EUROPEAN COMMISSION

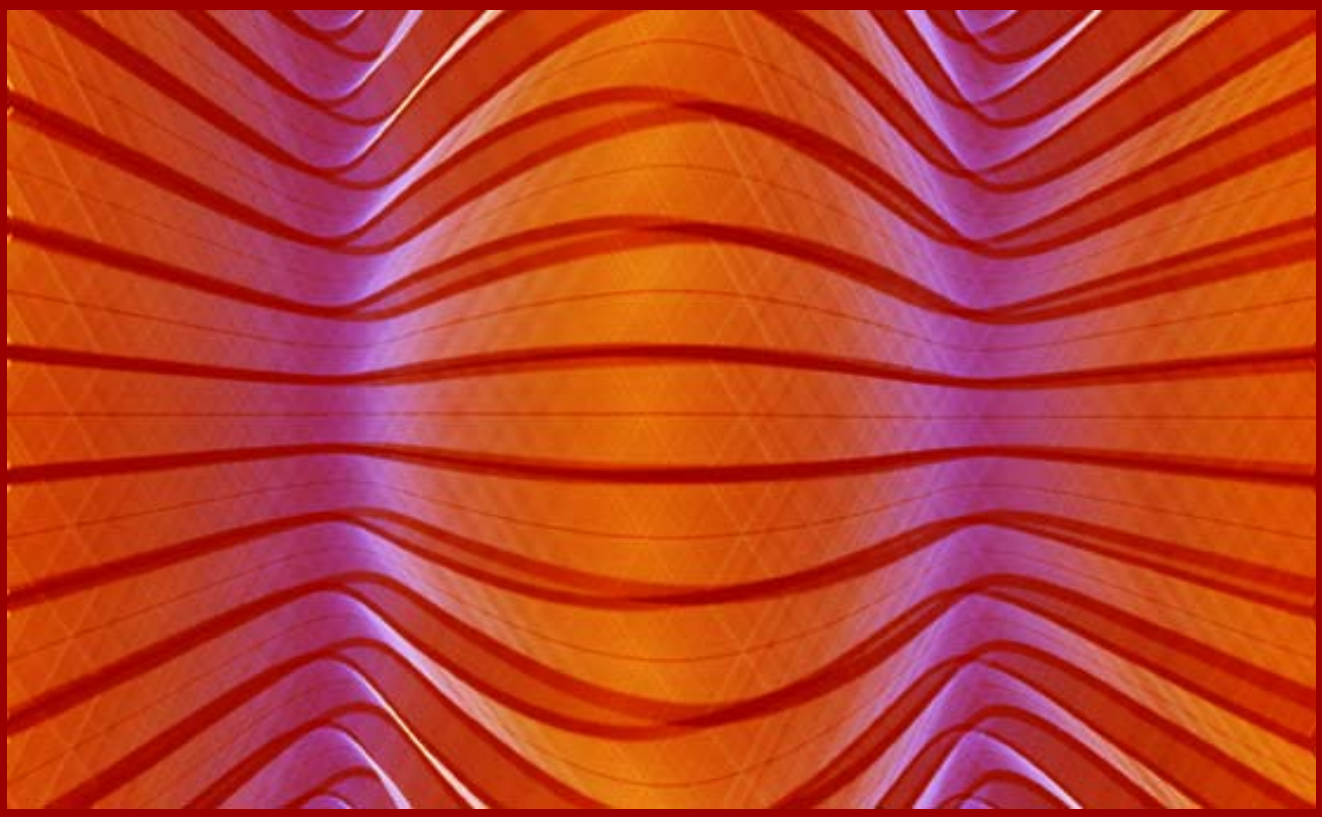
DIRECTORATE-GENERAL FOR ENTERPRISE AND INDUSTRY

**Financing SMEs, entrepreneurs and innovators**

# Financing technology transfer

## Summary report of the workshop

***Brussels, 08 November 2006***



European Commission

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## BACKGROUND

**Europe has a strong science and technology base but does not perform well in commercialising research results.** In its briefing paper, the Commission defined 'technology transfer' as the process of commercialising research results of universities or other research institutes. It argued that there is certainly an untapped economic potential of research results with a large number of 'dormant' ideas in the science sector, failing to contribute to general economic development.

