Final Report

March 2010

SMEpact

Impact assessment of the participation of SMEs in the Thematic Programmes of the Fifth and Sixth Framework Programmes for RTD

RTD-T04-SME-THEMAT-2008

Start date of project: 14 / 01 / 2009

Duration: 14 months

Coordinator: AVEDAS AG

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0 Executive Summary

The European Commission of the European Union is today the largest research financier in the world and its funding activity has a significant influence on the competitiveness of economic agents in the EU as they respond to incentives provided by the Commission. As SMEs have been found to be one of the primary drivers of the EU's economic development, the EC has stepped up its financial support for SMEs in the Framework Programmes. However, critical voices on the part of SMEs and SME stakeholder groups[1] pinpoint the fact that these programmes tend to benefit the 14,000 industrial "big players" leaving SMEs with a relatively low share of EU funds.

In response to the above and with the intention to improve funding conditions for SMEs, this project "Impact assessment of the participation of SMEs in the Thematic Programmes of the Fifth and Sixth Framework Programmes for RTD (SMEpact)" was conducted from January 2009 to March 2010. The project focused on investigating the participation of SMEs in the Fifth and Sixth Framework Programmes (FP5 and FP6 respectively) to better understand the benefits that SMEs have gained from their participation (in FP5 and FP6) as well as the impacts of their participation on the outcomes of the projects under FP5 and FP6.

More specifically, the main objectives of the study were the following: 1) to identify the profile of SME participants in the Thematic Programmes of FP5 and FP6, 2) to assess the role of SMEs in and their contribution to the project implementation and project outcome under FP5 and FP6, 3) to obtain evidence on the economic and social impacts of EC funded research project involvement on SMES in FP5 and FP6 in comparison with that of national research schemes, 4) to identify ways of enhancing thematic programme incentives to produce greater benefits for SMEs, and 5) to develop output and impact indicators of SME performance and a comprehensive system of data collection for monitoring and impact assessment purposes.

To conduct the study, data from the Commission database were cleaned to identify unique organizations which participated in the FP. Data were collected from several sources:

1. Case studies of 120 representative projects (countries, sectors, themes) in FP5 and FP6. More specifically RTD and demonstration projects in FP5 and Integrated Projects (IP) and Specific Targeted Research Projects (STREP) in FP6 were targeted. Each case study included a survey, examination of relevant background material and documents, and face-to-face and/or telephone interviews with the project coordinator, individual(s) at the SME(s) who were knowledgeable about the project, and relevant third-party stakeholders also involved in the project. Project insights from coordinators and third partners served to assess the role of SMEs in and their

[1] e.g. UEAPME-The European Association of Craft, Small and Medium-sized Enterprises

impact on project implementation and outcome.

2. Case studies of 21 projects from seven selected National Funding Programmes with similar characteristics to the EU FPs. The purpose of the control group case studies was to better understand whether there were differences between SMEs participating in FP5 and FP6 and SMEs participating in national research programs programmes in terms of impact.

3. Interviews with EC and National Programme stakeholders.

Analysis of the above data resulted in the following overarching findings:

1. The sheer number of participating SMEs is no longer a key issue. Based on the data cleaning exercise that allowed for the identification of unique organizations, SMEs turned out to be the largest group in terms of absolute numbers of participants/clients in FP5 and FP6. However, on average each SME participates in a few number of projects than research organizations. The number of participating SMEs has increased from 16,4% to 16,9% from FP5 to FP6. Although their share in funding has decreased from 13,2% to 12,4% (i.e., still below the 15% target), the outlook in FP7 is that participation should remain stable or increase slightly whereas funding share should increase due to the increase in SME funding to 75%. This does not mean that efforts to increase participation should not be continued, but that providing (economic) impact should now become the important strategic issue. (See summary statements 0-5 in main report (section 4.5.)

2. SME participation **had** indeed **positive impacts on the FP projects; most SMEs bring added value to the research collaboration partnership.** SMEs bring added value both to the proposal and to the execution of the project by bringing in complementary, specific or unique assets (see summary statements 7, 8 and 9). They are recognized as an important link between industry and science.

3. SMEs are not optimistic about exploitation and economic impact. SMEs usually enter the FP with both technical and business objectives. However, while more than 90% reported a positive impact on technological and / or scientific competitiveness, just half of them have experienced positive economic impact (although available data does not allow quantifying them). Moreover, while SMEs are generally satisfied with their participation and contribution during the FP projects, they generally are not optimistic about exploitation (see summary statements 10 to 17).

4. Based on the case study analysis, SMEs participate in the Framework Programme in a variety of roles. In order to depict the roles and functions SME play in the projects, a typology was developed. **Six types of SMEs were identified based on two dimensions:** 1) the degree of alignment between the SME's objectives and the FP project's objectives and 2)

the degree of involvement of the SME in the FP project. These are represented in the below table. (See summary statement 6.)

Technology Developers vs. Technology Networkers (% of total number of SMEs in case studies)

Technology Developers		Technology Networkers	
Strategic Innovators	21,7%	Experienced Technology Networkers	20,0%
Exploitation Seekers	12,5%	Curious & helpful	23,3%
Translators	17,5%	Free Riders	5,0%

5. Strategic innovators, whose goals are best aligned with those of the FP, represent only one fifth of participating SMEs. Among participating SMEs, it is the group of "Strategic Innovators" (see section 4.1.1) that have their objectives best aligned with those of the FP. These SMEs play an important role in FP projects, often making a substantial contribution to the project as a technology provider. In general, the technology output is competitive to highly competitive and the level of exploitation is high or very high. As a result, the FP's impact on the SME's overall economic performance, including business options, is also high. However, these SME represent only 21.7% of all participating SME**.**

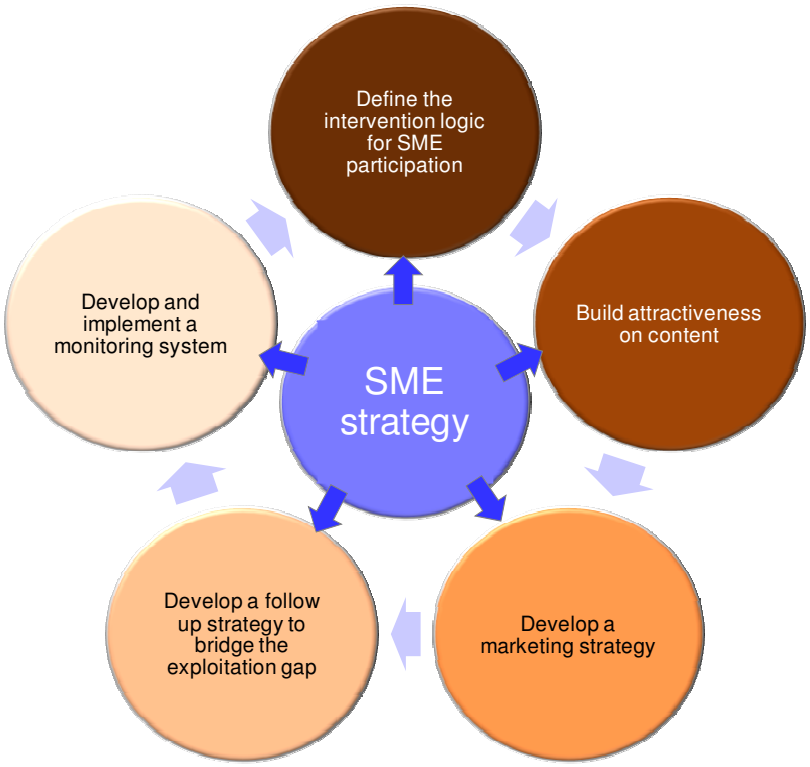
6. Two main routes have been identified to increase impact for these other groups of participating SMEs: bridging the exploitation gap ("Exploitation seekers" – 12.5%; "Experienced technology networkers" – 20%) and developing research themes better suited to SME business preoccupations ("Translators" – 17.5%; "Curious and helpful" – 23.3%).

7. The overall 15% target and the various incentives thematic programmes provide are intended to enhance SME participation, yet the focus should be shifted towards providing greater impacts instead of increasing the number of SME participants. In order to provide more opportunities for exploitation and thus for innovation, an SME strategy will need to be devised for the framework programme. Indeed if the European Union intends to make a significant difference for SMEs in research and innovation and in turn for the European economy that is achieving the EU 2020 objectives, and if the recent development from "research" to "research and innovation" for the distribution of portfolios within the College of Commissioners is of increased importance, **the Commission needs to define, implement and monitor an SME strategy within the Framework Programme for Research** as it is one of the most powerful instruments to achieving such goals through research and innovation. (See summary statements 18 and 19.)

What is an SME strategy in our interpretation? It is a strategy that will aim at recognizing that SMEs do bring value to the projects and should be included in the FP thematic domains suited to their needs. It is a strategy recognizing that business impact is as important as knowledge development for SMEs and that both can go hand-in-hand provided the structure of the FP better suits their needs. This strategy should also allow the Commission to define

its qualitative objectives regarding the intended impact for SME participation in order to complement the quantitative targets set so far.

This SME strategy is supported by five components that are complementary to each other (see below figure). These components should all be designed in detail and implemented once the overarching SME strategy has been developed.



Operational Recommendation 1: Define the intervention logic for SME participation.

Today there is no overall intervention logic for SME participation defining the precise dimensions of impact on SMEs envisaged for the Framework Programmes. The only input indicator is that of the 15% budgetary target to be allocated to SMEs from the framework programme budget. Furthermore, we have shown that there are different types of SMEs participating in the Framework Programmes. This intervention logic should, therefore, also discuss the different SME target groups that are relevant for the Framework Programmes.

Impact can be identified and we have assessed their nature and trend in this report, although it is much more difficult to measure them precisely; but without intervention logic it is not possible to say whether these impacts are satisfying or not, whether the Commission has reached its objectives since objectives were not defined in this dimension. Along with

the 15% budgetary target, new, impact related targets need to be defined along the following lines:

- SME assessment of the achievement of knowledge creation/development and business objectives
- Actual exploitation activities taking place either in the course of the project or right after the project (see below for a discussion on "bridging the exploitation gap")
- Impact assessment could also be considered, but our experience shows that it is always difficult to quantify the impact.

This strategy should also include an understanding of the actual and potential policy, strategic and operational linkages between the Framework Programmes and other European Programmes (e.g. CIP) as well as stepping up efforts with member states to create added value with ERA-NETS and other networks.

The national programmes reviewed for SMEpact suggest that they have a clearer focus on exploitation and successfully attract SMEs with the potential to translate research into commercial products and services. Similarly focus of FP needs to be put more on business/industry relevance and on providing impact for industry participants, including small enterprises, especially in the light of participation figures that reveal (after data cleaning) that SMEs are the biggest segment of clients of the FPs. The key issue here is about bridging the gap between pre-competitive research and the market.

In order to do this, an in-depth policy debate will need to clarify the conceptual and strategic linkages between the FPs and other R&D and innovation related programmes at the European and national level (e.g. ERANets, CIP, Pro Inno). In particular:

- The strategic objectives of the FPs with regard to exploitation need to be clarified and their alignment with the strategic objectives of other programmes needs to be established.
- Potential institutional and operational linkages for programme management need to be clarified and developed.

Operational Recommendation 2: Build FP attractiveness for SMEs on content and develop call measures in line with the SMEs role in their respective value chains

The attractiveness of the Framework Programmes for SMEs cannot be mainly built on financial (75% funding) and supporting measures. As SMEs play specific roles in value chains, their thematic concerns are thus very specific.

There are two main directions to be taken:

- **Translate the intervention logic developed into specific approaches for each thematic area.** Thematic areas deal with different industrial, competitive and structural contexts. It is thus natural that the way they try to develop a culture of SME friendliness is different. However, our findings have identified the fact that this culture is more shaped and driven by the willingness of directorate staff and their individual knowledge of SMEs' particular needs and circumstances (see summary statement N°3) than by a general policy commitment to SMEs. It seems preferable to embed the different measures and initiatives in a long term overarching strategy aimed at involving SMEs.

  We thus recommend that a set of minimum requirements is defined and implemented in each thematic area complementing the 15% budgetary target. It would be the responsibility of each thematic area to translate these minimum requirements into context specific actions.

  - The **content and call measures** could include the development of a strategic analysis of the thematic priorities in order to identify and specifically develop SME targeted themes (see *summary statement N°6 on the criticalness of projects in which SMEs are involved)*. Not all priorities, even within one thematic area are suitable for SME RTD involvement. Because of the industrial structure, the level of magnitude of required investments, and the dynamics of large companies themselves, some areas are more suitable than others. An example of this approach is given in the TSB Collaborative R&D programme[2] by the use of road maps for the identification of priorities and competition themes, closely tying the supply chain for a particular technology into the development process.

  - **"SME specific calls"** (*see summary statement N°2 for an analysis of the impact of new instrument IP*) would not necessarily be restricted to SMEs but the themes would be SME specific, with a shorter research horizon (1 to 2 years), smaller budget, limited number of partners and limited efforts to write proposals. The management and administrative workload should also be significantly decreased in these calls.

  - **SME-STREPs and SME-IPs** introduced during FP6 by the directorates Health, NMP and Aerospace are a first step in that direction but should be further developed.

  - **More "SME sensitive"** evaluation experts should participate in the evaluation groups.

[2] see national programs – UK TSB programme

- **Reengineer the proposal and management processes of FPs to decrease costs for Commission services as well as for SMEs.**

  Another way to increase attractiveness is to decrease the cost of participation for SMEs. Lean management techniques could be used to revisit all administrative and management processes and dramatically improve their cost – value balance (*See summary statement 4*). Various good practices have been identified such as:

  - Implementation of a two-stage proposal process (notably in the mainstream instruments) in order to avoid SMEs considering that the investment in the development of a fully-fledged proposal is too high to participate. A two-stage proposal is also much closer to current good practice in innovation management processes. The first step should be "light" enough to allow more proposals to be submitted, yet developed enough to allow evaluation experts to indicate whether the proposal should be further developed or not.

  - A swifter selection process, which would align the proposal-project cycle with the intrinsic time-scales of SME operations for SME specific calls.

  - New methods for shortening the financial management aspects, on the basis of electronic claims and allowing payments to individual partners, which would reduce cash-flow difficulties for SMEs associated with long payment delays. (see UK – TSB programme)

  - Other areas of improvement could include shortening the time to contract and to payments.

Operational Recommendation 3: Create awareness through the design and implementation of a new marketing strategy to attract not only more but the right type of SMEs to play important roles in FP projects

To improve the conditions for SMEs through FP, it also has to be demonstrated that the best-in-class SMEs, in their respective value chains, do participate. Best-in-class will participate because the Programme will have become more attractive. There is a need to identify and specifically target these SMEs in their respective value chains and approach those that are crucial in their respective sectors in order to present the new opportunities and potential benefits of participation in the FP.

We thus recommend complementing the new attractiveness strategy with a more proactive, marketing strategy.

The existing awareness-raising and SME support networks (e.g., NCPs and EEN) should also be better utilized for the purpose of proactive marketing. These activities should be

conducted bearing in mind the need to attract a fair diversity of SMEs (*see summary statement 2*).

Additionally, new networks are also appearing in Member States to improve conditions for SMEs. For instance, many European countries and regions have developed or are developing cluster policies and cluster organizations. New stakeholders are playing a role in mobilizing SMEs on technology related issues, such as the French "Pôles de compétitivité". Commission services should also better leverage its knowledge of these players and improve its strategy to mobilize them into targeted marketing strategies. For example, the Commission already has several on-going activities to facilitate the ability to find information on cluster, cluster organizations, and participating firms and other organizations, e.g. The European Cluster Observatory (http://www.clusterobservatory.eu). Clearly, resource availability will need to be evaluated, especially with regards to the ability of present services to perform the new tasks and whether they should be further strengthened through training or other means.

Operational Recommendation 4: Develop a follow-up strategy to bridge the gap between knowledge creation and exploitation

We have identified five main types of SMEs that have different strategic objectives and needs in terms of the impact they expect to achieve from their participation in FP projects. We recommend that the Commission develops a follow-up strategy in order to reap the benefits from the participation of these different types of SMEs. (The identification of different types of SMEs will be done through the monitoring system presented below in Operational Recommendation 5.)

In this context, different complementary routes can be taken:

1. *Opening new routes to exploitation at the end of FP projects*. Our findings (*see summary statement N°10 and 11*) show that if exploitation does not take place in the course of the project itself, SMEs often have difficulties to actually exploit results after the project. This exploitation gap is particularly important in the group of SMEs we have called "Exploitation Seekers". While the technology outcome of their projects is technically and economically competitive, it does not reach the exploitation stage because it would need further demonstration and validation activities. Thus, these projects could benefit from further support in order for the project to achieve exploitation of promising results and improve the impact of the project on the SME. One option could be the development of an Exploitation Fund for the Framework Programme. Another option would be the identification of an industry-dedicated scheme that would support activities that bring research results closer to the market for the benefit of (especially) Strategic Innovators (21,7%) and Exploitation Seekers (12,5%).

2. *Specific awareness campaigns for Translators, Curious and Helpful and Technology Networkers, aiming at promoting the new focus of FPs on exploitation.*

3. *The development of a "retention" scheme towards "Curious and Helpful" SMEs (23,3%).* These SMEs have proven that they can contribute to the success of R&D projects although the impact of the project is disappointing for them *(see summary statements N° 7 and 8)*. They are thus already interested in the FP and in developing their R&D capability. They are potentially "good partners". Suggesting to them to participate in the newly developed "specific calls" or presenting them as "good partners" to relevant stakeholders might help them benefit from future participation.

Operational Recommendation 5: Develop and implement a monitoring system

Establishing a monitoring system that can be used to characterize the impact of the FP on industry and on other policy areas will be necessary to support many of the other policy recommendations. This includes the ongoing collection of information of project input and output parameters as well as the identification and characterization of a set of dimensions of impact on SMEs. This monitoring system should also be used to characterize the participating SMEs and implement the relevant follow up strategy. More details are provided as regards this operational recommendation in Chapter 6.

1 Introduction

The project "Impact assessment of the participation of SMEs in the Thematic Programmes of the Fifth and Sixth Framework Programmes for RTD (SMEpact)" focused on the benefits that SMEs gained from their participation in FP5 and FP6 as well as the impacts of their participation on the outcomes of the FP5 and FP6 RTD projects.

The main objectives of the study were:

- To identify the profile of SME participants in the Thematic Programmes of FP5 and FP6
- To assess the role of SMEs in and their contribution to the project implementation and project outcome under FP5 and FP6
- To obtain evidence on the economic and social impacts of EC funded research project involvement on SMES in FP5 and FP6 in comparison with that of national research schemes
- To identify ways of enhancing thematic programme incentives to produce greater benefits for SMEs
- To develop output and impact indicators of SME performance and a comprehensive system of data collection for monitoring and impact assessment purposes

To address these objectives the SMEpact project developed and applied methods and tools to evaluate the effects on SMEs of EU funding for RTD projects within the fifth and sixth Framework Programmes and the impact the SMEs have had on the projects in which they participated. The methods and tools were then deployed in order to investigate 120 representative projects in FP5 and FP6 as well as a number of projects from selected National Programmes with similar characteristics to the EU FPs. The investigation methodology also comprised a series of interviews with EC and National Programme stakeholders and a survey to collect and analyse views of National Contact Points (NCPs).[3] **Although we have found and developed many results, we want to underline at this stage that SME participation has indeed had a positive impact on the projects and a positive and sustainable impact on participating SMEs in the R&D and technological dimensions.**

[3] The extended version of the methodology description, interview results, NCP survey and background literature conduceted during the project can be found in the Background Report.

Following this brief introduction, Chapter 2 provides an overview of the manner in which the involvement of SMEs in the Framework Programmes has evolved over the course of FP5 and FP6. Chapter 3 describes the analytical approach the SMEpact consortium has used and the methodology that has been applied. Chapter 4 presents the results of the impact assessment, starting with the important issue of accurately determining the profile of the SMEs in the Framework Programmes on the basis of reliable data and then discussing the main findings on the way SMEs influence the FP projects and on the range and extent of benefits they take as a result of participation in FP projects. The results are presented on the basis of overall statistics on the 120 case studies combined with the insights gained from the structured interviews with SME participants, coordinators and other project partners that allowed us to provide illustrations of concrete cases supporting the findings. Results are also presented for the control group case studies composed of projects taken from National Programmes, which examine the differences and similarities with the FPs.

The remaining chapters present policy recommendations (Chapter 5) that were developed on the basis of key findings of the impact assessment and ways of monitoring and assessing impact of SME participation in projects (Chapter 6).

The Consortium would like to acknowledge the benefits of the continuous and fruitful interaction with the monitoring committee as well as of its support in facilitating contacts with the different stakeholders and in making available valuable sources of documentation.

2 European Framework Programme for Research 5-7

The purpose of this chapter is to provide an overview of the manner in which the involvement of SMEs in the Framework Programmes has evolved over the course of FP5 and FP6, based on desk research of key documents and papers complemented by interviews conducted with European Commission (EC) officials from different EC directorates. The full review can be found in the Background Report (Chapter 3).

SMEs have two main possibilities to participate in the FPs. Either they can participate in specific programmes reserved for them, the so-called Cooperative and Collective research programmes (SME Specific Measures), or they can participate in the thematic programmes which are open to all firms.

SMEs tend to have different motives for participating in FPs. Research-based SMEs that typically have a business model that relies on them researching and then commercialising the research results quickly (e.g. pharmaceutical or biotechnology SMEs) tend to be more interested in shorter-term product and process outputs than larger organisations, which seek intermediate knowledge outputs[4].

The Framework Programmes (FPs) themselves have undergone constant change over the years. For example, the size of the FPs and the allocation of the budget among the different thematic programmes/priorities were changed following consultations within and outside the Commission[5]. Furthermore new Instruments have been introduced in FP6.[6]

The instruments aimed at generating, demonstrating and validating new knowledge through research and development, which are therefore also the focus of SMEpact regarding FP6, are Integrated Projects (IPs) and Specific Targeted Research Projects (STREPs) which were the focus in the FP6 case studies.

To monitor and follow SME participation in the Framework programme, the **SME Interservice Task Force** was established under FP6, made up of representatives from the Directorates General whose activities are related to research (TREN, ENV, INFSO, ENTR, etc.) and representatives of the thematic programmes coordinated by the Research and SMEs Unit of DG RTD[7]. Its functions are to set specific participation goals for individual priorities, undertake detailed analysis of actual SME involvement, and identify and encourage the take-up of best practices. One key task of the Task Force is to monitor SME participation in the

[4] Impact assessment of improving SME specific research schemes and measures to promote SME participation in the Framework Programme, Final Report, September 2006

[5] What the Evaluation Record tells us about Framework Programme Performance, Erik Arnold, January 2005

[6] IP, STREP and NoE

[7] SME Interservice Task Force Progress Report May 2003

Framework Programme and provide validated figures about actual SME participation figures in the Progress Report twice a year. This task of monitoring SME participation and providing validated and up-to-date figures has gained significantly in importance since the 15% budget target was introduced in FP7. Achieving this task was difficult, as the available data bases covering FP5 and FP6 were not developed and maintained to reliably flag SME participants. In fact, from FP4 and FP5, it appears that there was only a vague goal of 10% participation by SMEs although little attention was paid to reaching this percentage figure. From FP6, this lack of focus reportedly began to change with the creation of an SME Unit with management responsibilities in managing the SME scheme (Cooperative and Collective Research) and the launch of the Interservice SME Task Force to focus on SME involvement.

The SME Interservice Task Force invested significant efforts in producing reliable figures on SME participation. It has to be noted though that the figures regarding FP5 and FP6 were at large estimations based on statistics using random samples, as no cleaned total dataset on all the participants existed.[8] These deficiencies are well known and were addressed when designing the mechanisms for FP7. One example is the Participant Identification Code (PIC), which is a 9 digits identifier that uniquely identifies a legal entity. It is given at the time of registration and the participants will not have to submit their legal and financial information (and supporting documents) each time they submit a proposal or negotiate a grant agreement.

The FP7 participation figures are based on signed contracts and related budgets were regarded as very reliable by the Task Force members. The "SME 4th Progress Report on SMEs Participation in FP7 indicates that "... within the Cooperation programme as a whole 13,4% (850 million Euro) of the budget has been granted to SMEs so far."[9] The participation rate numbers to 15,7%. The analysis of the SME participation rate and the EC contribution includes the FP7 Grant Agreements signed before 1 October 2009. In order to achieve the 15% of the budget allocated to SMEs at the end of the Cooperation programme, 3.990 million Euro of the remaining budget would need to be allocated to SMEs.

