we have learnt several key points:

- Academics are very inventive people who have some remarkable ideas
- Many academics are keen to see their projects make an impact on healthcare but don’t necessarily have the tools or expertise to do that
- There is a real need for organisations such as MRCT’s Centre for Therapeutics Discovery to help translate some great ideas towards tangible clinical benefit
- A web-based portal can’t filter out unsuitable applications and it takes a long time to read and assess all of them

With the last point in mind, MRCT has refined its Call for Targets campaign and now focuses on:

- Dedicated business teams liaising with universities and institutes to identify suitable projects
- Call for Targets road shows to spread the message and encourage applications
- eMail and social media campaigns to increase awareness of MRCT resources and capabilities
- An MRCT and Call for Targets presence at events, conference and exhibitions

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



Helen Neville

## Partnering with the world to create greater value

*A key part of Procter&Gamble's (P&G) innovation strategy is to find innovation, not just develop it*

In 2001, P&G was in a period of declining growth. As innovation is the major driver of the Company's growth, P&G knew it needed to accelerate its innovation development and increase its innovation success rate. And leadership predicted, with the world continually getting smaller and moving faster, that the solution would be found in collaborating externally rather than in isolation. P&G launched "Connect+Develop" (C+D<sup>SM</sup>): a systemic, company-wide open-innovation programme charged with bringing the outside in, and taking the inside out.

### *How we ensured that C+D<sup>SM</sup> Took Root*

One of the biggest challenges to making this programme a success was the internal mindset barrier. P&G is a company that prides itself on "invented here." To open both minds and doors at the company, P&G needed to address the mindset problem; it did so over a number of years using two key strategies. Firstly, all the senior management of the company, and in particular the CEO and CTO (at that time AG Lafley and Gil Cloyd respectively) communicated clearly and regularly that C+D<sup>SM</sup> was an essential part of our innovation strategy and essential to meet the Company's growth goals. Secondly, a target was set that 50% of its innovation would contain a significant component of external collaboration. This measure led to a chain of events within the company with tracking of results inside the Global Business Units and engagement of GBU Presidents on the C+D<sup>SM</sup> project portfolio.

### *C+D<sup>SM</sup> Needed Expert Skills to Make it Happen*

To ensure the success of the programme and as a visible commitment to it, P&G invested into a dedicated C+D support group with skilled people who helped the broader organization put C+D<sup>SM</sup> into action. C+D<sup>SM</sup> is now embedded into the DNA of the company and is continually pushed to the next level by this global team of experts that search for solutions to business needs via external networks. This group also continues to develop our C+D<sup>SM</sup> approaches to fit to the changing needs of the company and to take advantage of new opportunities from the external world. One example in this area is the use of crowdsourcing. P&G has a long history of being close to our consumers to develop consumer-driven product innovation so that we typically carry out 20,000 consumer tests per year. With the recent development of crowdsourcing, we were quickly able to bolster our innovation idea pipeline by running crowdsourcing programs. Naturally we did not re-invent the wheel but partnered with a number of small companies (for example Atizio) to help run these program with us.

The C+D<sup>SM</sup> corporate team is linked via six main hubs in China, EMEA (Europe/Middle East and Africa), India, Japan, Latin America and North America giving global access to innovation hot spots and ensuring close connection to our 25 technical centers. They also run an innovation portal in five languages for idea submissions. This C+D<sup>SM</sup> team is ultimately a support structure since the company mindset is that collaborating for innovation solutions is now part of everyone's job at P&G, and part of all we do.

### *Delivering and Sustaining Results*

P&G was able to achieve its original goal in 2005, with more than 50% of P&G innovation fuelled by external partnership. Important is that we have been able to sustain this level of achievement for several years. This sustainability is fundamental to our programme and dictates our approach in how we look for, and work with, our partners. Firstly we



In many consumer tests, P&G also involves its customers in the product development process.

apply C+D<sup>SM</sup> broadly; C+D<sup>SM</sup> looks for innovative solutions for all areas of the business, from packaging to processes to products. C+D<sup>SM</sup> seeks partnerships with anyone who has a winning idea: academia, small and medium-sized enterprises, global companies, individuals, NGOs and government labs. Importantly within this partnership we look to ensure win-win enabling us to continue to future (2nd, 3rd, 4th ...) collaborations with our partners which tend to be easier, quicker and even more valuable.

