

Abstract of the Final Report 12/2013

## **Advanced Success Monitoring of the Programme to Promote Industrial Community Research (IGF)**

Sonja Kind, Simone Ehrenberg-Silies, Udo Hoppe, Sarah Hannicke,  
Peter Kaufmann, Iris Fischl, Laurenz Wolf

On Behalf of the Federal Ministry of Economics and Technology

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**On Behalf of  
the Federal Ministry  
of Economics and Technology**

**iit – Institut für Innovation und Technik**  
VDI/VDE Innovation + Technik GmbH  
Steinplatz 1  
10623 Berlin



In cooperation with

**KMU FORSCHUNG AUSTRIA (KMFA) -  
Austrian Institute for SME Research**  
Gusshausstraße 8  
A - 1040 Wien



For the sake of simplicity and easier reading, we have only used the masculine pronoun in this report. We explicitly point out here that both, the male and the female form, were meant to be addressed in the respective sections.

## **Evaluation Project Team**

### **iit – Institute for Innovation and Technology**

Dr. Sonja Kind (General Project Management), Simone Ehrenberg-Silies, Sarah Hannicke,  
Dr. Udo Hoppe

### **Austrian Institute for SME Research**

Peter Kaufmann (Project Management), Iris Fischl, Laurenz Wolf

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## Executive Summary

**The unique selling proposition of the Industrial Community Research (IGF) is the promotion of particularly practical, sector-oriented research activities of the German mid-sized industry covering all scientific fields. The IGF specifically supports SMEs to overcome their structural deficits in the area of research and development and contributes to an enhancement of the international competitiveness of individual sectors.**

Besides its recognition in Germany, the IGF is also considered a promotional instrument with a unique selling proposition throughout the whole of Europe. The characteristic features include a pre-competitive orientation, a thematic openness as well as a bottom-up approach tailored to the specific needs of various economic sectors regarding the identification and treatment of economically relevant research issues. Besides the innovative content, the competition-based selection of the projects eligible for funding does also take into account the criterion of their relevance in the industry.

The IGF provides a platform for the discussion of pre-competitive issues imposed by technological and societal changes as well as by internationalization to all industries, including also the less technology-driven sectors. It has been launched on the initiative of industrial stakeholders - self-organizing at sector or technology field level - that have merged to industrial research associations (RA) and networks under the auspices of the AiF in order to jointly organise and conduct pre-competitive research work. When dealing with relevant issues, the IGF does generally involve stakeholders from the entire value chain.

According to the persons interviewed in the course of the evaluation, the IGF particularly supports SMEs to offset their structural deficits resulting from a lack of research capacity. Hereby, companies are facing only low entry barriers, since direct investments are not required. Thus, the IGF offers SMEs the opportunity to get in touch with research activities for the first time. About 10% of the 1,600 participants had never done and 28% had occasionally conducted own research before.

The special approach regarding the transfer of R&D results from scientific into economic projects allows for a collective use of the research findings by a large number of companies, and thus ensures benefits for the entire economic sector and its associated fields, e.g. through effects on norms and standards.

**The IGF can be linked to other funding programmes and constitutes a complementary component in the spectrum of support schemes.**

The IGF is interlinked in two directions: On the one hand, it maintains relations to academic and non-academic institutes of fundamental research, such as the Max Planck and Helmholtz Institutes as well as the Gottfried Wilhelm Leibniz Scientific Association (WGL), ensuring that the “key technologies” arising from fundamental research will be further developed in the context of an application-oriented basic research. Sometimes, the aforementioned research institutes are also involved themselves in the research projects undertaken by the IGF.

On the other hand, in a further step, the project results of the IGF will be made applicable for company-internal use and developed to market maturity in a process of applied research. Companies directly integrate the latest project findings into their business activities and use to develop, in cooperation with research centers, individual solutions on the basis of the IGF results. For the latter step, the companies may also draw on public funding sources. In this

context, the "Central Innovation Programme for SMEs" (ZIM) run by the Federal Ministry of Economics and Technology (BMWi) has proven particularly suitable. In some cases, SMEs are actually for the first time introduced to research activities on the occasion of their participation in an IGF project and may turn these, in a next step, into an internally or jointly funded research project covering all forms of research cooperation between scientific and economic stakeholders.

The IGF's unique selling proposition clearly distinguishes this funding programme from others without losing any of its integrability. Due to its features, the IGF stands out in the spectrum of support schemes in Germany and fills a significant gap in the funding landscape.

### **IGF – an important norm-setting support instrument**

The IGF is the only funding programme to implement projects which are explicitly laying foundations for standards and norms. These are commonly attributed to high economic welfare effects and benefit the entire industry, as original pre-competitive research results are made available for collective use. According to a survey conducted with stakeholders from the research centers, almost 40% of the IGF projects could have a standardisation- and regulation-relevant impact: One to four years after project completion, 6% of the research results had been transferred to standard-setting processes; further 32% of the findings were considered to have the potential of affecting norms and standards. Further proof of the standard-setting relevance of the IGF has been delivered in the conducted company survey. Almost one fifth (21%) of the interviewed companies stated that they had benefitted from the projects, as they had contributed to the setting of norms and standards (period from 2007 to 2012); another 17% had been able to learn from the project findings how the company could react to legal changes. This high share can be explained by the fact that almost half of the companies had been participating in several project support committees during this period.

### **The IGF services are matched to the industry's needs: project selection is based on a majority involvement of SMEs in particular.**

In about 75% of the projects, SMEs had been intensively or even very intensively involved in the process of developing project ideas; in 46% of the projects, this is equally applicable to large enterprises. Under the IGF, project ideas are initiated by both sides, industry- as well as research-driven, and they often arise from committees of the research association or from the boards of affiliated or cooperating associations. Research issues may also result from previous projects and will be further developed in a research center. Normally, the project selection is a multi-actor process, in which the various boards of the research associations take an active part.

### **Companies report that they were able to maintain and enhance their competitiveness due to their participation in the project support committees (PSCs).**

The participation in the project support committee offers SMEs the opportunity to get in touch with research activities for the first time and paths the way to further research projects contributing to remain or to become even more competitive. Moreover, when participating in the PSC, companies acquire knowledge on how to accelerate product and development



processes at an early stage, e.g. if company-owned machinery or materials are used to test new procedures or applications for the purpose of supporting the research project. In this way, the supplementary step of the results' in-house utilization is no longer required. Those companies providing own materials or machine runtimes for project research purposes or offering consulting services to researchers may derive a particular benefit.

**The project support committee plays an important role and is worth participating from the companies' perspective.**

The project support committee is an instrument which offers great benefits to the companies involved in the IGF projects, and far more. It does not only play a significant role when designing and implementing the projects; it is also of major relevance for the transfer of results and any potential follow-up projects.

The benefits for the companies participating in the project support committees are numerous: The project support committee is an essential platform for the exchange of information and serves as an opportunity for networking activities, the initiation of contacts with other industry players or research partners or even for customer acquisition. Furthermore, it serves technology scouting purposes by providing companies with an overview about ongoing technological developments. In the course of each IGF project, companies can exert a controlling influence on the project's development and can enter into a direct dialogue. These aspects have nevertheless been mentioned by some 80% of the interviewed companies as an achieved result. Further benefits include the improvement of products and/or development of new products, contacts with distribution partners as well as the development of collaborative partnerships (the latter had been achieved by about 50% of the companies).

In almost all projects, additional effects are arising, notably due to the "lessons learned" for follow-up research activities and for the purpose of initial and on-going formation. With regard to the benefit for individual companies, the survey revealed that companies participating in the project support committees did normally profit from an asymmetry of information compared to non-PSC-members, who are usually informed about the (interim) project results only on the occasion of transfer-related events or via publications.

With regard to the structure of the project support committees, the evaluated projects have demonstrated that all of them had been entirely covering the value chain relevant to the main objective of the respective research projects.

From the companies' high level of motivation to again participate in a project support committee in the course of future projects (97% of the interviewed companies declared their willingness), it can be concluded that the cost-utilisation ratio is positively assessed from the companies' point of view.

**The radius of impact of the research associations is larger than their number of members would suggest.**

The number of members of the research associations considered for the evaluation varies considerably and ranges from about 20 up to some 100 members; most of the associations do however record a number between 50 and 150 members.

Depending on the business organisations acting as members, such as associations with their own member base, sometimes, the radius of impact is significantly larger than the number of research association members would assume.

**The introduction of the competitive approach is being seen in a positive light, and critical aspects of the review system have already been addressed by appropriate measures.**

The competitive approach is generally seen as positive. The higher level of competition has already led to a considerable increase in quality of the project proposals. At the same time, the first signs of an enhanced cooperation between research associations can already be found, assuming a relatively low level as reference: for the years 2005-4/2011, in only 14% of the projects a formal cooperation between research associations had taken place. However, this analysis does not take into account, for instance, the collaboration of research associations in relevant bodies and project support committees.

At the beginning of this evaluation – i.e. before the change of the review system – the evaluation approach of the expert groups and the criteria weighting for the competition-based assessment of the project proposals had been mentioned as critical issues due to a perceived mismatch. Another criticized aspect were the long delays for projects eligible for financial support that had however been rejected. The latter issue is related to an increasing number of project proposals triggered by the introduction of the competitive approach as well as to the availability of funds on the part of the IGF. Nevertheless, these deficiencies could have been improved over the past years.

The AiF, in close collaboration with the BMWi, and substantiated by a special report in the context of this evaluation, (1) has developed a new questionnaire with appropriately revised criteria and a new evaluation scheme, and (2) re-arranged the pool of experts.

The expert questionnaire, and thus the evaluation criteria, have been adjusted with a focus on the preparation of fundamental items for norms and standards as well as on the interdisciplinary cooperation (integration of the ZUTECH programme into the standard procedure). The interview partners have recently observed a trend towards projects with a high degree of innovation, which could lead to competitive disadvantages for classical topics being less innovative, but with a high relevance for the respective industry. These aspects have been taken into account in line with the revision of the expert questionnaire: The experts may now award bonus points for cross-sector relevance (interdisciplinarity) and – on separate request – for special industry relevance.

In the course of the revision of the review system, the number of SME representatives in the expert groups was increased. On the occasion of the expert elections in 2012, particular emphasis was also laid on a greater parity between the candidates from science and from industry.

Since 2005, the evaluation periods could also have been reduced, inter alia, due to a renunciation of content restrictions in the evaluation process, which has led to acceleration.

In the light of these new developments, most critical issues have already been addressed, as perceived by the evaluators. It is recommended to review the system in two to three years time.



**At all levels (BMW, AiF), the application procedure has further been accelerated, but there is still potential for further improvements.**

The actions defined by the working group *Acceleration* (including representatives of the BMW and AiF) have largely been implemented. The various measures to accelerate the process have hitherto resulted in a reduction of the period from the submission of the project proposal to the application's approval from 14.2 months in 2007 to 10.8 months in 2010. The longest time thereof (about six months) was needed for the evaluation procedure; now, the AiF needs a little more than one month, until the documents are forwarded to the BMW, which needs another 2 up to 2.9 months for the approval procedure. With the integration of the evaluation process into the newly developed, electronic 'IGF Portal', further efficiency gains may be achieved.

The research associations principally confirm to have perceived a clear reduction of bureaucracy regarding the application procedure and project implementation in recent years. Efforts contributing to a "lean" process organisation should however be continued. The improvement of effectiveness and efficiency of the funding processes is already considered a central and permanent objective of the BMW and AiF. A new working group *Programme Implementation* has been founded, which consists of employees from the BMW and AiF, and holds biannual meetings to exchange information and implement measures.

**The IGF supports human resources development as well as the education and advancement of young researchers.**

The IGF projects do also contribute to the training of future scientists. 2,330 researchers, of which 617 or 26% are female, are working together in 468 projects. (Other) employed research staff at postdoctoral level and undergraduates makes up the largest share with about 40% each. The average team of five people (median: 4) working in a project had been composed by two undergraduates, one PhD candidate and up to two employed research associates. 56% of the projects had moreover provided the basis for associated dissertations, and in 48% of the projects, the undergraduates and PhD candidates had been further employed, also after the projects' completion. In 41% of the projects, the R&D staff (including undergraduates and PhD candidates) had given up their positions in a research center and became employed in an industrial enterprise. In the company survey, 9% of the interviewees stated to have recruited at least one employee from an IGF project in the period from 2007 to 2012; further 6% had found new staff through the extended IGF network.

Taken the two surveys together, it can be assumed that in 40-50% of the IGF projects, at least one young researcher will be recruited by a company, and in the case of the other half, at least one young researcher will be further employed in the research center after project completion. About 15% of the companies have recruited one employee within six years, either directly from an IGF project, or from the extended IGF network.

It can thus be concluded that the IGF contributes to an application-oriented training of young scientists and allows companies to obtain access to skilled professionals.

Not least, the IGF is characterized by a high level of continuity having led to the establishment of solid networks between institutions and their acting people. In the IGF projects, it is possible to trace the development of complete employment biographies of people who had started their career with a dissertation in the context of an IGF project, and have gradually

developed up to a professorship or have moved to the industry, and are now getting involved in project support committees.

**The use of an electronic network called “IGF Portal” contributes to a service improvement and greater transparency.**

The first steps to implement the electronic network were taken in 2012 with the activation of the IGF web portal, which is constantly being further developed.

The current functionality (information about the available research proposals) is already being accepted by most of the research associations. Further planned enhancements include: the electronic application procedure for research associations (since end of 2013, whereby the database system ANDAT, which was widely criticized in the evaluation, will be replaced), the enlargement of the user group to research centers (for the accounting and reporting), the data management as well as the integration of experts in the user group (verify project proposals and carry out evaluations by electronic means) for 2014.

In this way, all aspects of the application and accounting process will prospectively be covered.

**The IGF often helps to establish complete research lines or project families**

About 15% of the IGF projects have their origin in previous IGF projects. These are dealing with research issues which had come up during the execution of one or several funded projects. As research associations are partly implementing strategic processes for the purpose of prioritising research topics, the IGF funding programme is often enough used to establish complete research lines. Also projects which are not based on a previous IGF project are often integrated in “project families” being thematically closely related.

After completion of an IGF project, findings are brought to application maturity in various constellations and programmes, e.g. also by individual enterprises (for instance, in own contribution or within the scope of the ZIM programme). It may also be the case that new issues arise in a project which are rather relevant to fundamental research, and which will then be addressed by research centers and investigated in the context of programmes to fund basic research activities (e.g. DFG). On the one hand, this contributes to an iterative further development and more detailed elaboration of research topics; on the other hand, new research lines are developed.

**The funding module ZUTECH has been successfully integrated into the standard procedure; other funding modules, such as “Leittechnologien”, CLUSTER or CORNET are also in demand.**

The integration of ZUTECH into the standard procedure was effected in 2010 already and has brought more clarity about the various funding modules. In the latest IGF directive of 14<sup>th</sup> September 2012, the present funding module ZUTECH was described as “cross-sector project” as part of the standard procedure. Within the scope of the evaluation processes, one or two bonus points may be awarded for an interdisciplinary cooperation. The criterion for the “cross-sector relevance” is met when - according to the directive “Solutions are developed encouraging structural changes in the economy based on more advanced technologies. This shall require that the projects are to be carried out by at least two research centers with different profiles and are preferably supported by several research associations.”

The various funding modules have met with a certain demand. In 2010, about 4% of the sub-projects were attributed to the funding module CORNET, 1% to CLUSTER and 3% to the newly established module “Leittechnologien”.

Particularly “Leittechnologien” shows a growing demand: 60 research associations have followed a call for project proposals launched in January 2013 and presented altogether 44 project proposals.

### Recommendations for action

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**Major recommended actions of the previous evaluation are presently in the process of implementation or have already been completed. Moreover, the implementation of recommendations of the present evaluation has already started as well.**

The new evaluation aimed to further accompany and document the already initiated process of change of the IGF and to derive recommendations for action. Over the past years, the RWI/WSF has begun to put the recommendations of the previous evaluation into practice, of which a part has already been fully implemented. Thus, a successful contribution has been made to the enhancement of the programme flow as well as of structures and processes. Also from the present evaluation, recommendations have already been taken up and have helped to restructure the evaluation and review system. This is an example for the success of a flexible, support-based evaluation approach generating tangible results in the project execution phase already.

However, at one point or another, there is still potential for improvement. The recommendations for action derived in the present evaluation are briefly summarized in the following.