**There are numerous structural, economic and legal barriers that hinder spin-out initiatives**. On the one side, academic institutions often lack management skills linked to business creation; on the other side, they also need to cope with the complex issues of patents and intellectual property rights. Moreover, compared to the US, European technology transfer infrastructures remain fragmented and suffer from a lack of critical mass. The commercialisation record in the US tends to be much better. According to a recent study conducted by EIF[1], the superior track record can be explained by the significantly larger R&D budgets and the advantages provided by a large homogeneous market for goods and services.

**A key factor in explaining difficulties of academic spin-out initiatives in Europe is the lack of proper funding resources.** In the early stages of spin-out creation access to finance is crucial. But according to EVCA, while the volume of private equity investments in Europe has shown a sharp increase, the share of early stage investments is still declining.[2] The lack of early stage investors is partly due to low returns that often make such investments unattractive. Work by DG ECFIN (dealt with in the paper on seed capital) shows that there are negative or small returns in this area.

## KEY OUTCOMES FROM THE WORKSHOP

*Technology transfer offices (TTOs) have a key role to play. A number of critical success factors were identified with regard their operations.*

**Several models of successful technology transfer organisations were presented and discussed at the workshop** – the *Fraunhofer-Gesellschaft* (Germany), *Institut Pasteur* (France) and *Weizmann Institute* (Israel). Appendix A provides a summary of these presentations. Based on the discussion of these models, a number of conclusions were reached with regard to their operations.

**Developing a successful TTO depends on being able to exploit economies of scale.** One way of achieving this is to establish TTOs that operate on behalf of a number

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[1] *EIF, "Technology Transfer Accelerator – Final Report", September 2005*

[2] *EVCA Yearbook 2006. Private equity investments increased by 27% from €36.9 billion in 2004 to €47.0 billion in 2005. However, seed financing was not able to pick up on the growth of private equity. Seed investments fell by almost 34% from €148m in 2004 to €97m in 2005. This decline is reflected in the sharp decrease of the share of seed investments of the total from 0.4% in 2004 to 0.2% in 2005. Start-up investments increased slightly from €2.2 billion in 2004 to €2.3 billion in 2005.*

of different universities. At the same time, it is important that TTOs develop specialist know-how in the technology fields that make up their 'target market'. This presupposes not being active in too many fields. Both the *Fraunhofer Gesellschaft* and the Weizmann Institute illustrate the feasibility and advantages of this type of approach.

**The professionalism of TTOs needs to be improved**. In particular, there is a need to attract more people with business experience and expertise rather than relying, as has hitherto tended to be the case, on recruits from the academic world or public sector. One idea would be to introduce schemes to subsidize the TTO costs of taking on people from business. At the same time, people with business experience who join TTOs need to have an understanding of academia.

**Successful technology transfer depends on a close academic-business relationship.** However, at the same time, the roles of different partners should not be confused. Ideally, universities should not be directly involved in spin-out activities beyond the R&D phase and once a product is licensed. They do not have the expertise required to successfully commercialise R&D and this function is best left to business.

**From a university's perspective, it is also important not to jeopardise academic principles and autonomy in the pursuit of technology transfer.** To support this argument the example was given of delaying a scientific publication to increase the chances of patenting or licensing a product. Furthermore, business should be more closely involved in the decision over which R&D projects are worth pursuing and patenting. At present, academics tend to have too much influence on this process. More business involvement at an earlier stage could also make it easier to subsequently raise finance because there will be a greater familiarity with the project concerned.

**It is important that Technology Transfer Offices do not adopt a purely regional or national focus.** Much can be learnt from the both *Fraunhofer Gesellschaft* and *Institut Pasteur* in this respect since they have established a presence in the US and Far East and this has contributed to their success, for example by developing links with potential investors from other countries.