### *Some Additional Results:*

C+D<sup>SM</sup> enabled projects consistently delivered with greater efficiency, speed, value and market impact:

- More than 50% of P&G innovation is currently sourced externally
- 70% higher than average NPV from C+D<sup>SM</sup> enabled projects in 2009 (112 initiatives representing 77% of NOS)
- 40% of C+D<sup>SM</sup> partners have multiple deals with P&G
- About \$3 billion in annual sales at partner companies driven by P&G-shared innovation

### *A New Goal*

To take C+D<sup>SM</sup> to the next level and drive greater value through C+D<sup>SM</sup> partnerships, we have set two new goals in 2010:

- Triple C+D<sup>SM</sup>'s contribution to P&G's innovation development by delivering \$3 billion toward the company's annual sales growth through open innovation
- Become the Partner of Choice for innovation collaboration by consistently delivering win-win relationships

### *In Summary*

C+D<sup>SM</sup> is now part of P&G. It has proven to be successful and continually evolves to better meet the needs of our business. Our partners value what and how we work. This success has been achieved after sustained top-level commitment to this vision and investment into the programme over many years.

For further reading, see the articles in the Harvard Business Review by Sakkab et al 2006, and Brown et al 2011.

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





# Outlook

- 1** The challenge of innovation systems
- 2** It's entrepreneurship, stupid!

## 1

*Allyson Reed*

# The challenge of innovation systems

A view from the UK's Technology Strategy Board

Today, as countries and businesses look to stimulate growth in economies still dominated by the downturn, innovation matters as never before. Yet it's difficult. The phrase 'Never waste a good crisis' rings true as we seek to transform to the sustainable-knowledge economies of the 21st century in what are by any measure tough circumstances. So understanding trends and ways of influencing innovation, and where public and commercial organisations can work in partnership are vital. Innovation is demanding and rarely achieved in isolation.

The world has come a long way from the simple 'invent, make, sell' model of innovation. Today it's about services and products, spans all sectors – traditional and emerging – and involves a range of skills and players: large and small companies, investors, researchers and support organisations in public and private sectors. There is no simple or single recipe for success. It's a system problem in which there are many players. For ourselves, the challenge lies in focusing on where we will be most effective in accelerating economic growth through business-led innovation.

The Technology Strategy Board (TSB) was set up four years ago as the UK's national innovation agency with an annual budget of some GBP 300 million. Over that period we have worked with some 4000 businesses and almost all the UK's universities in a variety of ways to stimulate innovation. We promote, support and invest in technology research, development and commercialisation. It spreads knowledge, bringing people together to solve problems or make new advances. To reach these goals the TSB has a number of mechanisms and tools available. These currently include

- Knowledge Transfer Networks
- Collaborative research and development
- Small Business Research Initiative
- Knowledge Transfer Partnerships
- Technology and Innovation Centres
- International Programmes

Our focus is on understanding the challenges faced by businesses and in using our assets: our people, money and connections in smart ways to accelerate innovation. Making our money smart is the key. So what have we learnt in our quest to stimulate tomorrow's economy?

## Challenges

Firstly, that challenges drive sustainable markets. Today's drivers of change include our ageing society, climate change, the desire for health and wellbeing, urbanisation and the need to secure resource supplies – such as food, water and energy. We focus our activities around addressing these socio-economic challenges, identifying areas



where there is a clear potential business benefit, helping today's emerging technologies become the growth sectors of tomorrow. Using criteria of large global markets, timeliness, a competitive advantage and the test of whether our actions will make a transformational difference, we have focused on a relatively small number of high impact initiatives. Our low-carbon vehicles programme has attracted many different players with differing skills and technologies. As a result, over 300 demonstrator vehicles are on test. This not only proves the technologies, it also gives huge confidence that we are serious about this future industry thus attracting more businesses. The focus around a market-led goal, and bringing together different partners, who would not otherwise naturally meet have both proved vital. We are also convinced that such large scale demonstrator projects are pivotal in overcoming barriers to commercialisation. The challenge gives us a market-led focus, enabling solutions to be developed at scale and to build up value chains which help rapid market entry

## A joined-up landscape

We know that for many companies investment often comes too late or too little to make a significant impact. In a global market, the success will depend upon how we effectively manage the knowledge we have, but also rapidly commercialising the technologies that knowledge subsequently develops. The economic and societal benefits of a thriving and dynamic research community are vast but if innovation is to flourish there needs to be a more concerted effort to connect the landscapes of public and private sector players.