Recommendations for action				
Effectiveness and efficiency of project flows, selection and evaluation processes	Target group			
	AiF	BMW	RA	Ex- perts
■ Provision of project reports for other research associations	X		X	
■ Research associations – and also experts in particular – to be continuously informed about the interpretation of the funding directive about the integration of SMEs into project support committees	X			
■ The option for a third annual expert meeting in order to further accelerate the procedure	X			X
■ Prompt integration of the review activity into the IGF web portal	X			
■ Confirmation of the experts, to deliver their evaluation results within a four-week's delay	X			X
■ Enlargement and/or further division of the review groups into subgroups in order to avoid an overstressing of individual experts	X			X
■ Bringing experts with diverging opinions together early before the expert meetings.	X			X
■ A larger number of experts from commercial enterprises to be included in the review groups	X			X
■ Revision of the review system within roughly three years	X	X		
■ Examination after about three years as to whether the IGF does still meet its objective of a broad-based industry promotion after the introduction of the competition-based procedure and the rule for projects to be dropped according to the funding average	X	X		
■ Research associations to be informed as soon as a project proposal seems to have the chance of being approved, even if this chance may be very little	X			
■ Option to withdraw the project applications and to re-submit revised concepts; enhance the visibility of research associations	X			
■ Avoidance of project starts on very short notice		X		

▪ Discussion and further development when dealing with the project related expenditures in the working group „IGF Programm Implementation“.	X	X		
▪ Exchange on good practices of the project selection processes; the regional group meetings are a suitable occasion for a mutual exchange of experiences	X		X	
▪ Integration of companies as early as possible during the project genesis and after the project start; the <i>Good Practice Guideline</i> on the transfer of results to be used as orientation			X	
▪ Use of the <i>Good Practice Guideline</i> for the design and staffing of project support committees			X	
<b>Transfer of results and achieved effects</b>	<b>Target group</b>			
	<b>AiF</b>	<b>BMW</b>	<b>RA</b>	<b>Ex- perts</b>
▪ Strengthening of the guiding role and responsibility of the research association with regard to the transfer of results			X	
▪ Survey of the PSC members after project completion on the project findings and lessons learned, their prospective in-house use and on their level of satisfaction with the project implementation			X	
▪ Completion of the list of activities for the transfer of results by the research association in the project application			X	
▪ Research associations to apply the <i>Good Practice Guideline</i> compiled in the context of the present evaluation			X	
▪ Support of the research associations by offering individual consulting services to be provided by the AiF secretariat.	X			
▪ Intensification of linkages to other funding programmes: To inform about possible funding programmes, such as ZIM or KMU-innovativ, on the occasion of the final PSC meeting and intensify the consulting activities			X	
▪ IGF database: The search in the project summaries could profit from an automatic indexing.	X			

Status and development of the standard procedure and the funding modules (ZUTECH, CLUSTER, CORNET, "Leittechnologien") as well as their interaction	Target group			
	AiF	BMWi	RA	Ex-perts
<ul style="list-style-type: none"> <li>Funding modules should be constantly observed and at a later stage (in about four years), reviewed for their relevance to the IGF programme as well as for eventual potentials for improvement</li> </ul>	X	X		
<ul style="list-style-type: none"> <li>Verify whether the budget and the efforts spent for the co-ordination regarding CLUSTER are in balance</li> </ul>		X		
The AiF/IGF	Target group			
	AiF	BMWi	RA	Ex-perts
<ul style="list-style-type: none"> <li>The IGF secretariat should continuously support learning processes in the research associations (regional working groups, individual consulting).</li> </ul>	X			
<ul style="list-style-type: none"> <li>Development of a binding brand concept with the assistance of a professional service provider involving all relevant stakeholders</li> </ul>	X		X	
<ul style="list-style-type: none"> <li>Make effective use of the evaluation results for public relations work; statements, of SME representatives in particular, as well as personal experience reports of company representatives relating to IGF projects presented at relevant events are expedient.</li> </ul>	X		X	
<ul style="list-style-type: none"> <li>Strengthening cooperation between research associations in the standard procedure</li> </ul>	X		X	
<ul style="list-style-type: none"> <li>New funding modules should not be at the detriment of the actual bottom-up approach and thus of the standard procedure. A focus on a limited number of modules seems to be appropriate.</li> </ul>		X		
<ul style="list-style-type: none"> <li>Monitoring of the thematic development of approved projects in terms of the interdisciplinary cooperation approach</li> </ul>	X			
<ul style="list-style-type: none"> <li>In case the currently implemented incentives for a stronger interdisciplinary work are not sufficient, it could be examined as to whether a coordinating "umbrella organisation" and/or technology scouts for several research associations would create a more powerful stimulus.</li> </ul>	X		X	



No need for action				
<ul style="list-style-type: none"> <li>No need for action with regard to principally filling the committees with SME representatives, so that assertive and efficient decision-making bodies based on the self-organisational principle will prevail within the competitive system.</li> </ul>				
<ul style="list-style-type: none"> <li>The streamlining of the IGF regarding the number of research associations should be implemented in "selfmanagement" based on the self-organisational principle.</li> </ul>				
<ul style="list-style-type: none"> <li>No funding of transfer activities of the research center: The transfer activities laid down by the research center in the project proposal, including any consulting services, as well as the associated required financial resources should already be included as an elementary component of the project, to the extent that these are covered within the pre-competitive scope according to the eligibility for funding criterion.</li> </ul>				
<ul style="list-style-type: none"> <li>No further action in terms of a reinforced development of evaluation models and demonstration objects, since they become relevant are used depending on the project context.</li> </ul>				
<ul style="list-style-type: none"> <li>No further action for setting up a database to record the use of project results</li> </ul>				

# 1. Evaluation Concept

The Federal Ministry of Economics and Technology has commissioned the iit – Institute of Innovation and Technology at VDI/VDE-IT (iit) and the Austrian Institute for SME Research to perform an advanced success monitoring of the Programme to Promote Industrial Community Research (IGF). The evaluation was carried out in the period 01/2011 to 12/2013.

The present report is an abstract of the final report.

## 1.1 Industrial Community Research – A Funding Programme with Tradition

Germany is one of the most efficient and competitive economies worldwide. An important factor for Germany's economic strength is a high-performing and innovative corporate landscape, which is characterized by medium-sized businesses and an export orientation. International innovation studies rank Germany high for special qualities, notably in the field of innovation. In the latest European Innovation Scoreboard (2010), Germany was ranked fourth in terms of innovation performance, and thus occupies a position among the world's leaders. With regard to the output indicator of the “innovators”, Germany is even the world's number one. This indicator measures the number of small and medium-sized enterprises (SMEs) which had implemented product, process, marketing or organisational innovations over the survey period. The funding and support of medium-sized businesses, constituting the fundamental pillar of the German economy, has been a central concern of innovation policy for many years now. Programmes to arouse great international interest are for example the two funding lines of the BMWi and BMBF, the ZIM SME programmes (Central Innovation Programme for SMEs) as well as KMU-innovativ (SME innovative). Recent evaluations provide evidence for the success of these measures.

Although having a longer history, the Industrial Community Research (IGF) was explicitly assessed a successful measure in previous evaluations.

In contrast to most other innovation activities of the BMWi and BMBF, the IGF is no specialised programme and does not represent a typical SME support scheme open to applicants from all fields. The IGF is furthermore no funding programme for cooperative research, but is basically designed on a structural basis with a regional and sectoral base. Eligible for funding in this line are all legally distinct, non-profit research associations being full members of the German Federation of Industrial Research Associations (AiF). Unless the research projects are not executed by the research associations themselves, the project work is carried out in so called research centers, i.e. notably at universities and non-profit research institutes. If a research institute chooses this option, it will transfer the funds allocated according to the notice of appropriation of funding to the research centers as final recipients. The major aim of the IGF is to offset the disadvantages of small and medium-sized enterprises in the research and development area which are structural in nature. Given their small size, the companies addressed by the IGF are often not able to finance externally contracted research projects or to carry out own R&D activities.

**IGF is a unique, cross-sector funding programme for SMEs open to applicants from all fields**

The implementation of innovations in SMEs shall be promoted through the support of the pre-competitive, applied research and the technology transfer of research results to entire economic sectors and technology fields. In this context, it is sometimes possible to bridge

the gap between basic and application-oriented research. Hence, the IGF pursues a very direct objective, namely the widespread strengthening of the capacity for innovation, and thus the enhancement of the performance of the German innovation system.

The programme's thematic openness, the easy access for SMEs to research results of funded projects as well as the consequent focus on the economic use of the project results are specific features of the programme. In contrast to most of the other R&D programmes, SMEs play only a minor role in the actual process of research and development. They are, however, considerably involved in selection and steering committees in the course of the project to ensure the projects' horizon of application.

The programme assumes a system and market failure in the field of pre-competitive research, particularly in terms of SMEs. It is moreover based on the assumption that the concentration of sectoral research in the research associations, which have been launched by the industry itself for the specific purpose of conducting an industry-wide research, and which are full members of the AiF, contributes to a more systematic use of the generally expected spillover effects; that SMEs are facilitated in gaining access to know-how which they consider relevant for their purposes. With the targeted funding approach, the focus is placed on individual bottom-up projects initiated by industrial players who provide relevant know-how to identify the "the right research issues".

At an early stage already, the programme has followed approaches which have only recently become known in innovation policy under the captions „open innovation“ or „user-driven innovation“. Also the central programmatic element, to establish long-term structures in the pre-competitive environment through research networks, serves mainly this objective and constitutes a key feature, which distinguishes the IGF programme from other support schemes open to applicants from all fields, such as ZIM (Central Innovation Programme for SMEs), that are however not covering the pre-competitive aspect.

The funding programme is characterized by a high level of thematic openness, and for that reason alone, it is influenced in its strategic approach by the wide range of topics dealt with in the member associations and research centers. Since its launch in 1954, the programme's executing agency is composed by the approx. 100 member associations of the German Federation of Industrial Research Associations (AiF). The research associations differ by size, number of members, membership structure (SMEs, large enterprises, associations, direct membership of individual people) and thematic focus as well as in terms of their structure of committees, the availability of an own research center similarly organised than a research association, and the way in which they cooperate with sector-specific associations.

Account has been taken to the aspects of inter- and transdisciplinarity, which are increasingly discussed in debates related to research and innovation policy, as well as to the shift away from a linear understanding originating from fundamental research towards innovation by changes in the design of measures: Discipline (ZUTECH, or precisely today "Leittechnologien") and subject integrating research (CLUSTER) as well as internationally oriented research (CORNET) are part of the programme. With a budget of about € 130 million for 2010 and € 141 million for 2012, the programme has certain significance in the German research landscape.

## 1.2 Assignment for Evaluation

The IGF has been continuously evaluated for many years now. After an evaluation by the Prognos AG (the final report was published in 1989), in 2005 and 2008 the evaluation of the IGF was taken over by the Rhine-Westphalian Institute for Economic Research (RWI) in cooperation with the Economic and Social Research WSF Kerpen. The evaluation report about the IGF was submitted in February 2010. In addition, a further evaluation report was issued in February 2011 dealing with the funding modules of major focus, CLUSTER and CORNET.

IGF having  
a long tradition  
also in terms of  
evaluation

The evaluation effected by the RWI and WSF has already made a valuable contribution to an improvement of the programme flow. Potentials for structural and process improvements have been demonstrated and already partly initiated. The new evaluation performed by the project team of the iit – Institute of Innovation and Technology at the VDI/VDE-IT and the Austrian Institute for SME Research is built on the previous advanced success monitoring conducted by the RWI/WSF and has been further enhanced.

The successfully completed preparatory work has provided a sound empirical basis. The latter formed also the basis for consensus between the parties involved, for its continuation, and thus served as a bridge between the new and “old” evaluation. The new evaluation has taken up the evaluation findings – notably the formulated recommendations for action – and has monitored, among other aspects, to what extent those actions had already been put into practice.

The new evaluation aimed to further accompany and document the IGF change process as well as to derive recommendations for action. Another goal was to identify exemplary processes and structures and to examine their options for standardisation within the scope of the IGF.

In summary, the evaluation was supposed to describe the respective status and further development regarding the following aspects:

- Experience with the competitive funding procedure
- Stronger involvement of and greater benefits for SMEs
- Effective/efficient processes regarding the genesis/selection of projects
- Review and selection procedure
- Services offered by the research associations and centers for the transfer of results
- Broad impact of projects (quantitatively and qualitatively)
- Cooperation and cross-linking of research associations
- Status and development of the standard procedure and the funding modules ZUTECH, CLUSTER, CORNET, “Leittechnologien” as well as of their interaction

A project advisory board accompanied the evaluation with the aim to multiply the findings

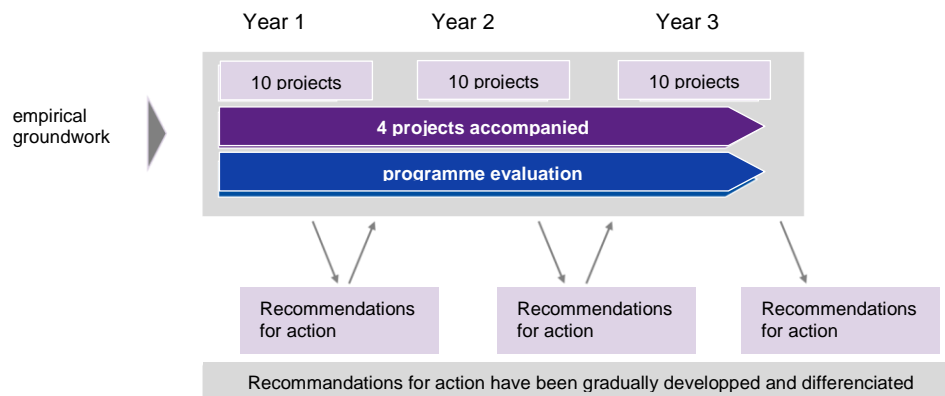
As in the previous evaluation, also this time, a project advisory board has been installed. This working group is composed of nine representatives from the Scientific Council of the AiF, the AiF Management Advisory Board, and the research associations or research centers. Prof. Dr. Michael Dröscher acted as speaker and director for the project advisory board and coordinated internal requests. The working group used to meet twice a year for a workshop, what contributed to a close interlinking of the evaluation process with the project advisory board. The function of the advisory board was to establish a transparent process, to act as multiplier and to discuss the results elaborated in the course of the evaluation. The members of the project advisory board contributed their insights to the evaluation process and, vice versa, transferred the outcome to the outside. The working group is committed to transparency and open for new members. The BMWi explicitly demanded for a flexible composition depending on the thematic focus.

### 1.3 Evaluation Design

In continuation of the previous evaluations, two content-specific levels have been considered for the analysis: The evaluation of individual projects (micro-level) as well as the evaluation of the funding programme as a whole (macro-level).

Figure 1: Overview evaluation process

#### Scope/Design of the Evaluation



Source: iit, 2011

10 projects have been considered per year and 4 in an accompanying evaluation, i.e. in total, 34 projects have been evaluated.

Within the scope of an **ex post evaluation** individual, completed projects - ten per year – have been considered. Thus, over the full duration of the contract, 30 projects have been evaluated. In terms of time, focus has been put on projects that had been completed one to five years before the evaluation, in order to review potential first implementation results in the companies. The projects have been selected in such a manner that the funding modules ZUTECH, CORNET and CLUSTER had all been covered. Such research associations should primarily be considered for the selection of projects that are particularly suitable for learning processes in terms of issues related to the project genesis and the transfer of results. Hereby, the analysis has covered both, research associations executing a large number of projects per year as well as such dealing with only a few projects.

For the ex post evaluation, particular focus has been set on positive utilization results achieved by SMEs along the entire value chain, e.g. in terms of follow-up projects, company-specific R&D or staff exchanges, etc. Where appropriate, the conversion of project findings into concrete new products, processes and services in the companies was also in the centre of focus.

The ex post analysis was supplemented by an **accompanying evaluation** of four projects which had started as of 2011. Hereby the investigation has focused on the issue of involvement of SMEs. The four projects had been selected from the four following fields:

- Mechanical Engineering/Metals Processing
- Textile/Chemistry/Plastics
- Food and Agriculture
- Environmental Technology

The ex post evaluation as well as the project accompanying evaluation did both include a particularly intensive analysis of the workflows in the research associations and/or research centers, covering all processes from the project genesis to the project execution, and finally the transfer of project results with focus on their effectiveness and efficiency. The **programmatic or macro-level** of the evaluation was covering the investigation, assessment and formulation of recommendations for improvement of the programmatic cornerstones. Besides the analysis of processes and evaluation criteria for the selection of projects, methodological approaches for the identification of new projects as well as for the specifically conducted success monitoring of the IGF have also been subject of the investigation. Moreover, the considerations included the innovation networks of the IGF, concrete examples for technology transfer as well as further external effects (spill-overs) with an impact on the AiF and its client base. It was decided not to perform a database-driven analysis of secondary statistics, since the previous evaluation had already covered a comprehensive analysis of the macroeconomic scope relevant for the IGF, which has meanwhile been completed by a study of the DIW on the macroeconomic relevance of technology and innovation funding to support small and medium-sized businesses<sup>1</sup>. Besides the measurement of effects of the IGF funding programme, the programme evaluation was primarily concerned with the institutions of the funding instrument, its reform process as well as with its fitting into the current innovation process. This was attributable to a restructuring of the funding landscape, since new “large” SME programs and cross-cutting measures, such as ZIM and KMU-innovativ, had been launched over the past years.

The programme and project evaluation was re-allocated between the partners of the evaluation team. The iit conducted the project evaluation, whereas the programme evaluation was carried out by the Austrian Institute for SME Research. The iit was also responsible for the overall evaluation. Despite this formal division of tasks, the analytical units “Programme” and “Projects” have demonstrated considerable interdependence. The results obtained in the various work packages have been used to support the analysis - either-way contributing to a comprehensive picture of the IGF, its structures and processes.

iit evaluated the projects; the Austrian Institute for SME Research the programme.

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<sup>1</sup> Belitz et al. 2012, Macroeconomic Relevance of Technology and Innovation Funding to Support Small and Medium-sized Businesses, Project N° 49/10 of the German Institute for Economic Research (DIW), Berlin.



## 2. Conclusion: Summary of the Major Findings

This chapter summarises the major findings of the conducted evaluation. For this purpose, the results obtained from the surveys of the research centers and companies, from the analysis of the AiF monitoring data, and from the qualitative contents resulting from the interviews have been outlined in the following text.

The conclusion exclusively focusses on the results of the empirical investigation and data analyses. The derived recommendations for action can be found in the fulllength version of the final report.

### Some figures and facts at a glance:

- The IGF budget has increased between 2005 and 2012 by 40% to an amount of € 141.5 million.
- The IGF portion of the R&D budget allocated by the BMWi for SME research activities has declined from 42% (2005) to 15 % in 2011.
- The IGF reaches a significant share of the potential target group of commercial enterprises. Within the more than six years between 2005 and 5/2011, about 15% of the companies in the German manufacturing sector committed to innovation have participated in an IGF programme. Thus, about 10% of all industrial enterprises have at least once been represented in a project support committee of the IGF.
- Within the period from 2005 - 5/2011, about 80 universities, 20 universities of applied science, and 160 non-academic research institutes have been involved 4,575 times in 2,975 IGF projects.
- In the same period, 25,156 PSC participations from about 10,800 companies have been recorded. This results in an average participation of 2.3 per company and 8.6 companies per project support committee.
- Half of the approx. 1,500 companies that have participated in the survey had not applied for funding from another support programme in the previous six years.
- About 60% of the interviewed companies see a demand for a more intensive dissemination of the IGF findings. Notably small research associations and those dealing with interdisciplinary issues are recognized for their potential.
- About 60% of the interviewed companies and research centers are entirely satisfied with their research association.
- 74% of the executed projects are characterized by an intensive or very intensive involvement of SMEs in the development of ideas; in 46% of the projects this applies equally to large enterprises.
- The average time between the identification of a research issue and the submittance of a project proposal is nine months. 40% of the proposals are developed to become a full application within six months.
- The processing time for a project application has been reduced from 20 to 11 months since 2005.