In the following the different support actions, services and information sources will be summarized, resulting from interviews with representatives from the thematic priorities and the literature review. The most important actions and measures (not only limited to the thematic areas) are hereinafter summarized.

[8] During the investigation for SMEpact, FP5 and FP6 data have been cleaned within the selection criterions as outlined in the terms of reference. Final figures for FP5 and FP6 SME participation and budget allocation can be found in section 4.1

[9] SME 4th Progress Report on SMEs Participaion in the 7th R&D Framework Programme, Brussels, 1 December 2009

2.1 Incentives supporting SME participation

From FP5 to FP7 different incentives were introduced in order to increase the number of SME participants in the Framework programmes. The most important ones will be outlined in the following sections.

Information sources

The internet provides SMEs with a huge amount of important information. The respective website CORDIS comprises services and information sources, a list of organisations interested in participation and a range of tools and networks offered by the European Commission to identify potential partners[10]. There are various publications on how the FPs are structured and on the opportunities for SME participation. They contain information on what companies have to do if they want to participate, what support or help they can receive. Among them e.g. the RTD info magazine[11] which is published quarterly and contains a summary table of planned calls and their timetables. Another comprehensive source of information published by the European Commission is the Guide for Applicants, available for each FP respectively, which shall provide the greatest possible assistance to potential partners regarding participation procedures, proper funding, potential partners, etc. SMEs Success Stories is another EC-publication; it presents the achievements of various projects completed under FPs 4, 5, 6 and 7 respectively and illustrates the diversity of the results that SMEs can obtain from EU research projects.

SME Tech Web

The SME TechWeb was created under FP5 and offers a range of information dedicated to SMEs interested in participation in EU research. It is designed for technology oriented companies wishing to innovate and internationalise. It is still maintained and developed under the later framework programmes and can be visited at http://ec.europa.eu/research/sme-techweb/index_en.cfm. It offers SMEs to identify calls, getting support, finding relevant publications or use the forum for ideas and suggestions.

[10] See Participating in the European Research Programmes: Guide for applicants under the fifth Framework Programme

[11] RTD magazine available online at: http://ec.europa.eu/research/rtdinfo/index_en.html

Information and guidance locally (close to SMEs) - National Contact Points

The National Contact Points (NCPs) are national structures established and financed by Member State governments and the states associated to the Framework Programmes. In most countries, services provided by NCPs are free of charge. The basic services provided are the distribution of Commission documentation, the NCP website[12], phone/fax/e-mail helpdesk, face-to-face consultations and seminars and training courses for proposers and contractors. The architecture in the Member and Associated States are very different, from highly centralised to decentralised networks, situated in ministries, universities, research centres, special agencies or private consulting companies.

In the context of SME support, the NCPs help organisations locally by assisting and making information on research programmes available in the local language. Thus being in direct contact with organisations on the ground, they are a valuable source of information regarding the benefits of and barriers to SME participation in the framework programmes.

The monitoring and performance and quality assurance of NCPs is under the responsibility of the national authorities establishing the NCP systems. The paper "Guiding principles for setting up systems of National Contact Points"[13]describes how the Commission integrates NCPs as partners for the implementation and management of FP7, e.g. nominating contact persons for NCPs in the Commission services, so called NCP correspondents for all thematic and horizontal priorities of FP7.

The online questionnaire sent out by the project team to the NCPs reveals that especially Exploratory Awards (FP5) have been regarded as useful incentive attracting SMEs for research projects. The exploratory awards helped to cover the costs of preparing a full proposal. However, this incentive has not been extended in FP6 or FP7.

Furthermore the organisation of events such as information days are seen as an important instrument to inform SMEs about the framework programmes and to present success stories to motivate SMEs to participate.

IPR Helpdesk[14]

The IPR Helpdesk (Intellectual Property Rights Helpdesk, established under FP5) is an online source and guide to patent information. The project was set up in 1998 to be a central

[12] http://cordis.europa.eu/fp7/ncp_en.html

[13] Guiding principles for setting up systems of National Contact Points for the Seventh Framework Programme for Research and Technological Development (FP7), 23/08/2006 European Commission DG RTD A2

[14] www.iprhelpdesk.org

reference point for intellectual property inquiries and advice. Main objective is to assist potential and current contractors taking part in the FPs. The webpage has been restructured in recent years to facilitate for SMEs the access to important information about IPR, as they are seen as main focus group for the IPR-Helpdesk services, as more than any other entity they require assistance on issues such as research cooperation, the exploitation of results, etc. On their webpage they have an extra content area called "SME Gateway", specifically designed for SMEs.[15]

Accompanying measures

Those measures contributed to the implementation of the Specific Programmes with a view to enable the projects to achieve their strategic objectives and to prepare for or to support other indirect RTD activities. Those were run by intermediary groups such as NCPs, networks or associations of research performers etc.

SME Dedicated Calls and SME relevant Topics

Within the instrument STREP[16] and IP[17]several calls dedicated to SMEs were introduced in FP6, e.g. SME STREPs or SME-IPs[18]. Experience had shown that when SMEs were in leading positions within a project, they tend to involve more SME participants than in other projects. The thematic priority Space as well as Nanotechnologies introduced such call in FP6, and they were reported as successful instruments to enhance SME participation. For SME-IPs the experience was that it is important that the projects do not have too large consortia, as the coordinating challenges will be quite substantial.

Also the identification of SME relevant topics was seen as an important incentive. The thematic priority Health had for example published a specific SME call in FP6, focusing on STREPS. The topics for the call were selected by consultation with associations during workshops, advisory groups or the programme committee to identify SME targeted topics.

[15] http://www.ipr-helpdesk.org/fp7_programme.html#

[16] STREP – Specific Targeted Research Projects

[17] IP – Integrated Projects

[18] SME-IPs were established in areas of particular interest to small companies with a stipulated SME participation of at least 50%. These initiatives are smaller than regular IPs, while large companies are permitted to join as consortium members, they are SME-led

Further opportunities to join on-going projects

The Rules for Participation allowed the Commission in FP6 to increase the Community financial contribution to an indirect action already under way in order to expand their scope to cover new activities, which may involve new partners. In FP6 two new instruments were included, namely Integrated Projects (IPs) and Networks of Excellence (NoE). During their initial negotiation with the Commission, IPs or NoEs might reserve a portion of the project budget for specific tasks to be carried out by a new contractor or contractors, who will join the consortium at a later date. New partners will be selected from proposals submitted in response to a competitive call. But only a limited number of calls were open during FP6 in certain priority thematic areas so the impact of such calls was very limited in regard of the overall participation rate.

ETI - Economic and Technological Intelligence

This initiative had the goal of helping SMEs assess their research capabilities and needs to better prepare for participation in transnational research projects. The projects were carried out mainly by intermediaries (e.g. NCPs, industrial federations etc.). SMEs also received assistance throughout the proposal process, for example help finding partners and advice on legal and financial issues. In total 49 ETI initiatives were launched during FP5 and FP6. ETI actions are not an instrument in their own right, but are implemented using Specific Support Actions and Coordination Actions. The report “Impact assessment for improving SME specific research schemes” states, that ETIs have a strong structuring effect by leading many SMEs to propose a project for, and eventually participate in the EU programmes. In the survey results of this study, the SMEs indicated that they benefited from the ETI-services in terms of the up-to-date information they provide on funding opportunities, partner search services and assistance in preparing a joint proposal for submission.

Specific Support Actions (SSA)

The Specific Support Actions were a continuation of the Accompanying Measures available in FP5. The main objective of SSA was to support the implementation of FP6, to stimulate, encourage and facilitate the participation of SMEs, small research themes, newly developed and remote research centres and organisations form the EU candidate countries. The projects were carried out mainly by intermediaries (e.g. NCPs, industrial federations etc.). Thematic Priority Space had two SSAs introduced in FP6, “AeroSME” and “Ecare SSAs”with success and those measures contributed to an increased participation of SMEs

Evaluation criteria

In particular, in IP and STREP proposals, the proposer should clearly indicate how they intend to involve SMEs. One of the subcriteria for evaluating IP and Specific Targeted Research Project proposals with respect to "the quality of the consortium" was the extent to which the opportunity of involving SMEs in the project has been adequately addressed. In addition, "the potential impact" of IP proposals was evaluated as to the extent to which they are suitably ambitious in terms of their strategic impact on reinforcing competitiveness, including that of SMEs, or of solving societal problems.

Also, one of the criteria for evaluating NoE proposals with respect to "the potential impact" was the extent to which there is an effective plan for spreading excellence, exploiting results and disseminating knowledge, including to SMEs and to those outside the network.

Participation of SME groupings

SMEs could have participated in the new instruments in FP6 through SME Groupings or Associations, in which the latter become participants on behalf of their SME members. SME Associations only used this possibility in a limited number of cases.

Pre-allocated budget for take-up measures

In many cases the specific nature of the results of projects suitable for take-up measures by SMEs only became clear during the course of the project, and this would prevent identification of partners at the proposal stage. In these cases, the consortium have been permitted to provide for these activities when calculating the project budget and the relevant part of the Community contribution agreed during contract negotiations was set aside for SME partners to be identified after contract signature.

Marie Curie Actions – Training and fellowships

Under the programme "Structuring of the European Research Area", the specific scheme "Marie Curie Host Fellowships for the Transfer of Knowledge" are directed at enterprises in need of developing new areas of competence. Knowledge transfer fellowships will allow SMEs to host experienced researchers for the transfer of knowledge, research competences and technology.

New initiatives and incentives under FP7

FP7 (2001-2013) comes with a substantial budget increase to EUR 54.6 billion (more than double that of FP6), replacing the former activity areas into four programmes (Cooperation, Ideas, People, Capacities):

The FP7 Cooperation programme with its 10 thematic programmes can be compared to the seven Priority Thematic Areas of FP6. In this Programme the 15% of the funding available is earmarked for SMEs.

The mix of funding instruments has also been adjusted to take account of the intention that there should be a reduced number of partners in consortia and a greater focus on smaller projects than it was the case under FP6.

The Networks of Excellence (introduced under FP6 as a new instrument) continued largely unchanged. But Collaborative Projects (CPs) now blur the distinction between IP and STREP in terms of scale[19]. A STREP-like model is also being employed for the 10 themes.

The SME specific measures (CRAFT in FP5, Cooperative Research and Collective Research in FP6) are now under FP7 incorporated into the Capacities programme as "Research for the benefit of SMEs and SME Associations". With its 1.3 billion € budget, it aims to enhance the competitiveness and the innovative capacity of small enterprises with limited or no in-house R&D capabilities by helping them to outsource research activities and participate in transnational networks.

Simplified financial and Administrative Procedures

In FP7, the funding rate for SMEs was increased to 75%. Also, the requirements for audit certificates have been reduced and no bank guarantees are obligatory. It was replaced by a guarantee fund to cover the risks of partners failing to complete their obligations. SMEs are no longer obliged to seek expensive bank guarantees, which allows them to apply for projects and join consortia even if they have shortage of financial resources.

Improved Intellectual Property Rights (IPR)

The participants can now decide how to manage intellectual property through their consortium agreement. The Commission has put in place a limited number of basic rules

[19] Supporting SME – Participation in Research Framework Programmes, European Commission, p. 8

surrounding IPR, which are designed to promote both the implementation of the project and the exploitation of its results**.**

Joint Technology Initiatives (JTIs)

Joint Technology Initiatives (JTIs) are a public-private partnerships and were established under the Cooperation programme. The European Commission has identified JTIs as a new strategy for implementing the Seventh Framework Programme according to the goals of the Lisbon Strategy to support, in a limited number of cases, large scale initiatives that could not be implemented efficiently, using the other R&D funding mechanisms. SMEs may contribute to the development of a JTI and to the implementation of activities.

European Technology Platforms (ETP)

A European Technology Platform (ETP) is a European network bringing together researchers, industry and other relevant stakeholders in a particular technological field in order to foster European research and development in the concerned area. The ETPs were first introduced in the EC Communication "Industrial Policy in an enlarged Europe" in December 2002. As of December 2007, there were 34 ETPS active. Technology-oriented and high-tech SME associations that are members of ETPs are often found to be strongly involved with ETP activities.

Eurostars

Eurostars is a Joint Programme addressing R&D performing high-tech SMEs with a total value of 400 million EUR over 6 years. Currently there are 24 EU Member States and 5 Associated Countries committed to the programme. It is the first European funding and support programme which is specifically dedicated to SMEs and is managed by Eureka. With this initiative the Commission intended to devise a programme specifically dedicated to high-tech SMEs to establish short-term projects with smaller consortia in collaboration with other European SMEs. The results are expected to be highly relevant for SMEs for exploitation and for commercialisation.

Enterprise Europe Network (EEN)

Enterprise Europe Network is the largest information and consultancy network in Europe and it aims to assist SMEs in developing their innovative potential and to raise awareness for the policies of the European Commission aimed at businesses and related funding

opportunities, including informing SMEs about the Research Framework Programme. The EEN was established in 2008. The Network is partially funded through the EU's Competitiveness and Innovation Framework Programme (CIP), in cooperation with institutions at national level.

Overview Summary of support actions, services and information sources for SMEs in FP5 - FP7

Thematic Programmes Incentives		
FP5	**FP6**	**FP7**
• SME Tech Web • Accompanying measures • Other communication activities (workshops, publications, meetings, distribution of SME success stories, etc.)	• SME Tech Web • Specific Support Actions • Other communication activities (workshops, meetings, publications, distribution of SME success stories, etc.) • SME dedicated Calls • SME relevant topics • Join on-going projects • Evaluation Criteria • Participation of SME groupings (Collective Research) • Pre-allocated budget for take-up measures	• SME Tech Web • Specific Support Actions • Other communication activities (workshops, meetings, publications, distribution of SME success stories, etc.) • SME dedicated calls • SME relevant topics • Join on-going projects • Evaluation Criteria • Participation of SME groupings intensifies under Capacities • European Technology Platforms (ETP) • Simplified financial and administrative procedures • Improved IPR
Other SME Specific Measures		
FP5	**FP6**	**FP7**
• National Contact Points • IPR Helpdesk • Exploratory Awards • SME dedicated programme: CRAFT	• National Contact Points • IPR Helpdesk • SME specific measures: Cooperative (SME) and Collective Research (SME Associations) • Marie Curie Actions • Specific Support Actions: Economic and Technological Intelligence (ETI)	• National Contact Points + EENetwork • IPR Helpdesk • SME specific measures "Research for SMEs" and "Research for SME Associations" (in Capacity Theme) • Marie Curie Actions, esp. IAPP[20] • Joint technology initiatives (JTIs) • Eurostars

[20] IAPP = Industry Academia Partnerships and Pathways

3 The analytical approach taken and methodology applied

3.1 Key Challenges

Before describing the methodology used for conducting the study, the following important key challenges have been identified in the beginning of the project for successful addressing the objectives of the present impact assessment.

- Identification of the participants in the FP5 and FP6 projects that are SMEs
- Composition of a balanced and representative sample selection of SMEs and projects for the investigation
- Elaboration of a questionnaire and case study methodologies able to capture answers to the comprehensive set of research questions defined in the tender specification.

Our approach to address these challenges is presented in the following sections, with emphasis on the Quality Assurance measures that were deployed.

3.2 Starting point – objectives, modules and research questions

The focus of the impact assessment was SMEs participating in RTD and demonstration projects in FP5 and the Integrated Projects (IP) as well as the Specific Targeted Research Projects (STREP) in FP6. Only SMEs have been examined for the analysis where the projects were already completed a few years ago to ensure that impact can be measured.

The evaluation was based on the in-depth analysis of a pre-selected representative sample of 120 funded projects across sectors and countries. Furthermore 21 so-called “control group cases” have been conducted, which comprised SMEs who were beneficiaries of national research programmes in the Member States.

The starting points for the approach were the research questions posed by the Commission (Annex A - Research Questions). These research questions are all closely linked to the five objectives described in the introduction section Furthermore each objective is directly represented by one of the five following modules; the research questions were mapped and grouped according to the modules:

Module 1 – Profile of SMEs in the thematic programmes of FP5 and FP6: Understand the SMEs in the context of the projects. What are the characteristics of the participating SMEs, what different SME types can be identified and in which projects do they participate, and

what roles do they play? This module resulted in a typology of the SMEs participating in the projects.

Module 2 – Impact of SME participation on projects: Evaluating the relationship of "SME impact on project". What effects do the SMEs have on the projects in which they are participating? Are there any differences between projects without SMEs and are there any differences between different types of SMEs?

Module 3 – Impact of project participation on SMEs: Learning from national funding programmes. What incentives, mechanisms and effects are there for the SMEs, and what would be recommended to consider in future EC funding?

Module 4 – National schemes for SMEs in the field of research: Learning from national funding programmes. What incentives, mechanisms and effects are there for the SMEs, and what would be recommended to consider in future EC funding?

Module 5 – Monitoring and impact assessment: Facilitating monitoring of impact in the future. How is the current monitoring done in each thematic priority, what indicators are used and what data are collected? Based on the results in the study, what indicators are recommended to be used for assessing the impact of SMEs on projects and projects on SMEs, what data should be collected, and how could an efficient and effective continuous monitoring be ensured?

3.3 Data collection

One of the key challenges of the study was to have a representative selection of SMEs and projects to investigate. A prerequisite was to get a complete picture: How many SMEs and projects are there in total and per category (country, role, area, instrument, etc.).

At the beginning of the project, there was no available dataset that was reliable and complete regarding which SMEs have participated in the FP5 and FP6 projects. The project team used the dataset that could be extracted from eCORDA[21] and the starting point was to clean the FP5 and FP6 data in order to get a complete and correct picture of the SME participation.

[21] Source: Common Research Data Warehouse EU: eCORDA link: https://webgate.ec.europa.eu/e-corda/
FP6: filename: FP6 Contracts 20080602.mdb; received: October 2008; format MS Access; date (of dataset) 2008-08-12
FP5: filename: FP5_CONTRACT.mdb; received: December 2004; format MS Access; date (of dataset) 2004-27-04

Three data quality areas needed to be addressed:

1. The number of unique[22] organisations was overestimated. As information regarding the FP participant is based on self-declaration on the A2 form, we have found that participants from the same organisation often provide different spellings and descriptions for their organisation. This leads to false positives that need to be cleaned and combined into one organisational entity only since these multiple spellings of the same organisation falsely inflate the numbers of organisations.

2. The organisational type may be incorrect, e.g. industry, higher education, other. The data has not been checked to see if the self-declared organisational type was correct, thus also resulting in a false number of industry organisations.

3. The SME classification may be incorrect. The SME flag available in the database is also self-declared. Each organisation needed to be assessed to determine if it falls under the SME definition.

It is evident that a high data quality is a prerequisite for high quality analysis as all errors in the "raw data", if left uncorrected, will be reflected in the final results. To correct for this and to properly identify the SMEs, the following cleaning processes have been conducted.

Data cleaning methodology

Organisations often participate in several FP projects. Further to this very often the spelling of the organization name varies. To determine the real numbers of organizations that participate and hence the size of the different client (e.g. SMEs, Higher Education,…) groups to the FP it is necessary to uniquely identify the participating organisations. This has been done in this project through various steps of data cleaning.

Instead of a pure manual data cleaning, a computer-aided cleaning procedure (N-gram based searching) has been applied that involves the use of a tool developed for this purpose. The most important feature this tool offers is a search that has a tolerance for those 'mistakes' that are often in the data. Further, it helps the user in the process of assigning unique identifiers to cleaned organisations.

[22] Unique participation means that an organisation is only counted once, regardless of how many projects it is involved in.

The most common errors in the data were the following:

- Spelling errors
- Different spelling due to different languages
- Differences in word order within a name

The different cleaning steps can be summarized as follows (the detailed data collection processes and cleaning processes are described in the Background Report)

1. Cleaning the dataset regarding organisation types (Higher Education, Industry, Research, Other)
2. Matching the resulting dataset with various databases containing information on enterprises like number of employees, sector, turnover, etc.
3. Manual investigation of cases which could not be identified and matched with external databases (internet and telephone).
4. From the remaining cases that could not be matched in this way, a representative sample of 100 cases was randomly selected in order to determine the distribution of SMEs and large enterprises within that remaining group of "unknowns". Extensive investigation was then undertaken in order to determine the status (whether SME or not) of all those that were selected for the sample. [23]The measures taken were web page investigations and personal contacts.
5. Based on the information gathered in Step 5, the remaining organisations could be distributed to the already identified set of SMEs to perform the statistical analysis.
6. Analysis of the resulting data set

[23] This approach was developed jointly with the Institute for Stochastic at Karlsruhe University in order to ensure that the sample was indeed representative of the overall population.

Characterization of SMEs and their FP participation

Once the above cleaning was completed, the SMEs have been classified and characterized according to the following criteria:

- Location: Low, medium or high performance region (NUTS2) and low, medium, and high performance country.
- Area: The thematic area(s) in which the SME is participating.
- Instrument: The instrument of the project(s) in which the SME is participating.
- Role: Coordinator or Participant
- Size: Micro, Small or Medium (number of employees, turnover)
- Sector the company belongs to (e.g. Industry or service company based on NACE or other industry code, as NACE is not fully available for all countries)

As the complete set of SMEs have then been mapped and categorised, it was then possible to make a representative and balanced selection of SMEs and projects.

3.4 Selection Methodology of projects for Case Studies

Selection of the Focus Group and the creation of a contact data base: The objective was to define a sample of SMEs which will be representative of the total population of SMEs participating in the FP projects. Since each FP case study is a project, it has been looked in depth at a minimum of one SME per FP project and then sampling these SMEs according to the actual distribution of SMEs in the projects.

Representative sample: The sample is representative if the distribution of SMEs in the sample is as similar as possible to the distribution of SMEs in the total population. In other words, the quota methodology was used. This methodology is a sample selection methodology where the sample is similar to the total population analyzed on a few criteria.[24]

Statistically relevant sample: The above concept differs from the concept of a statistically relevant sample. In order to achieve statistical relevance, it was important to have a representative sample (this is because the most efficient way to achieve statistical relevance is to use the quota methodology).

[24] Usually for political polls age, social segment, genre)

But there is a further condition to be able to consider that the sample is statistically relevant, this is that the population of any given segment analyzed is no less than 10.

The basic sampling criteria defined were:

- Geographical zones (3 zones, High, Medium and Low economic performance))[25]
- types of activities (service and industry)
- The 11 thematic areas

If the three criteria mentioned were used above, we would need a sample of "3 (geographical zones) *2 (types of SMEs) * 11 (thematic areas) * 10 (minimum number per subset)" thus 660 projects to be sure to have statistical relevance for any subset we would need to analyze.

Since this is not possible given the project's setup, we proposed to select a sample of:

- 3 zones * 2 types of SMEs * 2 FPs * 10 = 120 projects

To allocate the EU15 and EU25[26] countries for performance we looked at GNP per capita:

For FP5 (GNP per capita for 2003):

- Group High (EU15-2003): Luxembourg, Netherlands, Sweden, Denmark, Belgium, United Kingdom, Germany, France
- Group Medium (EU15-2003): Italy, Ireland, Austria, Finland
- Group Low (EU15-2003): Greece, Portugal, Spain

[25] The zone criteria was used in order to detect differences between countries with different economic performances

[26] For the sake of this evaluation the project team focused for the sample on EU-15 (FP5) and EU25 (FP6), therefore associated countries were removed.

For FP6 (GNP per capita for 2005):

- Group High (EU25-2005): Luxembourg, Netherlands, Sweden, Denmark, Belgium, United Kingdom, Germany, France
- Group Medium (EU25-2005): Ireland, Spain, Italy, Finland, Austria
- Group Low (EU25-2005): Greece, Portugal, Estonia, Poland, Slovakia, Hungary, Lithuania, Latvia, Cyprus, Slovenia, Czech Republic, Malta

Due to the criterion of the 3 zones (in terms of Member States' economic performance) that is driving the selection of the case studies, these are actually selected on the basis of the SME rather than the project as a whole. This is because only the SMEs can be classified in terms of the country of residence, not the projects. As a result, whether the sample is statistically representative depends on the number of SMEs in each sub-set, not the number of projects.

Moreover, a number of 10 case studies in each sub-set would allow analysing the sample quantitatively. However, it is not possible to select twelve samples of ten case studies each, if the criterion of the sample being statistically representative is to be maintained.