**Last but not least, whilst there are some good technology transfer models, it is not always easy to replicate them.** Both the *Fraunhofer Gesellschaft* and *Institut Pasteur* are well-established organisations that have developed their reputations over a long period of time and are now deeply embedded in their respective environments. This makes it difficult to simply replicate the models in other countries where the environments for technology transfer are different. An interesting and innovative ides is putting TTOs in a separately quoted company, for example on the Alternative Investment Market in the UK.

*Various methods are available to promote technology transfer, in particular licensing and promoting spin-outs, and these each have advantages and disadvantages.*

**There are many factors that determine which strategy is most appropriate for the promotion of technology transfer**. The decision on whether to pursue a spin-out or licensing route depends partly on the legal framework within which universities operate. Thus, the 'Professors' Privilege' system that existed in Germany (and some other countries) until recently, under which intellectual property (IP) was owned by the academic responsible for the R&D, meant that if a university wanted to commercialise a project, the only way of doing this was through a spin-out company. The ending of this system means that universities now have a greater range of options with regard to commercialization methods.

**Although most effort is put into supporting spin-outs, the alternative – which is more common in the US - of focusing on licensing and leaving it to established companies to undertake the commercialisation of R&D is often a more appropriate strategy.** It also needs to be recognised that many R&D projects do not involve taking out patents, often because there is a reluctance to incur the costs that the procedure involves. It was suggested by several workshop participants that the relatively high cost of patenting R&D in Europe could be addressed by introducing an equivalent of the US 'Small Entity Scheme'.

**There is a need to bridge the 'Valley of Death', i.e. the funding gap between the R&D/proof of concept stage in a project's development and commercialisation and the establishment of a company.** This funding gap (examined in more detail below) partly exists because of the divide between academia and business. There is a need to develop more financial instruments that are suitable for providing early stage finance for R&D-based spin-outs.

**Promoting an entrepreneurial culture amongst researchers is necessary to stimulate an interest in seeking to commercialise R&D.** One way of helping to achieve this is to encourage academics to adopt a more commercial approach to their activities by providing potentially large financial incentives to all involved (e.g. the Weizmann Institute offers royalties to academics – the so-called 'Ferrari Effect').

**The quality of spin-off management is critical and must include people with business skills.** Whilst those involved in a spin-out have the necessary technological know-how, academic spin-offs usually lack the necessary business skills. Recruiting experienced CEOs to manage spin-offs is one way of addressing this problem but they must be brought in at an early stage and it can also be difficult to identify suitable individuals who are willing to undertake such a role.

**Ultimately, both licensing and spin-out options need to be available as a way of promoting technology transfer.** This is because there might not be an existing company that is willing (or able) to take up a license. Conversely, although universities may consider the creation of a spin-out preferable, in many circumstances, the licensing route may be more appropriate. To some extent, the choice also depends on the type of technology a project is based on. The nature of the local economy is also an important consideration – in some regions and countries, there are not enough medium-sized or larger companies to make licensing a feasible option. Finland was cited as an example in this respect since with the exception of one or two large undertakings (e.g. Nokia) the economy is dominated by small firms.

*Turning to technology transfer financing, the main problem in Europe lies in market shortcomings with regard to the provision of early stage funding.*

**The main gap in the provision of technology transfer finance is at the pre-seed and seed capital stage.** More particularly, whilst grant aid from public authorities is often available for proof of concept and related R&D activities, it is much more difficult to finance the next stage when commercial development starts but the company has not yet begun to generate sufficient revenue its costs. At this stage, there are market shortcomings in Europe in the provision of early stage finance.

**Achieving a good financial return on early stage investments can be difficult.** Proof of concept funding can yield a higher Internal Rate of Return (IRR) than later stage investment but because the amount of investment is comparatively small, a good return

can be difficult to achieve. Moreover, if intellectual property is created through a project that is publicly funded, it could be argued that universities should not expect a large financial return. From this perspective, it is arguably more appropriate for universities to obtain a return from royalties rather than equity investments. This approach is also likely to make collaboration more attractive to business.

**There are a number of ways in which the early stage funding gap either can or could be addressed.** This includes: the provision of government grants; incentives for venture capital funds to invest at an earlier stage – e.g. giving them a first option on new patents if money is invested in a project and this subsequently leads to a spin-out (the Weizmann Institute tried this but with only limited success); raising finance from larger companies - but only a limited number of projects can demonstrate the necessary potential to attract corporate venture capital; and reducing the cost of early stage development – e.g. through the use of incubators.