- Despite the progress made over the past years, there is still seen potential for further improvement.
- About 500 people are working as experts for the IGF on a voluntary basis.
- The review system has been revised in the course of the evaluation: (1) 40% new experts (2) evaluation scheme, identifying relevance in the industry and cooperation activities, has been adapted.
- According to the monitoring data, the economic benefit for SMEs of the research centers is rated as high in approx. 55% of the projects, whereas high technological benefits are attributed to 75% of the projects.
- 59% of the IGF projects have contributed to a further development of processes and 42% to an enhancement of products. Contributions to new products and processes are rated at 15% or 23%, respectively.
- About two third of the companies have been able to internally utilize a result from the IGF projects.
- The technology scouting is ranked first among the benefits mentioned by the companies; in this context, in almost 60% of the companies, relevant research issues could have been derived for internal R&D activities. The further development of processes and upgrade of products in terms of quality was another benefit just as frequently referred to. In addition, the contacts to potential future cooperation partners were also rated as highly important with almost 50%.
- More than two third of the companies considered the IGF important or very important in terms of a further enhancement of the competitiveness of their industry and/or relevant technology fields.
- In 71% of the cases, the IGF projects have resulted in follow-up projects; thereof 40% within the IGF in the sense of project families and 35% in the context of a direct assignment by a company.
- In 40-50% of the IGF projects, at least one young researcher is recruited by a company after project completion.
- In the period from 2005 to 2011, most of the projects (86%) have been executed by a single research association. The portion of projects with at least two research centers involved has increased over the years from 37% (2005) to 44% (2010).
- Almost 50% of the interviewed companies are actively involved in at least two, and 27% even in three research associations.

The priorities of the technology and innovation policy of the German Federal Government, which have been set for small and medium-sized businesses since 2005, have been outlined in the study by Belitz et al.<sup>2</sup> according to the three development lines: (1) the SME funding scheme of the BMWi not giving preference to certain technologies (ZIM with its funding lines), (2) KMU-innovativ as entry-level programme for technology-specific specialised pro-

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<sup>2</sup> Belitz et al. 2012, Macroeconomic Relevance of Technology and Innovation Funding to Support Small and Medium-sized Businesses, Project N° 49/10 of the German Institute for Economic Research (DIW), Berlin.

grammes launched by the BMBF as well as (3) the focusing of the pre-competitive research on applied research with a high probability for implementation in SMEs, including INNO-KOM-Ost and the IGF. Being the main representative of pre-competitive funding programmes for small and medium-sized businesses, the Industrial Community Research has undergone a considerable development in recent years, which has been accompanied by the consortium RWI/WSF within the scope of the present and previous evaluation.

The previously conducted work provided a sound empirical basis for the present evaluation.

The previous evaluation of the IGF performed by the Rhine-Westphalian Institute for Economic Research (RWI) and the WSF - Economic and Social Research Kerpen provides a comprehensive analysis of the IGF in its various facets. In order to accompany and to document the reforms initiated in that context, the present evaluation performed by the Institute of Innovation and Technology (iit) and the Austrian Institute for SME Research Austrian focused on the following three objectives:

The new evaluation has aimed to further accompany and document the already initiated IGF reform process and to derive new recommendations for action.

- To make a contribution to the fine-tuning and optimisation of workflows and processes, at both levels – for individual projects, but also with regard to the overall programme
- To make general reflections on the prospective further development of the Industrial Community Research, including a potential need for structural changes
- This is also related to the essential provision of communication approaches for the dissemination of the programmatic specifications of the Industrial Community Research

## 3. Status quo and Change of the Industrial Community Research

### 3.1 Objective and Role of the IGF Funding Programme

The IGF's mission is to strengthen the capacity for innovation and competitiveness of small and medium-sized companies at sector level. The statutory reform as of 1<sup>st</sup> January 2012 defines the objectives of the AiF as follows:

- (1) Initiation of research involving SMEs,
- (2) Qualification of young scientists and professionals in innovative fields, and
- (3) Organisation of the exchange on scientific research results in a practical way.

With the new statute, the operational and/or outcome level has been increasingly addressed, whereas before, the focus had been on the coordination of research associations. The objective of qualifying young scientists and professionals was then mentioned as an explicit objective, and thus given greater priority. The relevance of a qualification and training of scientific and technical young researchers is substantiated by the fact that German companies consider the shortage of qualified professionals as a rather unfavorable framework condition for R&D and innovation (Belitz et al. 2012: 168).

With the new statute of the AiF, the focus is also shifted to a qualification.

The objectives of the AiF as an organisation are corresponding to those of the IGF – one of the major programmes hosted by the AiF. The interviews held with the different groups of people involved in the IGF do equally show a high consistency in terms of the objectives formulated for the IGF.

The programme's intervention logic, including its integration in the German federal portfolio of funding schemes, is adequately designed measured against the objectives and expected impact levels. The IGF constitutes an instrument with low entry barriers from the companies' perspective in the area of pre-competitive research. On the one hand, the IGF is linked to fundamental research, but involves likewise applied research activities, when IGF results are used in follow-up projects. The approach, to implement projects with a focus on the bottom-up definition of research contents as well as on the industry-based funding of research association and the AiF, is assessed by the evaluators as an efficient and effective form of organisation with a unique selling proposition. The IGF allows for a sector-oriented research open to applicants from all fields, which is also appropriate to overcome the structural deficits of SMEs in the area of research and development.

#### 3.1.1. Institutions of the IGF and Their Transformation

Since 2006, the AiF has undergone a fundamental process of restructuring and reorganisation. Thus, the AiF has for instance conducted a spin-off creation of two limited liability companies: The *AiF Projekt GmbH* based in Berlin and responsible for the Central Innovation Programme for SMEs (ZIM) as well as for the expiring funding measure PROgramm "Progamme to support the increase of innovation competence of middle-class enterprises (PRO INNO II)" as well as the *AiF FTK GmbH* established in Cologne, which coordinates the funding module CORNET, amongst others. Furthermore, the committees have been restructured. A new statute was given to the AiF, and in 2010, a Corporate Finance Codex (CFC) was released. The spin-off creation of the two limited liability companies has moreover contributed to strengthening the IGF's core business and its secretariat's role as service center at the

The AiF has recently undergone a fundamental process of restructuring.

Cologne location. The IGF has been described predominantly as a synonym for the AiF by the interview partners of the evaluation. In the external view, the AiF and IGF are often converging to one single “institution”.

In addition, the AiF has been promoted in terms of its function to support learning processes in the research associations: The AiF FTK GmbH has for instance been offering regular seminars on selected IGF topics since 2013. Also the regional group meetings of managing directors (in total five regional groups) are considered an effective instrument of the AiF for coordination amongst the research associations as well as for the ensurance of a constant information flow. Besides the purely administrative exchange of information, these meetings do now increasingly serve the purpose of “mutual learning” and identification of opportunities for cooperation.

**The number of research associations will be automatically regulated by the principle of self-organisation.**

The merger of thematically related and/or complementary research associations has been dealt with in the course of the previous evaluation in order to reduce the relatively large number of currently 100 research associations. According to the evaluators' opinion, this will be a self-developing process following the principle of self-organisation. In implementing the changeover to the competition-based procedure, and with the rule for projects to be dropped according to the funding average, it must be assumed that the research associations will be exposed to an evolutive pressure to conform in order to maintain their position within the system.

**The competition-based procedure has already resulted in an increase of the number of project proposals and in the improvement of their quality.**

The intensified competition has already resulted in an increase of the number of project proposals as well as in the improvement of their quality. Smaller research associations participating in IGF-funded projects only irregularly (and thus tending to use less effective quality assurance mechanisms) will increasingly be put under pressure to succeed. Given this logic, small research associations should be interested in a closer cooperation and/or in merging with others of their kind. The monitoring data covering the period until 2011 cannot be considered for a clear demonstration of this trend, given the short time span after the introduction of the competition-based system.

**Especially smaller research associations will presumably be exposed to an evolutive pressure to conform.**

Although the relatively short observation period of the previous evaluation indicates certain advantages for larger research associations at sector level, the findings are, however, still too heterogeneous to make a general statement. Across all industries, those economic sectors which tend to accommodate “larger” research associations (i.e. those dealing with a large number of projects) seem more likely to gain benefits with the changeover to the competition-based procedure. Among the other sectors, development trends are quite different, albeit with a relatively large number of sectors with stagnating or declining funding volumes.

Also if the question of the large number of research associations in thematically closely related fields is well justified, it must not be overlooked that research associations - even if they are addressing the same or a similar technology spectrum - often have established regional network structures in their surrounding geographical area integrating SMEs. In the worst case, a merger of research associations could lead to a disintegration of these structures, which promote regional value creation. Interview partners did moreover feel that “small” research association remained rather skeptical about a potential merger,

since they were addressing partly specialized sections of a technology spectrum, which they would eventually not be able to push forward in the established committees of larger research associations in case of a merger. These seem to be justified concerns that could theoretically be addressed by ensuring a reasonable balance when concluding a merger. However, this may practically be seen as an obstacle. As a further option for action, the research associations are recommended to initiate an enhanced cooperation at strategic and project level (in the course of interdisciplinary projects), what will be further discussed in the following.

### 3.1.2. Relevance of the IGF Funding Programme to Research Associations and their Sectors

The onehundred research associations of the AiF cover a wide range of technologies and applications reflecting the technological strengths of the German economy. The spectrum varies from sectors that are hardly associated with research to high-technology sectors, which do also have their place in the IGF with regard to pre-competitive research issues.

Most of the interviewed research associations have rated the relevance of the IGF funding programme for their own institution and sector as high or very high. Mostly, the available research budget of the research associations is composed on the basis of many different sources, whereas the IGF occupies the most important position among the numerous research associations with a share significantly exceeding 50 % in some cases. The IGF funding programme is of major importance to the research associations in the traditional sectors, since there is practically no alternative funding scheme available for their specific problems.

The interview partners from the research associations and companies, respectively, particularly emphasize that the entry barriers for companies were very low, since direct investments were not required. Thus, SMSs are facilitated in getting in touch with research activities for the first time. Notably the thematic openness of the IGF and the herewith related project selection, which is based on the bottom up principle and involves industrial stakeholders, are acknowledged with appreciation. The results of the online survey of the research centers and companies widely confirm these correlations.

Achieved results are often relevant to the respective industry as a whole and its associated fields. The IGF does moreover contribute to an elaboration of fundamental items for norms, standards, and directives. Projects pursuing this objective are only partially addressed by other funding programmes run by the Federal Government, and would hardly have been feasible without the cooperation of research associations and inter-branch organisations, as it is explicitly promoted by the IGF.

### 3.1.3. Relevance of the IGF Funding Programme in the Context of Research Funding

The IGF budget has nominally increased in the fiscal years 2005-2012 by about 40% to € 141.5 million. 60% of this increase has benefitted the standard procedures, and 40% have affected the funding modules.

According to the more than 50% of the interviewed research associations, the IGF budget occupies the most important position among the R&D funding sources.

Typical features of the IGF are, inter alia: close relations to the industry, bottom up approach, thematic openness, introduction of SMEs to R&D

The IGF budget has increased by 40% in the period from 2005 to 2012 to € 141.5 million.



The IGF share of the BMWi budget for R&D activities in medium-sized enterprises has been reduced from 42% (2005) to 15% in 2011.

The overall R&D budget of the Federal Government has increased by about 51% in the fiscal period from 2005 to 2011 (Federal Government Report on Research and Innovation 2012: 389). The budget of the BMWi for R&D activities in medium-sized enterprises has more than tripled in the period from 2005 to 2011, mainly due to the focus on the ZIM funding modules (Belitz et al. 2012: 72). Consequently, the relative share for the IGF budget of the BMWi funding of R&D activities in medium-sized enterprises has been reduced from considerable 42% in 2005 to 15% in 2011.

The average success rate for IGF applications amounted to 65% in the period from 2005 to 2009, and stood thus at broadly the same level as programmes addressing similar target groups (e.g. ZIM-SOLO and ZIM-KOOP, basic programmes of the Austrian research promotion authorities). Given the increased number of project proposals as a result of the introduction of the competition-based procedure, the share for financing commitments started to slightly decrease as from the year 2008. This effect will become even stronger in the case of further increasing project applications at constant budget levels.

On the one hand, the IGF is linked to fundamental research, but involves likewise applied research activities.

According to the majority of the interview partners, the IGF is considered as a funding instrument with a unique selling proposition in Germany and Europe. Given its thematic openness and orientation to the needs of SMEs, the IGF thus closes the gap of existing funding schemes, whereas alternative programmes were mostly too specific and/or followed overarching trends. For traditional sectors, the IGF is often the only eligible funding instrument in the field of pre-competitive research. In general, interview partners have considered the IGF as an essential link between the BMBF- and the DFG-funded fundamental research projects, respectively, and the application- and market-oriented research – covered by the funding instruments, such as e.g. the ZIM programme run by the BMWi.

For traditional sectors, the IGF is often the only eligible funding instrument.

The results of the survey of companies did moreover show that 62% of the participating companies were permanently conducting research activities, 29% occasionally, and 10% had not been doing research at all. In 40% of the companies, only a few people had been assigned with R&D tasks (R&D staff of one to five people). In further 5% of the cases, there was no person responsible for R&D issues. Based on these figures, it can more or less be concluded that 40-45% of the interviewed companies were corresponding to the particular target group of the IGF, which is supposed to be “introduced” to R&D activities. As the number of survey participants is not considered representative for the IGF, the actual share could even be higher, since research-intensive corporations are more likely to participate in such a survey.

Based on the data of the Mannheim Innovation Panel of the ZEW, the DIW Berlin (Belitz et al., 2012) has analysed the innovation behavior of the German industry for the year 2008. Given this analysis, the following rough calculation can be derived to determine the potential of the IGF (ebenda: 39ff.). About 105,200 companies of the approx. 270,000 German enterprises in total are belonging to the manufacturing industry. About 72,000 (68%) of these are considered as innovation-active industrial enterprises and 38,000 as industrial corporations with a continuous or occasional R&D activity. An indeed considerable share of those 72,000 innovation-active companies of the manufacturing industry can be identified as target group of the IGF.

In a little more than six years, from 2005 to 5/2011, 10.000-11.000 companies have been actively involved in project support committees of the IGF, which corresponds to 14-15% of the innovation-active industrial enterprises or to about 10% of all companies from the German manufacturing industry. This seems to be a considerable, wide-ranging impact for a single funding programme with an annual funding budget of € 101 to 135 million for that period<sup>3</sup>.

In addition, the findings of the IGF projects do reach another unknown number of companies due to activities in terms of technology transfer (publications in academic and practice-oriented journals, final reports, presentations held on the occasion of conferences of business associations, project portraits distributed via email, AiF database, etc.) which are integrated in the networks of the 100 research associations, including industry associations, and in those of the research centers.

In 2007, Germany counted 395 academic institutions, thereof 108 universities and 215 universities of applied science. In addition, further 1,025 non-academic active research institutions were recorded (Polt et al. 2009: 23). These figures include 4,575 involvements of 80 universities, 20 universities of applied science and 160 non-academic research institutes in 2,975 IGF projects. Consequently, a major part of universities, a relatively small part of universities of applied science, and a not insignificant share of non-academic research institutes, which corresponds naturally to a non-uniform distribution due the weight of large institutes, have finally participated in IGF projects.

The survey of companies did moreover reveal that the IGF was indeed able to reach a significant number of companies that had not participated in any other funding programme. About 50% of the interviewed companies stated not having been involved in any other funding programme in the period from 2007 to 2012. This seems to be a substantial portion, even when considering the fact that the interview partners may not always have had an exhaustive overview about the financing commitments of their company.

### 3.1.4. Areas of Improvement in Terms of Administrative Processes

In the course of the organisational change process of the previous years, the application procedure and the process of project implementation have generally been made less bureaucratic. The interview partners expressed their support for a continuation of the path begun and a further optimization and facilitation of administrative processes. This is primarily related to a general facilitation of the projects' implementation, implying e.g. efforts to further accelerate the application and approval procedures as well as an improvement of the suitability of processes for practical application. In this context, some of the above mentioned objectives could already have been realized within the scope of the evaluation. The IGF portal, launched at the beginning of 2013, has been much appreciated. Also the widely criticized retroactive approvals of project starts could have meanwhile been allayed. Furthermore, since 4/2013 there is now the option for companies and research centers to submit project-related claims for their participation in virtual meetings of the project support committees. Besides a further acceleration of the procedure, other suggestions for improvement are related to an early feedback regarding the approval status, giving research centers the opportunity

The IGF reaches a major share of the potential target group. In the period from 2005 to 2011, about 15% of the innovation-active German industrial enterprises have been involved in the programme.

With about 80 universities, 20 universities of applied science and 160 non-academic research institutes, a major proportion of the German research landscape was actively involved in IGF projects in the period between 2005 and 2011.

50% of the companies involved in IGF projects had not participated in any other funding programme.

Considerable progress was made in terms of reducing bureaucracy and accelerating administrative processes.

But there is still potential for further improvements.

<sup>3</sup> This corresponds to approx. 0.99% of the R&D expenses of the Federal Government (cf. Federal Government Report on Research and Innovation 2012: 389)

to improve their project ideas and to re-submit their proposals or to find alternative funding sources. There is still a lack of clarity among certain research associations regarding the specification of the SME definition in terms of the composition of the project support committees. Some research associations mention considerable difficulties in composing the project support committee with a sufficient count of SMEs, what would be a prerequisite for a principle realization of any project. As this is not considered an obligatory rule, a deviation from the minimum number of SMEs can be justified in the light of the industry structure. Moreover, the interview partners expressed their wish for the possibility to claim the full costs, given the fact that the usual lump sum compensation of 20% for project-related overhead costs had not been covering the actual costs in the case of some research centers.

### 3.1.5. Public Relations and Awareness Level of the AiF/IGF and Research Associations

The AiF has boosted its PR activities in recent years.

The AiF has enhanced its efforts to raise public awareness during the last years. These include a new corporate design of the AiF, regular business trips for entrepreneurs, the execution of a performance demonstration for the IGF, and the use of further PR instruments. The pre-competitive character of the IGF determines the formats, as the project results should be disseminated, as far as possible, to the majority of companies in a given economic sector or even to the entire industry.