This is because the actual distribution of SMEs according to the three criteria suggests a different distribution of case studies in terms of the three criteria. The final sample structure looks as follows:

Table 1: Final case study sample

	Zone 1 – High		Zone 2 - Medium		Zone 3 - Low		Total
	Industry	Service	Industry	Service	Industry	Service	
FP5	25	41	3	8	4	8	**89**
FP6	6	16	2	4	1	2	**31**
Total	**31**	**57**	**5**	**12**	**5**	**10**	**120**

Selection of interviewees for the production of case studies

The case studies have been prepared on the basis of interviews with project stakeholders that have specific input to provide for the purposes of the evaluation exercise. The stakeholders were:

- the project coordinator
- relevant individual(s) at the SME(s)
- relevant stakeholders, who, based on their role would be expected to provide evidence-based views with regards to SME participation

Selection of the Control Group[27]

The purpose of the control group case studies was to better understand if there are differences between SMEs participating in FP5 and FP6 and SMEs participating in national research programs. For that reason the selection criteria for the control group were as similar as possible to those used to identify the projects that will form the basis for the FP5 and FP6 focus groups.

The first step was to identify national programmes that present similar characteristics to FP5 and FP6. In this perspective, national programmes should mainly:

- Focus on collaborative applied R&D between academia and industry
- Allow SME participation and contribute to the development of their R&D capabilities but not be specifically designed for SMEs
- Cover a variety of thematic areas.

In total 21 projects have been selected for the control group, 3 projects per member state from 7[28] member states. The selection took place based on a list of program participants received from the respective national program coordinator. This is based on the same premises as the FP case studies although it is important to note that they are not required to be representative of all EU-25 national programmes. The selected programmes are described in detail in "Annex D: National Programmes examined".

Interviews

The study required the organisation of an extensive investigation programme, aiming at collecting detailed quantitative and qualitative information from SMEs in the focus and

[27] See section 4.4.2 for more information

[28] The 7 member states were: France, Germany, Hungary, Greece, Ireland, UK and Sweden

control groups and other stakeholders related to the projects, and then producing a considerable number of case studies.

A mix of electronic questionnaires, telephone interviews and face to face interviews has been used with the aim to collect the required set of information needed for the preparation of the case studies:

- Questionnaires, based essentially on closed questions - partly completed by the information found in the project documents - enabled the obtainment of additional information on certain facts regarding the project but also an initial estimation of impact.
- Telephone interviews provided the core input to the case studies and will be based on open questions.
- Face to face interviews aimed at obtaining more information, as deemed necessary and as discussed further below.

3.5 Elaboration of the case studies

Training of Evaluators

A highly experienced core team of experts with very extensive evaluation experience undertook the interviews and the development of the case studies. They have been trained intensively and monitored carefully by experienced expert to ensure maximum consistency and reliability.

Production of case studies for the control group

For the Control Group the procedure followed the same lines as for the SMEs participating in EU projects. There was a thorough discussion with the Contracting Authority of the chosen programme, aiming at clarifying the programme objectives and any aspects related to the evaluation, as well as obtaining participation in statistics and list of participants if available. SMEs then were selected following the criteria developed beforehand and the interviews proceeded following the same lines as with SMEs of EU programmes, except that there was no online questionnaire sent out in advance. Case studies were then developed, according to the methodology described for the SMEs participating in EU programmes.

Case Study reports for FP5, FP6 and National Programmes

The final case study reports have been produced based on the questionnaires, the interview findings and the review of project-specific documents.

3.6 Data analysis

Statistical relevance of the results for the analysis

For this study it was important to guarantee the relevance of the findings of the sample of 120 cases compared to the entire population.

There are two main statistical parameters to determine whether a quantitative finding in a given sample is "valid", in the sense that the finding would be the same if the entire population had been probed:

- The "confidence level", i.e. the measure of "how sure we can be" that the finding based on the sample is valid for the entire population.
- The "confidence interval", i.e. the margin of error for a quantitative observation, due to the fact that a sample is used instead of the total population.

As an example to illustrate the meaning of these two parameters, if the confidence level is A% and the confidence interval for an observation on a sample with value equal to O is n, then there is a probability of A% that the value of the observation will be within the interval O-n and O+n if the entire population is probed.

The two parameters are linked through a well-established relation[29]. Other parameters that intervene in this relation are the sample size, the total population size and the value of the observation.

It is a usual approach to fix the confidence level at a certain value and calculate the confidence interval for a given quantitative observation. In most research projects the confidence level is taken equal to 95%. We have decided to use this value of confidence level in our study.

The table below shows how the confidence interval varies for different values of an observation. The sample size is set to 120, which is the value of the target sample for the

[29] Part of this section in particular the statistical tables is based on a statistical calculator that can be found in the link: http: / / www.surveysystem.com / sscalc.htm

case studies. We have also taken values for the entire population that is representative of the total number of projects in the FPs.

Table 2: Confidence interval for a sample of 120 and a 95% confidence level

	Total Population Size		
Observation Value	1,000	3,000	6,000
95%	+ / -3.7%	+ / -3.8%	+ / -3.8%
90%	+ / -5.0%	+ / -5.3%	+ / -5.3%
80%	+ / -6.7%	+ / -7.0%	+ / -7.1%
70%	+ / -7.7%	+ / -8.0%	+ / -8.1%
60%	+ / -8.2%	+ / -8.6%	+ / -8.7%
55%	+ / -8.4%	+ / -8.7%	+ / -8.8%

An example of the information the table above provides is the following: If in a total population of 3,000, a value of 80% is obtained for a parameter on the sample of 120 (cell shaded in green), there is a chance of 95% (confidence level) that the value for the entire population is 80% + / - 7% (confidence interval) that is between 73 and 87%.

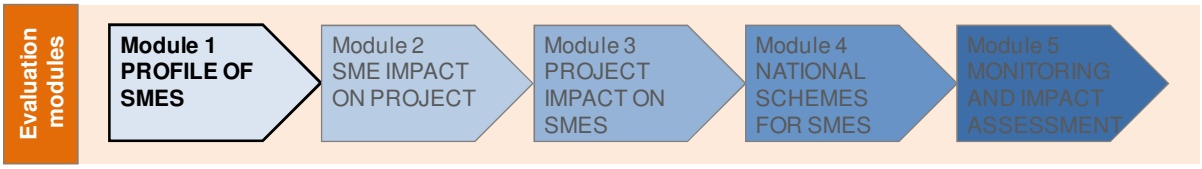
One important initial remark is that the confidence interval is almost insensitive to the exact size of the entire population for the range considered.

The values above determine the degree of validity of the conclusions drawn for the target sample of 120 in comparison to the entire population. For example, if in a question 60% (or more) of the sample provide a specific answer, it is safe to say that the answer is valid for the majority of the entire population, because the actual interval for the latter is between 52 and 68%. But for values of 55% or lower such a statement could only be interpreted as an indicative trend, because the corresponding interval for the entire population would be between 48 (thus below 50%) and 63%.

However, because the thematic areas are not among the three criteria used to define the sample, we cannot use quantitative results to discuss the questions related to the specific thematic areas. For these questions, only qualitative analysis has been used.

4 Profile of SMEs and Case Study Analysis

4.1 Profile of SMEs in the thematic programs of FP5 and FP6



This module aims to determine the profile of SME participants under the thematic programmes of FP5 and FP6. The following evaluation questions have been determined for this module:

E.1	What is the profile of SME participants in research projects under the respective thematic programmes (e.g. sector, country, research capability (high-, medium, low-tech), number of employees, level of annual turnover, etc.) in FP5 and FP6?
E.1.1	Can any differences between sectors and / or any trends be detected in the type of participants EU funded research programmes attract? If so, why?
E.2.1	What is the percentage of SMEs that participate in projects directly as research partners and that of those participating indirectly via dissemination or take-up actions in later stages of the projects? What are the reasons for possible differences between the thematic programmes in this respect?
E.2.2	What percentage of projects was initiated and / or co-ordinated by research performing SMEs? What might be the reasons?

The following sections give an overview of the profile of participating SMEs in Framework Programme 5 (FP5) and the Framework Programme 6 (FP6).

In FP5, the following thematic areas and instruments are covered:

- Thematic areas: Overview based on FP5 projects in the instruments Research project and Demonstration project and the five thematic areas EESD-ENERGY, EESD-ENVIRO, Growth, IST, QOL
- Instruments: Research project, Demonstration project

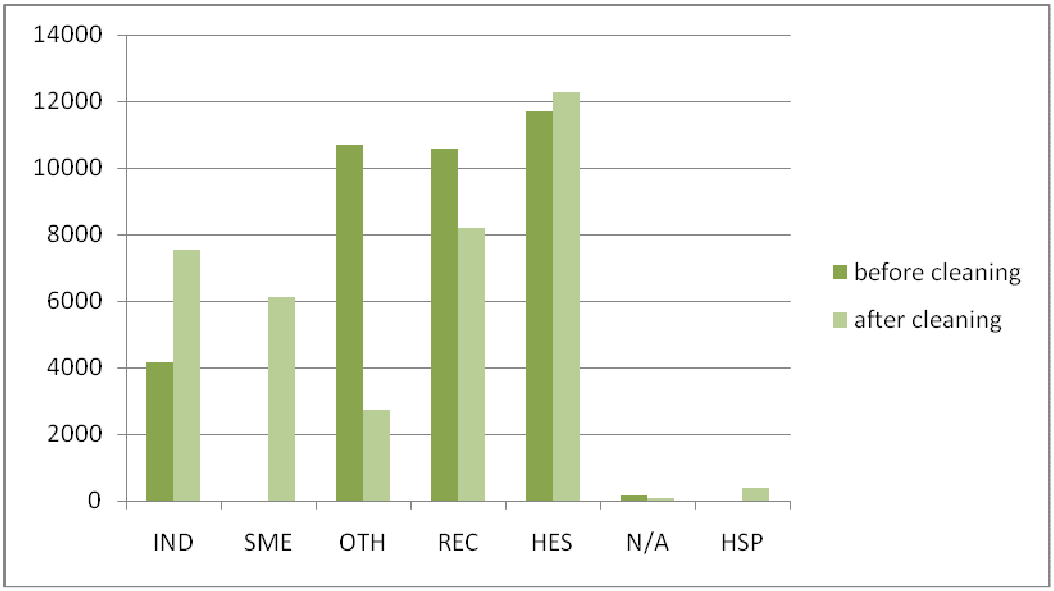
In FP6 the following thematic areas and instruments are covered:

- Thematic areas: LSH / IST / NANO / AERO / FOOD / SUSTAIN / CITIZEN
- Instruments: Integrated Projects (IP) and Specific Targeted Research Project (STREP)

Based on these selection criteria, the number of participating unique organisations[30], the number of participations and the funding received by SMEs the two Framework Programs can be analysed and compared. All statistics and tables can be found in Annex B and C. The following section summarizes the main findings of the profiling:

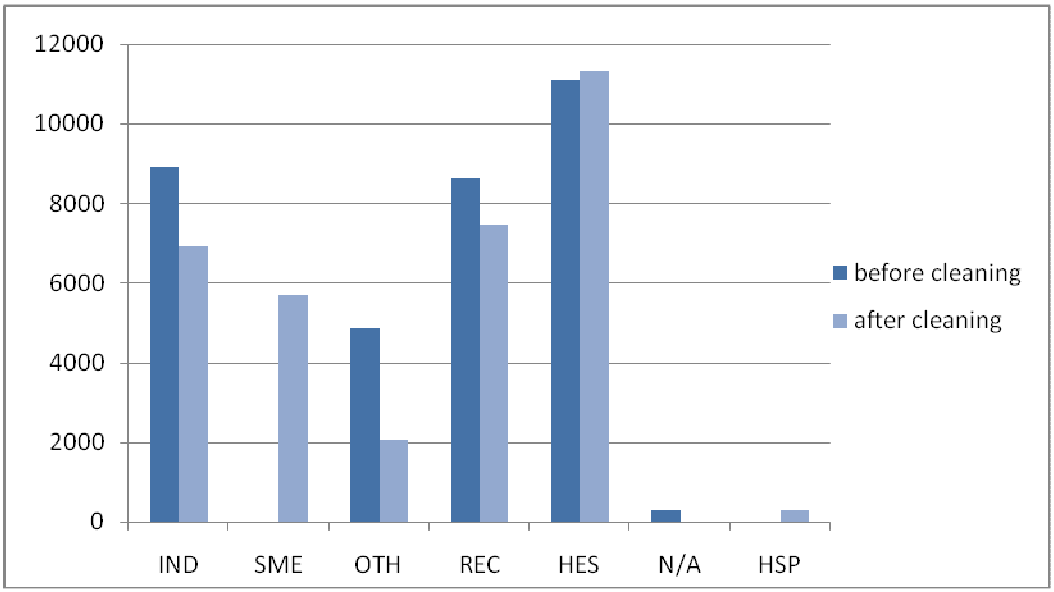
An organisation often participates in several FP projects, is therefore necessary to uniquely identify the participating organisations. This has been done in this project through various steps of data cleaning. The result is a list of unique organisations. Every time we refer to organisations, this means unique organisation. The term participations refer to the number of times an organisation participated in a project, leading to a significantly higher number. The table below displays the number of participations per organisation type before and after the data cleaning. The table below shows what the major shifts of activity type were.

Table 3: Summary of the number of participations in FP5 per organisation type before and after the data cleaning



[30] Unique organization means that an organisation is only counted once, regardless of how many projects it is involved in

Table 4: Summary of the number of participations in FP6 per organisation type before and after the data cleaning



Most obvious is the shift towards Industry (IND) from Other (OTH) and Research (REC). The type for hospitals (HSP) was introduced and logically consists mainly of former Higher Education organizations.

Counting an organisation only once even if it participates in multiple projects leads to the number of unique organizations. To achieve this, a name cleaning has to be done as to identify an organization uniquely.

Table 5: Summary of the number of organizations in FP5 per organization type before and after the data cleaning

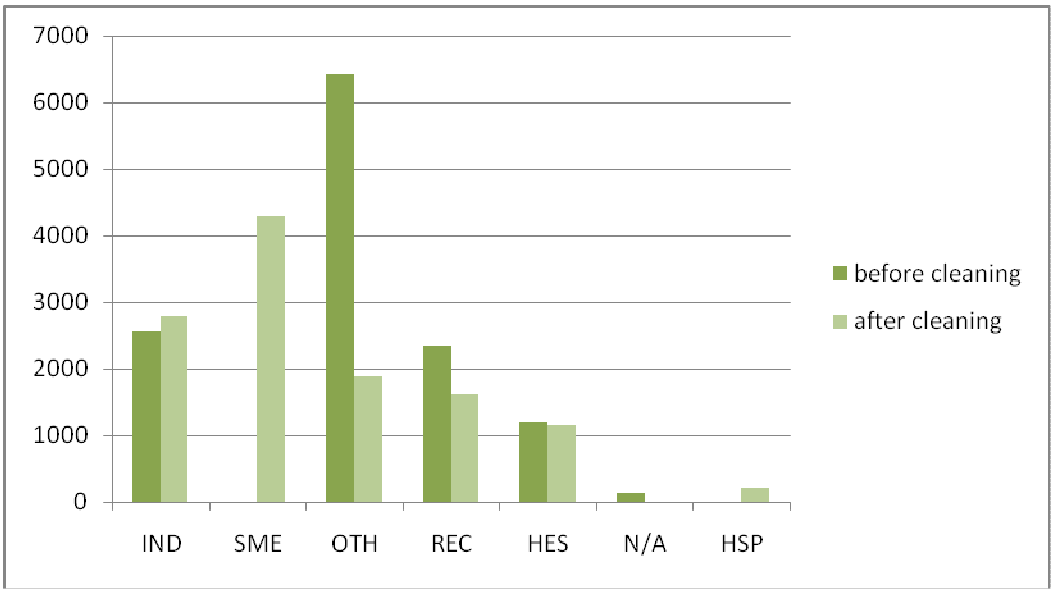
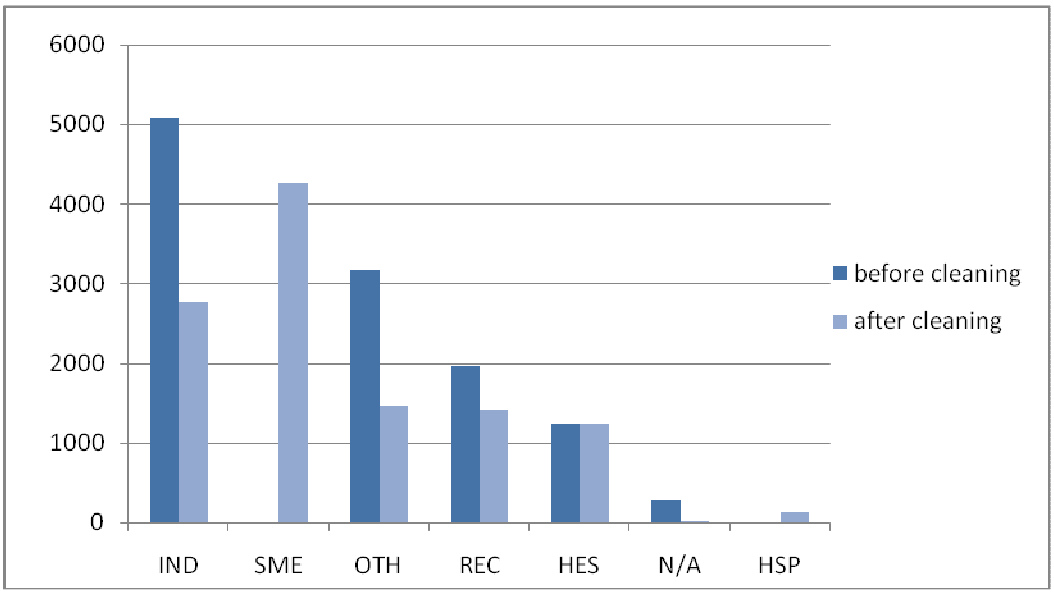


Table 6: Summary of the number of organizations in FP6 per organization type before and after the data cleaning



Key figures on SME participation in FP5 and FP6 after data cleaning within the project:

- Due to the frequency of participation (figure before cleaning), RTD performers were identified as the largest community of clients to the FP, but when it comes to unique organizations, SMEs account for the largest segment of clients (quote figure). However, SMEs do not come back so often since the FP does not meet all their technical and business needs.

- In FP5 a total of some 12.000 (Table 77) unique Organisations participated. In FP6, that figure was 11.200 (Table 99).

- The percentage of funding received by SMEs decreased from 13,2% in FP5 (Table 78) to 12,4% in FP6 (Table 100) – a decrease of 6%. This means that even though the participation rate slightly increased, the total funding received by SMEs decreased.

- Looking at the average level of FP funding per SME participation, we find a substantial increase from FP5 to FP6 for SMEs. In FP5, an SME received on average almost €170,000 per project participation; however, in FP6, this number climbed to €220,000 per SME project participation, an increase of almost 30%.

- In FP6, on average the number of participants in Integrated Projects (IP) was 25. STREPs had on average consortium size of 9 partners of which there were 1.6 SME.

- Integrated projects were clearly dominated by Higher Education and research organisations (Table 108). On average 4.2 SMEs participated in IPs. In these consortia the SMEs often had the role of technology provider (e.g. providing Software) or the role of minor development partner. The major part of the budget was allocated to research and the organisations conducting this research. This way the budget allocated to SMEs in Integrated Projects was significantly smaller that within the STREP. Within IPs, SME had a budget share of 11,5%, were as their share in STREPs was 13,8%

- Of all organisations participating in FP5, 35,9% (Table 78) were SMEs. In FP6 the number increased to 37,8% (Table 100).

- Seen to the number of participations, SMEs accounted for 16,4% in FP5 (Table 78) and 16,9% in FP6 (Table 100).

- Compared with Higher Education organisation or research institutions, SMEs are the largest group of participants, both in FP5 and in FP6, when counting the number of participating organisations. (Table 77 and Table 99)

- Analysing the number of participations the picture looks quite differently. In some 75% of the cases an SME only participates once in an FP project. (Table 116 and Table 95)

- The rate of participation remained quite constant between the FPs. Calculating the percentage of SME participations the figures for FP5 are 16,4% and for FP6 16,9%. The figures for FP7 are likely to be more favourable due the higher funding rate.

- Some 67% of the participating SMEs in FP6 (in the analysed thematic programmes) are smaller than 50 employees. In FP5 that figure is 63%.(Table 97 and Table 118)

- Role in the project (please see section 4.2.1 for further information of the SME role in the project) Some 25% of the SMEs stated that their main role was that of 'exploiter'. This role can be associated with a relatively low degree of R&D capability. In very few cases did an 'exploiter' coordinate the project. In contrast, SMEs that acted as technology developers or service and technology providers mostly brought a high R&D capability to the project. These enterprises were clearly chosen to join a project based on their technical know-how and specialist expertise. 'Exploiters' are expected to bring market know-how to the project. In order for this know-how to be actively used in a project, however, this would have needed to produce results at a level that allows marketing or at least testing of the technology developed.

- Project Coordination: Even though SMEs are the largest group of participants, in FP6 only 11,8% (Table 120) of all projects and in FP5 only 12,6% (Table 92) of the projects are coordinated by an SME. A possible reason can be found in the fact that most SMEs participate only once in a research project under the European Framework Programme. Adopting the role of coordinator is considered to add a substantial level of complexity to project participation. SMEs that are not geared towards the coordination of this kind of projects as business activity (e.g. such as project management consultants or companies that have gained the necessary experience through multiple participation) will not accept the risk and burden of acting as project coordinator. Those SMEs that chose to act as coordinator are not characterized by specific research intensity. Instead, this decision appears to be a function of SMEs' project management experience. These are often companies that either have project management experience as part of their profile (e.g. consultants) or have gained this experience through repeated participations.

- Looking at the size of participating SMEs at the start of the respective research project, only some 20% had a head count of more than 50 and / or a turnover of more than €10 million. So by far the largest number of participating SMEs fell into the categories of either micro or small enterprises.

- Analysing the R&D capability based on the current annual R&D expenditure measured in percent of turnover, two distinct groups can be identified. Around half of the participating SMEs are spending less than 10% of turnover on R&D while the other half is more R&D intensive. This division also holds true when classifying SMEs on the basis of an assessment of R&D capability in terms of the percentage of staff employed in R&D. Finally, the group of more R&D intensive SMEs can be further

analysed to reveal that about one 25 % of the SMEs can clearly be regarded as research intensive, spending more than 30% of their turnover on R&D related activities. Interestingly, more than half of both the micro and small enterprises describe their R&D expenditure as being higher than 10%. Compared to that, only 25% of the medium-sized enterprises can be regarded as somewhat R&D intensive..

- Pre-empting some of the findings on project impact on SMEs, looking at trends since project completion, some 25% of the SMEs increased their R&D expenditure over the last 3 years. In contrast, less than 20% of SMEs stated that they had not developed any new technologies over the past three years.

- Not only have new technologies been developed, but 75% of the SMEs state that they have introduced new technologies into the SME's operations over the past three years. Seeing this as a positive sign of the SME's ability to innovate in their own organisation, some 25% attributed this -- at least partly -- to the project in which they participated.

- It is interesting to note in this context that the R&D capability has increased throughout all types of SMEs when comparing the start of the project with the current situation. This positive notion is also confirmed by the trend in SMEs' turnover for the last three years. For more than 50% the turnover increased. Only some 10% saw their turnover decreasing. Due to increased R&D capabilities, they could pursue further or more diversified activities that resulted in higher turnover.

- As to the size of the participating SMEs, the following pattern can be observed: only about 25% of the SMEs participating are younger than 10 years old. Looking at those young enterprises, it is important to note that a large majority can be regarded as highly research intensive. Looking at the overall distribution of the enterprise age, a significant correlation between increasing age and decreasing R&D intensity can be observed.

Table 7: Summary of the SME participation and funding percentages

	FP5	FP6	% change
# of unique SMEs as % total unique organisations	35,9%	37,8%	+5.3%
# of unique SME participations as % of total participations	16,4%	16,9%	+3.0%
SME funding as % of total FP funding	13,2%	12,4%	-6.0%
Funding per SME FP participation	€170,000	€220,000	+30%

The SME participation in FP7 report[31] from 30 September 2009 has following figures regarding SME participation and funding in FP7:

- 1.832 Grant Agreements (Research Project Contracts) have been signed, of which 3.174 are SME participations, which is **15.7%** of the **participations**
- Out of the 6.337 million Euro EU contribution in signed Grant Agreements within the Cooperation Programme, 850 million Euro is allocated to SMEs
- **13.4%** of the **EC contribution** in Signed Grant Agreements is therefore allocated to SMEs
- On average SME participants receive **268.000 €**

4.1.1 Typology of participating SMEs

Moving beyond the data analyses and the case studies, data was then considered with the purpose of identifying shared features of projects and SMEs and any potential groupings that might shed further light on the patterns that influence the success of SME participation in FP projects. In this additional level of analysis, the cases have been clustered based on the various dimensions as expressed in the interviews. On this basis, we have identified two main groups of SMEs involved in FP5 and FP6 projects:

- Technology Developers
- Technology Networkers

These two overarching groups are distinguished by their broad approach towards and expectations from participation in FP projects. Joining FP projects can fulfill an SME's primary and/or secondary strategic objectives depending on the degree that the FP project is of strategic importance to the SME as we explain below.

