to make sense from a macroeconomic perspective. The market processes involved cannot be replaced by government measures. But in particular in the early phases of development of technologies, the government can provide important impulses through the funding for university and non-university research institutions and the support for knowledge transfer. Start-up companies have a particularly important role to play. The government can also provide support with the acquisition of products of cutting-edge technology – and in this respect Germany only reaches the average level for the EU-15 member states.[10] Support for future technologies must take priority over measures which are primarily aimed at maintaining existing structures.

Over the past decade, Germany has beens able to reduce its structural deficits in comparison with other industrial nations in the field of cutting-edge technologies, although starting from a low base level. In the field of knowledge-intensive services, Germany still has considerable weaknesses[11]. In the new version of the High-Tech Strategy care should be taken that the support in the five fields of requirements (health / nutrition, energy / climate, security, mobility, communications) and in the cross-cutting topics is not only technology-oriented, but also takes into account the associated innovative business models and services.

A 3 NEW APPROACH IN R&I POLICIES – TARGETING THE HIGH-TECH STRATEGY

Cohesive and uniform R&I policies in the new High-Tech Strategy

With the establishment of the High-Tech Strategy in 2006, the previous Federal Government attempted to implement a coordinated strategy for promoting R&I in all government departments. It is not yet possible to assess the medium-term effects of the High-Tech Strategy, but it has been possible to considerably increase the funds deployed for research and development in Germany. The national R&I policies have also been made more effective by improved coordination between government departments. At the same time, the High-Tech Strategy in its original form was characterised by a vaguely defined range of topics and a lack of focus. For the continuation of the High-Tech Strategy, the Federal Government should therefore concentrate more on supporting the most important fields of requirement. The definition of five priorities and cross-cutting topics is a step in the right direction. The increased importance attached to the implementation of research findings is also appropriate and must be extended to cover all priority areas.

Careful selection of support priorities

A systematic approach should be adopted for identifying the most important requirement fields. In the EFI Report 2008, the Expert Commission advised drawing on the results of the Foresight Processes. In addition, a catalogue of criteria must be created for the identification of promising fields of innovation which require government support. The R&I policy should concentrate on areas of knowledge and technology which have a promising future and in which Germany already has a high level of research expertise and a development lead which can be secured internationally, for example by patent applications. As a condition, there should be commercial links in the fields receiving support. Either companies must already exist which are capable of implementation, or it must be possible for new, value-creating industries to grow in Germany. The selected priority technologies should not be dominated by ruinous international competition, and it must be possible to provide a sufficiently large R&D budget in Germany over a longer period.

Advisory bodies

Numerous advisory bodies are active in the overlapping policy fields of the environment, health, energy, and security and they pursue differing policy objectives. In many fields, research and innovation has become increasingly important, but currently there is not an institution which could carry out continuous evaluation of scientific findings and new technologies in order to provide these bodies with adequate information. This point is considered in Section B 1.

The Expert Commission recommends that the Federal Government, together with organisations such as the German Academy of Science and Engineer-

ing (Acatech) and the Academies of Sciences should launch a series of analyses of fields of technology which not only address strengths and weaknesses but also illuminate the value-creation potential of new lines of research, develop road maps, and present possible scenarios for the future development. The fields of technology should be evaluated not only by scientists and engineers, but also by business representatives and in particular actors with experience in seed funding, in order to avoid a bias towards established technologies and evaluation strategies. In addition, the analyses should include balanced risk-benefit evaluations, in order to promote the public acceptance of new technologies. Such a remit would be beyond the scope of the Science and Industry Research Union, which does not have an independent capacity to conduct analyses.

A 4 FURTHER DEVELOPMENT OF THE R&I INSTRUMENTS

Continuing the Top Cluster competition

The Top Cluster competition within the framework of the High-Tech Strategy is a good way to promote promising innovation clusters. It supports the cooperation between science and industry and stimulates the commercialisation of marketable products and services. A positive feature is that the support is not spread thinly and indiscriminately, but is targeted on the projects which have particularly good prospects for success. However, it is currently rather short-term. Clusters selected in the competition should receive support for more than five years. The required funds could be released by reducing the number of strategies supported in each round of the competition. A thorough evaluation of the chosen top clusters is particularly important for this instrument.

BOX 04 **Shareholding in university spin-off companies**

The investment of drive specialists Wittenstein AG in September 2008 in attocube systems AG is an interesting example of cooperation between an existing company and a university spin-off.
attocube systems was founded in 2001 as a spin-off of the Centre for Nano-Science of the Ludwig Maximilian University Munich. It specialises in the development and production of high-precision servo-motors in the nano-range. By acquiring the shareholding in attocube, Wittenstein AG was able to enter the international market for specialist, high-precision nano-drive systems. This created the opportunity to market new nanotechnology products and to establish market leadership in this field. In turn, attocube has benefited from the established global network of its partner.

Improved research and knowledge transfer

German universities and scientific institutions generate many promising research findings. However, they frequently lack marketing expertise for newly developed products and services. Germany's economic strength depends to a considerable extent on the commercialisation of developments from the field of cutting-edge technologies. It is very important that there is not a reorientation of basic research to applications, but rather that the results of basic research, which is funded less selectively, should be utilised in a more targeted fashion. This can be done by involving medium-sized companies in university spin-off enterprises (Box 04).
The Expert Commission proposes the formation of a publicly administered "commercialisation fund". This would provide funding for the transfer of research findings. This should go beyond the existing approaches in programmes such as the EXIST Transfer of Research or the High-Tech Start-ups Fund. There is a need for considerably more government financial support for transfer research to fill the funding gap created by the lack of private funding.

Supporting standardisation processes

An important aspect of the commercialisation of innovative technologies is establishing standards where there are various implementation options or where it is necessary to provide coordination between actors. From the point of view of an individual company, successful standardisation can involve a time-consuming and costly process in order to ensure the adoption of its technologies. Above all for small and medium-sized enterprises there can be a lack of incentive to pursue standardisation alone, because competing companies will also profit from the standard-