The research associations follow individual approaches to disseminate the project results.

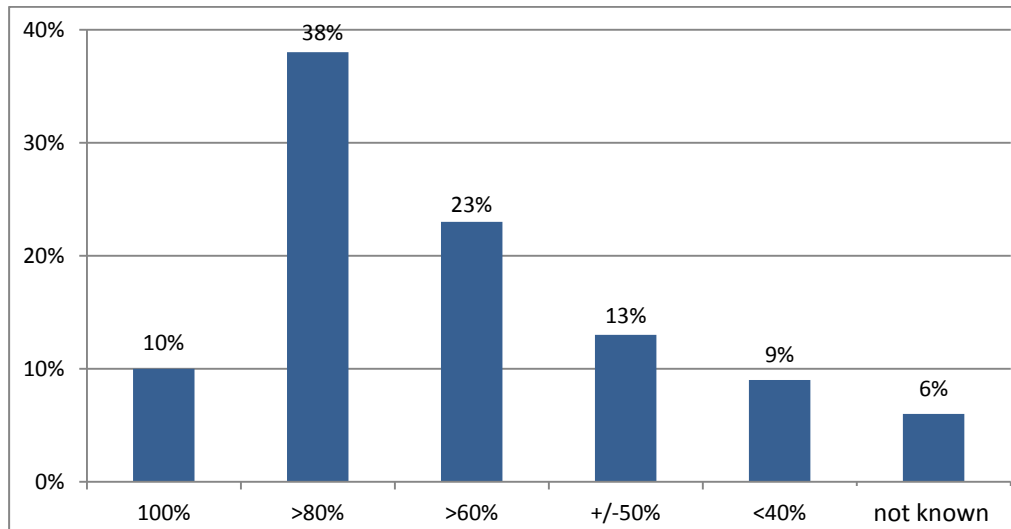
The reach depends on the structure and focus of the research association within a given industry.

Generally, a variety of instruments is used to disseminate the project findings. Also the transmittance of the project reports is handled in a completely different manner. Some research associations are publishing abstracts of the project reports on webpages, occasionally also in the detailed long-form reports, which can hence be accessed by all interested parties, even beyond the borders of Germany. Rarely, report summaries are distributed also via email according to a distribution list including contacts beyond the own company member base. Non-members are often not actively addressed, but information is provided upon request. Here, it should be noted that the reach of the research associations is heterogeneous and is depending on their respective thematic/technological priorities, the structure of the concerned industry in terms of number and size of the companies, their institutional embedding within the industry as well as on their public relations activities.

Individual research associations are naturally covering their target groups to a varying extent; this can certainly be further optimized. A rough indication hereof has revealed from the survey of companies (see figure 1). This figure depicts the statements of those companies which might profit from the work of the primary research associations (within a given sector or across industries in the case of interdisciplinary issues) regarding their awareness of these associations. Nearly half of the companies assessed the degree of awareness of their primary research association to be 80% of the concerned target group. Notably those research associations were rated as well known, which had been addressing clearly defined sectors. In contrast, research associations with a broad thematic spectrum addressing several industries had greater difficulties achieving a high degree of brand awareness, even though they were ranked among the "large" research associations.

Least have been known the small to medium-sized research associations, whose public relations efforts have only limited impact on the companies' awareness. These do also include those research associations which joined the IGF lately.

**Figure 2: Degree of brand awareness of the AiF research associations**



Source: KMFA/iit company survey 2013; N = 1,591 or 1,571. The following specific questions have been raised: What is your estimate of the degree of awareness of your primary research association among those companies (within the sector or across industries in the case of interdisciplinary issues), which may profit from their work? As well as: Please estimate the degree of awareness of the Industrial Community Research (IGF) in your specific industry?

About 60% of the interviewed companies felt a particular need to intensify the dissemination of the IGF results. Especially in the case of smaller research associations and those dealing with interdisciplinary issues or technologies, companies were seeing a potential for an enhancement of the transfer of results. In this context, the research associations interviewed within the scope of the project evaluation have largely emphasized that the raising of the IGF and AiF's public awareness – also among the companies - was considered a major challenge.

To increase the visibility of individual research associations and of the IGF/AiF, respectively, the evaluations are both recommending the development of a uniform brand strategy. This issue will be dealt with in the section "Recommendations for Action".

**About 60 % of the interviewed companies see a need for a more intensive dissemination of the IGF results.**

**Potential is especially seen in smaller research associations and in those dealing with interdisciplinary issues.**

### 3.1.6. The Satisfaction of Companies with the Research Associations

The highest level of satisfaction was achieved by the research associations for their information function and their active encouragement for the contribution of research ideas.

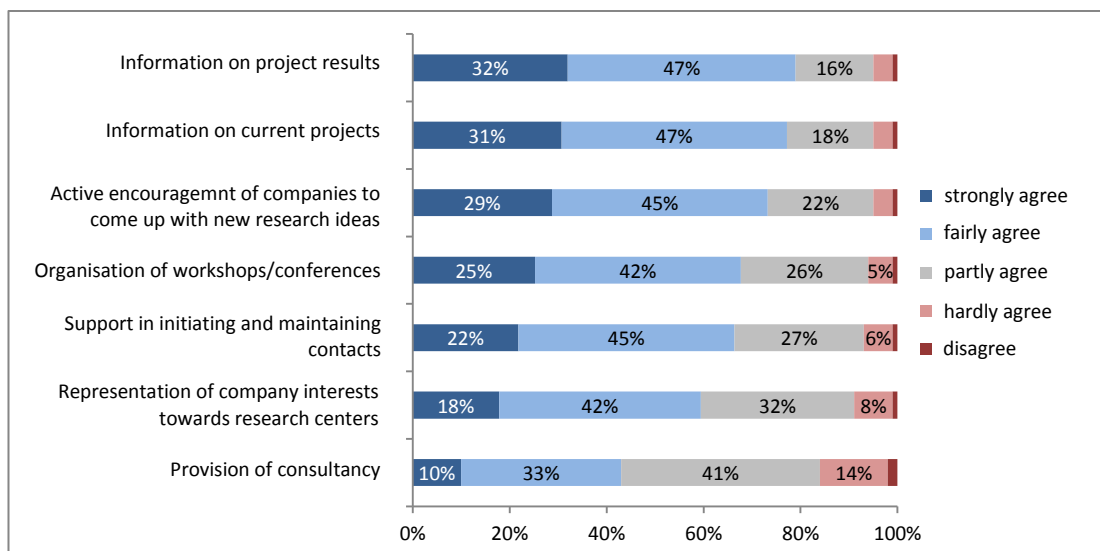
However, there is still room for improvement.

In the company survey, it was also examined how satisfied the companies are with their research association they are primarily working together with. As visualised in the following figure, about 30% of the companies are very satisfied, and further 50% are broadly satisfied with the actual core responsibilities of the research associations, namely the initiation of research projects and the transfer of information.

However, these aggregated results are greatly varying for the 100 research associations in particular. This is due to the industry structure, the institutional embedding as well as to the respective activities of the research associations.

Apart from the generally high level of satisfaction, this does also indicate that some research associations still leave room for improvement.

**Figure 3: How satisfied are you with the performance of your primary research association regarding its work within the scope of the IGF?**



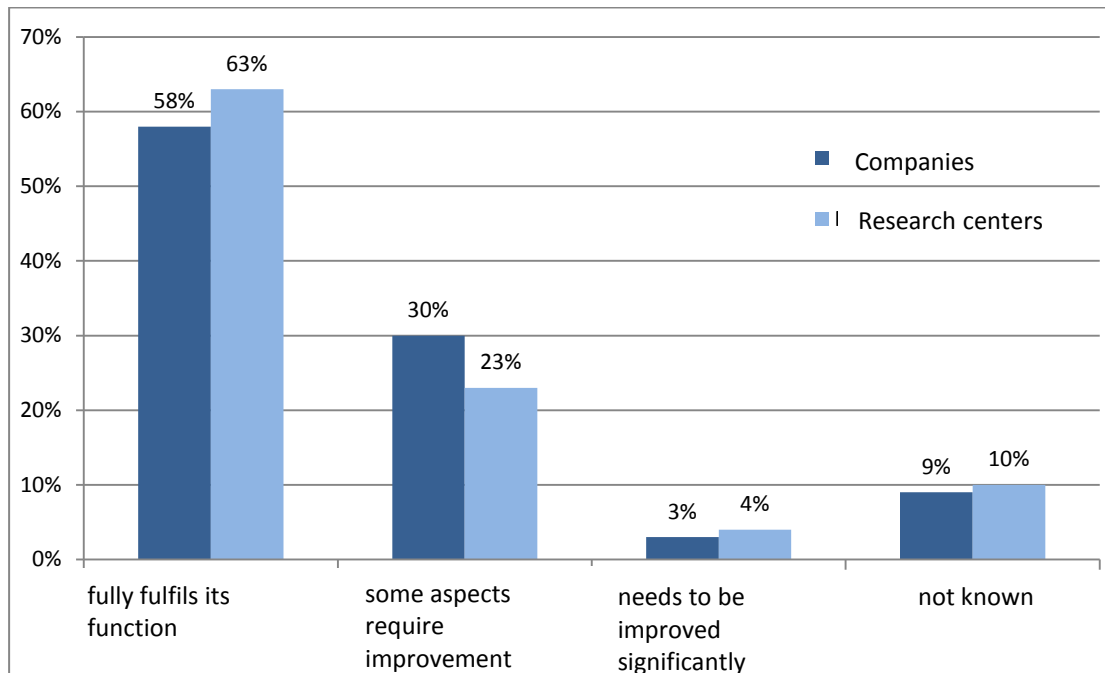
Source: KMFA/iit company survey 2013; N = 1,576; the term "primary research association" relates to the association, in which the company is "most actively involved".

The survey of the research centers substantiates this finding, as those research associations showing a strong commitment to initiate projects as well as to coordinate and moderate the research process, including the transfer of results, had also received high satisfaction values.

About 60 % of the interviewed companies and research centers are fully satisfied with their research association.

The following figure finally demonstrates that the level of satisfaction with the research association in its role as coordinator, network manager and in its responsibility for the transfer of results is generally rated as high. About 60% of the companies, and also of the interviewed research centers, are very satisfied with their primary research association, whereas up to one third would like to see little or major improvements.

**Figure 4: In summary: How do you evaluate the role of your primary research association as coordinator, network manager and in its responsibility for the transfer of results?**



Source: KMFA/iit company survey 2013 and survey of research centers 2011/12; N = 1,589 companies and 489 research centers

Especially in the light of the given heterogeneity of the research associations and the bottom up approach, this result is to be interpreted as positive and to be seen as motivation for further optimisation according to the evaluators.

### 3.2 Effectiveness and Efficiency of Project Flows, Selection and Evaluation Processes

#### 3.2.1. Project Genesis/Selection (at Research Center and Research Association Level)

##### Project Genesis

The project genesis in the IGF is a multi-actor process, differing only in the sequence of involvement of different groups of actors (scientists, industry), but not in their principle participation in the process.

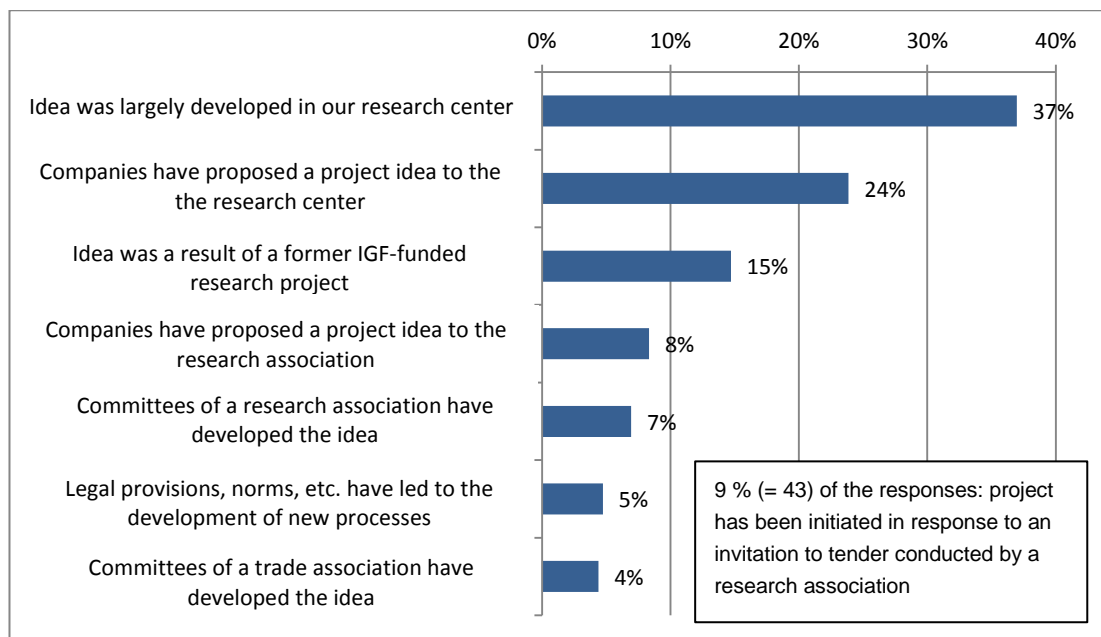
Ideas for IGF projects may develop in very different ways. Hereby, the location of idea development is mostly related to the organisational form of the research associations that use to pursue different paths for the project genesis. Whereas some research associations are following a mainly industry-driven approach, others are performing their project genesis rather research-driven or in a balanced way including both sides.

**Project ideas often arise through the involvement of numerous actors from industry and science.**



According to the previous evaluation performed by the RWI/WSF, about 55% of the project ideas were originated in companies and 38% in research centers. The survey of the research centers conducted within the scope of the present evaluation presents a nearly identical result, but does also underline that the process of project genesis is often multidimensional and interactive in kind: In 52% of the cases, research centers have mentioned several sources coming up with the same project idea. In 15% of the cases, former IGF projects have directly served as basis for the development of a new project. For about 9% of the projects, the research centers had been assigned with a research task in response to an invitation to tender conducted by a research association, whose idea had previously been developed in their committees.

**Figure 5: Where did the idea for the IGF project originate?**



Source: KMFA/iit survey of research centers 2011/2012 (multiple answers permitted; N = 851 replies)

In 74% of the projects, SMEs had been involved in the project genesis.

The survey of research centers revealed that SMEs (according to the IGF definition) tend to be more closely involved in the project genesis than large companies. In 74% of the executed projects, SMEs had been involved intensively or very intensively; in 46% of the projects, this is equally applicable to large enterprises.

### Procedure for the Selection of Project Ideas Before their Submittance to the Research Association

Research associations sometimes carry out complex procedures for the preselection of project proposals

Similarly to the development of project ideas, preselection processes at research association level are likewise depending on their structural embedding within the respective industry and their organisation.

Thus, research associations with close links with association-related structures and without own executive structures rarely have established specific preselection processes. In fact, project ideas are discussed directly in the committees of the respective associations. In the case of research associations with own research centers and of those, whose projects are often initiated in the institute's environment, the preselection processes take place in the

respective research centers. The other research associations use to organise preselection processes on the basis of their technical committees or do not perform a preselection at all.

With regard to the preselection processes at research center level, the survey revealed that 64% of the non-academic research institutes were having an own committee for the prioritisation of project ideas; this applies equally to 35% of the academic institutes.

### Consulting and Application Phase – Selection Procedure at Research Association Level

Decisions about the submittance of project proposals are subject to mutual consultation and are usually made in the competent committees of the research association, the research center or the industry association. The selection procedure varies among the different research associations according to the following characteristics.

Meetings are held regularly, mostly once to three times a year. It is a frequent practice to first elaborate a brief project proposal and to provide the opportunity for the presentation of project ideas. After a number of iteration loops of revision, the full proposals are finalized and have a similar structure as the IGF project proposal. Only a few research associations make their selection on the basis of fully developed project proposals. Some research associations use to base their decisions about the project drafts or proposals on an expert and/or preliminary assessment by the members of the committee. The applied criteria are almost identical to those used in the IGF evaluation. The vast majority of the examined research associations have established a formal selection procedure with specified deadlines for the final decision-making. The duration of the selection procedure at research association level varies considerably between two weeks and ten months. Besides the project contents, the type of the research association does notably play a major role.

Research associations without a differentiated institutional structure tend to advance faster. Most of the research associations with an implemented preselection procedure do also carry out comprehensive formal selection procedures at research association level. Preselections do hence not seem to replace the time-consuming formal selection procedures. On the contrary, there is a correlation between the size of a research association in terms of the number of project proposals and the efforts spent for their selection. 80% of the project ideas discussed at research association level will finally be submitted as proposals to the AIF. Higher submittance rates are usually achieved by those research associations that had already sorted out less promising projects in a preselection process performed in research centers or industry associations.

The selection process at research center level is varying considerably.

Typical are:

- Several iteration loops until the submittance of the full project proposal
- Formal selection processes to be implemented by dedicated committees/gremien

## Acceleration Prior to the Application's Submission to the AiF

It takes on average nine months from the identification of a research issue to the submittance of the funding proposal.

40% of the project proposals are developed into full proposals within 6 months.

The survey of research centers has shown that it takes on average nine months (median) from the identification of a research issue to the submittance of the funding proposal to the AiF, almost 40% of the project proposals are even developed into full proposals within six months only, and that about 80% of all funding applications are submitted within a year. The duration from six to twelve months can be assessed as realistic time required, if committees of research or industry associations are involved, in which project ideas are discussed and which usually come together once every six months. A potential acceleration does furthermore largely depend on the number of meetings of the decision-making bodies. In this regard, it should be noted that the period of time cannot be shortened limitlessly due to a potential trade-off between the duration of the development process and the quality of the project proposals.

In order to accelerate the process, the research associations had generally followed two approaches, either regarding the preparation of the project proposals by the research centers and/or referring to an acceleration of the decision-making process in the research associations themselves. Thus, some research associations try to encourage the research centers to promptly elaborate their project proposals, for instance by setting deadlines or by involving a coordinating, motivating and coaching "project supervisor". With regard to an acceleration of the decision-making process at research association level, the written circulation procedure has proved to be the most common among the effective methods.

## Involvement of SMEs in the Committees

Company representatives – notably from SMEs – are broadly represented in the executive bodies of the research associations.