Technology Developers consist of SMEs who enter FPs with the purpose of developing a specific technology. For this group (except the translators – see below), the projects fulfill the SME's primary strategic objectives since we find that the project's and the SME's objectives are in high alignment. The FP provides access to funds, physical resources, human resources, and markets, all of which are necessary for the SME's business development due to its small size. Moreover, participating in FPs reduces the risk of investment in the development of a new technology.

[31] SME Participation in FP7 report, Autumn 2009

Technology Networkers consist of SMEs that use FP projects to fulfill *secondary* strategic objectives. While the degree of alignment between the project's and the SME's strategic objectives is not high, the project is still of secondary strategic importance to these SMEs. These SMEs enter FPs since they view FPs as a significant tool in their networking strategy. In these cases, the FPs provide them with the means to improve their organizational reputation and/or to improve their scanning, i.e., "technological/information intelligence" and search capabilities. For those who have an open mind to exploring new areas, being part of an inter-disciplinary international network helps these SMEs to avoid technology lock-in since the FP provides access to partners outside their established customer and regional networks.

A deeper analysis revealed that the above two groups could be further divided into three sub-groups based on two dimensions:

a) the degree of alignment between the SME's objectives and the FP project's objectives and

b) the degree of involvement of the SME in the FP project.

The following groupings thus emerge from this analysis and are described below.

Table 8: Technology Developers vs. Technology Networkers

Technology Developers		**Technology Networkers**	
Strategic Innovators	21.7%	Experienced Technology Networkers	20%
Exploitation Seekers	12.5%	Curious & helpful	23.3%
Translators	17.5%	Free Riders	5%

In terms of the link between the different groupings, we found no evidence of any interaction or dependency in our case studies. However, it is important to note that when we conducted our case studies, we were not aware of these groupings. As such, we did not have any specific questions investigating the interaction or dependency between these groupings. This could be one area for further investigation.

Technology Developers:

Strategic Innovators: 21.7% of all case studies can be seen to belong to this group. They tend to be in the micro or small bracket of SMEs. Strategic innovators consider FP projects as critical or important as the objectives of the FP project are highly aligned with the strategy of the SME. These SMEs seek to participate in FPs since they are a valuable source of funding

and human resources, especially given the micro to small size of the SMEs in this sub-group. These SMEs play an important role in FP projects, often making a substantial contribution to the project as a technology provider. Due to their extensive experience gained during their relatively longer lifetime (most of the SMEs in this group were established prior to 2000), coordinators in these projects indicate that the SMEs have a high positive impact on both the execution and the outcomes of the project. In general, the technology output is competitive to highly competitive and the level of exploitation is high or very high. As a result, the FP's impact on the SME's overall economic performance, including business options, is also high.

Exploitation Seekers: (12.5%): 12.5% of SMEs in the reviewed cases can be categorized as exploitation seekers. These SMEs join projects with the explicit hope of exploiting the results of the project. The projects are important or critical for them since these SMEs tend to be micro to small size and have limited funding and resources. They tend to have a lower level of R&D intensity, i.e. less than 10%, indicating that they may lean more towards exploitation on the exploration to exploitation continuum than Strategic Innovators. These SMEs tend to have a high impact on the FP projects. However, due to slightly misaligned objectives between the project (more towards exploration) and the SME's strategy (more towards exploitation), the project does not have that high a level of impact on the SME. While the project coordinators tend to rate the technology outcome as technically and economically competitive, it does not reach the exploitation stage. Thus, these projects could benefit from further support in order for the project to achieve exploitation of promising results and improve the impact of the project on the SME.

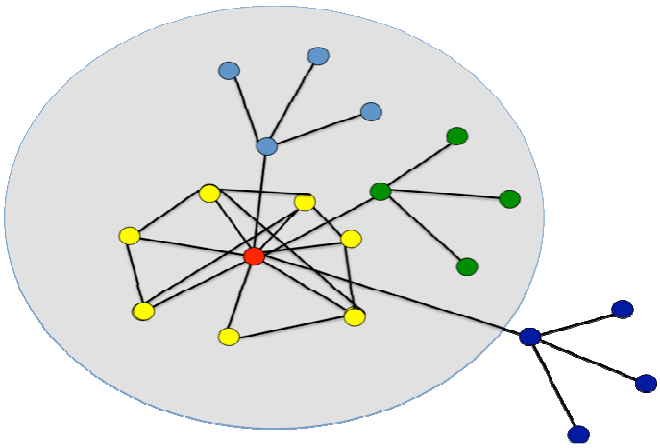
Translators: 17.5% of SMEs in the sample of FP5 & FP6 projects fall within this group. These SMEs generally are asked to join FP projects in order to play the role of the translator between research and the market. Translators are focused on the technology and tend to be of middle R&D intensity (>10% and <30%). Since they have previous experience with the technology and are adept at introducing new technologies to the market, they tend to have an R&D/technical/scientific role in the project. The projects are important but not critical for them, thus the degree of alignment between the project's objectives and the SME's strategy is less than that of the Strategic Innovators and Exploitation Seekers. As a result, while the SME has a moderate to high impact on the project, there are mixed results in terms of the impact of the FP project on the SME.

Technology Networkers

Before looking more closely at this group, it is important to have an understanding of what drives these SMEs that fall into the technology networker grouping. First, FP projects enable these SMEs to proactively scan technological developments in their field. EU projects are considered to be leading edge as they are often inter-disciplinary, bring together the experts in the industry from across Europe, and importantly they have received a stamp of approval

by the EC. Thus, these SMEs see these projects as the best means to learn about where the technology and field are going, enabling them to make well informed decisions in the future about where to invest and spend their limited resources, i.e. to avoid betting on the wrong horse.

Second, through these FP projects, these SMEs gain access to numerous important networks across Europe. Research has shown that successful organizations are those that strategically build a limited number of strategically important relationships – build relationships before they are needed with those who are the experts or who are central in other networks as opposed to just building many relationships with many people. Since SMEs have even more limited resources than larger organizations, then they also have limited resources they can spend on networking activities. Some of the leaders in the field and their organizations are involved in these FP projects, thus they represent some of the best people and organizations with which to build relationships. Organizational research has also shown that those organizations that are able to build boundary spanning positions, i.e. bridging a number of networks (the red dot in the figure below), are more successful because they enable both *access to and control over* resources. Through these expanded networks, these SMEs gain access to a considerable amount of different resources, which enable them to quickly act especially in industries with a high pace of change. For example, if the technology starts to develop in a different direction, then they may already have a relationship that they can immediately activate. Additionally, the SMEs have control over resources through their position in the network. In their local networks, they gain a position of high reputation as they play the role of a broker. Local organizations (the yellow dots below) turn to these SMEs when they need resources, and the SMEs can then broker relationships for these local organizations with other organizations throughout Europe. Being in this central position further enables SMEs to scan the environment and see which way the technology and the market are developing.



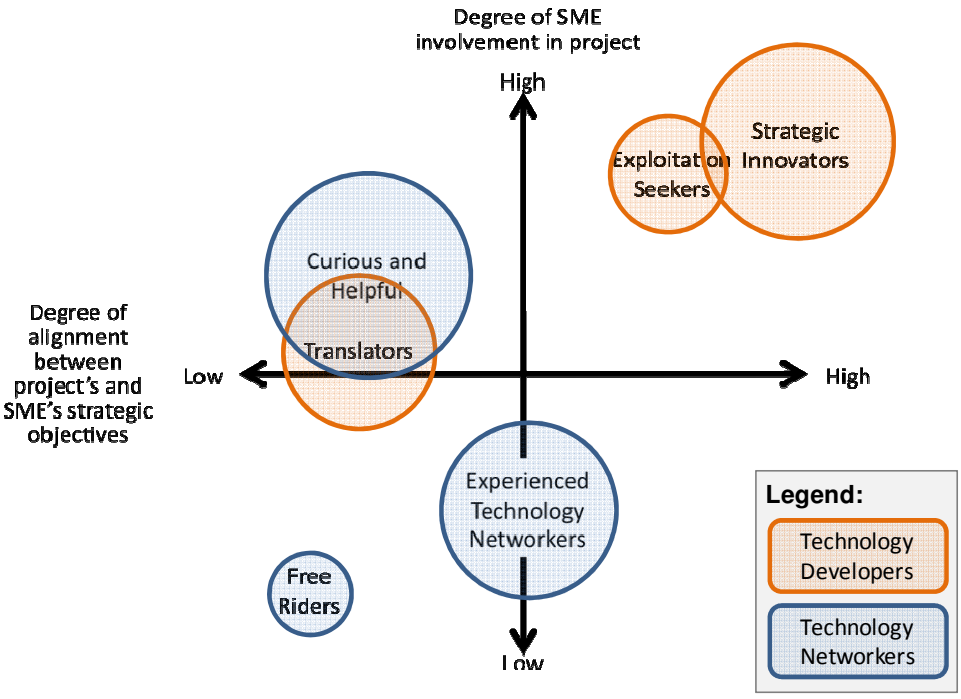
Graph 1: Network structure

Experienced Technology Networkers: 20% of SMEs under consideration can be classed as such. SMEs in general are less able to shape their external environment than larger firms due to their small size; therefore, they must be proactive in their approach to learning about technological developments in their industry. However, due to limited resources as discussed above, smaller firms have difficulty in establishing and maintaining relationships outside of their everyday external activities and local regions as well as going beyond incremental innovation. Thus, Experienced Technology Networkers join FPs for the purpose of technology intelligence and network development. Generally speaking, they have a high level of R&D intensity (<30%) and have built a solid reputation as they are both well-established (primarily before 2000) and generally have been involved in more than three EU projects. These SMEs play the role of technology provider or advisor; however, they tend to be at the periphery of the project. There are mixed results in terms of the impact of the SME on the project. As for the impact of the FP project on the SME, while there is no to moderate business impact, the FP project has a high impact on the SME's networking. It is important to note that a portion of this group has the same characteristics as the rest of this sub-group, but they have only been involved in between one and three EU projects. Thus, these can be seen as the next generation of Experienced Technology Networkers.

Curious and Helpful: 23.3% of SMEs in our sample belong to this group. This sub-group of SMEs are good networkers in that they have joined FP projects due to their curious nature and willingness to help out despite the FP project not being in high alignment with the company's strategy. These SMEs tend to be well established (before 2000) with a low level of R&D intensity and one reason for joining an FP project is that it enables the SME to broaden its horizons outside of their local region or country as well as engage in a challenging task. In general, the project is a positive experience for the SME in that they gain new insights, broaden their networks, and potentially develop their R&D capabilities as well as their skills related to working in cross-cultural, interdisciplinary teams. However, the SME's objectives for the project are generally not achieved, and as such, the value obtained by the SME through FP participation is low to moderate and there is no business impact on the SME. While the majority of SMEs make only a low to moderate impact on the project, some (around 20 of this sub-group) did have a higher than expected impact on the project.

Free Riders: Only 5% of SMEs can be classified as free riders. This sub-group of SMEs is thus a relatively small sub-group with only a handful of companies. They are generally asked to join FP projects so that the project can "fulfill the SME quota". They were generally found through one of the project partner's networks and were asked to join due to their well-established reputation (company founded generally prior to 1994). Free-riders tend to be medium-sized, which enables them to allocate the necessary resources on a project that is not in alignment with the SME's strategy (i.e. peripheral or limited interest in the project). Due to this limited interest by either the project or the SME, these SMEs tend to have low or no impact on the project while the project has no impact on the SME. One of the reasons for an SME joining such a project may be to acquire funding; however, another reason may be that they use this project to maintain or build social capital with the partner that recommended this partner to join the project.

The following diagram illustrates how the different sub-groups of SMEs are positioned in relation to two sets of key characteristics of SME participation in FP projects, namely the degree of alignment of the project with SME objectives and business strategy on the one hand and the degree of SME involvement in project implementation.



Graph 2: Typology of different SME groups

Turning to research within the fields of strategy, entrepreneurship, and project management, our results are greatly supported by the extant literature in these fields. However, our results also shed light on an area about which we know relatively little: the dynamics of knowledge exchange within publicly funded R&D public-private partnerships (PPPs) and the impact of these collaborations on the participating organisations.

While PPPs have existed for centuries, it is only within the past two decades that the number has been significantly increasing within Europe as well as across the globe. Moreover, studies of the actual PPP organisational form have tended to focus on those projects producing more tangible results such as increasing the supply of regional housing or improving access to public medicine. However, R&D collaborations focusing on the creation of knowledge-based or more "intangible" outcomes are poorly understood since they have received surprisingly little attention to date from researchers and practitioners.

The underlying rationale for many publicly funded R&D PPPs is to improve competitiveness through the exchange and creation of knowledge between the R&D member organisations

of which firms are critical participants. As firms are argued to be the primary driver of competitiveness within a region due to the creation and sale of value-added products and services, it is important to understand how firms leverage the knowledge exchanged and created in these R&D collaborations. Moreover, firms and more specifically SMEs, play a vital role in today's highly competitive environment as traditional industries are merging at the same time as completely new industries are emerging. However, the ability for SMEs to succeed is becoming increasingly difficult due to shrinking product lifecycles, the need for integration across an increasing diversity of technologies in products and services, and increasing levels of competition from new competitors crossing not only geographical but industrial borders as well (Boland & Tenkasi 1995, Purser, Pasmore, & Tenkasi1992). All of this puts increasing pressure on these high-growth firms to do a better job of gaining access to new knowledge in their business environments while at the same time leveraging their existing knowledge across the firm (Bartlett & Ghoshal1989, Doz & Hamel 1997, Drucker 1990, Hedlund & Nonaka 1993).

The underlying assumptions for the above is that knowledge is the most valuable resource and the source of competitive advantage (Kogut & Zander 1992) and that knowledge grows through two generic processes (Ghoshal & Moran 1996, Schumpeter 1934): 1) the combination of previously unconnected knowledge that leads to novel solutions, and 2) the exchange of knowledge between actors. As such, knowledge generation is seen as an inherently social process in which new knowledge results from the interactions between various network actors, rather than resulting from the creative act of a single individual or organisation such as a firm (Håkansson 1987, von Hippel 1988).

R&D PPPs by their very nature are network structures purposefully designed to promote the exchange, combination, and creation of new knowledge. However, due to their inter-organisational and cross-sectoral nature, they are faced with significant challenges to achieving effective outcomes. First, in terms of a relational dimension, members may have divergent interests and objectives for why they enter and what they expect to achieve in the collaboration. Research on triple-helix partnerships (THPs) - or research collaborations involving academia, government, and industry organisations, in Sweden has found that partners tend to have divergent motivations and objectives for what they expect to achieve in the collaboration and that these may even change over time. These differences impact the degree to which knowledge is shared and exchanged in the collaboration (Ruuska & Teigland 2009). Our findings related to the alignment between the SME's objectives and the project's objectives clearly echo this literature. The Strategic Innovators had a high degree of alignment with the project and as such experienced a higher degree of impact in contrast to the Free Riders and Translators.

Second, research on projects and intra-organisational dynamics has found that the ability to contribute the necessary resources required for the project (e.g., Pfeffer 1981) also affects outcomes. Findings from the above research on THPs suggests that the necessary resources include both tangible resources, such as financial, PPE, and human, and intangible resources, such as expertise, reputation, goodwill, legitimacy, and other forms of social capital available

through the organisation's networks. Factors such as the size of the member organisation as well as the commitment and the level of priority assigned to the collaboration by the member organisation may affect the resource allocation to the collaboration (Ruuska & Teigland, 2009). Looking at the research on SMEs in this context, SMEs face two barriers to innovation: 1) financial – lack of funds for innovating, too high risk for innovation projects, or too expensive technology and 2) manpower – no qualified personnel or lack of time by key personnel. Our findings clearly reflect the above as we found that the Technology Developers primarily entered the FP projects to gain access to key resources to enable them to develop a specific technology.

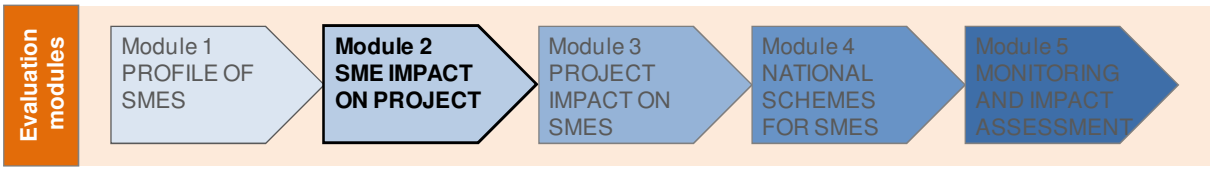
Finally, R&D collaborations are a cooperative endeavour, one in which the purpose is to coordinate the various activities of its members in order to accomplish a goal that could not be achieved by any of its members individually. However, the development of a shared social reality by members may be difficult to achieve as these network organisations are often characterized by a high level of diversity. For example, they may have a high level of role-related diversity as individual members may have different occupations, organisational positions, specialized knowledge and skills in addition to a high level of personally inherent diversity due to differences in the age, gender, nationality, and personality of the individual members (Maznevski 1994). This diversity is generally associated with underlying differences in the behaviours, values, and attitudes of members. Research has found that people in different roles not only notice different information, but that they perceive the same information differently (Maznevski 1994). As a result, diverse organisations are challenged in their ability to achieve their objectives. Our findings support this as well since we found that Exploitation Seekers tended to be disappointed since the project did not live up to their expectations due to a slight misalignment of objectives.

Recent advances in the project management literature indicate that successful PPPs are those that are able to achieve collective competence (Ruuska & Teigland forthcoming). Collective competence is based on a shared reality and shared understanding by the project members of the project as a whole and is argued to be at the group level and as such integrates both practical as well as interpersonal competence (Sandberg 1994, 2000). This approach suggests that competence is constituted while project members mutually engage in the project's tasks and collaborate and create meaning as they work together in an open and trusting environment (Sandberg 1994, 2000). Research in this field suggests that project management plays a significant role in the creation of collective competence through such means as the designing of the interdependence of the project members' tasks, creating trust through open and balanced communication, and managing conflict to achieve creative conflict (Ruuska & Teigland 2009). Given the complex nature of many R&D collaborations, achieving collective competence can be hypothesized to be highly dependent upon the project's management and its ability to effectively manage the members' differing objectives and interests, the scarcity of resources, and the creation of open and trusting relationships. Turning to our dimension of degree of involvement in the project, we see a parallel with the project management literature. Competent project coordinators are those who facilitate the involvement of the SME in the project such that collective competence can be developed.

Turning to the network literature, research has found that knowledge and information required to develop new core competences often originate outside the firm. One way that organisations can access this knowledge is to expand their networks and gain capabilities through formal partnerships such as alliances. Anand & Khanna (2000) suggest that the most important factor in alliance success is previous alliance experience. Certain organisations have developed an alliance capability in that they are able to develop an ability to develop and participate in alliances and in turn this leads to higher stock market returns because they are able to create more value as they accumulate experience (Anand & Khanna 2000). Our sub-groups of Experienced Technology Networkers and Curious and Helpful reflect the findings of this literature – clearly indicating the value of FP projects for these kinds of organisations. The final group of Free Riders reflects previous research on inter-organisational relationships, which has found that it may be individually rational for an organisation to take more knowledge than it gives — to choose not to be transparent about its knowledge (Hamel 1991), thus impacting the dynamics of the R&D collaboration.

In summary, we find that our two groups and their sub-groups are highly supported by the literature from various fields.

4.2 SME Impact on Project



For the purposes of the analysis it was found convenient to structure the presentation of findings in terms of the following areas:

SME Role in FPs, corresponding to evaluation question E2, that is

E.2 At which stage of the project and in which role is SME participation more apparent under the respective thematic programmes? What are the reasons?

SME Impact on Project Implementation, corresponding to

E.3 What added value did SMEs bring to the project?

E.3.1 How do SMEs perform in the projects (e.g., capacities; needs and motivation; role, degree of participation, input in the project, etc.)? Are there differences between the thematic programmes in this respect? If so, what are the reasons?

E.3.2 How satisfied are the other participants with the involvement of SMEs?

E.4.3 To what extent were the expectations of SMEs concerning the participation in the thematic programme fulfilled (e.g. in terms of whether information on the ways and means of participation, and support actions and services were well-established, co-operation with other participants, return on investment, etc.)?

E.5 What illustrative practices can be identified with regards to SME involvement in research projects (in terms of e.g. input, project management, networking, dissemination and exploitation of results, etc.)?

SME Impact on Project outcome, corresponding to

E.3.3 To what extent did SME participation contribute to the success or failure of the project?

E.3.4 What results and practices are more apparent in projects co-ordinated by research-performing SMEs?

E.4 How do SME participants assess their involvement in projects under the thematic programmes?

E.4.1	To what extent did SMEs reach their overall objectives (e.g. scientific, financial, exploitation objectives, etc.) through project participation? If not, why?
E.4.2	What are the main success and / or failure factors for projects? Is there a direct link between the level of technical achievement and the actual take-up of results by SMEs? If not, how can a possible gap be bridged?
E.7	How successful were the respective framework programmes in providing benefits for SMEs?
E.7.3	To what extent did project participation under the respective thematic programmes correspond to the needs and business objectives of SMEs? What are the differences in this respect between SMEs in different sectors, SMEs with different capabilities and SMEs from countries with different economic performance?

4.2.1 SME Role in FPs

E.2	**At which stage of the project is SME participation more apparent (under the respective thematic programmes)? What are the reasons?**

SME participation can be understood in terms of a sequential perspective of the project:

1. The first stage is the initiation and realization of the project proposal.
2. The second and main stage is the execution of the project, which reveals the sub-roles of the participants and of the SME in particular.
3. The third stage is the exploitation stage, which is assessed as a particular task after finalizing the project.

Stage 1: Initiation phase

As suggested in the chapter on the profile of participating SMEs, we find from looking at the contractual roles taken by the SME that around 10% were coordinated by SMEs. A majority of projects were academically and more research based and as a consequence initiated and led by academic or research partners.

Table 9: Project lead / initiator

Was the project industry-led / initiated or was it academic-led / initiated?	
	Percentage
Academic / research led / initiated	58,8%
Large industry led / initiated	15,1%
SME led / initiated	26,1%
Total	100,0%

This implies a limited role for SMEs, which are more commercially based, in the initiation phase and proposal writing.

Results suggest that the role of SMEs in the proposal writing stage tends to be of three types.

1. In projects where the SME takes responsibility for a work package, the SME naturally assumes the main responsibility for writing the proposal chapters for their specific tasks.

2. The second type of involvement taken by SMEs is to add value to the proposal based on the SME's particular knowledge. This knowledge input is of a complementary nature in comparison to that of the academic partners and tends to relate to specific end-user or specific field-based experience and networks. The interviews suggest that in many instances such complementary knowledge was actively identified by the lead academic consortium member and group of key partners on the basis of specific SME strengths and assets. Such relevant knowledge was identified through an SME's existing reputation, its leading role in the market of the project's focus area, and / or on the basis of existing relationships between this SME and a key project member. The interviews suggest that SMEs that had previously participated in FP projects were sometimes identified through the corresponding FP databases and contacted directly by aspiring project coordinators.

3. The third role for SMEs is that of a contractor to the project. Around 10% of SME participants fell into this category. The interview results suggest that in these cases the SME had no role in proposal writing. Rather they were literally identified and contracted once the project had been approved to provide a very clearly defined product or service to the project consortium.

Around 25% of the coordinators suggest that the project was SME led or initiated. This compares to only a handful of projects that were coordinated by SMEs (see above). This appears to confirm the finding that in a considerable number of cases SMEs had an important role to play in conceiving and developing a project idea even if they did not act as coordinator.

Stage 2: Execution phase

The general importance of the SME contribution during the project execution stage was considered by the coordinators in almost 80% of the projects as "important but not crucial" or "crucial" to the execution of the project (see more detailed discussion in question E.3.2 below). The interviews suggest that in many cases SME involvement was spread over the whole project period with SMEs acting as complementary partners throughout. Coordinators who indicated that a consortium approach was necessary to undertake the particular project suggested that this was due to the need for a multi-disciplinary effort. Combining this with the findings related to the selection of SME partners above, this would appear to suggest that SMEs contributed an important dimension to the actual project execution.

