



**European Cooperation
in the field of Scientific
and Technical Research
- COST -**

Secretariat

Brussels, 13 December 2006

COST 336/06

MEMORANDUM OF UNDERSTANDING

Subject : Memorandum of Understanding (MoU) for the implementation of a European Concerted Research Action designated as **COST Action IS0604: Science and Technology Research in a Knowledge-based Economy – STRIKE**

Delegations will find attached the Memorandum of Understanding for COST Action IS0604 as approved by the COST Committee of Senior Officials (CSO) at its 166th meeting on 20/21 November 2006.

**MEMORANDUM OF UNDERSTANDING
FOR THE IMPLEMENTATION OF A EUROPEAN CONCERTED RESEARCH ACTION
DESIGNATED AS**

COST ACTION IS0604

Science and Technology Research in a Knowledge-based Economy – STRIKE

The Signatories to this ‘Memorandum of Understanding’, declaring their common intention to participate in the concerted Action referred to above and described in the ‘Technical Annex to the Memorandum’, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 299/06 ‘Rules and Procedures for Implementing COST Actions’, or in any new document amending or replacing it, the contents of which the Signatories are fully aware of.
2. The main objective of the Action is to improve our understanding of the process of scientific and technological development and of the transfer of scientific and technological developments to markets and into economic development.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at approximately 7 million EUR in 2006 prices.
4. The Memorandum of Understanding will take effect on being signed by at least five Signatories.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of the document referred to in Point 1 above.

COST ACTION IS0604

Science and Technology Research in a Knowledge-based Economy – STRIKE

A. ABSTRACT AND KEYWORDS

Based on the understanding that investment in research, development and innovation is a major driver of long-term economic performance, policy-makers in Europe have an urgent need for evidence-based policy recommendations that promote appropriate strategies for the governance, incentives and conduct of scientific research and of the knowledge transfer between public and private entities. The main objective of the Action is to improve our understanding of the process of scientific and technological development and of the transfer of scientific and technological developments to markets and into economic development. A critical mass of established and young researchers will be brought together to shed light on these issues and to develop policy recommendations. Furthermore, the Action will improve the collection, harmonization and provision of micro data and will thereby make a lasting contribution to science and technology research. The research is organized into four Working Groups: science, technology and knowledge creation; diffusion of science and technology; intellectual property rights; development of markets.

Keywords: Research and development, technological development, knowledge transfer, intellectual property rights, economic performance.

B. BACKGROUND

With the understanding that science, research and innovation are major drivers of long-term economic performance, the European Council adopted the “Lisbon Agenda” calling for the EU to become “the most competitive and dynamic knowledge-based economy in the world” by the end of the decade. Subsequently, in Barcelona, the European Council set the target to raise R&D to 3% of the EU’s GDP. In light of these objectives, policy-makers in Europe have an urgent need for evidence-based recommendations to promote appropriate strategies for the governance and conduct of science and R&D to support both research and knowledge transfer to drive technological developments that can fuel growth in the years to come.

The influence of globalisation gives rise to structural changes in national economies. The contraction of specific sectors has led to unemployment in some regions of Europe. Improvements in science and technology can foster growth in new sectors and can generate additional employment opportunities. Governments therefore need to understand the innovation process within companies and how this process influences the success of companies.

It is now widely recognized in the economic literature that R&D and innovation are major drivers of economic growth. Solow found that increases in labour and capital only account for a small part of economic growth; the major contribution comes from technological change. On the theoretical side, the literature on endogenous growth identifies commercially oriented innovation efforts as a major engine for technological progress and productivity growth.

Following the pioneering work of Griliches, a large number of empirical studies at the firm, sectoral and aggregate level have confirmed that R&D activity has a positive impact on value added and

productivity growth. In some countries, the average rate of return on R&D investment is more than twice the rate of return on investment in capital equipment. But the social rates of return are even higher, as knowledge spillovers between firms can double the rate of social return. Although such knowledge spillovers are a major driver of economic growth, their character as public goods has complex implications for firms' R&D investment activities and for innovation policy.

Although the existing literature has clearly shown the importance of science and innovation for economic growth, a coherent body of theory and insight into the multifaceted nature of the links between science and markets is still lacking. The processes by which scientific knowledge feeds into successful innovations and consequent economic growth are still not well understood. The limited evidence available suggests that the way science contributes to innovation and ultimate economic growth is not straightforward.