The staffing of the committees is carried out at research association level beyond the scope of the AiF/IGF's management, and is hence regulated in the context of self-administration at sector level. Based on the conducted interviews, the evaluation may also confirm that companies are broadly represented in the executive structures of the research associations.<sup>4</sup> Especially those committees of the research associations responsible for the preselection of project ideas, are mostly composed equally by economic and scientific stakeholders. The bodies of research associations with close links to the respective industry association tend to be almost exclusively composed of company representatives. Sometimes, these do also include specialized bodies, directly subordinated to an industry association. The ratio between representatives from SMEs and large companies in these bodies relies very much on the individual sector. In numerous sectors of the German economy (e.g. construction, textile industry), mergers have led to the emergence of associated enterprises in recent years. Although these enterprises are no longer covered by the IGF definition of an SME, they remain their SME-typical structure and do also act as such.<sup>5</sup>

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<sup>4</sup> No quantitative statement can be given as regards the integration of companies in the executive bodies of the research associations, particularly with focus on SME representatives, as the provision of sound evidence herefore has not been subject of the present evaluation.

<sup>5</sup> The IGF definition of an SME covers those companies with a maximum annual turnover of € 125 million (including associated enterprises).

## Composition of the Project Support Committee

The formation of the Project Support Committee (PSC) usually takes place prior to the submission of the project proposal to the research association. The companies are addressed either by the research centers or the respective research association. Some research centers maintain very close contacts to companies and are thus taking over the principal communication. In some cases, the approaching of companies is exclusively organised by the research associations themselves. The latter can frequently be observed in smaller sectors, in the case of research associations closely linked to an industry association.

Anyhow engaged companies are naturally easier to convince regarding their participation in a project support committee and are therefore more likely to be addressed. This is the reason why some research associations have increased their efforts to win also non-member companies as PSC participants. For this purpose, companies are, for instance, addressed in newsletters or on the research centers' or research associations' websites. The research associations sometimes also try to involve industry associations in the activities of the project support committee that are particularly suited to the role of multipliers for the transfer of results.

As regards the composition of the project support committees, the monitoring data reveal that the share of SMEs (according to the IGF definition) involved has declined over the past years by one percent each year from 63% (2005) to 58% (2010). Besides specific cases of company mergers, this is probably related to the partially dynamic development of company turnovers (inter alia influenced by actual trends in commodity prices), owing to which some companies might have been reclassified into large enterprises despite a sometimes unchanged SME-typical headcount. In any case, this trend could not have been balanced out to the same extent by involving new SMEs.

Due to the definite turnover threshold as well as to the merge clause, the research associations of certain sectors have difficulties ensuring the minimum number of SMEs participating in their project support committees (the target number is 50% or at least five representatives of interested SMEs). As the SME-related criteria constitute a recommendatory provision of the funding directive, exceptions to these criteria may be accepted if they are properly justified in the project proposal. It must be clearly stated that despite the numerous efforts made, it has not been possible to compose the project support committee with a sufficient count of SMEs, and this should be justifiable with the respective industry structure. As the companies participating in the IGF are no beneficiaries, there is no need for an orientation towards the strict SME-related criteria defined by the EU Commission (an annual turnover of € 50 million and a maximum headcount of 250). Given the specific structure of the German middleclass economy, the funding should instead be based on a wider scope of threshold definitions.

Within the scope of the present evaluation, a *Good Practice Guideline* for the composition of project support committees has been elaborated.

Research centers and research associations are both addressing relevant companies.

The share of SMEs involved in project support committees has slightly declined. This is probably related to sector-specific restructuring processes well as to the definite turnover threshold used in the IGF definition.

The non-compliance with the SME criterion for project support committees may be justified in exceptional cases.

### 3.2.2. Processing of the Project Proposals at the AiF and BMWi

Since 2005, the time of processing the project proposals has been reduced from 20 to 11 months.

Despite the progress made in recent years, there is still seen potential for improvement.

As displayed in the table below, the procedural processes have significantly been shortened in recent years, from 20 to 11 months from the submittance of the project proposal to its approval. Most of the time (about six months) is needed for the evaluation process; in 2010, the AiF required a little more than one month for the transmission of the applications to the BMWi (formerly six months), and the BMWi needed between 2 to 2.7 months (formerly 3 months) for the corresponding approval process. According to the interviews conducted for the project evaluation, this acceleration has also been recognized by the research associations and centers. However, there is still seen potential for further progress.

**Table 1** Period that passes from the submittance of the project proposal to the approval of projects with starting date in the year...

	year of project start						
	2005	2006	2007	2008	2009	2010	Total
	median in months						
Entire period passing from the submittance of the project proposal to the approval	19.9	17.2	14.2	12.4	<b>10.6</b>	10.8	13.3
AiF: Period passing from the submittance of the project proposal to the final vote of the expert group (EG)	6.9	6.6	6.4	7.0	6.3	<b>5.6</b>	6.4
AiF: Period passing from the final vote of the EG until the transmission to the BMWi	6.0	6.0	2.3	1.6	<b>1.1</b>	1.4	1.9
BMWi: Period passing from the transmission to the BMWi to the approval	2.9	3.2	2.3	<b>1.9</b>	2.5	2.7	2.5

Source: AiF monitoring data as of June 2011. Only approved projects.

Based on the monitoring data and the survey results, the following rough calculation can be made. The process in the research associations and centers from the development of a project idea to the submission of a project proposal to the AiF, which is stretched over an average period of nine months, is now followed by an average period of eleven months passing from the submittance of the project proposal to the decision on the project's approval. In assumption of a two years term for the project's execution following the approx. 20 months period from the project genesis to the project's approval, this results in a duration of almost four years for the whole process from the development of a project idea to the project's completion. It may at best take some three years, if this process is further accelerated. For some industry-driven research issues, this duration still appears a little too long. Nevertheless, the first companies will immediately benefit from their participation in the project support committee, in the project implementation stage already and before the project's completion, i.e. after two to three years upon definition of the project idea.

Further accelerations may be achieved through the entire digitalisation of the procedural flows. With the activation of the IGF webportal in 2012, the first steps were taken to implement the electronic network, which has since then been further developed. The current functionality (to provide information on the submitted project proposals) is already well accepted by most of the research associations. Further planned enhancements include: the electronic application procedure for research associations (from the end of 2013), the enlargement of the user group to research centers (for the accounting and reporting), the data management as well as the enlargement of the user group by including experts (verify project proposals and carry out evaluations by electronic means) for 2014.

The electronic network was launched in 2012 together with the IGF webportal.

For the purpose of simplifying administration, a working group *IGF Programme Implementation* has been established (consisting of employees from the BMWi and AiF) which meets biannually. The working group aims to further develop and simplify administrative issues. In recent years, contents included, for instance, the implementation of the competition-based procedure, the new IGF directive, the implementation of new legislation, the discussion of evidence forms and of the forms used for the evaluation of research findings (by research associations and/or research centers), etc. It can be expected that all implemented measures, in combination with the initiated activities of the working group *IGF Programme Implementation*, will contribute to a further improvement and acceleration.

A working group of the AiF and BMWi is continuously working on the improvement of administrative processes.

If the evaluation phase is to be further shortened, the entire evaluation system will need to be adjusted, e.g. by increasing the frequency of review meetings or no longer holding physical expert meetings for coordination purposes.

### Predictability of the Project Start

As point of criticism, it was mentioned in the interviews at the beginning of the evaluation that it was difficult to predict when a project would finally start. This applied to the backlog of projects waiting for approval, owing to budgetary uncertainties at the BMWi as well as to the retroactive approval of projects, posing a challenge for the research centers with regard to the need for a short-term provision of personnel and an accelerated project execution. Meanwhile, the problem of retroactive approvals has been overcome by virtue of the fact that the project start date is scheduled at least a month or three after the date of approval.

Given the specific design of the system, a certain number of projects are generally being "piled up" due to budgetary restrictions. Although being classified as eligible for funding, these projects do thus not have a realistic chance for being funded. In general, the problem of waiting times in case of good project proposals, which had however received a worse rating, and with that the problem of delayed project starts, cannot be completely avoided. The BMWi is constantly funding the best-rated projects over the year and shall pay due regard to ensure a balance between cash funds of the current financial year and the available financial resources for future years.

Waiting periods cannot be completely avoided for system-related reasons and due to budgetary restrictions.

The long waiting time for funding for up to 18 months in case of project proposals recommended for funding by the evaluators is meanwhile addressed by means of the IGF portal, allowing for an improved communication. Thus, research associations are now given the option to increasingly withdraw their project applications with a low probability of being funded, and to revise their concepts.

Proposals may be withdrawn for revision.



### 3.2.3. Project Execution

#### Project Progression and Role of the Project Support Committee

The 30 IGF projects considered in an ex post evaluation have largely proceeded as scheduled. Where there were delayed project developments, the projects could have been cost-neutrally extended without noticeable impact on the projects' results. In approx. 10% of the examined projects, no major technical problems had occurred that could have led to an inadequate achievement of the pursued project objectives. The fact that not all projects have recorded a target-compliance ratio of 100% lies in the principal nature of research projects associated with risks.

The project support committees are an important instrument for the alignment of the projects to the industry's needs and for the transfer of results.

Over the last years, research centers and research associations have attached greater importance to the role and relevance of project support committees (PSC). Some research association have started to increase the number of companies in the project support committees on their own initiative beyond the required minimum number of at least three members from the economy (of which half or five being representatives of SMEs). On the one hand, this can be explained with a meanwhile stronger focus of the evaluators on the composition of the project support committee. On the other hand, some research associations have also made the experience that project support committees generally use to have positive effects. In 2010, in only 10% of the projects the project support committees had less than six companies involved when the project proposal was submitted. In some research centers, enquiries raised by companies in the course of a project are answered by inviting them to the project support committee. In projects with a given broad interest, the project support committees may then consist of more than 30 people throughout the entire project despite a higher fluctuation. Given the broadly staffed project support committees, positive effects can be expected with regard to the transfer of project results.

In the period from 2005 to 2010, almost two third of the project support committees have held meetings at least twice a year, whereas the committees of academic institutes tended to meet more frequently, and while 43% of the non-academic institutes used to have only annual meetings.

Companies are largely represented in the project support committees. Also industry associations and public authorities are of relevance.

The survey of the research centers shows that representatives from SMEs had participated in all project support committees, large companies in at least 85% and industry associations as well as other researchers had participated in 41% or 47% of the projects. Stakeholders from authorities and other NGOs had all the same been represented in about 16% of the project support committees. This is likely to be the case where projects had focused on norms and standardisations. The participation of representatives from public authorities in the project support committees has so far proved to be more difficult, since they are suffering from a lack of resources.

It has been confirmed that companies or SMEs, respectively show a stronger commitment in the project support committees if they had been intensively involved in the project genesis before. Conversely, SMEs tend to reduce their commitment to the project support committee significantly if they had found difficulty in the formation of the project support committee as well as in finding relevant project partners. In addition, a higher commitment correlates positively with the frequency of the PSC meetings held within a year, the experience of the responsible project manager of the research center with the execution of IGF projects, the efforts of different actors to disseminate relevant results as well as with the utilization of the project findings by SMEs.



The overlapping of response categories in the survey of research centers reveals that SMEs and large enterprises influence each other in a positive way in the project support committees. SMEs tend to be more active, and there has been little indication that large enterprises are dominating SMEs. On the contrary, the commitments of both provide a positive way of reciprocal influence and are primarily affected by the relevance of the project contents, respectively. This may also be related to the partially existing interrelations between SMEs and large enterprises within value chains.

Almost onethousand companies of the about 1,600 enterprises that have participated in the survey of companies had also been involved in at least one of the project support committees within the period from 2005 to 2010: 30% of these companies had participated in up to two, one third in three to five and 37% in at least six project support committees, and had thus demonstrated a relatively intensive commitment. The last category is fundamentally made up by large enterprises, most probably owing to their greater tendency for research activities. This also means that different departments or operating entities of companies use to work on varied topics and are sometimes involved in different research associations.

The following figure depicts the various aspects of the project support committee in a summary. 97% of the companies stated that they would most probably again participate in future project support committees, underlining their high relevance to the companies according to their perception.

The information policy with regard to the project development was largely appreciated, even though most of the suggestions for improvement presented in an open interview session were hereto related. These are mainly concerning the requirement to hold two PSC meetings per year, the quality and (online) availability of information on the project progress between the meeting as well as the composition of the project support committee, as improvements were sometimes considered to be needed with regard to the latter.

A large share of 87% expressed a positive opinion concerning the possibility to influence the project development. Also the interviews conducted with the company representatives of the 30 projects analysed in an ex post evaluation revealed a likewise high satisfaction with the quality of the project support committees' work. In a few cases, a conflict of role between the concerned research center and companies in the project support committee was described regarding the focus of the projects. In these cases, it is necessary to involve the companies in the development of the project ideas or to make sure that the first meeting of the project support committee is held at an early stage already, and that the research association takes over a moderating role, implying an intervening function in the case of disagreement.

Companies along the value chain are seen by far more important to the project support committee than competitors. It seems that a regular feedback on the PSC meetings in the sense of a continuous quality control of the process is not being collected in all cases yet. Some research associations are asking the PSC members to provide their feedback in written form upon completion of the project, describing their positive experience.

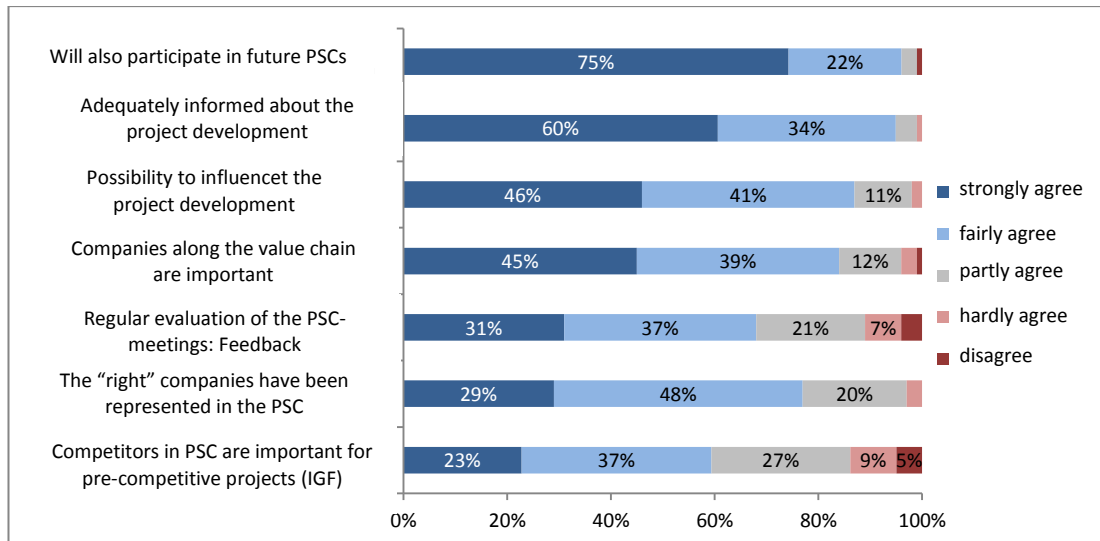
**SMEs and large enterprises are mostly showing an intensive commitment to the work of the project support committees.**

**Nearly all companies would like to participate again in a project support committee, when they had once been involved.**

**Not only the research centers, but also the research associations play an important moderating role for the work progress in the project support committee.**

**The collection of a written feedback of the PSC members upon project completion should become a standard practice.**

**Figure 6: Which of the following statements about the Project Support Committee (PSC) are true?**



Source: KMFA/iit company survey 2013; N = 939 companies participating in a project support committee.

**Primary benefits of participating in a PSC:**

- Improvement of the competitive situation
- Insights in R&D trends
- Adjustment of the project to practical requirements
- Networking with players along the value chain and competitors
- Recruiting of new talent

The motivation for participating in a project support committee is multifaceted and can be summarized as follows. The companies are expecting an improvement of their competitive situation; they hope to gain insights in current research and technology trends at an early stage, and thus to gain a timely information advantage over non-members. Furthermore, the companies are appreciating the given potential to influence the projects' development, hence allowing for an adjustment of research to practical requirements and to derive the greatest possible benefit for their own operations. And not least, the networking argument is of major relevance. The project support committee is considered an important platform for the exchange of information and provides an opportunity to get in touch with industry participants and research partners, but also with regard to winning new customers or recruiting new talent. Sometimes, the companies further mentioned the exchange with competitors in the project support committee as a positive experience; whereas the interview partners also stated that open discussions were only possible if the competitive situation had not been too intense.

The company survey moreover revealed that the companies were also often involved (73%) in their research associations when defining research issues. Precompetitive projects without public funding had been carried out by about 38% of the companies within the research association.

The companies that had consciously participated in at least one project support committee had also provided the most resources (provision of premises for PSC meetings and the like), project-related contributions in kind, services (according to their own information) with approx. 70%. Still 60% of the companies stated that they had provided testing facilities and appliances, whereas project-related payments were least popular with about 25%.

It is noteworthy that more than 40% of the companies stated that their participation in the project support committees would have led to an initiation of further research cooperations with other enterprises, also beyond the IGF. The large share reflects that apart from publicly funded projects, a considerable number of research associations are also executing own industry-funded research projects. As a result of the precompetitive IGF research, follow-up projects are implemented, sometimes also in cooperation with other enterprises (see also the 38% of the companies that had carried them out within the research association according to the above mentioned survey results). As a further side effect, 10% to 15% of the companies had been able to open up new sales channels through the contacts of the PSC members.

About 38% of the companies have also carried out internally funded, precompetitive projects within the research association.

It can therefore be said in summary that the project support committee plays an essential role for the concrete design of the projects, the transfer of results and also for the genesis of follow-up projects. In addition, it also contributes to the initiation of industry-funded follow-up projects.

### 3.2.4. Status and Results of the Introduction of the Competition-based Procedure

Owing to the introduction of the competition-based procedure, smaller companies and research associations with an own research center tended to feel threatened in their existence. This applies particularly for the last-named group, as this had been constantly financing a core pool of staff in the past, including a very high IGF percentage.