Table 10: Motivation for project

Why was it necessary to form this consortium to carry out this Project?	
	Percentage
A multi-disciplinary effort was needed to tackle this problem	42,9%
A multi-national effort was the only way to achieve results in this area	22,7%
To achieve a critical mass of expertise	12,6%
It was the best way to achieve effective industry-academia collaboration	10,1%
It was the best way to ensure optimum technology transfer to industry	4,2%
Most of us were already working together on this topic and this project was a natural next step	4,2%
It was the only way to obtain funding at this level	3,4%
Total	**100,0%**

The case studies, and in particular the interviews, also illustrate that many SMEs proved to be important active partners in the projects who often went beyond the call of duty in terms of their role as specified at the outset. While such active engagement with the project tended to be facilitated by the coordinators who had an overview of progress in different work packages, it was often the SMEs who took on more responsibility than formally required and willingly shared their field or product development expertise with the other partners. Thus, they often acted informally as a project sounding board, providing field based expertise throughout the projects. In particular, the SMEs put most emphasis on their

scientific knowledge and technical skills as having high positive impact on the project execution compared to e.g. manufacturing skills.

Table 11: Scientific knowledge contribution of SME to project

What was the impact of your SME's contribution to this project during the project, arising from your scientific knowledge?	
	Percentage
High positive impact	27,7%
Moderate positive impact	36,1%
Low positive impact	26,1%
No impact	10,1%
Total	**100,0%**

Table 12: Technical skills and expertise contribution of SME to project

What was the impact of your SME's contribution to this project during the project, arising from your technical skills and expertise?	
	Percentage
High positive impact	32,8%
Moderate positive impact	47,9%
Low positive impact	14,3%
No impact	5,0%
Total	**100,0%**

In other cases, however, the SMEs performed a rather limited, clearly described part in the project and had little contact with the wider project consortium. To a large extent, this would have been connected to two factors:

1. the structure and centre of gravity of the consortium and

2. the relevance of the research undertaken to the SME's immediate business needs.

Where 1) a large consortium was dominated by research partners and 2) the main gist of the research was to extend knowledge boundaries and develop breakthrough technologies with all the associated risks of technology development in fairly early stages, difficulties could arise in the project in terms of integrating SME and research partner objectives and tasks. In these cases, the SMEs had much less of an active involvement and resorted to interacting with a sub-set of consortium partners who were closer to their particular technological interests. In some cases, particularly where the SME had been recruited with essentially a supplier role to the project in mind (this was sometimes the case, even when the official role

was one of partner rather than contractor), SMEs had a fairly passive role, delivering on clearly circumscribed tasks, but not offering any additional value to the project.

About 25% of the SME respondents suggested their particular interest in the project consisted in improving the competitiveness of a particular technology by advancing their knowledge and product development effort through project participation. In this case, it appears that SMEs' strong self interest made them quite resourceful in getting the most out of project participation in supportive as well as slightly more difficult conditions. Thus, they contributed their practical technical skills to the project as a whole where this was possible or used them to secure sufficiently valuable outputs that corresponded to market needs for their own purposes where this was not possible. Where SMEs had a clear, active interest in the project focus, SME involvement was considerable despite the fact that their formal roles in the projects - in terms of budgets and / or major roles as coordinators or work package owners - were relatively small.

Finally, the case study results suggest that for about 25% of projects that were SME led or initiated, the SMEs played a crucial role for project execution. Driven by a clear market need and / or opportunity, SMEs in these projects used FP funding in a very structured and focused way to fund their product development activities and gain access to very specific elements of complementary knowledge from academic and other industrial consortium members.

Stage 3: The exploitation phase

While knowledge exploitation is a key criterion for FP projects across the board, this is more explicitly embedded in some projects than in others. Where a clear commitment to exploitation goals existed (either from the start or evolved during the project), corresponding preparatory actions tended to be realized during the project's lifetime. While actual exploitation activities such as approaching potential customers or investing in other market-facing activities tend to be excluded from FP projects, the analysis suggests that early stage activities included market analysis and the creation of an exploitation group.

Following project completion, the technology is reported as being subject to current in-house exploitation activities by some or all of the partners in more than 40 percent of the projects.

Table 13: Current technology exploitation arrangements

If the technology is currently being exploited, how is this being carried out?	
	Percentage
By some or all of the partners in-house	42,0%
It is not being exploited	35,3%
By some or all of the partners mainly externally	19,3%
By an external exploiting group or entity	3,4%
Total	**100,0%**

In only a relatively low proportion of projects is the SME party to IPR group ownership arrangements, which would suggest that SMEs have a limited share in technology exploitation post-project. However, in a similar number of cases, the SMEs are sole owners of the IPR.

Table 14: IPR ownership

Who owns the IPR on the technology?	
	Percentage
The SME with other partners	37,8%
No IPR	17,6%
Other project partners without the SME	16,0%
An exploitation group including the SME	13,4%
The SME	10,1%
An exploitation group excluding the SME	6,7%
Total	**100,0%**

The role of SMEs in post-project technology exploitation is discussed in more detail in the chapter on SME impact on project outcomes below (section 4.2.2).

4.2.2 SME impact on project implementation

E.3	**What added value did SMEs bring to the project?**
E.3.1	**How do SMEs perform in the projects? Are there differences between the thematic programmes in this respect? If so, what are the reasons?**

Exploring the specific roles of the SMEs and their performance in the projects, a range of aspects evolve during the project execution and the follow up of the projects. Here, the performance of the SMEs will be related to specific capacities, SME needs and the motivations underlying the SME input to the projects which leads to an elaborate understanding of the SME role and performance in the projects.

Capacities, needs and motivation

According to the coordinators the impact of SMEs on achieving the goals of the project was "important" or "crucial" in more than 70% of the projects. The SMEs themselves appeared to be quite aware of their unique capacities in adding to the project's execution. 'Technical skills and expertise' stands out in the eyes of the SMEs in more than 80% of the cases followed by 'scientific expertise'. A large group (42%) did also identify themselves as mainly technology developers in the consortium.

While 'end-user knowledge' was mentioned by coordinators as a criterion for initiating contact with the SME, it was considered as important by the SMEs during the project execution in about 40% of the cases. As suggested earlier in this report, exploitation represented a relatively small part of the entire project task; therefore, SMEs did not have the opportunity to contribute with their exploitation capabilities. A large group of SMEs (44% are micro firms, and these report in the interviews that they did not have the financial resources to invest in exploitation actions and several of them have decreased their number employees since the end of the project.

How critical the project was for the SME and how well they are likely to have performed as a result can be related to particular SME needs. Based on the fact that more than 80% of the SMEs had previous knowledge in the technical field of the project, their own judgment of the criticalness of the projects to their firm is quite reliable. In more than 60% of the cases, the projects were considered as "important but not critical" or "limited or of peripheral interest" for the SME. Only around one-third of the SMEs could have conducted the project without funding, but not on their own. The SME perspective on the criticalness of the project was commented in the interviews as not being competitive enough to an immediate market launch. This reflects another understanding derived from the interviews, namely that the participating SMEs tend to be knowledgeable enough in the field of the projects to recognize the importance of the projects, but in the majority of cases, their project engagement was not critical for the entire operation of the SME or considered as having an immediate economic potential on their firms. This could be put into perspective through the coordinators' views on the competitiveness of the technological outcome of the project. They consider the outcome as competitive in more than 80% of the cases, including that it depends on the existence of the right conditions or regulations. But more than 60% of the coordinators indicate that the technology is not yet exploited because it is not competitive. The conclusion then is that the SMEs seem to have an earlier awareness of the exploitation

possibilities compared to the academic coordinators. Yet in a longer term perspective their perspectives converge. Finally, about 50% of the coordinators express an explicit need for multi-disciplinary approaches to achieve the project aims and objectives. In the interviews they explain that the SMEs are invited as complementary participants to the academic partners. Thus, an understanding of SME needs and capacities when engaging in FP projects must be related to their need of advancing their knowledge in their main field of activity on the one hand and to their growth intentions on the market. The complexity of the problems tackled is to a large extent well beyond the expertise and capabilities of the SMEs but do not include their market needs and knowledge.

Specific roles in the projects

Apart from the need of SMEs to join forces with experts within their field, their motivation and expectations from FP participation have been presented as low from a commercial perspective. This was reinforced in the interviews. The SMEs clearly saw participation in such projects as an investment in a necessary joint effort to enhance their knowledge in the area of the project. Consequently, the SMEs report in the interviews that their role in the projects tends to be related to familiar areas and tasks but takes such activities further and thus expands and deepens the scope of their activities and capabilities.

The familiar responsibilities are ones to which they can contribute with practices and processes that draw on their knowledge of a particular field and thus make a very specific contribution to the project activities. An illustrative example is presented below based on the case study of the project Detox Fungi.

One SME in the wine industry was responsible for providing access to grapes at an appropriate point in time in the growing cycle. The grapes needed to be harvested shortly before the main harvest. The company therefore advised the research team when the grapes had the appropriate ripeness (monitoring factors such as sugar levels, etc. as they would as part of ordinary operations) and facilitated access to the grapes. The university research team would then undertake the scientific analysis.

This example illustrates how several SMEs had connections and field-based operations that yielded important inputs to the project execution. This was found in other projects too that were not in the agricultural or health sector where field experiments and trials are of particular relevance. Specific industry relations in other sectors also formed the backdrop to field experiment sites being included in the projects ranging from medieval church organs to gas power plants. The coordinators' perception of the SMEs' main contribution and impact (C3.8) were in line with the above examples suggesting that SME contribution was very specific and unique, if rather limited. 'End-user knowledge' and 'field access' in particular were frequently mentioned.

These kinds of roles were important throughout the projects since it made a valuable contribution to both a refined proposal and to the different stages of actual project execution. At the proposal stage, SMEs were able to provide valuable input based on their commercial and market experience. During the projects they brought knowledge and expertise close to the market, enabling the development of field data and / or prototypes. The free text comments by the coordinators (C3.8) express in different ways the particular contribution of the SMEs as:

- main-end product designers
- expertise on scaling-up lab results
- only supplier of special tool components
- provided specifications for the products
- global worldwide knowledge of the market
- independently validated the outcome of the research

Performance of the SME in the projects

Summing up the performance of SMEs and their particular roles in the projects, the overall impact on the project of the SMEs was considered as high by a large number of the coordinators and moderate by a considerably higher number, see below.

Table 15: Overall impact of SME on the project

Impact on this SME's contribution to project outcomes?	
	Percentage
High positive impact	34,5%
Moderate positive impact	42,9%
Low positive impact	17,6%
No impact	5,0%
Total	**100,0%**

Taking the preceding discussion about SME capacities, needs and motivation into account, the picture that emerges from this analysis regarding SME performance in the projects suggests that SMEs tended to deliver on project tasks, tended to have sufficient interest in project activities to engage with the research as a whole, but tended to depend on a degree of facilitation and mediation on the part of the coordinator or the most closely associated

consortium partner (in many cases, an SME was introduced by research partners or larger companies that had a pre-existing relationship with or knowledge of the SME). Where, as was suggested earlier, the centre of gravity in terms of consortium structure and research theme was too far removed from the SME's own field of interest and expertise, SMEs would have had a rather limited involvement in the project.

E.3.2 How satisfied are the other participants with the involvement of SMEs?

To answer this question, we examine two relevant case study survey questions. The first question (C3.1) asks, "How important is the SME's contribution to the execution of the project?" As can be seen in the graph, around 75% of the coordinators replied that the SME was "crucial" or "important but not crucial" in terms of the SME's contribution to project execution while only 5% replied that the SME was "not important" at all. Results from the interviews reveal that in the cases where the partners were satisfied with the SME's contribution and there was a continued shared interest between the partners and the SME, collaboration between the partners and the SME continued even after the final deadline of the FP project. In some instances, they even sought and acquired further EU funding.

Table 16: Importance of SME to project execution

How important was this SME's contribution to the execution of the project?	
	Percentage
Crucial	29.4%
Important but not crucial	42,9%
Moderately important	22.7%
Not important	5,0%
Total	**100,0%**

The second question (C5.5) asks what is the "impact of the SME's contribution to project execution?" As seen in the table here, we find a similar picture as above. We find that around 75% of the respondents are of the opinion that the SME had a "high positive impact" or a "moderate positive impact" on the project's execution while only 5% reported "no impact". A cross-tab analysis reveals that for those who indicated a "high positive impact", the SMEs in these projects were more likely to be a micro SME and tended to have the role of a technology developer. This was further confirmed by the interview data.

Table 17: Impact of SME on project execution

What is the impact of this SME's contribution to project execution?	
	Percentage
High positive impact	37.8%
Moderate positive impact	37.8%
Low positive impact	19.3%
No impact	5.0%
Total	**100,0%**

Further analysing the impact of the SME's contribution to project execution (C5.5), we find that in those cases where the SMEs whose primary objective for entering the project was "to improve R&D networking" (S2.18a), the coordinator stated that the impact of the SME's contribution to project execution was rather limited. On the other hand, according to the coordinators, those SMEs whose main objective to join the project was to improve R&D funding had a significantly higher impact.

Table 18: SME contribution to project execution compared to SME objectives[32]*

	High positive impact	**Moderate positive impact**	**Low positive impact**	**No impact**	**Total**
To obtain funding for R&D	11	11	5		**27**
To improve R&D networking	3	4	8		**15**
To improve technical or R&D capabilities	8	5	1	1	**15**
To enter a new technological field	5	7	1	1	**14**
To gain access to partners' know-how and resources	3	7	4		**14**
To develop a new or existing product	5	2	1	1	**9**
To solve a specific industrial or technical problem	3	3	1		**7**
To obtain funding for exploitation	4	1			**5**
To find a way to conform to a new technical standard or regulation	1	2		1	**4**
To find customers for own existing products or know-how	1	2			**3**

[32] * This is a cross table and difficult to show percentages since there are two totals. Thus figures are shown in absolute figures.

To enhance business networking	1		1	1	**3**
To enhance R&D or business reputation			1		**1**
To enter a new market				1	**1**
No answer	1	1			**2**
Total	**46**	**45**	**23**	**6**	**120**

These findings suggest that the coordinator (and thus the other project partners) is more satisfied with the SME's contribution when the SME has a specific purpose for entering the project – to obtain funding for a specific R&D project, as opposed to just improving networking. This finding is echoed in the analysis of the interview data, which indicates that the coordinator and other project partners tend to be more satisfied with the SME's contribution when the SME has had a clearly defined role in terms of what value it could bring to the project.

E.4.3 To what extent were the expectations of SMEs concerning the participation in the thematic programme fulfilled?

Regarding participation in the EU projects, around 75% of the SMEs responded that they would **not** have conducted the EU project on their own while about 67% of the SMEs responded that they would **not** have conducted this project without EU funding. This inability to complete the project on their own or without funding is interesting in light of the fact that just over 50% responded that the project was "important but not critical" and around 8% of the SMEs responded that the project was "critical" while only just under one-fifth said that the project was of limited or peripheral interest. These findings indicate that these EU projects are something that fills an important developmental need but that they do not rely solely on such projects.

Table 19: Ability of SME to conduct project

Could your SME have carried out such a Project on its own?	
	Percentage
Yes	7.6%
No	76.5%
Maybe	16.0%
Total	**100,0%**

Would your SME have carried out such a Project if not funded	
	Percentage
Yes	5.9%
No	65.5%
Maybe	28.6%
Total	**100,0%**

In looking at the case studies and in particular the interview material, we find that SMEs join the EU projects as a means to gain access to resources that they do not have in house and that enable them to explore possible new directions within their field or tangential ones.

This leads us to ask why SMEs enter EU projects, and in the case studies we find some interesting results. For the entire set of SMEs, we find that 22.5% of the SMEs responded that the main objective for entering the EU project was "to obtain funding for R&D". This was far above the next two most frequent statements, which were "to improve R&D networking" and "to improve technical or R&D capabilities". Respondents added that they did not have the sufficient resources in-house to fund R&D. The ability to join an EU project provided them with access to resources that they did not have. This is especially important for those companies that were interested in exploring new areas. As a new research area may not yet be a critical part of the SME's business, it has fewer resources to spend on exploration. The EU projects could be used to provide access to funding for more exploratory purposes.

Table 20: SME's objective for joining project

What is the main objective of the SME for joining this project?	
	Percentage
To obtain funding for R&D	22,5%
To improve R&D networking	12,5%
To improve technical or R&D capabilities	12,5%
To gain access to partners' know-how and resources	11,7%
To enter a new technological field	11,7%
To develop a new or existing product	7,5%
To solve a specific industrial or technical problem	5,8%
To obtain funding for exploitation	4,2%
To find a way to conform to a new technical standard or regulation	3,3%
To find customers for own existing products or know-how	2,5%
To enhance business networking	2.5%

To enter a new market	0,8%
To enhance R&D or business reputation	0,8%
No answer	1,7%
Total	**100,0%**

However, looking at the cross-tabs between the objectives for entering the project and the size of the SME, we find a disproportionate amount of micro-SMEs (<10 persons and<= 2 mln Euro) that are primarily after R&D funding. Of these micro-SMEs, around 3330%% are after R&D funding compared to about 16% of small, medium, and large and of medium SMEs primarily interested in funding.

Table 21: SME size compared to SME objectives

	Larger (≥250 persons and >50M Euro turnover)	Medium (<250 persons and ≤ 50M Euro turnover)	Small (<50 persons and ≤ 10M Euro turnover)	Micro (<10 persons and ≤ 2M Euro turnover)	No answer	**Total**
To obtain funding for R&D	1	5	9	12		**27**
To improve R&D networking		2	9	3	1	**15**
To improve technical or R&D capabilities	1	1	3	10		**15**
To enter a new technological field		5	6	3		**14**
To gain access to partners' know-how and resources	3	5	3	3		**14**
To develop a new or existing product		3	4	2		**9**
To solve a specific industrial or technical problem	1	3	2	1		**7**
To obtain funding for exploitation		2		3		**5**
To find a way to conform to a new technical standard or regulation		2	1	1		**4**
To find customers for own existing products or know-how			2	1		**3**
To enhance business networking	1	1		1		**3**
To enhance R&D or business reputation		1				
To enter a new market			1			**1**
No answer			2			**2**
Total	**7**	**30**	**42**	**40**	**1**	**120**

For the small and medium sized enterprises, there is no one clear-cut objective – rather they are spread across the various objectives. This finding indicates that the EU is filling an important financial role for micro companies. The question is whether these micro companies are really just spinoffs or "extensions" of university/academic institutions and are used as means to get funding for academic research. In one of the interviews, it was revealed that the SME actually has its offices at the university in the same physical area where its EU academic partner's department is. Or could the reason be that the SME is so small and recently started that it really does need the funds for its own development? Further investigation reveals that both scenarios are valid. There is a reverse correlation between the size of the firm and the need for resources, i.e. the smaller the firm, the more the need for resources – despite the age of the firm, as we saw in the case studies.

When we look into the question to what extent the SME's expectations concerning project involvement were fulfilled, we find that only 5% of SMEs responded that the project did not meet its expectations. The he majority responded that some or most of the expectations were fulfilled, and to some the expectations were fulfilled to a great extent (14.3%). A further investigation of various cross-tabs involving expectations being met and other factors such as size, EU project involvement, R&D intensity, role in project, importance of project, revealed no identifiable patterns.

Table 22: Fulfilment of objectives

To what extent were the expectations in this Project fulfilled?	
	Percentage
To a great extent	14.3%
Most expectations were fulfilled	41.2%
Some expectations were fulfilled	39.5%
Did not meet expectations	5.0%
Total	**100,0%**

E.5 What illustrative practices can be identified with regards to SME involvement in research projects (in terms of e.g. input, project management, networking, dissemination and exploitation of results, etc.)?

An analysis of the case studies reveals that there are numerous illustrative practices to be found. Below we highlight some of the more interesting ones related to the impact of the SME on the project. In addition, we return to this in the typology that we develop later in this report.

Broadening strategic horizons

A Spanish manufacturer of technical plastics was invited to join a project aiming to advance the manufacture of nano composites to reduce the cost and weight of automotive parts as well as extending tool life and recyclability of the parts by replacing fibre glass.

The SME played a very active role in overcoming obstacles associated with the sourcing of raw materials and the fact that the expected properties of the nano composites could not be proven. Even though other promising properties were identified, the technology is not economically viable and no exploitation has been undertaken.

In spite of this the company representatives were highly satisfied with the company's project participation and perceived the enhanced understanding and knowhow of innovative manufacturing processes as a strategic advantage that they expect to be to their benefit at some point in the future.

Contrasting commercial (business needs) and scientific (technical needs) motivations

The aim of a project triggered by BSE concerns consisted in undertaking R&D into a reliable system for the traceability of livestock (from birth to abattoir) and meat (from abattoir to table) based on the joint use of electronic identification (EID) and Molecular Markers (DNA). The SME, itself a spin-out from a leading Irish university, had extensive experience in genetic identification and DNA analysis. However, it was specifically brought in to support the implementation partner – also an SME – in undertaking much of the sampling and analysis activity.

As the project progressed it became apparent that research into EID traceability was at the centre of project activity and scientific success in terms of proving that EID and DNA could work together was secured. The SMEs' main interest, however, focused on DNA sampling and analysis which received less attention in the overall project. The concept of automatically linking the traceability of meat from birth to the consumer's plate using EID and DNA mechanisms proved not to be cost effective. Moreover, differences in approach between partners from different EU countries caused delays that hindered the commercial application of the findings. This ultimately resulted in a considerable discrepancy between the coordinator's assessment of the project's success and that of the participating SMEs.

Pressing industry need in wake of BSE[33]

A Dutch gelatine manufacturer was invited by the European manufacturing association to translate the protocol developed by the Managing Director of how to test for BSE in the manufacturing process into a research project proposal. In the resulting research project with three academic partners, the SME took on the role of developing a laboratory scale process that exactly modeled the actual industrial processes.

This allowed the consortium to move very quickly from proof of concept to industrial demonstrations. The results of the project have subsequently been implemented not only by the company itself to safeguard its market position, but also by the industry at large.

Consortium hinging on SME commitment to technology

A Swedish SME that was created as a spin-out from the CERN research centre in Geneva participated in an FP project with the aim of using the results of previous research projects to develop a finalized commercial product based on a new quartz-based material for windows.

The company is the only business with the expertise and facilities required to process the large aerogel plates that were needed to produce the high insulating windows. The SME was thus an integral part of this project and a number of others that had gone before and had developed the technology to this stage. Nevertheless, all projects were coordinated by one of the key academic partners, who the SME had established contact with early on after the creation of the company and the first steps in developing the technology.

Networking underpinning chemical service and consultancy business model

A German SME specializing in the study of the effects and fate of chemicals in the environment was a partner in an FP5 project. The company offers two types of services to the chemical industry and governmental agencies, namely experimental testing under laboratory and field conditions and consultancy.

The project did not aim to develop new products or technologies but focused entirely on further advancing existing knowledge and procedures for use in the environmental risk assessment (ERA) of human and veterinary pharmaceuticals. From the outset, the SME's strategy was to increase its visibility and raise the profile of their specific skills and services

[33] Bovine spongiform encephalopathy – also known as mad cow disease

specifically vis-à-vis regulatory bodies. This was achieved through extensive dissemination activities in conferences and journals.

Participating in collaborative research is an essential component in the company's business model. Regular participation in FP projects and national programmes as well as a sustained effort to nurture one-to-one relationships with research centres of various kinds has allowed the company to accumulate substantial knowledge in this domain.

Large scale air traffic control system implementation

The Dutch SME participant in a project designed to evaluate the quantitative benefits of a new air traffic control system specializes in the development and delivery of all types of traffic control systems. In the project, it delivered the key function of target tracking for the large scale testing and evaluation of the operational concept for a new air traffic control system, the Advanced Surface Movement Guidance and Control System, at Hamburg Airport.

The SME develops traffic solutions for customers in-house. At the end of the project, the SME perceived that the technology was not in their core technology and business interests and did not expect the system to have any great or sustainable impact on the sector. Since project completion, however, subsequent research projects have demonstrated the great potential of the system that is now used in more and more airports.

Squeeze on SME resources

A Swedish SME partner ICT company specialised in visual applications with special attention to the needs of disabled people was a key partner in a project focusing on the development of mobile phones, an objective that was revised to the development of corresponding services, since the delays in the roll-out of 3G networks became an obstacle to the original objectives.

The SME was a very small company at the beginning of the project, employing only 6 staff and even though the company was economically sound, it was financially weak when entering the project. As a result, the project produced a major financial strain on it: they had to advance salaries, expenses, etc. and faced closing down.

It appears to have been the company strong commitment to this particular technology area (most of its own employees are deaf) that helped it see the project through.