The main objective of the Action is to improve our understanding of the process of scientific and technological development and of the transfer of scientific and technological developments to markets and into economic development. In order to achieve this objective, four research areas have been defined that will be investigated in detail.

In the area of "Science, technology and knowledge creation" the Action will investigate the productivity of individual researchers and scientific institutions (universities and non-university based public research institutions (PRIs)). In particular, the Action will search for determinants of the productivity of individual scientists. The Action will look at the incentives for universities and PRI to conduct basic and applied research. In addition, the Action will take into account the demand side of knowledge creation by investigating the importance of users for suggesting and implementing innovations for the goods they use (lead users and lead markets).

The second area covers "Diffusion of science and technology". Here the Action will look at the efficiency of technology transfer offices of universities and PRIs, the influence of mobility of researchers on the R&D productivity and at the success of companies in tapping knowledge available abroad by establishing their own research laboratories ("listening posts") and using information from customers and suppliers ("open innovation"). Furthermore, the Action will look at the role of foreign trade and foreign direct investment for international technology transfer.

In the area "Intellectual property rights" the Action will investigate the increasingly important role of patents as strategic instruments in high-tech competition. The Action will also investigate what determines whether patents are licensed and the importance of patents as building blocks for the foundation of new firms.

Finally, in the area "Development of markets" the Action will investigate how competition in product markets influences the innovative performance of companies. The Action will also investigate the links between R&D, productivity and employment at the company level.

The insights gained through the Action's research will be used to inform policy makers at a European, national and regional level. The Action also will include stakeholders (e.g. university managers, technology manager in companies) in all its efforts to disseminate the results of our research.

The Action is complementary to two networks of excellence of the EU Framework Programme: DIME (Dynamics of Institutions and Markets in Europe) and PRIME (Policies for Research and Innovation in the Move towards the European Research Area). A limited extent of overlapping

memberships will help avoid the duplication of research efforts and secure a steady exchange of knowledge between these networks and the STRIKE Action. DIME covers the micro to macro analysis of the dynamic economic and institutional systems taking primarily an economic and spatial perspective (www.dime-eu.org). The Action uses similar econometric and theoretical modelling as DIME does. It is, however, thematically more focused on knowledge creation and the role of knowledge as an engine for growth. PRIME addresses transformations that research and innovation policies are currently facing. (www.prime-noe.org). Covering political science and sociology of science, it is more policy oriented and less focused on the (economic structure of) incentives for individuals, companies and institutions than this Action.

C. OBJECTIVES AND BENEFITS

Objectives

The main objective of the Action is to improve our understanding of the process of scientific and technological development and of the transfer of scientific and technological developments to markets and into economic development.

The Action will bring together research fragmented among several European countries. Young researchers will be introduced to the European research community. With young researchers this document mainly refers to PhD students. However, post-doctoral researchers and assistant professors will also benefit from the Action. These individuals are at an early stage of their career where it is important to develop a network and to establish contacts with potential co-researchers.

The Action will ensure that its research is continuously informed by current STI policy concerns. Likewise, an important objective is the transfer of research results to policy-makers.

In quantitative terms, it is expected that at least 10% of the generated working papers will be authored across countries. Annually, about 40 research visits are envisaged. At our conferences, young researchers should constitute 30% or more of participants. At least 5% of participants should be policy-makers. The Action will organize specific sessions at each event addressing specific innovation policy needs (e.g. methods for evaluation and impact assessment).

Benefits

Innovation activities in an economy are a key driver of growth and new employment opportunities. Europe as a whole will therefore benefit from a better understanding of the innovation process. The Action will consolidate insights in the innovation process from different countries and will draw recommendations for best practice. The Action will provide useful advice to policy-makers at the European, national and regional levels.

The Action will improve the collection, harmonization and provision of micro data. Research on science and technology is often data-intensive. For example, researchers in different countries need to find solutions of how to match company and patent information and how to clean inventor data from patent applications so as to allow a meaningful analysis. The Action allows researchers to discuss the best ways of performing the data work and to find rules that will result in harmonized data sets. These data sets will then facilitate research to provide results that will be comparable across countries. This will make a lasting contribution to science and technology research.