## Open and engaged universities

The UK's universities are important in their innovation landscape and over the past 10 years have changed to be far more open and engaged with business. Today, every university has enterprise on the agenda of its senior management team and research quality is assessed on 'excellence with impact'. We've moved beyond seeing universities simply as sources of knowledge or intellectual property. While university spin-out companies continue to prosper and draw down more investment, in many cases the incubators which house them and associated science parks have become sought-after locations for other early-stage ventures, thus building clusters and acting as a focus for investors, entrepreneurs and other companies in value chains. This trend results in universities acting as anchor points in the enterprise economy and important parts of the infrastructure, especially in growing vibrant clusters.

Within the universities, innovation is not restricted to spin-out company formation. We see a broad spectrum of external activity from intellectual property (IP)

commercialisation by spin-out formation, licensing and consultancy through participation in research collaborations, contract research, informal advice, facility use to personnel exchanges, training, and networking. Further evidence of the breadth of engagement comes from analysis of our collaborative research projects. Having university partners in a consortium correlates with success and when questioned on the value add, researchers' insight and perceptions were highly valued. We work with the research funding agencies to promote more strategic co-ordination of funds and to ensure that we are joined-up at the earliest stages of the commercialisation journey in areas such as proof-of-concept schemes. Our emphasis is on generating higher quality deal flow which can subsequently attract private investment funds and grow into sustainable large-scale businesses.

In the UK, the changing economic and industrial climate is currently coupled with structural change in the university scene. The TSB is working generally to encourage ambitious high-growth SMEs and so a particular focus concerns how we can help them derive best value from universities. For example about whether young, high-growth SMEs have differing needs to those of other SMEs.

We are also seeing a number of differing schemes being trialled within university technology transfer groups. Examples are of universities grouping up to offer better deal flow, to combine complementary research areas or to gain a critical mass of expertise in commercialisation functions. Another recent experiment is in providing open access to intellectual property to stimulate deals without fees, to encourage uptake for overall economic benefit rather than to generate university revenue.

## **Encouraging open innovation and entrepreneurship**

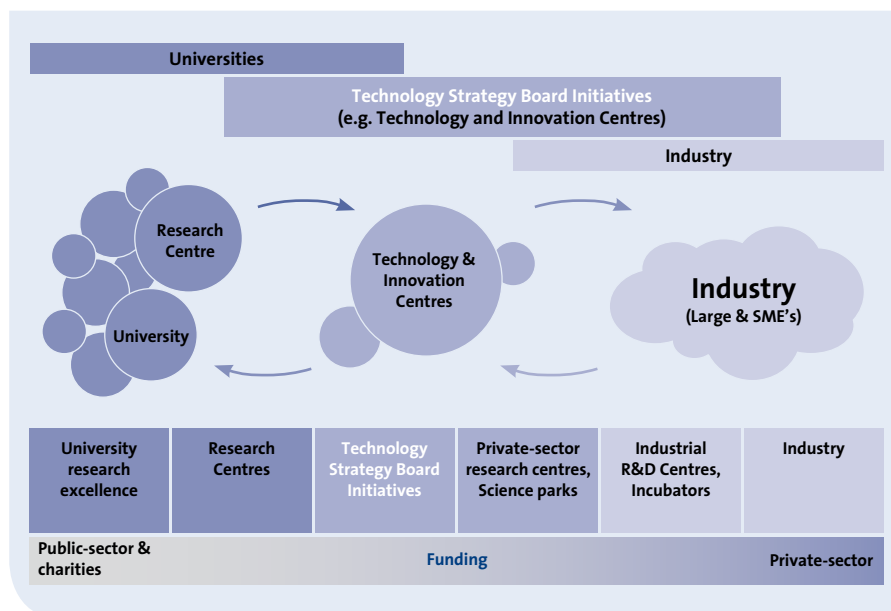
Within universities, as elsewhere, there is a sharply rising trend in entrepreneurial activity. Student entrepreneur groups are thriving and more graduates than ever before are looking to run their own business. Early stage help for such companies can be in the form of grants in our challenges but we also see value in making connections to coaching, mentoring and networking. We have recently introduced electronic networking tools to connect our innovation communities and are working to bring added value to the growing entrepreneur communities through information, training and connections.