In this instance, the SME therefore managed to struggle to the end of the project and the period immediately afterwards and then succeeded in turning things around and collecting the fruits: considerable growth in all economic and non-economic company's assets.

Nevertheless, the example highlights the substantial vulnerability of SMEs in banking on this type of R&D activity.

Mediator between research and industry

In one IT project, the SME was asked to join the project as a technology developer. While the other potential partners could have eventually produced similar tools to those of the SME, the added value that the SME contributed was its knowledge of and networks in the global market. For example, the SME used its communication channels with clients and Universities in Europe and the USA to actively promote and disseminate the results of the project. Thus, its contribution was thought to be essential for the commercial impact of the project. In this project, one of the success factors uncovered in the case study is that there was an excellent balance among the academic partners, technology developers and end users in terms of roles and contributions in the project. Moreover, there were no competitive partners to the SME in the project.

4.2.3 SME impact on project outcome

E.3.3 To what extent did SME participation contribute to the success or failure of the project?

A key consideration in answering this question relates to the issue of how the notion of success or failure is interpreted. As regards the outcomes of projects, we have defined two dimensions of success or failure, namely technical effectiveness and exploitation effectiveness.

As a first step, it is therefore useful to consider to what extent SMEs and coordinators perceived their projects to be successful. The interviews undertaken for the case studies suggest that while SMEs made a clear distinction between technical and exploitation effectiveness, they were not necessarily disappointed when technical effectiveness did not lead to exploitation effectiveness.

Where SMEs had high expectations regarding the exploitability of research results, they were sometimes disappointed. However, many SMEs entered into FP projects with quite realistic expectations regarding the outcomes and as a result valued the broader outcomes and impacts rather than being focused exclusively on the exploitation of results. This is particularly the case when SMEs were invited to join an existing project consortium rather than being directly involved in conceiving and developing the project idea. SMEs were often involved with the aim of *exploring promising applications* or *adding to their know-how*.

The case studies do illustrate, however, that a discrepancy between the objectives of scientific partners and those of the SME participants did sometimes exist. For academic

partners, technical effectiveness is often interpreted as achieving research results that may be translated into a marketable technology product at some point in the future whereas SMEs perceive technical effectiveness as leading to the exploitability of research results.

It is quite revealing in this respect to compare the coordinator and SME ratings of success: 81% of SMEs felt that the project they participated in had achieved a very high, high or moderate level of **technical effectiveness** compared to 93% of coordinators assessing their project to have been successful in this respect. SMEs thus did recognise technical achievements, but in comparison to the coordinators tended to rate these slightly less highly leaning towards moderate rather than high or very high.

Table 23: Coordinator ratings of project technical effectiveness

Project Technical Effectiveness: (to what extent the project achieved its technological objectives and aims)	
	Percentage
High or very high level	63,3%
Moderate level	30,0%
Low level	5,8%
Not at all	0,7%
Total	**100,0%**

Table 24: SME ratings of project technical effectiveness

Project Technical Effectiveness: (to what extent the project achieved its technological objectives and aims)	
	Percentage
High or very high level	40,0%
Moderate level	40,8%
Low level	10,8%
Not at all	8,2%
Total	**100,0%**

Looking at the ratings regarding exploitation effectiveness, a slightly different picture emerges. It appears that coordinators are quite realistic in terms of their assessment of exploitation effectiveness with only 19% of coordinators judging the project they participated in to have achieved a high or very high level of exploitation effectiveness which is only slightly higher than the SME ratings with 14% of SMEs assessing exploitation effectiveness as high or very high. Differences do appear in the lower ratings, however. 30% of SMEs felt that a moderate level of exploitation effectiveness had been achieved. This does, however, compare to another 32% of SMEs stating that the project had achieved a low level of exploitation effectiveness only, a sentiment that is confirmed by 32% of coordinators

as well. Finally, while very few coordinators saw no exploitation effectiveness at all (7%), while a substantial number of SMEs felt this way (24%).

Table 25: Coordinator rating of project exploitation effectiveness

Project Exploitation Effectiveness: (to what extent the project achieved its exploitation objectives and aims)	
	Percentage
High or very high level	18,3%
Moderate level	41,7%
Low level	33,3%
Not at all	6,7%
Total	**100,0%**

Table 26: SME rating of project exploitation effectiveness

Project Technical Effectiveness: (to what extent the project achieved its technological objectives and aims)	
	Percentage
High or very high level	15,0%
Moderate level	30,0%
Low level	32,5%
Not at all	22,5%
Total	**100,0%**

The second aspect of the question about success or failure then relates to the specific contribution SMEs made to the success or failure of a project.

A substantial majority of 72% of project coordinators perceived the SME's **contribution to the project outcome** as either 'crucial' or 'important, but not crucial'. Only a handful of coordinators (5%) felt it had not been important.

This spread of assessments of the SME contribution to the outcomes is exactly the same as the coordinators' assessment of the SME's **contribution to the execution of the project** discussed previously (as opposed to the outcome) (see question E.3.1 above).

Table 27: Coordinator assessment of SME contribution to project execution[34]

… how important was this SME's contribution to the execution of the project?	
	Percentage
Crucial	30,8%
Important but not crucial	47,5%
Moderately important	17,5%
Not important	4,2%
Total	**100,0%**

Table 28: Coordinator assessment of SME contribution to project outcome

… how important was this SME's contribution to the project achieving the eventual outcome?	
	Percentage
Crucial	28,3%
Important but not crucial	43,3%
Moderately important	23,3%
Not important	5,1%
Total	**100,0%**

SMEs, on the other hand, consistently rate the strength of their contribution across various dimensions of skills and expertise during the project's execution phase more highly than during the exploitation phase after the project.

In more detail, SMEs rate the contribution during the project to the project outcomes made by their technical expertise and skills and scientific knowledge as quite high (81% and 64% respectively rating this as high or moderate positive). High or moderate positive ratings for their 1) expertise as end users of the technology (40%) 2) technological networks (39%) and 3) manufacturing skills and expertise (35%) illustrate that SMEs are not as convinced that they were able to make a substantial difference to the project in those respects.

[34] The results summarised in this table are discussed in more detail in the section E.3.2 above.

Interestingly, around half of all SMEs thought that neither their manufacturing skills and expertise (49.6%) nor their marketing expertise and networks (54.6%) had made any impact on project outcomes. The lower ratings of 'low positive impact' or 'no impact' also clearly prevail for

1. SMEs' marketing expertise and market networking (80.7%),
2. business acumen and networks (72.3%),
3. exploitation expertise (69.8%)and
4. management/admin expertise (68.1%).

Linking these results to the actual project achievements, the picture that emerges is one of coordinators rating the SME contribution slightly higher than SMEs themselves. There is slightly greater clustering in the coordinator responses around the correlation between the importance of the SME contribution and the technical and exploitation effectiveness of the project than what SMEs report. SMEs appear to have more diverse views about the strength of the correlation between their contribution and the overall success of the project. This is illustrated for instance in relation to the contribution their scientific knowledge made to the project's technical effectiveness as illustrated in the table below, which shows that while some SMEs saw a strong connection between their scientific knowledge and the project's technical effectiveness, views are more evenly spread here.

Table 29: Correlation between coordinator perception of project technical effectiveness and SME contribution to project outcomes

	Project technical effectiveness				
SME contribution to project outcomes	**High or very high level**	**Moderate level**	**Low level**	**Not at all**	**Total**
Crucial	25	7	2		**34**
Important but not crucial	32	18	1	1	**52**
Moderately important	16	9	3		**28**
Not important	3	2	1		**6**
Total	**76**	**36**	**7**	**1**	**120**

Table 30: SME perception of correlation between own contribution through SME's scientific knowledge and project technical effectiveness

	Project Technical Effectiveness: (to what extent the project achieved its technological objectives and aims?)				
What was the impact of your SME's contribution to this project during the project, arising from your scientific knowledge?	High or very high level	Moderate level	Low level	No impact	**Total**
High positive impact	18	14			**32**
Moderate positive impact	17	20	5	3	**45**
Low positive impact	9	11	6	5	**31**
No impact	4	4	2	2	**12**
Total	**48**	**49**	**13**	**10**	**120**

Table 31: SME perception of correlation between own contribution through SME's technical skills and expertise and project technical effectiveness

	Project Technical Effectiveness: (to what extent the project achieved its technological objectives and aims?)				
What was the impact of your SME's contribution to this project during the project, arising from your technical skills and expertise?	**High or very high level**	**Moderate level**	**Low level**	**No impact**	**Total**
High positive impact	20	18			**38**
Moderate positive impact	22	24	9	3	**58**
Low positive impact	4	6	4	4	**18**
No impact	2	1		3	**6**
Total	**48**	**49**	**13**	**10**	**120**

This is in line with the initial impression from the interviews outlined in the chapter on SME performance in the projects, which is that many SMEs perform a task that is important for the project as a whole. These tasks tend to be very closely aligned with their existing competencies and resources and make an important input into the project. In most cases, however, SMEs are less pivotal in translating the outputs from these tasks into project results. This tends to be more strongly driven by the academic partners and the larger companies involved.

E.3.4. What results are more apparent in projects co-ordinated by research-performing SMEs?

Only a small number of the case studies (13) were coordinated by SMEs. As a result, it is impossible to generalise anything about the impact their R&D intensity has on the project results. For projects to be coordinated by research-performing SMEs may not be the best indicator of their influence on the project, however. Most respondents recognised that the administrative and financial burden of FP projects represent a considerable challenge for SMEs. As a result and as indicated in coordinator statements regarding the project lead or initiation as presented in question E.2 above, research-performing SMEs with a strong direct interest in the R&D activities to be performed in the context of an FP project appear to capitalise on existing relationships with academic or other research partners who will often take on the coordination tasks of a project. In such circumstances, the SME will retain considerable influence on the execution and the outcomes of the project while not featuring as the coordinator.

Moreover, considering this question from the perspective of a quantitative analysis of the case studies, research performing SMEs have been identified purely on the basis of their R&D spend. The qualitative analysis, however, has demonstrated that it is important to keep SMEs' specific R&D related objectives in mind as they arise from their business strategy. The different types identified in the two categories of 'technology developers' and 'technology networkers' are not first and foremostly distinguished by their R&D spend, but much rather by the business models they have developed on the basis of their R&D activities.

E.4.1 To what extent did SMEs reach their overall objectives (e.g. scientific, financial, exploitation objectives, etc.) through project participation? If not, why?

SMEs tended to enter FP projects with diverse objectives including ones related to 1) R&D and technical aspects 2) resource-related objectives and 3) products and markets. There is a relatively even balance between a range of specific objectives with just a few standing out as being mentioned more often as suggested in question E.3.2 above. These are, most noticeably:

1. obtaining funding for R&D (23%),
1. improving R&D networking (13%),
2. technical and R&D capabilities (13%),
3. gaining access to partners' know-how (12%) and
4. entering a new technological field (12%).

Table 32: SME objectives in joining a project

What is the main objective of the SME for joining this project?	
	Percentage
To obtain funding for R&D	22,5%
To improve R&D networking	12,5%
To improve technical or R&D capabilities	12,5%
To gain access to partners' know-how and resources	11,7%
To enter a new technological field	11,7%
To develop a new or existing product	7,5%
To solve a specific industrial or technical problem	5,8%
To obtain funding for exploitation	4,2%
To find a way to conform to a new technical standard or regulation	3,3%
To find customers for own existing products or know-how	2,5%
To enhance business networking	2.5%
To enter a new market	0,8%
To enhance R&D or business reputation	0,8%
No answer	1,7%
Total	**100,0%**

Keeping this spread in mind, it is interesting to test SME perceptions regarding the extent to which project participation met their expectations on the one hand and business needs and objectives on the other. Answers for both of these are fairly evenly balanced between the higher and lower ratings (56%/44% and 43%/57% respectively). Clearly, however, slightly more SMEs saw their expectations met than those seeing their business needs and objectives met. A majority of SMEs (74%) did see clear added value from their participation in an FP project and only a handful (7%) stated that they did not obtain any valuable benefits.

Table 33: SME perceptions of extent to which expectations from project participation were fulfilled

To what extent were your expectations, concerning your participation in this Project, fulfilled?	
	Percentage
To a great extent	14,2%
Most expectations were fulfilled	40,0%
Some expectations were fulfilled	40,8%
Did not meet expectations	5,0%
Total	**100,0%**

Table 34: SME perceptions of extent to which business needs and objectives were met

To what extent did this Project corresponded to your needs and business objectives?	
	Percentage
To a great extent	17,5%
Most expectations were fulfilled	25,0%
Some expectations were fulfilled	48,3%
Did not meet expectations	9,2%
Total	**100,0%**

Table 35: SME perceptions of added value through project participation

How do you assess the actual benefits ("added value") obtained by your SME's participation in this Project?	
	Percentage
We obtained very valuable benefits	22,5%
We obtained moderately valuable benefits	51,7%
The benefits we obtained were of low value	19,2%
We did not obtain any valuable benefits	6,7%
Total	**100,0%**

Initial results from the interviews suggest that SMEs' expectations tended to be met through project participation because more often than not they were quite well aligned with their role in the project and thus the extent to which different objectives could realistically be met. To a large extent, this appears to be due to the fact that the less involved SMEs were in developing a project idea and driving its implementation, the lower and less specific their expectations were. In other words, where SMEs pursued specific technological objectives, they either played a strong role in ensuring that the project as a whole lived up to these expectations, or – where this was not possible, because they were not in the driving seat or the project was too large for them to reign in the wider consortium, many of them tended to be quite resourceful in identifying and exploiting pockets of specific expertise and partnerships that could help them achieve their specific objectives.

It also has to be said that many SMEs do not perceive FP projects as focused technological opportunities that lead directly to marketable products, but much rather they appreciate the opportunity to access and develop R&D networks and expertise and funding. For many SMEs, project participation is expected to open up new avenues, explore new techniques and approaches and thus broaden an existing base of technological capabilities rather than being highly focused development opportunities.

This finding, however, is slightly problematic, of course, in light of the results obtained for question E.3.2 above regarding the SME role in projects that suggested that a large number of coordinators (around 50%) noted a "low positive impact" (as opposed to medium or high impact) for those SMEs whose primary objective for entering the project was "to improve R&D networking".

As noted above, in some cases, specifically where SMEs are invited to join a project almost exclusively to supply a very specific product or service, they do not have very detailed objectives for project participation at all. As a result, satisfaction with results depends largely on a calculation of opportunity costs, a calculation that SMEs appear to mostly have concluded moderately positive. This can also help explain the difference between ratings for expectations on the one hand and business objectives on the other.

Issues can arise in terms of SMEs' own capacity to capitalise on project participation. In particular it is not always clear to SMEs how they can best manage issues around the intellectual property arising from FP projects. This is linked to a tension that does exist in FP projects and particularly larger consortia with a strong academic base. Academic and business objectives in FP projects do not align well. Academics' main objectives relate to publications and knowledge dissemination while industry needs to ensure much more immediate relevance of the research undertaken for their products and markets. Where SMEs do not have the capacity to influence project activity sufficiently to work towards the integration of these objectives, they will lose out when it comes to producing more tangible project outcomes.

E.4.2 What are the main success and / or failure factors for projects? Is there a direct link between the level of technical achievement and the actual take-up of results by SMEs? If not, how can a possible gap be bridged?

As set out above, the success or failure of projects can be characterised in different ways that depend entirely on the expectations and objectives with which SMEs enter FP projects and on the assumptions underpinning funding for SME participation. As noted earlier, many SMEs do not expect their project participation to lead directly to the take-up of results in the form of IP, new products or other types of technology exploitation and immediate economic impact.

This is borne out by the picture that emerges from the case studies regarding such immediate take-up of results. A vast majority of SMEs does not participate in new patents or other IPR as a result of the project and the trend over time is declining. This confirms the impression of a rather tenuous link between FP project participation and the introduction of new technologies or products. As Table 36 illustrates, most SMEs do not own new IPR as a result of FP project participation.

Table 36: Take-up of results by SMEs

How many new patents or other IPR does your SME participate in as a result of this project?	at end of project	currently	in 3-5 years from now
	Percentage	Percentage	Percentage
0	80,8%	85,0%	89,2%
1	15,8%	10,8%	6,7%
2-5	3,3%	4,2%	3,3%
5-7	0%	0%	0.8%
Total	**100%**	**100%**	**100%**

Comparing this picture that emerges from SMEs' own assessment of the IPR ownership situation with coordinators' perception of intellectual property issues following project completion as discussed in section 4.2.1, a slight discrepancy emerges. Coordinators paint a slightly rosier picture of SMEs' stake in IPR ownership suggesting a higher proportion of SMEs at least sharing in the ownership of IPR. Two factors can be assumed to contribute to this discrepancy:

1. Coordinators do not necessarily closely follow the IPR arrangements during and following a project.

2. SMEs do not consider group ownership of IPR as owning a patent because it limits them in terms of how they can use their rights, because it is shared ownership. This would suggest that such group ownership arrangements are not fully formalised between the consortium members

However, the fact that SMEs tend to be satisfied with their project participation as outlined above does suggest that success or failure is in the eye of the beholder. In some instances, SMEs will be involved in the exploitation of IPR rather than actually owning it, but in many others it is indeed the know-how and networking benefits that SMEs value.

Coordinators' perception of the IPR situation following a project sheds further light on the IPR situation. A majority of coordinators (70%) state that the SME is involved one way or another in the exploitation of IPR or make no statement at all.

Table 37: Coordinator perception of post-project exploitation rights

Who has the exploitation rights to the Technology?	
	Percentage
No IPR	10,0%
An exploitation group excluding the SME	9,2%
An exploitation group including the SME	16,7%
Other project partners without the SME	12,5%
The SME	11,7%
The SME with other partners	40,0%
Total	**100,0%**

Coordinators' assessment of who has the exploitation rights post-project suggest that SMEs who are involved in FP projects may often not be IPR developers with a strong interest in owning the resulting IPR, but are interested in the technology exploitation rights instead. Rather than owning the IPR, this can be achieved by obtaining the exploitation rights from the owner of the intellectual property rights (via licensing, being part of the exploitation group etc). These figures should therefore not be expected to be the same as the ones presented in Table 14 which focus on IPR ownership. The numbers are not necessarily related since IPR could have been moved around the partners or, as often happened in FP5, there was no agreement but the IPR was used by whoever was quicker.

A further factor, however, relates to the relative importance that coordinators attach to the actual development of competitive technologies or products and thus IPR as suggested above. A large proportion of coordinators (31.7%) don't have anything to say about why a project did not produce any competitive technology.

Table 38: Coordinator explanation for lack of competitive technology at end of project

If the project did not develop any competitive technology, why? (give up to 3 reasons, most important first)		
	Percentage	**Population**
Technology is competitive	44.2	53
N/A	31.7	38
Objectives achieved but technical aims were not reached	6.7	8
No enabling/platform technology exists yet	4.2	5
Over-ambitious or unclear technical objectives/aims	4.2	5
Other new technology overtook this one	2.5	3
Inadequate resources	1.7	2
Wrong technical approach/route	1.7	2
Disfunctional Consortium (Communication/cooperation problems)	0.8	1
Inadequate funding	0.8	1
Ineffective coordination/management	0.8	1
Insurmountable technical difficulties	0.8	1
Total	**100,0%**	

Taken together, these two findings arguably suggest that actual commercial exploitation of project results is not one of coordinators' key concerns in assessing project performance. Assuming that many coordinators have an academic background, this again confirms the finding regarding the differences in objectives between SMEs and academics referred to above.

In spite of the majority of coordinators who consider the technology developed as competitive (table above) just over half of the project coordinators (60%) describe the stage of development of the technology **at the end of the project** as not having moved beyond a lab prototype and beta test (C2.20b) and indicate that further research is being conducted on the technology after the project (C2.21a). Seeing that the industrial prototype stage can generally be considered as the point at which commercialisation proper can kick in, this further corroborates the finding that SMEs are likely to lose out on the commercialisation of results of FP projects, if they are unable to secure further R&D support from other public funding programmes (European or national) or are able to raise the necessary funds on private financial markets.

Table 39: Coordinator assessment of stage of technology development at end of project

At what stage of development was the technology at the time of the Project's end?	
	Percentage
Idea / Concept	4,2%
Model	5,8%
Lab result	11,7%
Lab Prototype	27,5%
Beta test	11,7%
Industrial prototype	23,3%
Commercial product	3,3%
Other	7,5%
No answer	5,0%
Total	**100,0%**

Table 40: Coordinators' statements regarding further R&D on technology after the project

Is there any further RD currently being carried out on the technology?	
	Percentage
No answer	6,1%
No	31,7%
Yes	68,3%
Total	**100,0%**

When it comes to coordinators' assessment of the **current** level of exploitation of the technology, the situation is reversed with just over half (53%) indicating that the technology has reached industrial prototype or commercial product stage. However, around half of the coordinators (53%) still refer to a low or moderate exploitation level or give no indication at all (Table 42). Combining these two findings may well suggest that SMEs, were they to receive support in establishing an appropriate route to market, could play an important role in actually ensuring the commercial exploitation of FP project results.

Table 41: Coordinator assessment of current stage of technology development

At what stage of development is the Technology currently?	
	Percentage
Idea / Concept	2,5%
Model	5,8%
Lab result	5,0%
Lab Prototype	15,8%

Beta test	6,7%
Industrial prototype	23,3%
Commercial product	28,3%
Other	12,5%
No answer	6,1%
Total	**100,0%**

Table 42: Coordinator assessment of current exploitation level of technology

If the technology is currently being exploited, what is the current exploitation level?	
	Percentage
High or very high level	13.3%
Moderate level	33.3%
Low level	19.2%
It is not being exploited	34.2%
Total	**100.0%**

Combining this with the fact that around 80% of coordinators rate technical competitiveness of the technology as anything from *'competitive depending on the right conditions and regulations'* to *'extremely competitive'* suggests that in many cases the results at the end of the project were thus at a stage that required further development before being ready for market introduction. While on the one hand, this is hardly surprising seeing that the Framework Programmes only support pre-competitive research, it does suggest that the involvement of SMEs and the benefits they are likely to gain from participation in FP projects from a commercialisation perspective do need further reflection. A stronger focus on identifying a route to the commercial exploitation of project results from the start, combined with follow-on support for the actual commercialisation may be needed to ensure that the European economy reaps the full benefits from the investment made in FP projects. The strategic objective for the Framework Programmes of improving the competitiveness of European markets cannot be achieved when at the same time there is no coherent path for SMEs to conduct further work to translate results into products, undertake the necessary demonstration or prototyping phase that are necessary to actually bring new products or services to market.

In some cases the results have been ahead of the market's willingness to pay for them, and new versions have been developed to reduce the market price of the outcomes of the projects. A next move has then been taken towards this end by the partners seeking new project funding to continue the research and development. From a longer term perspective, a negligible number of structured approaches have been formed to exploit the project results through an external exploitation group or entity.

As indicated earlier in this report, SMEs are involved in exploitation activities that are pursued during project execution but able to invest in exploitation activities after the project, whether on their own initiative or as part of an exploitation group, to a limited extent only. Ensuring technology exploitation after the project and, importantly, ensuring that SMEs themselves have an adequate ongoing involvement in further R&D activities is therefore vitally important in order to ensure that SMEs receive "a piece of the cake".

Several dimensions of SME capabilities as follows mean that they are at risk of losing out on such further technology development after the project:

- Many SMEs do not have the resources to closely follow the subsequent development of a technology where this has not reached a close-to-market stage at the end of a project.
- Where SMEs pursue an R&D project that is 'critical' to their development and invest heavily in such a project, failure to reach the exploitation stage may actually become critical to the survival of the SME where no follow-up funding is found.
- SMEs are not always as focused on maintaining close contact with scientific and technology networks as their academic and large company partners are.
- SMEs tend to find it difficult to regularly and systematically participate in FP projects due to time and effort to be invested, employee engagement, financial constraints etc.)

The above finding of SMEs consistently rating the strength of their contribution across various dimensions of skills and expertise during the project's execution phase more highly than during the exploitation phase after the project suggests that this is not sufficiently happening at the moment. Moreover, commercialisation considerations need to be more central to project planning and most notably, the consortium structure so that a reliable route to market exists, from the start.

However, the qualitative results from the case studies suggest that whether or not SMEs are able to actively exploit the results of an FP project depends on the level of technical achievement of the project, if – and only if - 'take-up of results' is understood to mean the immediate translation of research results into technologies and products. Where a more strategic concept of the take-up of results in terms of broadening the scope of interactions between SMEs and their clients and market place and as a result their responsiveness to market developments is used, the take-up of results for SMEs depends less on the level of technical achievement of the project. And yet, even in those circumstances, the extent to which SMEs are subsequently involved in undertaking research and carrying out follow-on R&D is a prerequisite for them to derive economic benefit from project participation at some point. This is because only where the broadened strategic horizon is used to inform subsequent R&D activities that do lead to a product or service being launched in the market,

the business will derive tangible results from the strategic advantage through increased knowledge or networking that they may have gained from projects with less of an immediate output.