D. SCIENTIFIC PROGRAMME

The Action will improve our understanding of science and technology, from knowledge creation to its impact on economic development. Research to be carried out under the Action is grouped into four areas.

1) Science, technology and knowledge creation

The first major area concentrates on the content, structure and institutional locus of science, technology and knowledge creation. This includes analysis of the institutional structure of universities and research institutes and the incentive structures that drive the productivity of researchers. Furthermore, the Action will study technological activities (patents, licensing, spin-offs) of universities and address differences in national innovation policies.

- Universities are important institutions for knowledge creation. The Action will study productivity in scientific research at the individual scientist and laboratory level. Detailed data on different European research institutions will allow us to analyse the production of knowledge through publications and patents and the behavioural dimension of both individuals and research units.
- Scientists employed by companies are in charge of conducting applied research. The Action investigates the productivity of scientists in the private sector. Special emphasis is placed on mobility. One aim is to study whether mobility increases the productivity of researchers. Exposure to different work environments could improve the efficiency with which scientists tackle problems. It could also be that more productive researchers are more mobile because they obtain more job offers. At the company level the Action will investigate the consequences of mobility for R&D productivity.
- The Action will study the organizational structure of universities and incentives employed to help these institutions to balance their activities in basic research, applied research and teaching. The Action will also look at incentives for universities to provide graduate training. This is an important task, since it ensures the ‘reproduction’ of the research system. These aspects will be studied both with a theoretical and an empirical approach.
- Users can also be an important source for innovation. This project aims at understanding the capabilities and limitations of user innovation processes, which quite often involve an open and distributed system in which innovations may be freely revealed to other users.
- Public policy is used to stimulate science, technology and knowledge creation. There are significant differences between European countries when it comes to the mechanisms used to stimulate private investment in innovation. The Action will compare advantages and disadvantages of tax-based and project based mechanisms.

2) Diffusion of science and technology

The nature of the knowledge-generation process itself is evolving towards a more network embedded process, with an increased emphasis on partnerships, as well as a growth in transdisciplinarity and heterogeneity of the actors involved. Hence, there is a need to develop a more refined understanding of the complex interactions and co-evolution of science and technology throughout the different stages of innovation. This is developed in the central theme of “diffusion of science and technology”.

- Technology transfer offices are responsible for the transfer of university-based research to applications in private businesses. Using a data set on contracts (patents, licences, licence revenue) the behaviour and efficiency of technology transfer offices will be studied.
- Circumstantial evidence suggests that labour movement is an important source of knowledge spillovers. Using a detailed dataset that combines information on patents, company accounts and employees, the Action will study whether movement of workers increases the R&D productivity of the firms they join. The Action will also test whether the movement of a worker increases the joint patent productivity of the current and former employers, indicative of a higher overall capacity to innovate.
- Companies can establish research laboratories in different countries in order to tap knowledge that is available abroad. Companies can also gain knowledge from interacting with suppliers, customers and competitors. The project will shed light on different mechanisms for technology sourcing.
- Choosing the right partner in an R&D cooperation can be quite important for innovation success. The project explores whether local or foreign partners are more conducive to success and whether the type of partner (private company or university) matters.
- Foreign trade and foreign direct investment are additional channels through which science and technology diffuse. The Action will study their influence on innovation performance and economic development in Central and Eastern European countries.
- Bibliometric, patent and R&D information will be used to generate a set of indicators to describe the links between science and industry for several European countries. Non-patent-citations will be linked to the home institution of the cited researcher. Linking patent data to scientific survey data will generate an indicator that allows a better understanding of knowledge flows.

3) *Intellectual property rights*

In the last decade, the most relevant international patent offices (USPTO, EPO and JPO) have witnessed double-digit increases in the number of applications submitted. At the same time there have been tremendous changes in patent law. Intellectual property rights (IPR) issues are a central concern for science and technology creation, while at the same time IPR provide a mechanism for diffusing science and technology. Because of the importance of these factors, a special research area is dedicated to rewards and knowledge diffusion through IPR.