**At the same time, more 'traditional' alternatives should not be overlooked as a way of covering the costs of the 'proof of concept' stage in an R&D project's development.** In particular, debt and/or grant financing of R&D 'proof of concept' projects is an obviously alternative to private sector investment but there is a need for more flexible schemes, e.g. lending on a contingency basis so that the loan is only repaid if the project leads to successful commercial development.

**Overall, a commercial approach to financing R&D projects is critical to success. Public officials understand grant systems but seldom have a good understanding of risk capital.** Professional management of schemes that provide pre-seed/seed finance is essential and this generally means recruiting people with business experience. The involvement of potential private sector investors at an early stage in the process of commercialising an R&D project is likely to contribute to its success by bringing in business expertise at a critical stage in a spin-offs development.

**Also, more innovative ways of funding TTOs themselves should be developed.** The example of the TTO of Imperial College (London University) being listed on the UK's Alternative Investment Market (AIM) is an interesting example of how technology transfer offices can be made attractive to investors.

*A key priority should be to develop the business angels sector since experience in some European countries and the US shows that this is a key source of technology transfer financing.*

**Business angels are an important potential source of seed capital funding that can help to fill the early stage financing gap**. However, there is a need to increase the pool of business angel finance in Europe which is much smaller than in the US. In particular, consideration should be given to introducing tax incentives to encourage business angel investment (it was recognised that this is a question for national authorities who are solely responsible for taxation policies). Several workshop participants suggested that one explanation for the reluctance of business angels to invest in R&D-based projects is that in many countries, the individuals concerned often come from a manufacturing or service sector background, and lack personal knowledge of the technologies typically involved in university spin-offs.

**There is a need to professionalize the way in which business angel networks operate.** At present, they tend to function in an essentially informal way. Whilst this has many advantages and is a feature of the business angel 'culture', the lack of professional

management and structures can have the adverse consequence of reducing the inflow of funds.

**Ideally, network management should be undertaken by people who have personal experience of setting up and running businesses.** The role does not necessarily have to be full-time. It requires skills in sales and marketing, and is more to do with an instinctive feel for a good business proposition rather than formal assessment of business plans, etc, or having specific financial expertise.

*Venture capital financing also has an important role in technology transfer although this generally applies at a later stage in the process.*

**One problem is that compared with the US, the average size of VC investments in the EU is much smaller (€3.8 million compared with €8.7 million).** One possible explanation for this is the greater risk–adverseness of investors in the EU. From the perspective of the spin-out it means that the level of investment may not be sufficient to fully cover the development and commercialisation of an R&D project. This, in turn, can jeopardize the prospects of success.

**Another complication is that venture capital funds can often obtain a higher return on their investment by selling their interest by means of a trade sale at a relatively at a relatively early stage, i.e. once an acceptable internal rate of return (IRR) is achieved but not necessarily before the company has achieved independent maturity.** This might typically happen at a stage in a company's development before it has fully made the transition from being still essentially a start-up to being a medium-sized firm. Whilst this may maximise the financial return to the investor, it can harm the long-term growth prospects of the firm in the area in which it was developed. A trade sale might result in the firm being moved to another area or another part of the world.

**Linkages between business angel networks and VC funds should be strengthened.** At present, these instruments tend to operate separately despite being complementary in terms of meeting a company's financing requirements. In addition, VCs often provide the exit mechanism needed by early stage investors. At the same time, differences between business angels and providers of venture capital need to be recognised (VCs typically handle larger investments).

*Note: many of the issues discussed in relation to early stage financing were also covered in the workshop on seed capital financing (21 November 2006) and reference should be made to the summary report for additional information.*

*Financial instruments to promote technology transfer need to be combined with other forms of support to achieve the best results.*

**In particular, experience suggests that early stage investment activities need to be combined with specialist business advisory support to ensure that technology based spin-offs and start-ups are successful.** These functions are generally combined in the US but less so in the EU. Business angels have much to contribute in terms of experience and expertise as well as their financial investment.