E.7.3 To what extent did project participation under the respective thematic programmes correspond to the needs and business objectives of SMEs? What are the differences in this respect between SMEs in different sectors, SMEs with different capabilities and SMEs from countries with different economic performance?

Considering the extent to which project participation corresponded to SMEs' needs and objectives in terms of the thematic programmes, different sectors, SMEs with different capabilities and SMEs from countries with different economic performance reveals no clear patterns or trends with the exception maybe of different economic zones. In that respect it appears that a slightly greater proportion of SMEs from Zone 3 countries felt that 'most expectations were fulfilled' or expectations had been fulfilled 'to a great extent'.

Table 43: SMEs' perception of needs and business objectives met by country groups[35]

To what extent did this project corresponded to your needs and business objectives?										
	To a great extent		Most expectations were fulfilled		Some expectations were fulfilled		Did not meet expectations		Total population	Total percentage
Z1	18	20.5%	19	21.6%	45	51.1%	6	6.8%	**88**	**100.0%**
Z2	2	11.8%	3	17.6%	8	47.1%	4	23.5%	**17**	**100.0%**
Z3	1	6.7%	8	53.3%	5	33.3%	1	6.7%	**15**	**100.0%**
Total	**21**	**17.5%**	**30**	**25.0%**	**58**	**48.3%**	**11**	**9.2%**	**120**	**100.0%**

A tentative statement could also be made about the FP5 QOL programme, where a slight bias towards the lower end of the ratings appears to exist according to the data. However, in view of the fact that the qualitative analysis did not offer any further pointers towards

[35] For FP5 (GNP per capita for 2003):
Zone 1: Luxembourg, Netherlands, Sweden, Denmark, Belgium, United Kingdom, Germany, France
Zone 2: Italy, Ireland, Austria, Finland
Zone 3: Greece, Portugal, Spain
For FP6 (GNP per capita for 2005):
Zone 1: Luxembourg, Netherlands, Sweden, Denmark, Belgium, United Kingdom, Germany, France
Zone 2: Ireland, Spain, Italy, Finland, Austria
Zone 3: Greece, Portugal, Estonia, Poland, Slovakia, Hungary, Lithuania, Latvia, Cyprus, Slovenia, Czech Republic, Malta

pronounced differences between the thematic programmes, this should be seen with a degree of caution.

Please note that only the thematic programmes highlighted in yellow have a sufficiently large sample to be able to deduct any conclusions from the data.

Table 44: SMEs' perception of needs and business objectives met by thematic programme

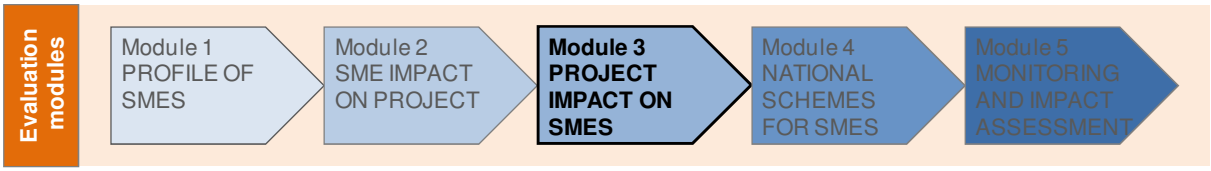
FP5: To what extent did this project corresponded to your needs and business objectives										
S1.5d	**To a great extent**		**Most expectations were fulfilled**		**Some expectations were fulfilled**		**Did not meet expectations**		**Total Population**	**Total Percentage**
FP5 - EESD-ENERGY	4	23.5%	3	17.6%	7	41.2%	3	17.6%	**17**	**100%**
FP5 - EESD-ENVIRO	2	33.3%	3	50.0%	1	100.0%	1	16.7%	**7**	**100%**
FP5 - GROWTH	4	15.4%	8	30.8%	13	50.0%	1	3.8%	**26**	**100%**
FP5 - IST	6	24.0%	5	20.0%	13	52.0%	1	4.0%	**25**	**100%**
FP5 - QOL	2	14.3%	2	14.3%	6	42.9%	4	28.6%	**14**	**100%**
FP6 - 1. Life sciences, genomics and biotechnology for health	1	33.3%		0.0%	2	66.7%		0.0%	**3**	**100%**
FP6 - 2. Information society technologies		0.0%	7	53.8%	6	46.2%		0.0%	**13**	**100%**
FP6 - 3. Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices		0.0%		0.0%		0.0%	1	100.0%	**1**	**100%**
FP6 - 4. Aeronautics and space	1	20.0%		0.0%	4	80.0%		0.0%	**5**	**100%**
FP6 - 5. Food quality and safety		0.0%		0.0%	1	100.0%		0.0%	**1**	**100%**
FP6 - 6. Sustainable development, global change and ecosystems	1	12.5%	2	25.0%	5	62.5%		0.0%	**8**	**100%**
Total	**21**	**17.5%**	**30**	**25.0%**	**58**	**48.3%**	**11**	**9.2%**	**120**	**21**

Similarly, when it comes to any differences between sectors, no clear patterns are identifiable.

E.7	**How successful were the respective framework programmes in providing benefits for SMEs?**

Drawing on these detailed findings to formulate a headline answer to these two questions, it thus appears that on the whole, SMEs tended to be fairly satisfied with their involvement in projects under the 5th and 6th Framework Programmes. The analysis did not point to any clearly identifiable differences between the thematic programmes in this respect.

4.3 Project Impact on SMEs



The objective of Module 3 is to provide an evidence-based assessment of the impact on SMEs arising from participation in FP5 and FP6. Module 3 deals, therefore, with the following questions:

E.6	To what extent can the economic and social benefits identified for SMEs be directly attributed to project participation?
E.6.1	What are the main areas of impact for an SME participant? What direct benefits can be identified?
E.6.1.1	What impact did project participation have on SME participants in terms of e.g. product / service / process development and diversification, innovation, regulatory issues and licensing, productivity, time-to-market, commercial output, market share, competitiveness, investment in R&D, turnover, etc.?
E.6.1.2	What impact did project participation have on SME company size, structure, demographics (e.g. employment and income profile; changes in sector, number and type of jobs and functions; project management resources) and on company infrastructure?
E.6.2	What additional impact did project involvement have on SMEs (e.g. competences and training; improving and expanding international networks [geographical and sectoral and contacts; organization and method learning)?
E.6.3	How successfully did SMEs get involved in the exploitation of research results?
E.6.4	What is the net effect when comparing the benefits received with the costs of participation (e.g. return on investment; benefits vs. costs; immediate gains vs. long-term effects)?

E.6.5	To what extent can any positive changes resulting from the intervention be expected to last when beneficiaries are no longer supported (e.g. sustainable structural impacts on the ERA, enhanced international co-operation in R&D activities; registered standards or patents; increase in investment in R&D, etc.)?
E.7.1	Are there differences in terms of impact between SMEs participating in big projects (e.g. IPs) and those in projects more tailored to SMEs (e.g. STREP)? And between SMEs with different capacities (e.g. high-tech SMEs vs. lower tech SMEs, SMEs joining in different phases of the projects, etc.)? If so, why?

The discussion of findings is organised in the following sub-sections:

- areas of impact from project participation
- exploitation of R&D results
- the net effect of FP project participation
- sustainability of benefits
- impact depending on type of project and R&D capacity of SME
- comparison with Control Group qualitative observations

A qualitative comparison of findings with observations on the control group consisting of projects in the framework of selected national R&D programmes is provided in section 4.4.

4.3.1 Areas of impact from project participation

E.6.1	**What are the main areas of impact for an SME participant? What direct benefits can be identified?**
E.6.2	**What additional impact did project involvement have on SMEs (e.g. competences and training; improving and expanding international networks (geographical and sectoral and contacts; organisation and method learning)**

4.3.1.1 An initial characterisation of Impact

The starting point of our analysis is to examine the data obtained through the case study interviews on the different areas of impact of FP projects on SMEs, such as economic impact,

impact on R&D and innovation, impact on other skill and impact on technological and scientific reputation.

4.3.1.1.1 Economic Impact

Economic impact on the SME is assessed along three dimensions: turnover and profit, marketing and markets and products &services.

Turnover and profit

The quantitative data are presented in the following table.

Table 45: Data for financial impact on the SME

a. Increased turnover	at end of project	currently	in 3-5 years from now
High positive impact	1,67%	5,83%	8,33%
Moderate positive impact	15,83%	17,50%	27,50%
Low positive impact	31,67%	25,00%	19,17%
No impact	50,83%	51,67%	45,00%

b. Cost savings	at end of project	currently	in 3-5 years from now
High positive impact	2,50%	0,83%	0,83%
Moderate positive impact	10,83%	6,67%	7,50%
Low positive impact	15,00%	12,50%	7,50%
No impact	71,67%	80,00%	84,17%

c. Approximate % increase in turnover due to project	at end of project	currently	in 3-5 years from now
greater than 10%	5,83%	5,83%	6,67%
between 5% and 10%	7,50%	12,50%	11,67%
between 0 and 5%	5,83%	9,17%	10,00%
None (*)	80,83%	72,50%	71,67%

d. Approximate % increase in profit due to project	at end of project	currently	in 3-5 years from now
greater than 10%	1,67%	1,67%	3,33%
between 5% and 10%	6,67%	4,17%	9,17%
between 0 and 5%	5,00%	16,67%	11,67%
None (*)	86,67%	77,50%	75,83%

(*) under none are also included cases for which it is not possible to isolate the effect of a usually small increase in revenue or profit due to project participation from the effect of other in-house or external developments.

Regarding impact on turnover as a result of project participation, the trend observed is that economic benefits take a few years to show: at the end of the project, 49% of the companies state that there is at least some positive impact on turnover (Table 45a), and correspondingly, 19% state that there was some increase of income (Table 45c), but these figures improve to 55% and 28%, respectively, when they refer to a few years following the end of the project.

A similar trend is observed for the increase in profit as a result of project participation (Table 45d), showing that it usually takes some time before concrete project outcomes turn into actual commercially profitable products and services. These findings also suggest that the improvements in turnover and profits are sustainable over the years following the end of the project and frequently improve with time. This sustainability in impact correlates well with the impact on skills and capabilities (see below) reported by a large share of SMEs, which allowed them to expand or even diversify their operations.

Sustainable and increasing with time impact on revenue and profit is essentially observed for micro and small enterprises with a strong R&D and technology base that very often have initiated the project and played an important role as technology developers. When the project does not lead to a concrete commercial result, these companies will, in most cases, further fund with own resources the research outcome in order to bring it to the market. Significantly, these improvements in income and profit correlate very well with the impact reported in business networking (see corresponding part of this sub-section below) by small companies in a project, indicating strong links between improved business results and increased relations with new business partners that eventually turn to customers for their products and services.

On the other hand, low or no benefits in terms of income and profit are mostly observed for larger SMEs. In fact, these SMEs would rather focus on enhancing R&D capabilities and technological skills rather than increasing their financial figures. In many of these cases, the interviewees stated that while new processes, skills or partnerships would have some positive influence on revenue and profit, it was not be possible to isolate their direct effect from other in-house or external developments.

Some positive impact on cost-savings (Table 45b) is also reported by about 30% of SMEs but this figure decreases in the years after the end of the project to about 15%. This trend can be explained by the fact that cost-savings are essentially related to reduced costs in production and service delivery methods developed in the course of the project that have an immediate effect after the end of the project. But the positive effect is progressively lost because:

- additional costs are required over time in order to maintain the competitive advantage of the technology, and
- changes in strategy or market needs lead to replacing the technology by a new one.

Marketing and markets

The quantitative data are presented in the following table.

Table 46: Data for impact on market

a. Greater marketing capability	at end of project	currently	in 3-5 years from now
High positive impact	8,33%	5,00%	6,67%
Moderate positive impact	15,00%	20,83%	14,17%
Low positive impact	20,83%	17,50%	18,33%
No impact	55,83%	56,67%	60,83%

b. New sectoral markets	at end of project	currently	in 3-5 years from now
High positive impact	3,33%	2,50%	3,33%
Moderate positive impact	18,33%	18,33%	19,17%
Low positive impact	25,83%	23,33%	19,17%
No impact	52,50%	55,83%	58,33%

c. New geographical markets	at end of project	currently	in 3-5 years from now
High positive impact	2,50%	2,50%	4,17%
Moderate positive impact	7,50%	6,67%	10,00%
Low positive impact	17,50%	18,33%	13,33%
No impact	72,50%	72,50%	72,50%

d. Approximate % increase in market share due to project	at end of project	currently	in 3-5 years from now
greater than 10%	1,67%	4,17%	3,33%
between 5% and 10%	2,50%	5,83%	3,33%
between 0 and 5%	3,33%	5,00%	5,83%
None	92,50%	85,00%	87,50%

FP project participation has a positive impact on the marketing capability in 45% of the SMEs (Table 46a) after the end of the project. While the increase in market share due to project participation is rather limited – more than 90% of SMEs see no immediate impact (Table 46d), for about half of the SMEs there is a positive impact on entering new sectoral markets (Table 46b), whereas a smaller percentage, roughly 30%, see their position improved in new geographical markets (Table 46c).

The results in these Tables indicate that:

- FP projects essentially assist SMEs into entering in new sectors more frequently than in new geographical markets, but the overall effect in increasing market share remains low, although slightly increasing over time. Since the overall market size for a new technology is also increasing, the reported constancy in market share in fact means an increase in absolute income, as reported above.
- The positive effect of entering new geographical markets is maintained over time, and this is due to the fact that in most cases SMEs expand their international business on the basis of very competitive technologies that have a sustainable effect, as well as the new cross-border networking gained by their project participation.
- Benefits in terms of marketing capability and penetration in new sectors tend to stay constant over time. In most cases where these trends were observed the products and services were less competitive and the SMEs progressively moved to other directions.

Products and Services

The quantitative data are presented in the following table.

Table 47: Data for impact on products and services

a. Greater range of products or services	at end of project	currently	in 3-5 years from now
High positive impact	9,17%	10,00%	11,67%
Moderate positive impact	23,33%	23,33%	25,83%
Low positive impact	25,83%	24,17%	20,00%
No impact	41,67%	42,50%	42,50%

b. Improved operations, processes, methods, tools or techniques	at end of project	currently	in 3-5 years from now
High positive impact	17,50%	15,83%	12,50%
Moderate positive impact	28,33%	24,17%	20,00%
Low positive impact	27,50%	21,67%	20,00%
No impact	26,67%	38,33%	47,50%

c. Decreased time to market of products or services	at end of project	currently	in 3-5 years from now
High positive impact	4,17%	1,67%	0,83%
Moderate positive impact	10,00%	10,83%	10,83%
Low positive impact	19,17%	16,67%	16,67%
No impact	66,67%	70,83%	71,67%

d. Improved techno-economic competitiveness	at end of project	currently	in 3-5 years from now
High positive impact	7,50%	6,67%	7,50%
Moderate positive impact	27,50%	26,67%	20,00%
Low positive impact	35,83%	32,50%	30,83%
No impact	29,17%	34,17%	41,67%

e. Improved technical quality and / or reliability of products	at end of project	currently	in 3-5 years from now
High positive impact	13,33%	8,33%	5,83%
Moderate positive impact	20,83%	24,17%	17,50%
Low positive impact	23,33%	19,17%	23,33%
No impact	42,50%	48,33%	53,33%

f. Improved socio-economic competitiveness	at end of project	currently	in 3-5 years from now
High positive impact	5,00%	5,00%	5,00%
Moderate positive impact	9,17%	9,17%	10,00%
Low positive impact	14,17%	15,00%	17,50%
No impact	71,67%	70,83%	67,50%

Through FP project participation, about 60% of the SMEs report that they obtain a greater range of products and services (Table 47a), a gain which is sustainable for a period extending at least a few years after the end of the project.

More than 70% of SMEs report a positive impact on their operations, processes, methods, tools or techniques (Table 47b) on the technical quality and reliability of their products (Table 47e) and on their techno-economic competitiveness (Table 47e), but these advantages in some cases are progressively lost over time, as competition catches up and the technologies developed gradually become obsolete.

Significantly, nearly 35% of SMEs report that their participation has had a positive impact on the time to market of their products and services (Table 47c), a gain which is more likely to be sustainable over the years after the project's end, as this figure drops to about 30% for the expectations in 3-5 years from now. Similar and sustainable trends are reported for the impact reported for the socio-economic competitiveness of the SMEs (Table 47f).

These results reflect the industrial nature of the projects and indicate that the majority of the SMEs of all sizes are impacted directly on their operations by their participation in the FP projects. During interviews, the SMEs often stressed that the most important benefits they gained were related mainly with the substantial improvements in their operations, as shown above.

4.3.1.1.2 Impact on R&D and Innovation

At the end of their project a large majority of SMEs report a positive impact on technological and / or scientific competitiveness (91% Table 48a) as well as improved R&D and technological skills (85% - Table 48b). These positive impacts are reported to decrease in the following years as shown by the lower figures for the subsequent time periods (to 64% and 62% respectively).

Participation in FP projects also has an impact on R&D and innovation capabilities; 60% of the SMEs increase their R&D activity (Table 48d) and 73% of the SMEs report increased prospects for further technological and / or scientific developments (Table 48c) as a result of participation in the projects. These trends are only partly sustainable over the following years as the figures tend to decrease (to 47% and 60% respectively).

The decrease over time in the impact figures of scientific / technical competitiveness and R&D skills are essentially related to new technological developments pushing ahead, especially for SMEs with a strong technology and R&D base, but also to changes of business focus to new areas, in which the acquired skills are not relevant any more.

However, many interviews indicated that their actual responses may be understating the impact on innovativeness, as they do not always include the long-term beneficial effects of project-enhanced innovativeness, e.g. in developing new, unrelated products and services. During interviews it also became clear that the SMEs that reported enhanced innovativeness were more often those that started from a lower level of innovativeness. This means that participation in FP project offers a “boost” to their innovative capability, allowing them to expand in new areas and new markets.

Many SMEs interviewed, especially those with little or no in-house RD, were particularly keen on stressing their “new approach” to RD as a result of their participation in the projects and many started new RD activities (or even opened new RD departments, where there was none before) as a result of their participation, which were mostly sustainable, especially in medium-sized SMEs.

Table 48: Data for R&D and Innovation impact

a. Improved technological and / or scientific competitiveness	at end of project	currently	in 3-5 years from now
High positive impact	20,83%	13,33%	10,83%
Moderate positive impact	38,33%	36,67%	27,50%
Low positive impact	31,67%	25,83%	25,83%
No impact	9,17%	24,17%	35,83%

b. Improved R&D and / or technological skills	at end of project	currently	in 3-5 years from now
High positive impact	21,67%	10,83%	9,17%
Moderate positive impact	35,00%	37,50%	25,00%
Low positive impact	29,17%	25,83%	28,33%
No impact	14,17%	25,83%	37,50%

c. Improved prospects for further technological and / or scientific development	at end of project	currently	in 3-5 years from now
High positive impact	18,33%	10,83%	9,17%
Moderate positive impact	23,33%	28,33%	24,17%
Low positive impact	31,67%	22,50%	26,67%
No impact	26,67%	38,33%	40,00%

d. Increased R&D activity	at end of project	currently	in 3-5 years from now
High positive impact	11,67%	9,17%	7,50%
Moderate positive impact	31,67%	22,50%	19,17%
Low positive impact	16,67%	21,67%	20,00%
No impact	40,00%	46,67%	53,33%

4.3.1.1.3 Impact on other skills

FP project participation has a positive impact on SME project management skills – for 67% of the SMEs (Table 49a) and leads to enhanced capacity to deal with technological change – for 52% of the SMEs (Table 49b) and with changes in the SME's business environment – for 40% of the SMEs (Table 49c). All these impacts are moderately sustainable over the years.

It is very significant that as much as 77% of the SMEs report that they acquired enhanced capabilities for cross-cultural and cross-border collaborations as a result of participating in the projects, owing to the European dimension of FPs (Table 49d), but these capabilities tend to be weakened a few years after the end of the project as the corresponding figure decreases to 60%.

The drop of these impact figures is essentially observed for SMEs that have participated in just one FP project. From the interviews, two main reasons could be identified for the loss of such benefits:

1. either employees involved in the project that have effectively acquired the new skills have left the company or have moved to other positions in which these skills were of no direct relevance, e.g. an R&D manager transferred to operations as part of a promotion scheme with financial incentives

2. or the company moved to new business directions after revision of its strategy, e.g. an SME in the ICT sector deciding to move from developing innovative software applications to commercialisation of standard business IT applications.

Table 49: Data for impact on other skills and competences

a. Improved project management skills	at end of project	currently	in 3-5 years from now
High positive impact	11,67%	7,50%	5,83%
Moderate positive impact	20,83%	20,83%	18,33%
Low positive impact	34,17%	25,83%	20,83%
No impact	33,33%	45,83%	55,00%

b. Improved capability for handling technological changes	at end of project	currently	in 3-5 years from now
High positive impact	7,50%	4,17%	4,17%
Moderate positive impact	24,17%	21,67%	19,17%
Low positive impact	20,83%	23,33%	18,33%
No impact	47,50%	50,83%	58,33%

c. Improved capability for handling changes in its business environment	at end of project	currently	in 3-5 years from now
High positive impact	3,33%	1,67%	2,50%
Moderate positive impact	16,67%	14,17%	14,17%
Low positive impact	19,17%	17,50%	12,50%
No impact	60,83%	66,67%	70,83%

d. Improved capability for cross-cultural and cross-border collaborations	at end of project	currently	in 3-5 years from now
High positive impact	20,00%	14,17%	12,50%
Moderate positive impact	30,83%	25,83%	20,83%
Low positive impact	25,83%	25,83%	26,67%
No impact	23,33%	34,17%	40,00%

4.3.1.1.4 Networking and technological / scientific reputation

Crucially, FP project participation has a widespread positive impact on both R&D technological and / or scientific and business networking, but also on scientific and / or technological reputation with more than 80% of SMEs reporting such impacts, which in fact are moderately sustainable over the following years (As already mentioned earlier in this sub-section, the large reported impact in improved business collaborations and networking correlates very well with the increased income and prospects reported previously. This was further clarified during the interviews when many SMEs stressed the fact that one of the main objectives in joining the project was "the opportunity to work closely with big players and potential customers". In many cases, participation led to direct business ventures, many of them sustainable, even in some cases where the project was not technically successful.

More specifically on the impact on reputation, the interviews often clarified that the chance of enhanced reputation (especially business reputation) was often seen as a major decisive factor for many SMEs' decisions to take part in a project, even overcoming their worries about perceived risks, especially economic and personnel risks. The results suggest that this approach was correct since the impact reported was very positive and at least 85% of SMEs benefited to some extent by their participation (Table 50a, b and c). This suggests that SMEs that take part in collaborative projects with academics and researchers link up with mostly scientific and business networks, enhanced by improved reputation as innovators.

As with impact on other skills discussed above, the drop of these impact figures is also observed more frequently for SMEs that have participated in just one FP project, meaning that in these cases benefits in networking and reputation are closely linked to efforts of individual employees and not to a deeper change in the company culture, so these benefits are lost when the employees have left the company or moved to new positions.

As already mentioned earlier in this sub-section (section 4.3.1.1.1), the large reported impact in improved business collaborations and networking correlates very well with the increased income and prospects reported previously. This was further clarified during the interviews when many SMEs stressed the fact that one of the main objectives in joining the project was "the opportunity to work closely with big players and potential customers". In many cases, participation led to direct business ventures, many of them sustainable, even in some cases where the project was not technically successful.

Table 50: Data for impact on networking

a. Improved R&D technological and / or scientific networking	at end of project	currently	in 3-5 years from now
High positive impact	18,33%	9,17%	7,50%
Moderate positive impact	40,83%	40,83%	35,00%
Low positive impact	25,00%	23,33%	20,83%
No impact	15,83%	26,67%	36,67%

b. Improved Business networking	at end of project	currently	in 3-5 years from now
High positive impact	16,67%	8,33%	7,50%
Moderate positive impact	28,33%	28,33%	20,00%
Low positive impact	33,33%	34,17%	32,50%
No impact	21,67%	29,17%	40,00%

c. Improved technological and / or scientific reputation	at end of project	currently	in 3-5 years from now
High positive impact	26,67%	15,00%	10,83%
Moderate positive impact	30,83%	30,83%	25,83%
Low positive impact	27,50%	28,33%	31,67%
No impact	15,00%	25,83%	31,67%

4.3.1.2 Further characterisation of impact on SMEs

The results so far are based on the analysis of answers collected from the case studies. In this section we conduct a deeper analysis taking into account certain aggregate parameters of impact. We have chosen to consider the impact the SMEs reported on:

- overall economic performance, business options and future development perspectives, that characterize business performance
- technological operations, R&D capabilities and networking that give a measure of development and innovation capacity.