- The number of patent applications increased markedly faster than companies' R&D expenditures in the 1990s, even though companies attributed a decreased role to patents for protecting innovations. Patents have gained a strategic importance for companies. They are used to block competitors from bringing similar products to the market and as bargaining chips in negotiations about cross-licensing. The aim of this project is the theoretical structuring and empirical analysis of the reasons for the observed changes in patent applications. Our research will inform policy makers about possible changes to the patent system that would improve its effectiveness in encouraging innovative activity.
- Technology licensing increased considerably worldwide during the 1990s, but there are still many patents the owner would like to license but that are ultimately not licensed. The Action will investigate the determinants of licensing given that the owner wants to license. By identifying which factors encourage or discourage actual licensing, we can understand the nature of these impediments, and how and whether they can be removed. Increased licensing would mean a greater utilisation of technologies.

- A large share of patents is not used by their applicants, i.e. the patents do not protect a product that the company has in the market. However, little is known about the determinants of the use of patents. The Action will use information on patents and the firms that own them to learn about the non-use of patents. In so doing, the Action will distinguish between patents that are used to prevent other companies from bringing competing products to the market and patents that are not used because the company finds no profitable application. It is important to understand the non-use of patents, since patents that are not used may slow down technological progress, especially in cases where technologies are cumulative.
- Many start-up companies adopt business models that use patents as core assets. Understanding the entrepreneurial process spurred by patenting activities is crucial for European competitiveness, since the rate of formation of new technology-based firms is much higher in the US than Europe. The Action will investigate to what extent patents are building blocks for the foundation of new firms and whether patents are a prerequisite for obtaining venture capital finance.

4) Development of markets

The throughput of science and technology to economic performance is covered by the theme “development of markets”. Here an improved understanding of the link between competition and innovation is of pivotal importance. Also, the Action will investigate the role of technology and innovation for the performance and growth of firms and countries. The empirical measurement of innovation, R&D and its impact on productivity growth and employment creation is included.

- The growth of value-added per capita in EU countries has lagged behind the US and this is widely believed to be due in large part to lower levels of innovation and lower adoption rates of the latest technologies. This is despite widespread reforms to liberalize product markets across EU countries. The Action will investigate whether the reforms introduced under the EU Single Market Programme resulted in subsequent increases in innovation intensity and productivity growth. The Action will also examine whether different labour market regulations influence how firms react to competition.
- Merger and acquisition activity changes the competitive structure of industries. M&A can be used to study how changes in competition influence the innovative activities of companies. The Action will distinguish between the effect of competition on the introduction of new goods (expanding the productivity frontier) and diffusion of existing ideas (catching up to the productivity frontier). In addition to the empirical perspective, the Action will also develop theoretical models to study these issues.
- With harmonized company-level data from several countries it is possible to make international comparisons of structural links and the dynamics of R&D, innovation and productivity. The effect of R&D on employment will be examined as well. Furthermore, the Action will investigate the influence of organizational and marketing innovations on productivity and their relationship with product and process innovations. The Action will try to model the potential feedback from productivity to innovation explicitly. Studies on R&D and productivity are also envisaged for transition and developing countries.
- It has been argued that an intensive use of information and communication technology (ICT) has led to productivity increases in the US economy. The Action will compare the productivity performance and the impact of selected IT components on economic growth for several European countries. So far, there is no clear-cut evidence of the impact of ICT on the productivity of these countries. Furthermore, the Action will investigate the relationship between ICT and labour demand. ICT may cause the relative demand for more highly educated

and experienced workers to rise. This has been cited as a possible reason for the higher wage inequality that has appeared in the US.

E. ORGANISATION

The research tasks of the Action are organized into four Working Groups:

- Science, technology and knowledge creation
- Diffusion of science and technology
- Intellectual property rights
- Development of markets

The Management Committee will be responsible for the overall coordination of the Action. Together with the leaders of the Working Groups, the Management Committee will formulate a work plan to ensure that the goals of the scientific programme can be achieved within the four-year duration of the Action. The Management Committee and Working Groups will meet twice a year in different host countries selected with the aim of achieving a good geographical balance.

The definition of the work programme is flexible to allow additional countries to participate at a later stage. The overall work programme is subdivided into four Working Groups, each of which is responsible for a coherent research area. Specific research questions are then defined within the Working Groups. As the Action evolves and additional researchers become interested in joining, it will be possible to incorporate further research questions within the framework of the Working Groups.