Alongside the rise in entrepreneurship, we see open innovation partnering increasing and an upturn in corporate venturing activity. With changing business models in traditional business sectors and new markets with multidisciplinary needs, large corporations are looking globally to find the most innovative sources of ideas and talent. Yet many still report it difficult to navigate the landscape and find the right research group or small business. Our key role is to be an intelligent intermediary – connecting or signposting businesses with research and early stage companies.

## **Technology and innovation centres (TICs)**

A year or so back, a gap was identified in the UK's innovation landscape for centres which build a bridge between university and business. We were inspired by the experience of other countries – notably Germany, Korea and Singapore which have had great success with centres. In particular, it was felt that large scale efforts

**Figure 8: Key players in the UK innovation value chain**



Source: Technology Strategy Board, British Embassy Berlin

focused upon those transformational technologies which could take a long time to bring to market, and yet would underpin large global markets of the future for the benefit of a whole industry sector were missing. Following an independent review led by the successful entrepreneur Hermann Hauser, the government accepted his recommendation and allocated some £200 million, significant at any time but especially in the depth of a tight spending review, to set up a network of elite centres. The TICs programme represents a long-term strategic investment to create a transforming innovation resource. The aim is for them to be business-led and to make world-leading research technologies available to UK business in a professional and entrepreneurial way.

While we have looked at best practice globally, the TICs are not direct copies of any particular model as they need to fit with the UK's innovation system. This is an exciting initiative and the first centres are coming into existence rapidly. We look forward to their development.

### Connecting people and cheerleading

Finally, we have learnt not to underestimate the value of communicating, networking and building confidence. Being a champion for innovation and cheerleading for the community is an important role. It gives confidence to all involved, from funders, businesses and supporting agencies to inspiring individuals to embark upon challenging and exciting new business. This can take many forms; talking about the impact of innovation, celebrating successes, highlighting role models, networking events, interactive conferences, promoting case studies, delivering media events, recognition through award of prizes and developing social networks. And providing such communities with relevant information, signposting and connections can add



significant value. With today's fast pace, global connectivity and ubiquitous internet communications, connecting innovative people is a purposeful activity.

So in summary, at this time when innovation matters and is so central to future economic growth, we are taking a dynamic role within the innovation system. There is more to be understood, perhaps especially as to how to tune the system in different sectors and for different players, but with a combination of focused initiatives and support schemes, we aim to engage, to inform and to inspire the brightest and best, making purposeful connections and investing in programmes to address key challenges.