**Business incubators can also have an important role in the technology transfer process.** Both *Institut Pasteur* and *Weizmann Institute* demonstrate that incubators are an effective instrument for the promotion of technology transfer since they provide spin-offs with a supportive environment that combines physical space with a range of other services. From the point of view of the investor, an incubator can help reduce the costs of launching a start-up (because overheads are shared) and the risk of failure. However, to operate effectively, incubators should be closely integrated into technology transfer structures rather than operating as stand-alone facilities.

## KEY RECOMMENDATIONS – EU AND NATIONAL AUTHORITIES

**The EU and national authorities have a key role to play in helping to develop appropriate financial instruments to support technology transfer.** As a guiding principle, the role of public intervention - and where this can demonstrate the highest added value - should be to support projects that the private sector is unwilling to invest in rather than those where the likely IRR is sufficient to attract private sector investors. There is a danger otherwise that if publicly-supported seed and capital funds seek the same level of return as the private sector does from investments this will cause a crowding out of the private sector.

**Steps need to be taken at an EU level and by Member States to encourage the development of the business angels market as this is a key source of early stage technology transfer finance.** At a national level, there is a need for action to provide tax incentives to help develop the pool of business angels' finance. This should, however, be packaged together with other measures including the development generally of pre-seed/seed capital financing schemes for technology transfer, promotion of networking and (on the demand side) investment readiness schemes. In many EU Member States there is scope for actions at both a national and regional level where networks are fragmented. Given the importance of physical proximity, particular emphasis should be placed on developing initiatives at a regional level to bring together entrepreneurs and potential investors.

**At an EU level, the Commission has an important role to play in supporting the development of European networks that bring together those involved in technology transfer.** Important EU networking initiatives include Europe-INNOVA which brings together professionals involved in technology transfer and cluster development, and Pro-INNO which is a scheme to promote transnational cooperation in the promotion of innovative projects in the technology transfer field. Looking ahead, these and other initiative should continue to place emphasis on extending their reach beyond those directly involved in operating TTOs and include business angels, VCs, and other support organisations such as professional advisers, incubators and organisations involved in providing more specialized advice and assistance to technology based start-ups (e.g. technology incubators). Community added value lies in bringing together key players to share experience, to identify good practices and to promote collaboration generally since it is difficult for Member States and organisations themselves to achieve this on their own.

**At EU level, there should also be a continued emphasis on developing new financial instruments to promote technology transfer.** Recently, the European Investment Fund (EIF) assessed the feasibility and defined the operational modalities of a new type of targeted risk capital and technology transfer investment vehicle linking centres of excellence from different European countries. The aim is to bridge the

financing gap between research and early stage financing through a financial scheme called the technology transfer accelerator[3].

**Several more specific issues were discussed concerning the role of the EU, in particular the question of IPR.** Where an R&D project is EU-supported, there can be complications with the patenting procedures because consortium agreements mean that IPR is shared. It was agued that partners should automatically be given a license to any pre-existing know-how to help overcome this problem. Another complication is the very large scale of size of many EU programmes which means that they are not very transparent to would-be users. The cost of obtaining a European patent is also too high.

**Overall, it was agreed that no single solution exists for improving funding for technology transfer.** Instead a combination of initiatives is needed. Whilst there is scope for EU-level intervention, many initiatives are likely to be best pursued at a national and/or regional level. There is also a need to have a better understanding of the term 'seed capital' and a clearer distinction from other areas of venture capital.

The workshop clearly confirmed that much needs to be done to develop financing methods for technology transfer in Europe and that this is a key to the Lisbon Strategy's aim of promoting a dynamic and entrepreneurial knowledge-based economy. In particular, there are shortcomings in the provision of early stage finance and a need to develop ways of attracting more private sector involvement in the pre-seed and seed capital financing stages of a company's development.

The development of financing for technology transfer tools needs to be combined with other actions to improve the performance of R&D-based start-up companies. This includes strengthening the role of technology transfer offices. Also, various priorities were identified specifically with regard to licensing and spin-off creation. Efforts to improve technology transfer can only succeed through an approach that combines public-private partnership at a national level with EU-level encouragement where this is likely to demonstrate Community added value.