Nevertheless, the competition is generally related to a degree of uncertainty. Strategic approaches to alleviate the uncertainty as to the projects' financing are based on the improvement of the quality of the own research proposals and on risk spreading, by considering other funding sources for the respective R&D portfolio, respectively, or by simply increasing the number or project proposals. It can be confirmed that all three strategies are followed by the research associations: The number of project proposals has likewise increased, as their quality has improved; in some research associations, diversification strategies in terms of funding programmes to be chosen can also be observed.

The research associations have varied strategic approaches to cope with the competition-based procedure.

It can be concluded from the qualitative interviews and online surveys that the introduction of the competition-based procedure is generally seen in a positive light by both, the research association as well as by the research centers, owing to its impact in terms of quality enhancement of the project proposals and a greater transparency. In the meantime, the interview partners have also expressed their concern about the fact that long-term planning had become more difficult due to the greater uncertainty regarding financing.

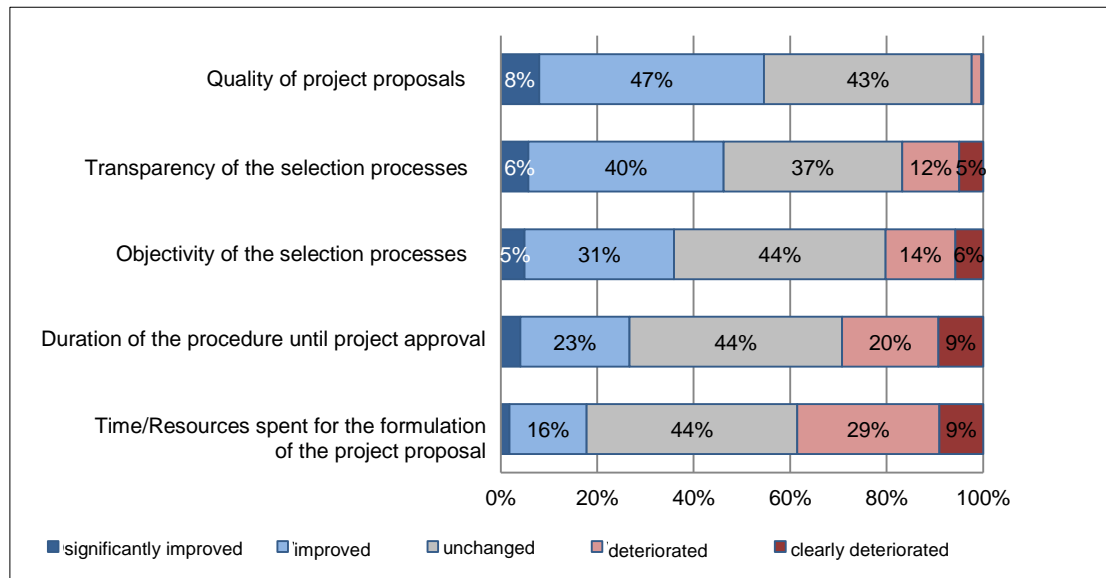
The following figure illustrates the changes perceived by the research centers since the introduction of the competition-based procedure. The efforts taken to formulate the project proposals have increased according to almost 40% of the interviewees. As a consequence, the quality of the research proposals has improved. This change tends to be increasingly perceived by project managers at non-academic institutes.

Divergent interpretation is given as regards the change of the proceeding's duration. This can be explained with the increased number of project proposals and the hereto related waiting lists for projects to be funded in the period from 2010 and 2011 with a simultaneous acceleration of the administrative procedure over the past years.

Almost 50% of the project managers felt that the competition-based procedure had created a greater transparency in the process of project selection. In contrast, only about 35% as-

sumed an increased objectivity as regards the selection process; about 20% even saw a deteriorating trend. This refers to the aspect of the evaluation process which had been quite critically scrutinized.

**Figure 7: How do you evaluate the changeover to the competition-based procedure with regard to the following aspects?**



Source: KMFA/iit survey of research centers 2011/2012; N = 275. This question was exclusively posed to project managers with at least six years of experience with IGF projects.

The previous evaluation conducted by the RWI/WSF outlined that the introduction of the competition-based procedure would possibly cause problems to smaller research associations due to the likely loss of planning certainty. Especially for small research associations with a rather insignificant number of projects in execution, the one project according to funding average had been of high importance and in the case of one to three current projects, even vital to the research association's existence. This can lead to an increasing competitive pressure for the research associations, which may even result in mergers or the dissolution of existing research associations.

Whether small research associations will be able to effectively compete, and how they respond to the competition-based procedure still remains to be seen.

As the analysis of the monitoring data covering the years from 2005 to 2010 has provided only first indications, but did not contain a clear provision, as to whether smaller research associations would actually experience structural disadvantages impeded by the system's change (abolishment of the quota procedure, revision of the evaluation process for the benefit of a stronger weighting of the industry relevance.), a final conclusion cannot be drawn yet. In general, however, it can be assumed that smaller research associations will be exposed to a stronger competitive pressure. Competitive advantages of larger research associations are not only based on the fact that their larger pool of resources allows for the elaboration of more research proposals and thus for the development of a systematic learning process;

they lie moreover in an additional learning effect triggered by the parallel activity of managing directors of larger research associations in the review committees of the IGF.

## Evaluation Process

The review system of the IGF includes ca. 500 experts working on a voluntary basis to enhance the technical quality of project proposals, of which 180 are organised in expert groups (EG). The remaining 300 people of the expert pool are consulted as special technical advisers on a case-by-case basis, notably when interdisciplinary topics are concerned. The experts act in an honorary capacity. Motivating aspects for their participation are mainly related to the associated reputation and the expectation to profit from a broad-based learning effect resulting from the conducted evaluations (including the company visits in individual cases).

The AiF, in close collaboration with the BMWi, based on the recommendations of the previous evaluation and substantiated by a special report in the context of the current evaluation, (1) has developed a new questionnaire with appropriately revised criteria and a new evaluation scheme, and (2) re-arranged the pool of experts by increasing the number of SME representatives.

Amendments made to the expert questionnaire included the aspect of industry relevance of the project proposals (on the basis of a separate request), the preparation of fundamental items for norms and standards as well as a bonus for interdisciplinary cooperation in line with the integration of the ZUTECH programme into the standard procedure. To simplify the procedure, the evaluation process has meanwhile been freed from content restrictions, the evaluation period has been fixed at a four-week's delay, and in contrast to the recommendation of the RWI/WSF, the intervals of the review meetings have remained unchanged being held biannually.

In 2011, a new election code was adopted, which provided the basis for the 2012 experts' election for the years from 2013 to 2015. Hereby, 146 expert positions had to be filled. 353 candidates had been put up for election (thereof 16 women = 4.5%); 145 candidates had not acted as AiF evaluators before. Finally, 39% of the experts appointed were new evaluators. The expert groups were composed equally by economic and scientific stakeholders, whereas representatives of research and industry associations count as representatives from the economy. 43% of the economic stakeholders do now originate from SMEs according to the IGF definition. The remaining 57% are distributed, inter alia, between large companies and after all 20 research associations. In the survey of research centers and also in the interviews, the participation of representatives from research associations as review experts has occasionally been criticized due to an incompatibility of roles.

The question related to the objectivity of the experts has led to polarizing results, also in the survey of research centers: Only about 50% had given a positive assessment (very good); according to almost 20% of the researchers, the objectivity of the evaluators was hardly ensured (sufficiently or insufficiently). The latter group of interviewees had particularly criticized the option to take up different roles within the IGF system, which can, in their judgment, not be agreed with the role of an evaluator.

About 500 people are working as experts for the IGF on a voluntary basis.

The review system has been revised in the course of the evaluation already:

- 40% new experts
- Adapted evaluation scheme outlining the relevance to a given industry

The objectivity of the experts polarises. One fifth of the research centers have a critical view though.

A maximum of 12 evaluation reports per expert would be an optimal annual workload, but may not always be complied with.

In 2010, each expert evaluated eight to 15 research proposals on average, whereas the upper limit seems to be quite a very high load for individual evaluators. The AiF currently tries to limit the experts' workload to a maximum of twelve evaluation reports per year, what is not always a manageable task, as it is difficult to anticipate the number of proposals submitted to a specific group of experts for review. Thus, in spring 2013, EG N°4 recorded twelve expertises per evaluator for the first half of the year already. This issue was addressed by co-opting two more experts.

It can thus be concluded that the recommendations for action given in the previous evaluation and in the special report of the present evaluation have been taken seriously, and have already led to a number of reforms. Therefore, the described analysis partly resembles also a retrospective. The reforms made in 2013 to adapt the review system will be subject to a separate analysis to be conducted after several years.

### **Rule for Projects to be Dropped According to the Funding Average**

As of January 2013, the quota procedure has been completely abolished with the adoption of the new funding directive of the Industrial Community Research (IGF). However, every research association may now apply upon separate request for two bonus points to be awarded for a project of their own choice with particular relevance to the respective industry. Given the competition-based procedure, this does only make sense if a project has already received a high scoring anyway, and if it could be lifted over the approval threshold when receiving the extra scores for industry relevance.

In the past years, the majority of the research associations have made use of the option to submit a project proposal according to the funding average rule. Thus, numerous research associations have taken advantage of this possibility and use to promote research projects with a high relevance for the respective industry, but with a rather low degree of innovation, such as e.g. standardisation or industry-related interdisciplinary projects. In the cases of these project proposals, the submitters were assuming a rather low rating according to the old evaluation forms. Some research associations had chosen the project according to strategic aspects, or with the purpose of closing "gaps" resulting from the competition-based procedure.

### **Formation of Project Families**

If IGF projects are built on previous projects, they mainly include IGF-funded projects and only to a smaller extent, projects that are funded from resources of other support schemes of from the research budget of the research associations themselves within the scope of feasibility studies.

Owing to the strategic processes of the research centers, in combination with the prioritisation of research issues, it is not unusual that the IGF funding encourages the establishment of entire research lines. Also projects which are not directly related to a previous IGF project are usually embedded in thematic "project families".

Not infrequently, research lines are established in the IGF in the sense of thematic "project families".



### 3.3 Transfer of Results and Achieved Effects

#### 3.3.1. Transfer Channels and the Provision of Support

##### Role of Research Associations and Research Centers in the Transfer of Results

Whereas there is largely common and clear understanding of the respective roles of research associations and research centers in the submittance of project proposal and executing of projects, this is mainly, but not always the case in the transfer of project findings. The transfers to be made within the scope of the project are already fixed in the research proposal. The actual implementation goes however beyond the project period, and requires a clear division of duties and a monitoring between research associations and research centers. Nevertheless, about one third of the project managers of the research centers stated that they did not know, whether the major part of the consulting services was carried out by the research center or the research association in a concrete project.

The 30 projects analysed in the ex post evaluation have shown that the transfer of results is seen as a responsibility of the research centers by many research associations. This is obvious by virtue of the fact that the research centers compile an overview of the results, maintain direct contacts with the companies of the project support committee, and may eventually have contacts to other companies contributing to a transfer of results. As it has already been pointed out in the previous evaluation and also specified in the funding directive of the Industrial Community Research of 2009, the research associations are institutionally responsible for the transfer of results and should also not be released from this obligation.<sup>6</sup> Only a joint and high commitment of the research associations and the research centers together can ensure that all appropriate information channels will be covered. This requires a clear division of duties and a close coordination between research center and research association.

An analysis of the different actors being involved in the dissemination of project results shows which channels are primarily used to transfer the project findings to economic stakeholders. The research centers also view themselves as bearing the prime responsibility for the transfer of results followed by the research associations and the members of the project support committee.

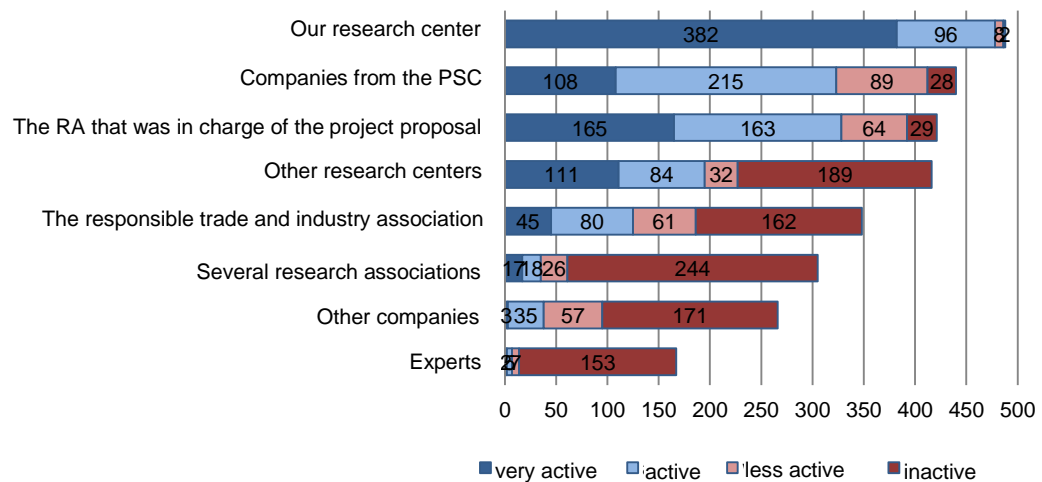
**The transfer of results should primarily be the main responsibility of the research associations. Nevertheless, the research centers have also a major role to play here.**

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<sup>6</sup> BMWi 2009. Funding Directive of the Industrial Community Research and Development of 3<sup>rd</sup> November 2009, Federal Ministry of Economics and Technology. Federal Gazette 176: 4145-4149.



**Figure 8: Who was involved in the dissemination of the results of the IGF project to the economy?**



Source: KMFA/iit survey of research centers 2011/2012; N = 488; difference to 488 is the category „not known“.

61% of the research centers indicated that at the time they were interviewed, they had already provided advice and support to the concerned companies for implementing the project results. Hereby, non-academic institutes were a little more deeply involved (67% vs. 55% as regards academic institutes).

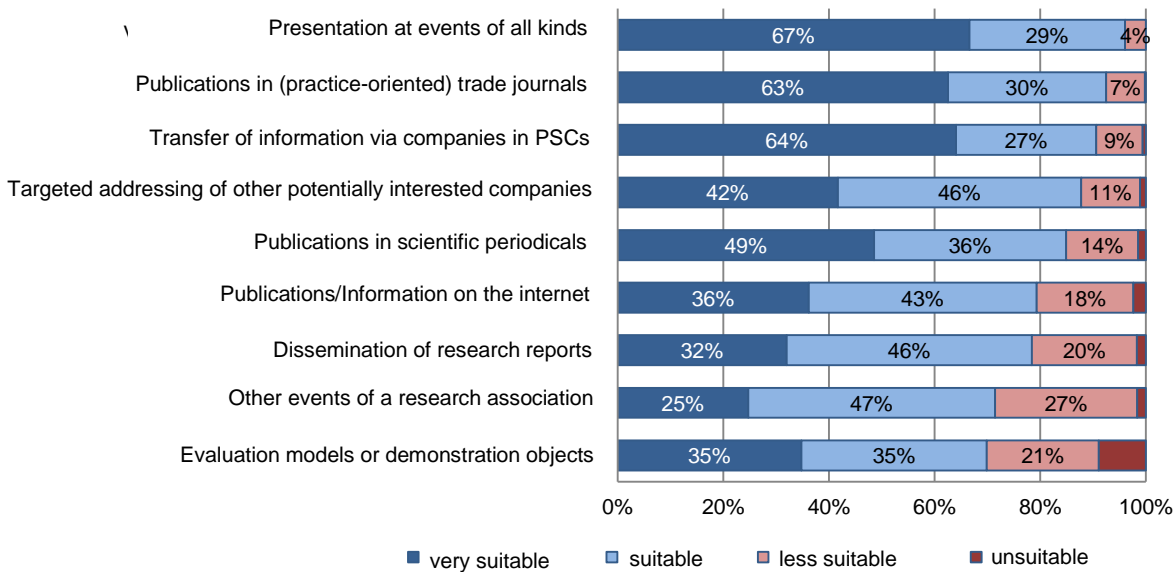
### Transfer of Results from the Perspective of the Research Centers

In answering the question, as to which measures would be particularly suitable for the transfer of results from the viewpoint of the research centers, a good two thirds of the interviewees had described the following channels as very conducive to an effective dissemination: (1) Presentation of results at events of all kinds (seminars, conferences, trade fairs, press conferences, etc.), (2) publications in (practice-oriented) trade journals as well as (3) the transfer of information via companies in project support committees. But also scientific publications and the targeting of companies are considered as „very suitable“ by 49% or 42%.

#### Particularly suitable instruments for the transfer of results:

- Events
- Publications
- Project Support Committee

**Figure 9: How do you evaluate the suitability of the following measures for the dissemination of results?**



Source: KMFA/iit survey of research centers 2011/2012; N = 482.

### Transfer of Results from the Perspective of the Companies

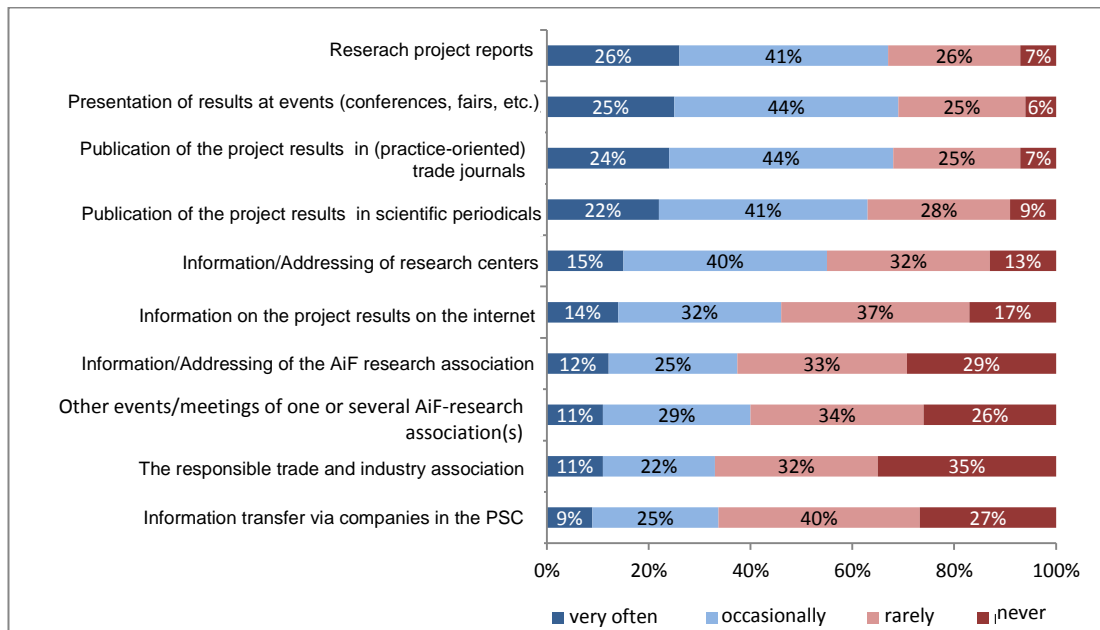
The companies have been asked for the sources they are generally using to get informed about the results of IGF projects, if they are not actively involved in the project support committee. The following figure illustrates that the major sources include final reports, events, practice-oriented and scientific publications, followed by the direct approaching by research centers, and information provided in the internet.