## 2

Hans Wissema

# It's entrepreneurship, stupid!

A fresh look at innovation policy and the role of the university

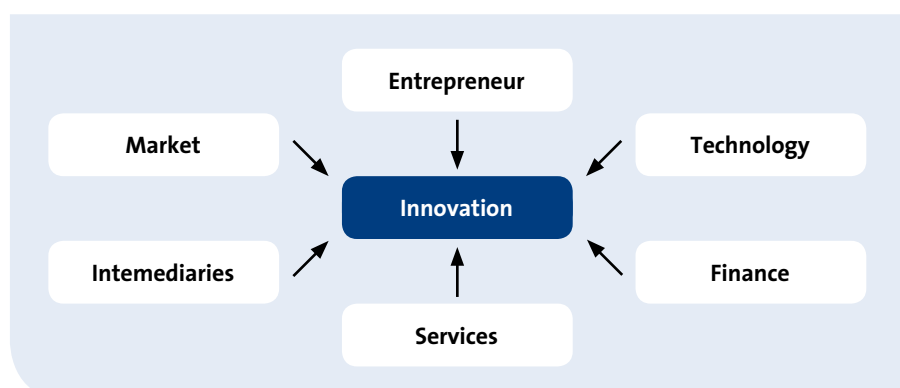
## National Innovation System

“Innovation is today’s equivalent of the Holy Grail. Rich-world governments see it as a way of staving off stagnation. Poor governments see it as a way of speeding up growth. And businesspeople everywhere see it as the key to survival”<sup>1</sup>. The question: “What does it take to innovate, that is, to bring an invention to the market or to use?” has become topical in economic thinking. In the 19th century it was the great inventors/entrepreneurs who brought technology to the market: James Watt, Samuel Morse, Daniel Bell, Thomas Edison and so many others. Today, innovation has become a complex process that requires the collaboration of many actors. This has led to the concept of the National Innovation System (NIS), proposed by Freeman<sup>2</sup>. His definition of an NIS is: “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.”<sup>3</sup> The work of Freeman is still the basis of innovation policy in many countries and we shall also use it in this article. However, we would like to emphasise the role of the entrepreneur and we propose a slightly different picture of the model<sup>4</sup> (Figure 9).

First of all, this model identifies six core factors (the interactions among these factors are not shown on the graph):

- The entrepreneur, the crucial factor in innovation. It is the entrepreneur, whether employed in an existing firm or whether in his/her own company, who brings a product to the market or puts a process, marketing or organisational innovation to use. Entrepreneurs are ‘dreamers who do’<sup>5</sup>. They are often obsessed by their idea or invention and they are willing to take personal risks in bringing it to the market or into use. Entrepreneurship flourishes in an entrepreneurial culture (as in California, the Boston area and the areas around the universities of Cambridge,

Figure 9: Core elements of the National Innovation System





UK, and Leuven, Belgium) but persevering entrepreneurs will also succeed in conservative cultures. Although entrepreneurship requires certain personality characteristics<sup>6</sup>, the ‘technology’ of enterprising can be learned as many more people harbour entrepreneurial talents than meets the eye<sup>7</sup>.

- Technology: technical knowledge has become a commodity that companies buy and sell from and to each other and from and to research institutes. This is known as open innovation<sup>8</sup>. Open innovation can be extended to ‘crowdsourcing’ in which challenges are simply put on the internet and solutions come forward<sup>9</sup>.
- Market: When Japanese companies want to test new high-tech devices on the market, they do so in the Shinjuku district of Tokyo, one of the most innovative markets in the world. ‘Innovative market’ means a market in which people are eager to buy and test new inventions, taking a certain risk that it turns out not to be what they sought.
- Intermediaries: transfer agents who act as intermediaries between the knowledge sector and business. In the agricultural sector, the so-called extension services, which advise farmers on the use of genetic material, fertilisers, pesticides, equipment and other tools, have been most instrumental in the increase of agricultural production as well as the protection of the environment<sup>10</sup>.
- Finance: risk capital in the form of business angels and capital venture funds. Silicon Valley, the Boston area and the Cambridge region in the UK owe their success as much to an elaborate and varied business angel/VC fund structure as to technological prowess.
- Services, made up of two components: professional services and infrastructure. Infrastructure support consists of incubators and science or technology parks. Incubators and technoparks often come with administrative services; some offer the use of high-tech equipment<sup>11</sup>.

Looking at the German situation, one is inclined to conclude that there is plenty of technology, plenty of finance<sup>12</sup> (although few business angels), plenty of intermediaries and plenty of services. The rapid diffusion of new products and services suggests that the market is reasonably innovation-minded. Existing corporations are in general quite innovative (compare the German car industry with the US sector), which suggests that there is an entrepreneurial climate within these industries. However, it is striking that Germany’s vast science & technology sector with its many top universities, research Gesellschaften and Gemeinschaften and impressive private R&D institutions, produces relatively few Googles, Skypes and Facebooks. Strictly speaking, this is not a German but a European problem. In a recent article, The Economist complained that: “Britain has produced too few world-class technology firms.”<sup>13</sup> Germany invented the research university, the Humboldt University, so that is not the problem. Or is it?