Every year the Action will organize a workshop or conference to which academics outside the Action and policy-makers will be invited. This will facilitate a broad exchange of ideas and the dissemination of results. The workshops and conferences will feature work from all four Working Groups. Researchers in the area of science and technology are generally familiar with the topics of all four Working Groups and can fruitfully discuss each other's work. This will allow researchers to maintain an overall perspective. The first workshop will be used specifically to make the Action known to researchers not yet participating.

A further important pillar of the Action is the short-term exchange of researchers. This will be especially beneficial for young researchers who are often not yet well connected in the scientific community. For the already better connected senior researchers the Action provides a framework for continued interaction. As additional benefit for young researchers, the Action will include a training school. Students will be rigorously trained in theoretical modelling and advanced econometric techniques relevant for science and technology research.

A website for the Action will be set up that will be regularly updated. The website will complement the above-mentioned activities by facilitating discussion and information exchange. It will make all of the material generated available, including discussion papers, conference proceedings, presentations and reports as well as relevant links. Information about participating researchers and institutions will be available to facilitate contact between researchers. It is planned to establish an e-mail network for the dissemination of calls for papers and the announcement of newly added discussion papers.

In order to improve contact with researchers in other international research programmes, it may be useful to organize a joint event with the Network of Excellence DIME. This could be in the form of

a joint workshop or in the form of a training school for PhD students from both networks. Here the Action can build upon experiences from ESSID (European Summer School for Industrial Dynamics).

The Action attaches great importance to the integration of young researchers. The proposing research groups are all active in the training of PhD students, which also underlines the importance and topicality of the research field of the Action. However, at the moment, most PhD students are only exposed to the research environment of their own institution. The short-term scientific exchanges will allow young researchers to develop lasting contacts by providing them with the financial means to be able to visit institutions where work is in progress on similar topics. The COST Action will facilitate the efforts of senior researchers to integrate the next generation of researchers. Furthermore, young researchers will be encouraged to participate as presenters and discussants at the Action's workshops and conferences. This will give young researchers experience in presenting their work in an international environment. Finally, the planned training school will improve the knowledge of research methods and provides an additional opportunity for networking.

F. TIMETABLE

The duration of the Action will be four years.

Year one

- Two meetings of Management Committee and Working Groups
- Workshop open to external researchers

Year two

- Two meetings of Management Committee and Working Groups
- Conference open to external researchers

Year three

- Two meetings of Management Committee and Working Groups
- Workshop open to external researchers
- Training school

Year four

- Two meetings of Management Committee and Working Groups
- Conference open to external researchers

Exchange of researchers will take place over the whole duration of the Action.

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest:

- | | |
|-----------|-------------------|
| ▪ Belgium | ▪ The Netherlands |
| ▪ Cyprus | ▪ Poland |
| ▪ Denmark | ▪ Slovenia |
| ▪ France | ▪ Spain |
| ▪ Germany | ▪ Switzerland |
| ▪ Hungary | ▪ United Kingdom |
| ▪ Italy | |

On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 7 Million € for the total duration of the Action.

This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

H. DISSEMINATION PLAN

Academic community

The target audience within the academic community consists of European and Non-European researchers working on similar topics. External experts in the field will be invited to the workshops and conferences. The discussion papers will be presented at international conferences, which will ensure the exchange of ideas with the broader scientific community. The finished pieces of research will be submitted to top-level economic journals. The Action website will offer academics a guide to the performed research and will inform them about upcoming events.

CEPR (Centre for Economic Policy Research, London) has expressed its willingness to promote the dissemination of results by publishing working papers resulting from this Action in its highly regarded discussion paper series. The Action will form part of CEPR's Science Innovation and Growth Working Group (SING), which will give the Action high visibility. SING maintains a webpage in the form of a wiki. The wiki is used by the members of the group to announce and organize meetings, publish papers and to discuss research topics online. The wiki can be edited by any member of the group, and can be read by the interested public, policy makers and journalists.

Policy Makers

The results of the Action are highly relevant for policy-making. As described in Section C, participating researchers are in close personal contact with policy-makers. In addition to personal contact, the Action aims to involve policy makers at workshops and conferences as keynote speakers and as participants. The Action website will include non-technical publications of high relevance to policy debate.

Wider Public

The main results of the Action will be disseminated to the wider public via press releases. CEPR has expertise in this field and regular contacts with the political and journalistic community in Brussels and within European states. Some of the participating institutions have personnel dedicated to the dissemination of research results.