[3] *http://www.eif.org/attachments/pub_corporate/TTA_Executive_Summary_September2005.pdf*

# APPENDIX A – PRESENTATIONS

## Fraunhofer-Gesellschaft (Germany)

The Fraunhofer-Gesellschaft has 58 different R&D institutes employing around 13,000 researchers. Sixteen of the institutes focus on ICT-related R&D. IP management and spin-off activities are coordinated by the Venture Group.

The Fraunhofer-Gesellschaft makes pre-seed financing of up to € 150,000 available to researchers for a period of up to 12 months. It also has a € 54 million venture capital fund (which includes business angels' funding) which has so far invested sums of between € 1 to 5 million in a total of 15 companies. 'Lead innovations' (there are currently 11) and other activities generate around 400 patents pa. In 2006, licensing income totalled € 134 million. Further returns are generated from the Fraunhofer-Gesellschaft's investment in spin-offs. Over the past six years there have been some 200 spin-offs leading to the successful formation of 100 companies. Investments have made in half of these.

## Institut Pasteur (France)

The Institute Pasteur is a private, not-for-profit organisation. It currently employs 45 staff and in 2004 generated revenues totalling € 187 million from legacies and donations, licensing activities and other sources including EU and national research funding.

The Institut manages Pasteur Biotop, a technology incubator providing a combination of physical space, advisory services (e.g. business support, IP advice) and seed capital financing. The incubator was set up in 2000 and has so far helped to launch 10 successful businesses. Its strategy is to focus on a limited number of high quality projects rather than seeking to create as many new companies as possible. Most of the supported projects specialise in therapeutics. Institut Pasteur has first right of refusal on licenses taken out by the companies.

A further aspect of Institut Pasteur's strategy has involved establishing a business development presence in the US (an office as opened in Boston in 2004) and the Far East (2006). An early initiative pursued via the US office was to arrange a meeting between French and US venture capitalists (the aim was to encourage US VCs to invest in French companies). A third activity, was the establishment of a subsidiary, I2T, in January 2005 to commercialise technologies by selling licenses to existing companies or by helping to set up new entities as a vehicle for converting R&D projects into successful new products. However, I2T was closed in June 2006 after the university withdrew support.

## Weizmann Institute (Israel)

The Institute, which currently has some 2,500 employees and 250 researchers, manages an annual budget of around € 160 million. YEDA ('know-how') is the Weizmann Institute's TTO which was created in 1959. It has 17 staff and is responsible for identifying R&D projects with commercialisation potential. It also manages IP with 50-70 patents and 20-30 licensing agreements (and 2-5 spin-offs) being handled each year.

Unlike many other organisations, the Weizmann Institute takes a royalty on the sales generated by licenses rather than an equity position. This approach tends to produce a higher level of income although the full benefit can take longer to materialise. The Institute has one of the highest levels of licensing income amongst technology transfer organisations anywhere in the world. The income is reinvested in R&D projects and other related activities such as covering the cost of filing patents.

Successful technology transfer systems depend on having close physical proximity to R&D projects. This ensures the development of personal contacts, networking and other factors that contribute to creating a favourable environment for technology transfer. This spatial concentration exists in the US where ventures capital provision is concentrated in areas where clusters exist.

## Development of Technology Transfer Framework (Hungary)

During the course of the workshop, an example of a new Member State initiative to develop a technology transfer framework was presented.

In Hungary, the first steps in developing a technology transfer system were taken with the establishment of the National Office for Research and Technology. The regulatory framework was set out in the 2004 Technological Innovation Act (2004). This oversees a Research and Technology Fund which is partly financed by enterprises themselves who are required to contribute 0.25% of their turnover to it.

A network of 'Regional Innovation Centres' is also in the process of being developed. This network focuses on areas where clusters either have or could be developed. The agencies have access to an Innovation Fund. Although the Innocheck Programme does not provide funding, it helps entrepreneurs and gives specific services. Some 600 companies have made use of the various innovation-support measures.

## APPENDIX B – LIST OF PARTICIPANTS

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