## Third Generation Universities

In the past decades, we have seen the emergence of international technology hubs, consisting of a wide range of innovative activities around a prominent university, a Third Generation University (3GU)<sup>14</sup>. Stanford University, Harvard, MIT and in Europe Cambridge, Leuven, TU Munich and Wageningen UR are examples of such 3GUs. The hubs are characterised by the combination of fundamental science, collaborative programmes of the university and high-tech corporations, the presence of corporate research institutions, efforts to train and support technostarters (students or academics who start their own, technology-based firm), incubators, technoparks, clubs of business angels<sup>15</sup>, support firms and much more. Third Generation Universities can create much value and employment of which Silicon Valley with its roots in Stanford University is the ultimate example. If the companies founded by MIT graduates and faculty were to form an independent nation, the revenues of these companies would make that nation the 24th largest economy in the world. The 4000 MIT-related companies (located worldwide) that existed in 1997 employed 1.1 million people and had annual world sales of \$232 billion. That is roughly equal to a GDP of \$116 billion, which is comparable to the 1996 GDP of South Africa or Thailand<sup>16</sup>. 3GUs are not degenerated, commercial versions of the Humboldt universities: they win most Nobel prizes on the one hand while creating immense value for the economy on the other.

The role of 3GUs in realising innovation makes them Innovation Systems in their own right and, as such, the seventh element of a modern NIS. Unfortunately, it is doubtful whether they can be planned. The examples quoted all emerged spontaneously, driven by student- and alumni-entrepreneurs, business angels and visionary university managers. Still, one can create the conditions for the emergence of a 3GU and if all the conditions are present, it is likely that a true know-how hub, that nobody can ignore, will develop.

Although the expression '3GU' has not yet been generally adopted in Germany, the concept is by no means new as RWTH, TUM and many other such hubs are already impressive while the *Gesellschaften* and *Gemeinschaften* combine government-sponsored fundamental research with work for industry, in the words of Jürgen Lehold of Volkswagen: "We do research together"<sup>17</sup>. Despite the virtues of these practices, systematic support for technostarters – students or researchers who start their own technology-based firm – is lacking. New technology is brought to the market by either existing firms or start-ups. We would postulate that without technology-based start-ups, innovation stumbles along on one leg. In the words of Theun Baller of Philips Research in his presentation to the Enterprising Knowledge Conference: "Business start-ups are more effective than technical solutions."

## Perspective

The unprecedented rate at which new discoveries are announced makes one feel as if scientific discovery has only just started. The first cell with a synthetic genome – "As close to God as it gets" read the cover of *The Economist* at the time – was created in 2010 by Craig Venter. By the way, this research was financed by a \$ 600 million grant from Exxon Mobile, which is pursuing modified algae as an alternative source of energy. Japanese robots can dance, play football, do all kinds of packaging, write their own name with a felt pen and play Elgar's *Pomp and Circumstance*

on the violin. We teach children that the moon rotates around the earth because of gravity, but 'gravity' is just a word: how does the moon know the earth is there in the first place? It seems that CERN is close to confirming the existence of the Higgs boson (proposed as early as 1964), which is the hypothetical manifestation of the Higgs field, which may throw light on such very fundamental physical questions and perhaps even some metaphysical ones. Remember that IBM's Deep Blue computer beat Garry Kasparov in 1997? It showed that computers are superior in making linear calculations but we would say: computers will never do associative thinking. Well, forget it. On Feb 16, 2011, after a three-night tournament, IBM's supercomputer Watson (so named after its founder, Thomas J. Watson) defeated champions Ken Jennings and Brad Rutter in the American Jeopardy TV show. Jeopardy is an American quiz show featuring topics such as history, literature, the arts, pop culture, science and sports. A major investment, this computer? No, the software runs on a standard supercomputer with 2,880 IBM Power750 cores (computing brains); it takes 15 terabytes of memory. This sounds like a lot of memory but 15 TB is just ten times more memory as my grandson got in the game computer he recently bought for \$ 1500. So, in say five years, 'Watson' will be in a cell phone near you. Imagine the Japanese putting 'Watson' in one of their robots, you would get something like R2D2 of the Star War series, or better. Imagine how such robots would revolutionise the way we do research.