A comparison with the survey of research centers shows that the suitability of transfer instruments was correctly assessed in most cases.

The role of the final project reports, as an effective communication tool alone, seems to be slightly underestimated by the research centers. Companies definitely want to examine the detailed records, and usually receive the documents by the research associations. The direct transfer of information to companies in the project support committees is rightly considered as very important by the research centers. However, less frequently, the results are disseminated via other companies in the project support committees, in the sense of a transfer to a much wider range of enterprises, and - if so - then in such cases where companies maintain close relations with the research associations and/or the IGF anyhow. It is somewhat alarming that a large part of the companies' staff responsible for innovation felt that the AiF research associations as well as the industry and trade associations had rarely or never informed them directly about the IGF project findings.

**The direct communication between research associations and companies as well as the transfer of results via trade and industry associations could still be enhanced in some cases.**

**Figure 10: Which sources do you generally use to get informed about the results of IGF projects, i.e. if you are not a member of a project support committee?**



Source: KMFA/iit company survey 2013; N = 1.545

In the interviews held within the scope of the project evaluation, all measures have furthermore been described as conducive to an effective dissemination of results that had led to a direct contact between research centers and representatives from industry. As regards the dissemination of results in written form, it was frequently mentioned that information should, first of all, have been prepared for a practically oriented dissemination and moreover, that the digital distribution of the results via email, etc. was not yet common practice. As further measures for an effective dissemination, the interviewees mentioned demonstrators, cooperation agreements with associations, staff transfers to industrial enterprises as well as internet-based social network solutions for the creation of virtual communication platforms.

### Leverage of Unused Potential for the Transfer of Results

The evaluation has equally demonstrated that there was still unused potential as regards the transfer of results. In the survey of companies, for instance, more than 60% of the enterprises had given the feedback that the dissemination of the IGF results among businesses should have been enhanced. This is a clear indication that the transfer of results via economy-related instruments could be further intensified. The existing potentials are however varying, depending on the respective industry and thematic focus of the research association. The potentials of research associations dealing with interdisciplinary issues across industries as well as of sectors with a large number of smaller enterprises can certainly be assessed as higher.

The transfer of results leaves unused potential, depending on the industry and research issue.

As described under the item “Project Implementation“, the feedback of the PSC participants on the projects’ development, the achieved results and their follow-up after project completion or at a later stage is not yet being systematically recorded. This could contribute to improve the state of information about executed projects.

### Advantage of a Transfer Plan

In the project proposal, a „Plan for the Transfer of Results to the Economy“ is outlined. This transfer plan has to be updated in the course of the project, by complementing the implemented and eventually new measures envisaged, and is integral part of the interim reports and the final report.

An analysis of project reports has also revealed that in most of the projects, apart from the presentation and discussion of results in the project support committee, the transfer activities indicated in the transfer plan, which will then later be implemented, are of a scientific nature, notably if the research center is attributable to the academic sector. Thus, typical instruments for the dissemination of results include lectures at industry congresses, articles in trade journals and the publication of the final report. Furthermore, more business-related forms of transfer are increasingly applied, such as e.g. the presentation of the results at trade fairs and at events of industry associations, the publication in industry magazines and newsletters as well as direct consulting of companies as regards the findings.

The activities specified in the transfer plans are rather of a scientific nature.

But business-related formats are equally used.

With regard to the transfer issue, there is meanwhile a greater sensitivity among both, the research associations and the research centers. Thus, the interim and final reports examined within the scope of the project evaluation as well as the conducted interviews have clearly revealed that the measures specified in the transfer plans have largely been implemented and considered as appropriate and conducive to the projects’ success.

### Obstacles to the Transfer of Results

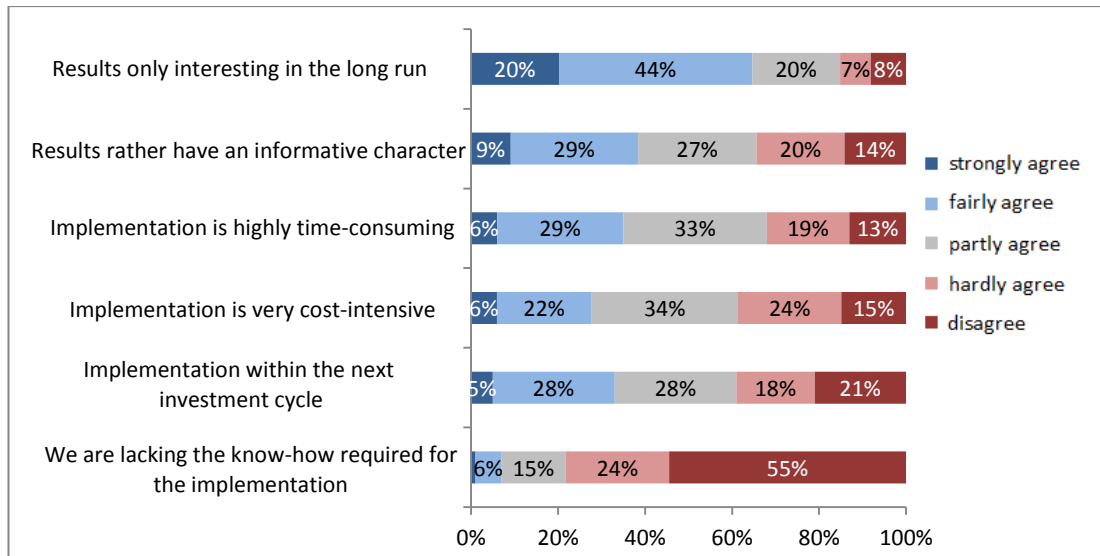
In the survey of companies, the interview partners were asked to evaluate existing barriers for the transition of project results. The most noteworthy result is that there was only a relatively minor group (companies without a continuous own R&D activity) that had perceived the lack of corporate know-how as problematic. This reflects the strong focus of the IGF projects on practical industry demands.

The lack of know-how is virtually no barrier for the transfer of project results.

The most relevant reasons for the non-transition of project results (so far) are lying in the character of the pre-competitive projects. The findings are interpreted by the companies as “interesting in the long run” and as informative in nature. Also projects providing fundamental items for norms and/or standards will not necessarily be followed by an internal implementation.

The non-transition of project results so far is often due to the long-term nature of the IGF project results.

**Figure 11: If a transition of the IGF project results has not (yet) been realized in the company, what are the reasons behind?**



Source: KMFA/iit company survey 2013; N = 838 companies participating in a project support committee.

Being hardly surprising, as already often specified in the innovation-related literature, the following facts can be concluded from the IGF survey: The less the R&D intensity of a company, the higher the demand for external supports as regards the utilisation of project results. Or formulated differently: The companies' capacity to absorb the IGF project results depends on the R&D headcount employed by the company.

Companies wish for a practically oriented preparation of the project results.

Also in the interviews of the project evaluation, the interview partners have been asked for their opinion about the greatest barriers for the transition of project results. Frequently mentioned were the communication barriers between the researchers and industry. As a consequence, the project results should be oriented in their formulation in publications and presentations for potential users as closely as possible to actual practice. In many cases, scientifically structured reports and articles in trade journals as well as technical lectures held by researchers do not comply with these requirements. A further obstacle to the transfer or research results is posed by the fact that SMEs do sometimes not have a dedicated contact person for research issues. In contrary, the contact persons on the part of the research centers are frequently changing, so that it is difficult from an SME's perspective to establish long-term relationships. According to certain research associations, difficulties in the transfer of results may also occur, when SMEs lack sufficient financial resources for the further development of findings from the IGF projects for their own purposes. In comparison to the survey results, this aspect has played a role for ca. one third of the companies.

### Cooperation Partners for the Transfer of Results

The majority of the interviewed research associations do not maintain any cooperation specifically focused on the transfer of results. In fact, relationships are usually maintained to other institutions on a technical-basis, which are finally also used for the purpose of transferring research results. Thus, most of the research associations do notably use their contacts to industry associations and research centers for the transfer of results. With regard

Numerous professional relationships of the research associations to other institutions are supportive in the transfer of results.

to projects dealing with norm and standard setting issues, the DIN as well as other compliance-relevant organisations of various sectors are further important cooperation partners.

### **Support of the Transfer of Results by the AiF Secretariat**

The interviews held with the research associations have clearly shown that the transfer of research results was primarily seen as a duty of the research association itself and/or of the research centers. An even wider support through the secretariat is evaluated as less effective, since the research association and/or research centers use to maintain a closer contact to the envisaged target industries and companies, and could hence implement the transfer of results more efficiently.

**The AiF secretariat can support the transfer of results on a higher level in selected areas.**

Within the scope of the present evaluation, a Good Practice Guideline for the transfer of results has also been elaborated, presenting measures that go beyond the instruments already being applied as a standard.

### **3.3.2. Contribution and Relevance of the Results**

#### **Benefit and Relevance of the Results for Companies and Industries**

Within the scope of the regular monitoring, the direct project results were collected in the research associations and research centers upon completion of the project. A total number of 2,975 IGF projects were supposed to have created a large yearly scientific-technical benefit of 70%-80% within the period from 2005 to 5/2011, which corresponds to an annual average of 75%.

An over the years fairly constantly high economic benefit for SMEs was attributed to about 55% of the projects. Despite the pre-competitive character, an industrial use was already given in 17% of the projects; in a further 53% of the projects, this was anticipated for the near future; about 11% did explicitly not meet this criterion, and in further 29% of the projects, an industrial use was not foreseeable at this stage of the survey. The utilization rate, shortly after project completion, can be explained with the projects' strong focus on application as well as with the "instrument" of the project support committee. In the project support committees, experiments are, for instance, sometimes carried out in the companies directly, further developed upon project completion, and finally integrated in the business operations.

**According to the monitoring data, the economic benefit of SMEs is rated high in about 55% of the projects, and the technical benefit in 75%.**

**Table 2: Industrial application of the results, project completion 2005-5/2011**

		Number	%
An industrial application of the results is given	yes	275	17%
	no	172	11%
	upcoming	691	43%
	not foreseeable at the moment	455	29%
	total	1,593	100%

Source: AiF monitoring data as of May Mai 2011

The 11% of the projects explicitly not having met the criterion of an industrial application may approximately represent those projects, whose negative results have nevertheless contributed to enrich the knowledge base of researchers and companies, as they have helped to identify the approaches not being worth to further investigate.

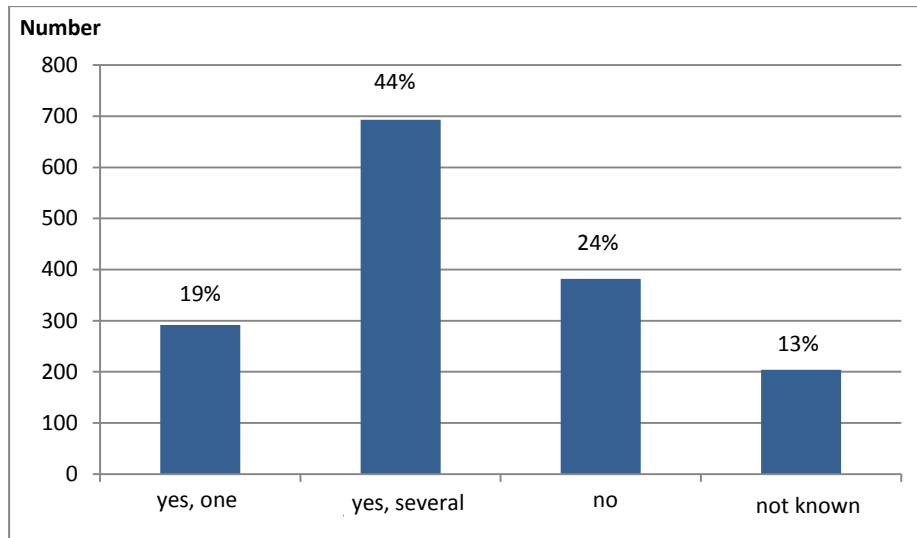
**59% of the IGF projects have contributed to an advancement of processes and 42% to a further development of products.**

The regular monitoring of the IGF projects does moreover provide information on the types of innovation generated in the projects: The emphasis is on the advancement of processes, to which 59% of the projects have contributed; 42% have furthermore contributed to a further development of a given product; in at least 25% of the projects, an innovative contribution was made with regard to the development of a new product, and in 37% with regard to a new process.

The monitoring data on the project results collected by the research associations and/or research centers can be reflected in the company survey, recording the status including a couple of years after project completion (in spring 2013).



**Figure 12: Has your company been using results of one or more IGF projects since 2007?**



Source: KMFA/iit company survey 2013; N = 1,571

About two thirds of the companies stated that they had been using results from IGF projects since 2007: almost 20% had used one project result and further 44% of the companies even several project findings<sup>7</sup>. This should present a lower threshold, insofar as 13% of the respondents had not been able to answer this question. A reference to the structural data of the interviewed companies shows that the continuity of the own research activities had a clearly positive effect on the number of PSC participations, and that the latter had the greatest influence on the internal utilization of the project results.

Those 63% (absolute value: 980) of the interviewed companies which had applied the results of IGF projects in their business operations, described the following tangible benefits, as displayed in the table below: First and foremost, the technology scouting argument was mentioned; in this context, almost 60% of the companies reported that they had derived relevant research issues for internal R&D activities. The enhancement of processes and product(s) (qualities) was another frequently indicated benefit. But also the already above mentioned contacts with potential cooperation partners were given a relatively high weight with almost 50%.

This is followed by feasibility studies (review of ideas, convergence of technologies, etc.) as well as “new processes and products” representing central issues for companies (about 30%).

About 2/3 of the companies have been able to make use of at least one result of an IGF project since 2007.

The tangible benefits for companies arising from IGF projects are numerous.

First and foremost, benefits are seen in the knowledge of technological developments.

<sup>7</sup> With that, the results of the previous evaluation are largely confirmed, in which about 80% of the respondents have mentioned that they had applied the results of IGF projects “in the past”. The present survey referred to a defined period beginning in 2007.

Almost one in ten companies has at least one employee recruited from an IGF project; further 6% had found new staff through the extended IGF network. In 8% of the cases, a (potential) patent application was an issue to be dealt with; in 1% it was a business creation.

About 20% of the companies had realised savings in materials and/or energy.

**Table 3: How does/did your company benefit from the project results? (multiple answers possible)**

	Replies	% of the number of companies
Knowledge about new technological developments	689	70%
Advancement of existing processes	573	58%
Knowledge of research issues of relevance to our company	564	58%
Improvement of the product quality	534	54%
Further development of products from the portfolio	526	54%
Contacts with partners for prospective developments	516	53%
Identification of issues not to be further investigated (feasibility)	361	37%
Introduction of a new process	330	34%
Development of a new product	300	31%
Savings in and/or replacement of materials/auxiliary materials	211	22%
Savings in energy	208	21%
Knowledge as to how to react to legal changes	162	17%
Having recruited an employee from an IGF project	89	9%
(Potential) patent application	83	8%
Having recruited an employee through an IGF network	56	6%
Business creation based on the application of the achieved results	8	1%

Source: KMFA/iit company survey 2013; N = 5,414 replies by those 980 companies that had internally applied the results of IGF projects, completed within the period from 2007 to 2011.

IGF research primarily aims to optimize and further develop existing products.

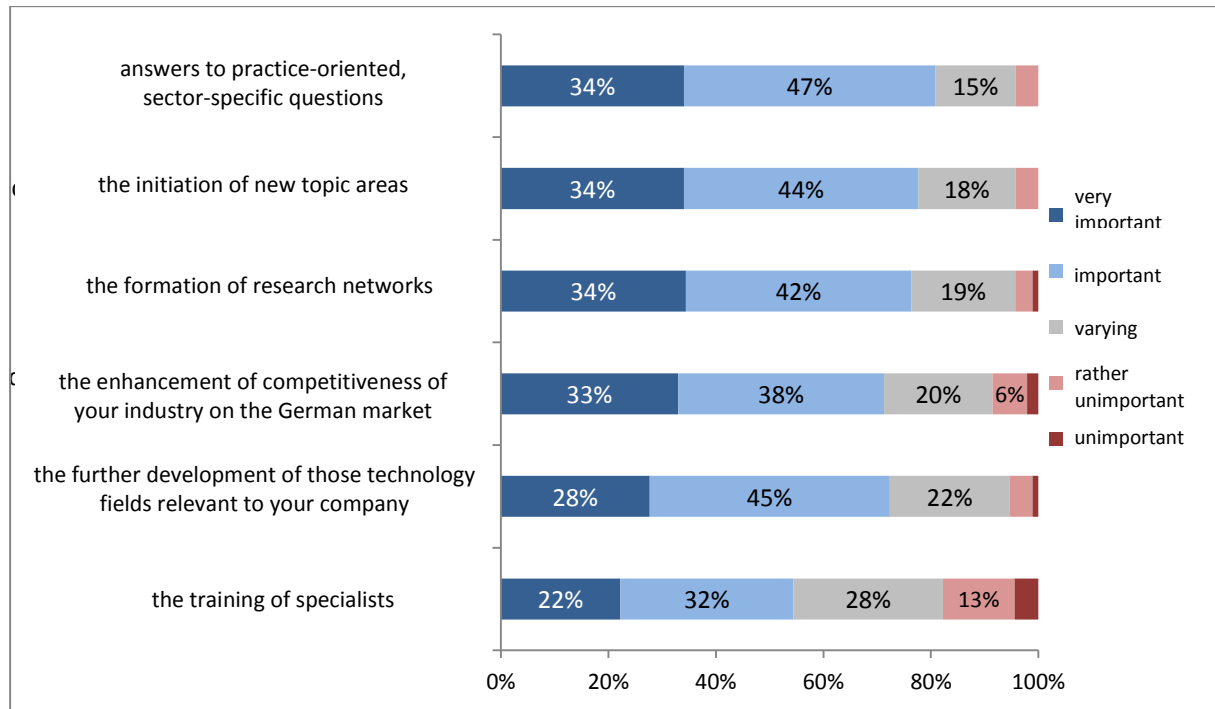
It does however lay also the foundations for the development of new processes and products.