### **The gap between adoption and discovery and innovation**

Equally striking as the rate of scientific discovery is the speed of diffusion: only eleven years after the first sequencing of the human genome, is this analysis routine in a number of hospitals. It took just-in-time logistics about as much time to be adopted globally.

Still, the gap between what we know and what we use seems to get larger all the time. If that is true, it would mean that the realisation of the knowledge economy depends more on the rate of adoption than that of discovery and this brings us back to innovation. In part, we still live in the 19th century. We train our children to become good scientists and engineers; we forget to train them in addition to become good entrepreneurs. There are several reasons for this. The idea that private entrepreneurship means enriching yourself at the expense of others is still widely engrained in Europe. Perhaps a more important reason is that, until now, we did not need high-tech start-ups, as the corporations would take care of innovation. This is no longer valid: we need "two-leg" innovation. This can only be accomplished if entrepreneurship – the weak element in the European Innovation Systems – becomes as much a part of our cultural inheritance as the values of the Enlightenment. This means: playful introductions into entrepreneurship at kindergarten, working papers at Lyceum, obligatory courses at university and Hochschule – in any university and Hochschule curriculum. It also means putting entrepreneurship high on the political agenda; there is some, albeit shallow, evidence that entrepreneurship policies can be effective<sup>18</sup>. Finally, it means we deliberately 'massage' our beloved Humboldt universities to adopt the 3GU model.

## Footnotes

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- 1 “Think different”, Schumpeter column, *The Economist*, August 6th, 2011, p. 53. See also the presentation of Jonathan Haskel of Imperial College to the Conference Enterprising Knowledge on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 2 Ch. Freeman and L. Soete, *The Economics of Industrial Innovation*, 3rd edn, Pinter, London, 1997.
  - 3 C. Freeman, *Technology Policy and Economic Performance – Lessons from Japan*, Frances Pinter Publishers, London, 1987.
  - 4 See: J.G. Wissema, “It’s entrepreneurship stupid! – A new look at Innovation Policy”, Edward Elgar Publishers, forthcoming.
  - 5 Pinchot, G., *Intrapreneuring: why you don’t have to leave the corporation to become an entrepreneur*, Harper & Row, New York, 1985.
  - 6 C. Chirstensen et al, *The Innovator’s DNA*, Harvard Business School Press (1 July 2011).
  - 7 J. Lerner, *Boulevard of broken dreams – Why public efforts to boost entrepreneurship and venture capital have failed, and what to do about it*, Princeton University Press, 2009.
  - 8 H.W. Chesbrough, *Open innovation – the new imperative for creating and profiting from technology*, Harvard Business School Press, 2003. See also the presentation of Roland Harwood at the Conference Enterprising Knowledge on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 9 See the presentations of Monika Lessl of Bayer HealthCare and Helen Neville of Proctor & Gamble to the Conference on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 10 E. M. Rogers, “The diffusion of innovations”, Simon & Schuster International; 5th Revised edition, 2003.
  - 11 The Technopark of TU Wroslaw in Poland offers its tenants the use of high-tech analytical equipment, obtained with a grant from the EU.
  - 12 See the presentation of Frank Kalkbrenner of Boehringer Ingelheim Venture Fund to the Conference Enterprising Knowledge on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 13 “Start me up”, *The Economist*, August 6th, 2011, pp. 26-28.
  - 14 J.G. Wissema, “Towards the Third Generation University”, Edward Elgar Publishers, London, 2009 (translated into Turkish, Polish, Macedonian; Russian translation to be published end 2011 by St Petersburg State University).
  - 15 See the presentation of Bradley Hardiman of Cambridge Enterprise, University of Cambridge UK, to the Conference Enterprising Knowledge on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 16 Economics Department of BankBoston (now Bank of America), MIT: *The impact of Innovation*, Publication of BankBoston, Boston, March 1997 ([web.mit.edu/newsoffice/founders/](http://web.mit.edu/newsoffice/founders/) - 3k).
  - 17 His presentation to the Conference Enterprising Knowledge on [www.stifterverband.de/enterprising-knowledge](http://www.stifterverband.de/enterprising-knowledge).
  - 18 F. Welter et al (eds), *Handbook of research in entrepreneurship policies in Central and Eastern Europe*, Edwin Edgar Publishing, July 2011.

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