It can thus be concluded that the IGF research primarily aims to optimize and further develop existing technologies, but also to lay the foundations for the development of a noteworthy number of new products and processes. These results are equally consistent with those of the survey of research centers. It is noticeable, though, that the research centers had been more cautious than the companies as regards the assessment of effects, i.e. although research centers are expecting the ranking of effects in companies to be similar, they slightly underestimate the extent of the implementation.

The above outlined tangible benefits of the the companies are also manifested in their evaluation of the IGF's contribution to various aspects. The contribution of the IGF for the handling of practically oriented research issues, new thematic areas as well as the formation of research networks were mostly seen as important or very important.

More than two thirds of the companies considered the IGF also as important or very important for the enhancement of the competitiveness of their industry and/or relevant technology fields. About half of the companies perceived the IGF as a training centre for qualified personnel.

**Figure 13: How do you evaluate the IGF's contribution as regards...**



Source: KMFA/iit company survey 2013; N = 1,578

Apart from the above described effects, company representatives emphasized within the scope of the qualitative interviews of the project evaluation that besides the initiation of further research activities, noteworthy additional effects were related to the area of initial and continuing education. Be it through the development of bachelor- and master papers and/or dissertations within the course of the project, or through the following application of the findings in specialists' trainings. Furthermore, it was mentioned the utilization of IGF project results for the dissemination of innovative methodologies in rather traditional sectors. In addition, interdisciplinary oriented IGF projects in particular, contributed to broadening the horizons of the research staff.

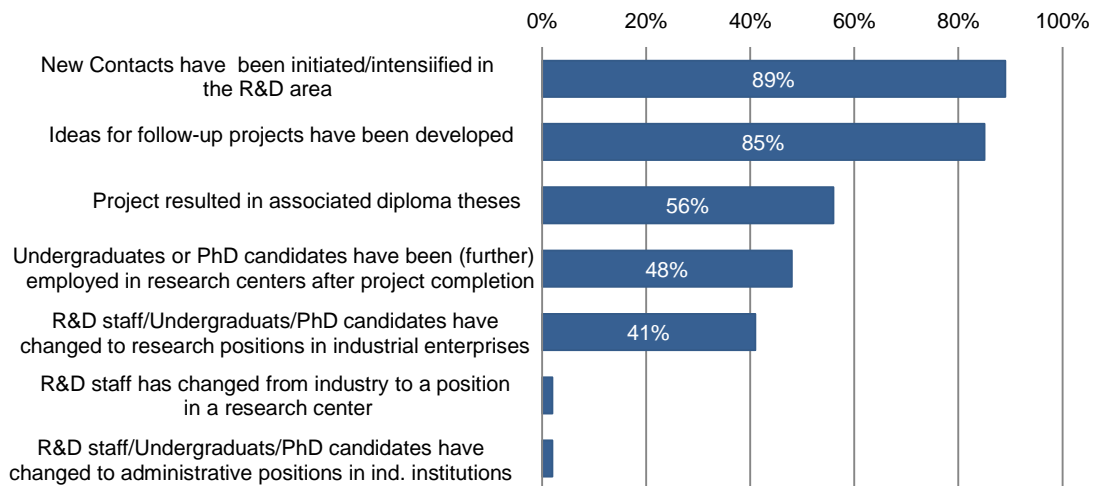
**More than 2/3 of the companies consider the IGF important or very important for the enhancement of the competitiveness of their industry and/or of relevant technology fields.**

### Benefit and Relevance of the Results for Research Centers

The most frequent effects resulting from the IGF projects include the initiation and deepening of contacts in the R&D area as well as the development of ideas for follow-up projects. As displayed in the following figure, these aspects were mentioned by 89% or 85%, respectively, of 494 research centers. 56% of the projects had moreover served as the basis for associated diploma theses, and 237 undergraduates and PhD candidates had been further employed, also after the projects' completion (in 48% of the projects).

With regard to changes of R&D staff (incl. undergraduates and PhD candidates) between industry and research institutes, it turns out that in 41% of the projects, employees had changed from a research center to an industrial enterprise. This was countered by eight people (almost 2%), who had changed from a company to a research institute.

**Figure 14: Which effects did you observe resulting from the IGF project?**

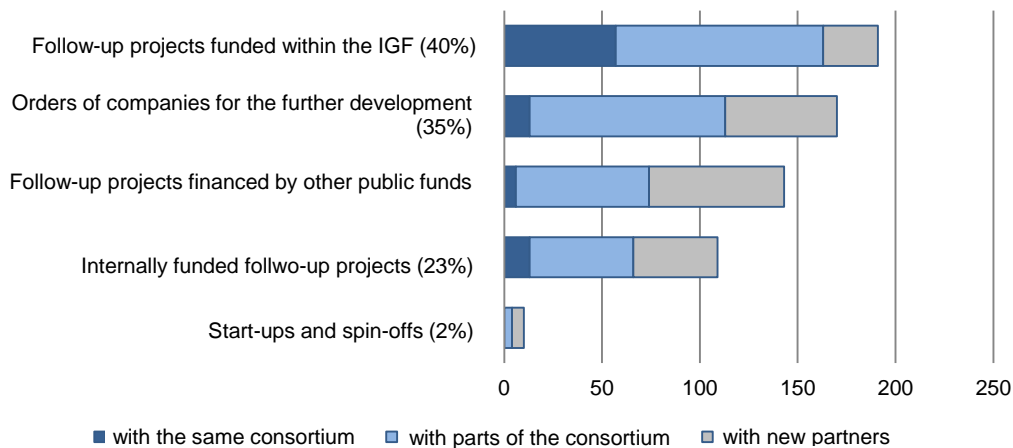


Source: KMFA/iit survey of research centers 2011/2012; N = 1,567 responses given by 438 project managers

**In 71% of the cases, the IGF projects resulted in follow-up projects; thereof 40% within the scope of the IGF and 35% under contracts with industrial enterprises.**

The research results of 482 projects have contributed to follow-up activities within the research centers in 71% of the cases (no figure). The major part of these activities have led to the initiation of associated projects within the IGF in the sense of project families or as direct follow-up projects (in 40% of the 482 projects), partially with other cooperation partners. In 35% of the cases, the follow-up projects had been implemented under contracts with industrial enterprises. In 30% or 23% of the cases, the initiated follow-up projects had been financed publicly or from own resources. By the winter season 2011/2012, ten start-ups and spinoffs, respectively, had been created on the basis of the IGF findings (about 2%).

**Figure 15: Did the project findings result in follow-up activities in your research center? If so, ...**



Source: KMFA/iit survey of research centers 2011/2012; N = 343; multiple answers possible.

From the 143 follow-up projects funded from other public resources (30%), 116 respondents have also been able to specify the respective source. 25% of each of them had been funded under the ZIM program or by the DFG.

The IGF does also contribute to the qualification of young researchers and other employees for the industry. The average team of five people (median: 4) working in a project had been composed by two undergraduates, one PhD candidate and up to two employed research associates.

Taken into account the average staffing of the project support committees with company representatives as well as the results from the survey of research centers, it can be concluded that in 40-45% of the IGF projects, at least one young researcher would be recruited by a company after project completion; in the case of the other half of the projects, undergraduates and PhD candidates had adjacently be (further) employed in the research center.

### Target Groups Benefiting most from the IGF Project Results

The figure below illustrates, from the point of view of the research centers, which target groups had been able to derive the maximum benefit from the results of the IGF projects. First and foremost, the companies involved in the project support committee had been assured that they would profit from the achieved research results (in 91% of the projects at least to a high extent).

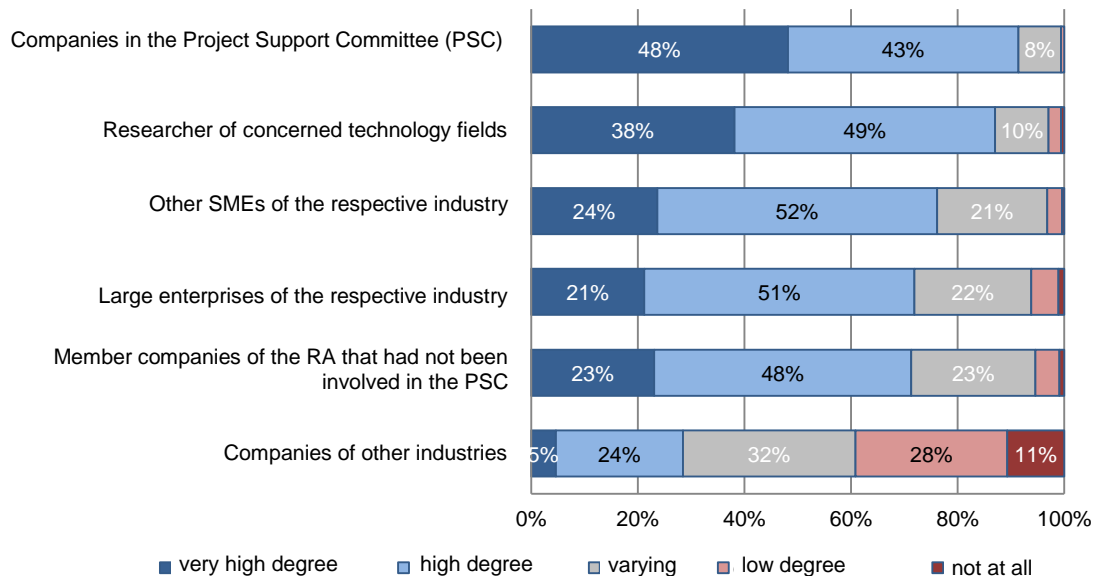
In almost 30% of the projects, it has been assumed that also companies from other industries would likewise, and at least considerably, benefit from the project results. The results point to a high sector orientation, as regards a major part of the IGF research.

**ZIM and DFG are typical support schemes for funded follow-up projects.**

**In 40-45% of the IGF projects, at least one young researcher will be recruited by a company after project completion.**

**Research centers see the greatest project benefit for companies in the project support committees.**

**Figure 16: Which target groups do benefit from the results of your IGF project?**



Source: KMFA/iit survey of research centers 2011/2012; N = 488.

### 3.4 Cooperation of the the Research Associations

#### Interdisciplinarity and Cooperation

The degree of inter- and transdisciplinarity of the projects is specified in the phase of the development of a project idea. The pursuit of interdisciplinary approaches on a broad basis is to encourage the in recent years increasingly observed phenomenon of an on average higher innovative content of interdisciplinary projects. More radical innovations are mostly to be found at interfaces between technologies and/or requirement areas. Being traditionally predominantly organised along industry lines, there was no compelling reason for the IGF to establish interdisciplinary cooperations in the past. This has fundamentally changed in recent years due to individual demand and technology trends and redefined societal challenges (see also the requirement areas of the High-Tech Strategy or the “Grand Challenges” of the Horizon 2020 Initiative at EU level). Not least because of this, the BMWi has started to provide incentives for cooperation activities by launching specific support networks, but also within the scope of the IGF.

With the introduction of the funding modules CLUSTER and “Leittechnologien” as well as with the integration of ZUTECH into the standard procedure (with up to two bonus points that may be awarded for projects with an interdisciplinary relevance), incentives for an interdisciplinary collaboration have already been created. In this context, a general distinction must be made between two levels of cooperation: On the one hand, the interdisciplinary cooperation at research association level, which is relevant in terms of the project design and the transfer of project results; and on the other hand, the collaboration of research centers from different thematic areas.



From the 2,914 IGF projects funded within the period from 2005 to 5/2011, 86% were implemented by a single research association; 11% were carried out by two research associations together; in further 2%, there were involved three and in about 0.5% of the cases, even four or five research associations. The cooperation patterns of research associations are determined by technology trends, institutional logics, and incentives through funding modules. Thematically related research associations are more likely to cooperate with each other. Due to their very nature, research associations with an interdisciplinary approach are looking for alliances across industries. Starting from a rather low level, some research associations have increasingly entered into cooperations in recent years, and several research centers have been involved in the project development and implementation. This trend is clearly related to the implementation of the new funding modules.

**In the period from 2005 to 2011, most of the projects had been carried out by a single research association alone.**

For those 14% of the projects, in which more than one research association had been involved, a simple network analysis has been conducted. As a result, a heterogeneous cooperation pattern has become evident, including some research associations that had been less connected, and numerous research associations with only a few or single link(s). 79 research associations had at least entered into a single cooperation, and further 19 had carried out projects without the involvement of any other research association (further two research associations had not been in charge of an IGF project).

**A small minority of the research associations is well connected, while the vast majority tends to cooperate rather singularly in their projects.**

In the approx. 2,800 research projects that had started between 2005 and 2010 (about 4,300 project participations of research centers), the share of the projects integrating more than one research center has constantly been increased from 37% to 44% over the years. As there had also been individual projects with up to seven research centers involved as a consequence of the funding modules, the average number for the IGF as a whole would be 1.54 involved research center(s) per project.

**The share of projects with at least two involved research centers has increased over the years from 37% (2005) to 44% (2010).**

This has not least been caused by the incentives provided by the programme line ZUTECH. A prospective extension as regards interdisciplinary research issues would not only be likely due to demand-side impulses, but would also be triggered by the integration of the ZUTECH approach into the standard procedure. Also programme lines, such as "Leittechnologien" and CLUSTER will be contributive in this regard. In terms of a direct use of evaluation results, the network analysis served as a basis for an internal portfolio discussion of the AiF in 2013, which contributed, together with the results of the survey, to a broader discussion about good networking practices within the scope of the regional group meetings of the research associations.

The companies in the IGF are definitely interested in topics of several research associations. A considerable proportion of 47% of those companies that have participated in the survey had been actively involved in more than one research associations; 27% even in at least three. Whether companies are cooperating with several research associations, primarily depends on the industry (with larger and multiple research associations) and on the respective company size (for example in the mechanical engineering sector, the automobile industry and regarding chemical products). But also small enterprises are sometimes working together with four to six research associations. Companies in the textile and food industry are acting contrary to the above mentioned trend, insofar as these are relying on one single research association only (81% or 65%).

**Almost 50% of the interviewed companies are involved in at least two, and 27% even in three research associations.**

### 3.5 Status and Development of the Standard Procedure and the Funding Module (ZUTECH, CLUSTER, CORNET, „Leittechnologien”) as well as Their Interaction

The funding modules of the IGF have not been considered in depth within the scope of the evaluation. Nevertheless, the interview partners have been asked for their opinions about the funding modules in the course of the interviews, and the monitoring data have been analysed.

The various funding modules have met with a certain demand. In 2010, about 4% of the sub-projects were attributed to the funding module CORNET, 1% to CLUSTER and 3% to the newly established module “Leittechnologien”.

Particularly “Leittechnologien” shows a growing demand: 60 research associations have followed a call for project proposals launched in January 2013, and presented altogether 44 project proposals.

CORNET aims to promote research cooperation at European level. The CLUSTER projects consist of at least four, thematically closely related subprojects, ranging from fundamental research to projects dealing with the industrial conversion into products, processes and services, whereas the application-oriented projects outside the IGF should rather be funded by the industry itself. As regards the funding module “Leittechnologien”, the purpose is to boost the funding of an interdisciplinary development of future lead technologies through a subproject approach.

The funding module CLUSTER is suitable to address complex issues. In the previous evaluation, it was already outlined that the CLUSTER projects had caused supplementary efforts with regard to the management and coordination tasks: Compared to the standard procedure, an additional effort of about 12.5 man-days was needed for project coordination and organisation purposes, while the major part would have to be borne by the research centers (ca. 60%) as well as by the research associations (ca. 30%) and the companies (10%). The fact that the management efforts were seen as a constraint by the responsible entities was confirmed by the interview partners in the present evaluation. Coordination tasks, however, are not subject to funding, as it is for instance practiced in other, comparable cooperative R&D projects (such as ZIM-NEMO). The interviews revealed that some research associations had consciously decided not to participate due to the expected efforts.

The recommendation given in the previous evaluation regarding the provision of detailed information about the funding modules has been implemented by organising informational events.

In some research associations, CORNET contributes, inter alia, to an internationalisation of activities. The central expectations associated with a participation in CORNET projects, for instance the treatment of research issues of international relevance or the international representation of industry interests, have been met. This was also substantiated in the previous evaluation. The research centers and research associations had moreover benefitted from the knowledge of the project partners and established long-term international cooperations. The assessment results regarding this module gathered in the interviews with the research associations of the present evaluation have nevertheless been ambivalent, as some research associations and/or industries had failed to find adequate cooperation alliances in the partner countries.

The programme line „Leittechnologien“ prompted great demand in 2013.

Some research associations spare the high coordination efforts associated with the CLUSTER projects.

CORNET projects can be implemented with varying efforts depending on the different industries.

The transaction costs of the implementation are sometimes significant.

It became evident once again that the varying funding conditions in the different countries were seen as barriers, which could only be overcome with great difficulty. Also the management of a project with a number of different international partners requires an enormous coordination effort that smaller research associations usually tend to avoid, and therefore decide not to participate in CORNET projects. It was also confirmed that it was difficult to induce SMEs to participate in the international project support committees (SME User Committees). This is mostly due to the additional resources to be reserved for meetings abroad, which usually take two or more days including travelling times and are often related to language barriers.

Furthermore, emphasis is again put on the bottom up approach of the IGF, which is also pursued in the other IGF funding modules. Although being rather top-town-based, the funding module "Leittechnologien" seems however effective as a limited initiative in the IGF portfolio for the bundling of resources to address the challenge of developing future technologies.

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