The tables below show how SMEs perceive impact resulting from participation in an FP project on their overall economic performance, business options and opportunities for future development (Table 51), as well as technological operations, R&D capabilities and networking (Table 52).

Table 51: Impact of SME project participation - business aspects

Degree of Impact	Overall Economic Performance	Business Options	Future Development
	Percentage	Percentage	Percentage
High positive impact	6,7%	11,7%	11,7%
Moderate positive impact	17,5%	29,2%	27,5%
Low positive impact	37,5%	29,2%	35,0%
No impact	36,7%	30,0%	25,8%
Negative impact	1,7%	0,0%	0,0%
Total	**100,0%**	**100,0%**	**100,0%**

Table 52: Impact of SME project participation - development and innovation aspects

Degree of Impact	Technological Operations	R&D capabilities	SME networking
	Percentage	Percentage	Percentage
High positive impact	8,3%	14,2%	18,3%
Moderate positive impact	37,5%	40,0%	34,2%
Low positive impact	35,0%	24,2%	32,5%
No impact	19,2%	21,7%	15,0%
Total	**100,0%**	**100,0%**	**100,0%**

In general terms it is observed that participation in FPs has an extended impact on R&D capabilities, technological operations and networking, where a positive impact was reported by respectively 81%, 78% and 85% of the SMEs. It is important to note that about half of the SMEs that acknowledge benefit in these areas consider that the impact was moderately positive to high positive. A smaller number of SMEs acknowledge positive impact on overall economic performance (60%), business options (70%) and future development perspectives (75%) and for these characteristics the impact is perceived to be essentially low-to-moderately positive.

These differences in the level of impact between development and innovation aspects on the one hand and business aspects on the other hand should be viewed from the perspective of the reasons for which SMEs enter FP projects (question E.4.3 – module 2). In fact, SMEs participate in FP projects more frequently in order to access R&D funding or

technology and enhancing networking than increasing economic / market performance and business perspectives. Indeed, these high findings reflect the aggregate perceptions of the majority of the SMEs that they reached both their technological expectations and business objectives to at least a moderate degree.

These initial observations on impact in these two aggregate areas have been further investigated taking into account parameters characterising the SME, in terms of size and R&D capacity and, critically, of the project itself. Data on impact in the above areas of performance have, therefore, been cross-tabulated with data obtained on the following parameters:

- SME size at the beginning of the project
- R&D intensity at the beginning of the project as measured by the proportion of R&D staff employed
- Criticality of the project for the SME in terms of technology
- Degree by which the SME needs and business objectives were met by the SMEs participation in the project.

The main findings of this analysis are presented and discussed below. Regarding **overall economic performance** of the SME, impact is more pronounced for:

- projects in which SME business objectives have been reached to a great extent, or when most SME expectations were fulfilled (Table 53).
- on the contrary, projects in which the SMEs report that only some or none of their expectations are fulfilled will most probably have no economic or – in rare cases - even negative economic impact for the SME (Table 53).
- projects aiming at opening new directions or markets and projects that develop technologies that are critical for the SME, provided, of course in the latter case that SME objectives are effectively reached, but when the objectives are not reached, such projects may have negative economic impact, especially on small SMEs (Table 54).
- on the contrary, projects that are not considered as critical or in which the SME has limited or peripheral interest will give limited or no economic impact (Table 54).

While SME size does not seem to considerably affect impact on overall economic performance, it is worth noting the trend of higher economic impact reported by very small SMEs. The case studies show that such enterprises participate more in projects that they consider as critical and are ready to take risks, in the sense that due to their size they are not in position to hire new staff for the project and are, therefore, obliged to move qualified staff from production to research. This in turn may even lead to negative economic impact initially, but may afterwards offer substantial benefits (Table 55and case studies).

Table 53: Impact on SME overall economic performance versus degree of reaching SME needs and business objectives

Degree of Impact - SME overall economic performance	Degree of reaching SME needs and business objectives				
	To a great extent	Most expectations were fulfilled	Some expectations were fulfilled	Did not meet expectations	Total
High positive impact	4	2	2		**8**
Moderate positive impact	7	11	3		**21**
Low positive impact	5	14	24	2	**45**
No impact	5	3	29	7	**44**
Negative impact				2	**2**
Total	**21**	**30**	**58**	**11**	**120**

Table 54: Impact on SME overall economic performance versus criticality of project for the SME

Degree of Impact - SME overall economic performance	Criticality of project for the SME				
	This is / was a Critical Technology for our SME	This Project opened new directions or markets	This Project was important but not critical	Limited or peripheral interest	Total
High positive impact	3	1	3	1	**8**
Moderate positive impact	2	13	6	0	**21**
Low positive impact	2	6	30	7	**45**
No impact	2	1	28	13	**44**
Negative impact	1		1		**2**
Total	**10**	**21**	**68**	**21**	**120**

Table 55: Impact on SME overall economic performance versus SME size

Degree of Impact - SME overall economic performance	SME Size			
	Medium (<250 persons and ≤ 50MEuro turnover)	Small (<50 persons and ≤ 10MEuro turnover)	Micro (<10 persons and ≤ 2MEuro turnover)	Total
High positive impact	2	2	4	**8**
Moderate positive impact	2	10	9	**21**
Low positive impact	10	15	20	**45**
No impact	8	16	20	**44**
Negative impact		1	1	**2**
Total	**22**	**54**	**44**	**120**

Regarding **SME business options**, impact is more pronounced for:

- projects in which SME objectives were achieved to a great extent, or when most SME expectations were fulfilled. Projects in which some or no expectations are fulfilled will usually have no impact on SME business options (Table 56)
- micro SMEs which, as mentioned above, participate more in projects that they consider as critical, when their project objectives are met (Table 57).

Table 56: Impact on SME business options versus degree of reaching SME needs and business objectives

Degree of Impact - Business options	Degree of reaching SME needs and business objectives				
	To a great extent	Most expectations were fulfilled	Some expectations were fulfilled	Did not meet expectati-ons	Total
High positive impact	6	5	3		**14**
Moderate positive impact	10	16	9		**35**
Low positive impact	1	7	23	4	**35**
No impact	4	2	23	7	**36**
Total	**21**	**30**	**58**	**11**	**120**

Table 57: Impact on SME business options versus SME size

Degree of Impact - Business options	SME Size			
	Medium (<250 persons and ≤ 50MEuro turnover)	Small (<50 persons and ≤ 10MEuro turnover)	Micro (<10 persons and ≤ 2MEuro turnover)	Total
High positive impact	3	4	7	**14**
Moderate positive impact	5	14	16	**35**
Low positive impact	8	9	18	**35**
No impact	6	17	13	**36**
Total	**22**	**44**	**54**	**120**

Regarding **SME future developments**, impact was reported to have been more pronounced by SMEs in projects aiming at opening new directions or markets and projects that develop technologies that are critical for the SME. This is very often related to concrete technological outcomes. Nevertheless, as illustrated by many case studies, even projects that are not considered as critical or in which the SME has limited or peripheral interest may still have a positive impact on SME future developments for reasons related to identifying alternative technologies to be explored or building upon enhanced technological / R&D capacities or contacts / networking developed in the course of the project (Table 58 and case studies).

Table 58: Impact on SME future development versus criticality of project for the SME

Degree of Impact - SME future development	Criticality of project for the SME				
	This is / was a Critical Technology for our SME	This Project opened new directions or markets	This Project was important but not critical	Limited or peripheral interest	Total
High positive impact	2	4	7	1	**14**
Moderate positive impact	2	11	14	6	**33**
Low positive impact	5	4	27	6	**42**
No impact	1	2	20	8	**31**
Total	**10**	**21**	**68**	**21**	**120**

Regarding SME technological operations and research capacity, impact may essentially depend on the R&D character of the SME (respectively Table 59 and Table 61and case studies) and the criticality of the project (respectively Table 60 and Table 62 and case studies) of the SME:

- For SMEs with high R&D intensity (more than 30% of staff in R&D), high and moderate impact is observed for technological operations and R&D capacity for projects dealing with technologies that are critical for the company. Such SMEs are often important technology and R&D performers in FP projects; they have extensive technological and R&D skills and as a result projects that are not considered critical or have a peripheral / limited interest for the SME also have limited or no impact on their existing knowledge base.

- SMEs with intermediate R&D intensity (10 to 30% of staff in R&D) acknowledge in most cases a positive impact on technological operations and research capacity. But there is limited or no impact in these areas when these SMEs participate in projects in which they have limited or peripheral interest or, in which their role is related to exploitation / dissemination of technology developed by other partners.

- For SMEs with low R&D intensity (less than 10% of staff in R&D) a positive impact is more frequently observed and this may be related to the degree of criticality of the project for the SME. For these essentially low or medium technology companies, however, the SME would sometimes consider the mere awareness of new or alternative approaches to its own standard practices and procedures as a positive impact on technological operations and research capacity.

Table 59: Impact on SME technological operations versus R&D staff at beginning of project

Degree of Impact - Technological operations	Percent of R&D staff at beginning of project				
	<10%	≥10% - <30%	≥30% - <50%	≥ 50%	Total
High positive impact	4	2	2	2	**10**
Moderate positive impact	19	12	7	7	**45**
Low positive impact	20	10	7	5	**42**
No impact	18	2		3	**23**
Total	**61**	**26**	**16**	**17**	**120**

Table 60: Impact on SME technological operations versus criticality of project for the SME

Degree of Impact - Technological operations	Criticality of project for the SME				
	This is / was a Critical Technology for our SME	This Project opened new directions or markets	This Project was important but not critical	Limited or peripheral interest	Total
High positive impact	2	4	4	0	**10**
Moderate positive impact	4	11	25	5	**45**
Low positive impact	3	4	26	9	**42**
No impact	1	2	13	7	**23**
Total	**10**	**21**	**68**	**21**	**120**

Table 61: Impact on SME research capability versus R&D staff at beginning of project

Degree of Impact - Research capability	Percent of R&D staff at beginning of project				
	<10%	≥10% - <30%	≥30% - <50%	≥ 50%	Total
High positive impact	7	4	4	2	**17**
Moderate positive impact	22	9	8	9	**48**
Low positive impact	11	11	2	5	**29**
No impact	21	2	2	1	**26**
Total	**61**	**26**	**16**	**17**	**120**

Table 62: Impact on SME research capability versus criticality of project for the SME

Degree of Impact - Research capability	Criticality of project for the SME				
	This is / was a Critical Technology for our SME	This Project opened new directions or markets	This Project was important but not critical	Limited or peripheral interest	Total
High positive impact	2	4	9	2	**17**
Moderate positive impact	3	15	24	6	**48**
Low positive impact	4	2	18	5	**29**
No impact	1		17	8	**26**
Total	**10**	**21**	**68**	**21**	**120**

Networking was frequently cited as an important SME objective which was achieved by participation, even when the project was not commercially successful or the economic impact was reported as limited. The case studies show that for most SMEs, typically 102 out of 120, project participation had a positive impact on SME networking, meaning that as the project gave the opportunity to companies to extend their contact and client base.

Interestingly, more than 50% of SMEs (Table 106: Impact on SME networking versus SME size) declare that the project had a moderately to high positive impact on the company. A slight trend is observed in Table 63 for impact to increase with size, as the corresponding aggregate numbers (sums of the two top impact frequencies) are: 12 out of 22 for medium SMEs (55%), 23 out of 44 for small SMEs (52%) and 28 out of 54 for micro SMEs (52%). However, the samples are not sufficiently large for this trend to be considered as valid for the entire sample.

Table 63: Impact on SME networking versus SME size

Degree of Impact - SME networking	SME Size			
	Medium (<250 persons and ≤ 50MEuro turnover)	Small (<50 persons and ≤ 10MEuro turnover)	Micro (<10 persons and ≤ 2MEuro turnover)	Total
High positive impact	4	9	9	**22**
Moderate positive impact	8	14	19	**41**
Low positive impact	6	14	19	**39**
No impact	4	7	7	**18**
Total	**22**	**44**	**54**	**120**

4.3.2 Exploitation of R&D Results

E.6.3 How successfully did SMEs get involved in the exploitation of research results?

It has already been stated in this report (Section 4.2.3, Module 2 – E.4.1) that many SMEs do not perceive FP projects as focused technological opportunities that lead directly to marketable products, but much rather they appreciate the opportunity to access and develop R&D networks and expertise and funding. It is, therefore, not surprising that SME involvement in the exploitation of results is rather limited. There are, nevertheless, a number of cases where SMEs did come out with concrete commercial benefits, as further described below.

From the qualitative analysis of the case studies the main factors that contribute to the successful involvement of SMEs in the exploitation of results would be 1) the project focus,

followed by 2) the level of R&D and Technology intensity of the SME and 3) the project alignment with the SME's objectives.

Projects that are driven by clear industrial or commercial objectives in their design would have good prospects to obtain innovative results that can be commercially exploited. The prospects would tend to be even better for projects that build on past R&D activities either in collaborative projects or in-house. In contrast, projects where initiators have essentially scientific or business networking objectives would seem less successful in terms of generating new products, processes or services. In such cases, many SMEs respondents reported that they would have achieved a greater level of exploitation if they had been given additional support by the EC, possibly in terms of a follow-up project, more focussed on down-stream development of the technology. Such further developments could eventually be in the framework of SME support measures at EU or national level or new SME dedicated schemes, but also more focused new FPs (as indicated at the beginning of this paragraph, projects that build on past R&D have improved prospects for concrete results), provided that the SME decides to invest on further proposal writing, which is not always the case.

R&D and technology intensive SMEs may more easily align their role in the project with their strategic objectives. These companies usually operate in competitive markets with high technology/innovation intensity and they tend to make better and more direct use of FP projects in their commercialisation plans. They more frequently assume a strategic role in FP projects and in such a case the projects have a strong focus on innovation and even if their role is not central, they may find ways to bring project results to the market.

It should be noted in this context that the approach to patenting would rather be mixed for R&D intensive SMEs. There are cases of SMEs with a long record and experience of patents that push for a patent strategy to be developed at the very early stages of the project. But, there are also companies that adopt an 'open' approach on the basis that it will be timely and costly for competition to copy the technology and if this happens they would still have a technology advantage in the particular or another field. Patenting is therefore not a pre-requisite for commercial success.

Some more specific trends observed in our analysis are presented below, supported by illustrations from specific examples.

SMEs are quick to respond to market needs and can focus quickly their R&D, as long as they have suitable financial support through funded projects or, even venture capital. In some cases, spin-off SMEs were established to carry out the exploitation.

A major European micro-electronics manufacturer, a University and a high-tech SME specialising in software development launched an FP6-STREP project aiming at developing a new process design method that would incorporate existing process design knowledge, enabling to reduce production costs and time. The project had a clear industrial focus, but the SME saw it as an opportunity to improve technical R&D capabilities, to gain access to

partners' know-how and resources and to obtain funding for R&D.

Among the commercial results that were exploited by other partners, the project produced a fully integrated design component software that the SME protected with a patent. However, the company decided that the line of service to be offered by this application was not within its core business, so it responded positively to the request of the expert within the company that developed the prototype, to form a spin-out in order to commercially exploit it. An agreement was soon reached between the company and the expert by whom the expert would be entitled to use the technology through a new business scheme, provided that the scheme would be launched at about the same time the project was coming to an end. As a result, the expert prepared a business plan that received attention and financial support from venture capitalists and the new company was effectively launched within the tight time scale agreed upon. The IPR was transferred to the new company against preferential terms of cooperation with the SME. After 2 years of operation, the new company employs 10 people and it is expecting to double this figure within the next 5 years.

Successful projects sometimes gave SMEs the impetus to move into new commercial activities and business deals, which they did quickly, on the basis of their new IP.

An R&D intensive Danish micro-enterprise has used the CRAFT programme in order to develop an innovative concept for co- production of bio-ethanol and electricity from Biomass, this being its core area of activity. The CRAFT scheme offered the possibility to access funding relatively quickly and to work with a reduced scheme on a specific and well-focused topic. Having, thus, developed the concept and initial designs, the SME wanted to prove the concept at an industrial scale, which could only be obtained with additional scientific and industrial resources and skills, as well as more important funding. So, the company initiated a 5-year FP5 project in EESD-ENERGY, which was conducted under the coordination of a major supplier of combined power and heating and renewable energy. The project aimed at developing an integrated system for producing electricity and bio-ethanol on the basis of the concept developed by the SME.

The possibility to commercially exploit early results led the SME and the co-ordinator to launch a joint venture during the third year of the project. The new company was meant to develop and commercialise engineering applications, combining the design skills of the SME and the technical and commercial capabilities of the industrial partner. It was able to grow in the international market at fast rates.

The SME obtained 4 patents as a result of the project. After its end, the SME decided to concentrate on consulting services in the area of co-production from wastes, which in view of the scientific reputation and commercial success of the technology developed by the project has ensured a steadily growing income. At the same time, the company

decided to capitalise on the commercial success of the joint venture and reached, shortly after the end of the project a business deal of several million euro with its partner for selling some of the patents and a significant number of shares.

SMEs are quicker to exploit a technology, especially one that is close to their core expertise and identify spill-over effects than larger companies, provided they have the resources to do so.

A major player of the European air space industry initiated an FP5 project, with the objective to finding ways for applying a new technology in the sensitive area of reliably validating safety-critical avionics software. A German SME, with strong R&D focus and expertise was invited to the project to carry out industrial validation tests and eventually develop industrial validation tools that could be used by air plane manufacturers. The project was at the core of the SME's competence and its inclusion to the project was motivated by the need to deal with the projected short and medium-term implementation and industrialization of results by a partner with such an experience.

The tools developed by the SME were available as its standard products a few months after the end of the project and the SME quickly found customers for these tools in sectors outside the avionic area (spill-over), such as automotive-related, illustrating the significant added value accruing from their application. The SME reported that, although the financial risks at the beginning were perceived to be high and requiring extensive self-investment, they obtained significant economic benefits since the end of the project such as 100% increase in income, increased profits, increased personnel (from below 20 at project start, the number of personnel has increased by more than 50% and entering new markets, leading to a very good – 'many times' was the term used by the SME interviewee - return on investment.

SMEs are quicker to identify opportunities for technologies, but they need resources and the appropriate timing to bring R&D results into the market

An FP5 project dealing with the development of novel materials and their use for gas separation was initiated by academic partners to address the industrial need to reduce the costs of existing technologies. A Portuguese high-tech manufacturer and supplier of medical and laboratory products and systems was invited, mainly to carry out some RD and also be the main manufacturer of the prototype and eventual exploiter of systems to produce high purity oxygen from air (PSA). The project did not fully succeed in its technical aims due to unforeseen technical problems and the bankruptcy of a crucial industrial partner dealing with gas separation technologies.

The SME saw from the beginning that the project could develop a potentially profit-

making device to add to its existing range of products. However, during the project (in 2005) it underwent a severe financial and personnel contraction due to economic slow-down in Portugal at that time because of the financial difficulties. As a result, the SME could not complete the exploitation of the technologies developed, but it was able to restarted in-house development of the PSA technologies in 2007 and has since then achieved appreciable levels of exploitation. The actual commercialisation of the technology required some more RD effort and own funds but has paid off to some extent in terms with a moderate positive impact on turn-over, but mostly a high positive impact in improving operations efficiency and scientific reputation.

In FP projects where the industrial or commercial focus is not the primary objective, either because they are more of a 'programme' type, as those that can be encountered in large IP projects of FP6, or because their primary objective is more of an exploratory character, high-tech and R&D intensive enterprises would rather tend to further enhance their knowledge and products, but the main outcome would rather be a follow-up, more application oriented R&D project accompanied with a low to moderate impact on products and reputation, as illustrated in the example below.

A major manufacturer in the telecommunications industry has initiated and coordinated an FP6 STREP project, with objective to investigate the potential fusion of traffic data from various sources to describe traffic situations and to develop short term traffic predictions taking into account road surface conditions. A highly innovative French spin-off SME was invited to bring its proprietary technology in data integration and management that was essential in developing the traffic management system aimed at by the project. The project did not go beyond demonstrating a concept, but the partners, including the SME have obtained funding for a follow-up FP6 project, with more focused development plans. The SME was able to increase the functionalities of its proprietary software and to enhance its client base and reputation, but expects more concrete commercial outcomes, including expansion to new sectors from the follow-up project.

Another pattern of approach of high-tech SME regarding results exploitation in exploratory projects is to fund, even with own resources, further development of the project outcome. However, divergent individual objectives amongst partners - typically academics aiming at follow-up R&D work and scientific papers and companies pushing for commercial products – may negatively affect the overall capabilities and, therefore, the commercial impact of the final product, as shown in the following example.

The principle objective of an FP5 RTD project was to design and develop a prototype Internet and telecommunications based seismic monitoring and early warning system for improved prediction of volcanic eruptions. The academic interest was directed towards

investigating the type and nature of volcanic seismicity and assessing their significance in terms of eruption potential through theoretical and applied research. A spin-off SME specialising in developing novel solutions for data management was brought into the consortium in order to develop the web-based system that would integrate seismic data and theoretical model predictions. The SME pushed for the development of an exploitation plan but an agreement could not be reached on the IPR regarding data and models. As a result the prototype that has been produced did not include the continuous real-time connection with seismic centres that was initially planned. As the SME was interested in entering a new field of applications, it went on to finance with own resources the commercial development of a scaled down version of the prototype. Overall, the project produced a marginally positive impact in terms of turnover, profit and number of jobs that could have been substantially higher if the system could incorporate the scientific knowledge developed by the project.

For enterprises with low technology / innovation intensity, FP projects would essentially have a minor role in the overall company strategy, largely due to the marginal relevance of innovation. For most such companies the outcomes would rather concern more indirect gains such as networking opportunities and development of standards, creation of databases and even increased reputation through contacts with academic institutions.

In general, as already mentioned before (Section 4.2.3, Module 2 – E.4.1) SMEs are involved in exploitation activities that are pursued during project execution, but may, in most cases, have limited possibilities to invest in exploitation activities after the project, whether on their own initiative or as part of an exploitation group. In this context, it would be rather surprising that only in a limited number of cases it was possible to combine the outcome of the FP project with some other source of funding for commercialisation, such as venture capital, or national / regional incentive schemes.

4.3.3 The net effect of FP project participation

E.6.4 What is the net effect when comparing the benefits received with the costs of participation (e.g. return on investment; benefits vs. costs; immediate gains vs. long-term effects)?

Return on Investment for most of the SMEs interviewed was not straight-forward to evaluate. Even when pressed, the respondents would rarely put a value on the Return of Investment (RoI). Nevertheless, the responses received during interviews and from the questionnaires, enabled a qualitative determination of the return on investment. In what follows, “investment” is taken as the total effort and resources that the SME made available to the project and “return” includes all types of benefits and impact received by the SME as a result of their participation in the project.

Analysis of the responses received (discussed in detail below) indicates that in general, the benefit received by most SMEs interviewed was strongly skewed towards indirect impact, including indirect economic impact.

Direct, immediate gains in turnover and profit were rare and only when the project developed technologies whose concept and application was clearly proven before the start of the project. Another pre-requisite for rapid gains in turnover was that the SME was either the initiator or the main exploiter of a technology with strong market-pull or industrial need, often for reducing costs, as for example:

A medium-tech foundry SME in Southern Italy with main activities in manufacturing rail track and associated products, was involved in an FP6 project (2003-2007) to develop new and improved "turnouts" (track switches) with better characteristics and better materials, mainly to reduce overall costs. This was a "core technology project" for them and they were heavily involved in the research, offering guidance and exploitation leadership, even pushing for rapid results. Even before the end of the project the new designs were tested at the factory and soon after the end of the project, new turnouts were installed in industry and other products from project results soon followed. The overall income increase for the SME is now over 100% (current annual turnover is about 23ME), of which at least 10% can be attributed *directly* to the project and the rest is heavily influenced by the skills and technologies acquired during the project. Therefore, the direct economic Return on Investment is therefore positive and still growing with excellent sustainability.

and also, in a completely different field:

A small specialist German high-tech SME develops and markets software for safety-critical applications, e.g. in avionics. It was involved in a FP5 RD project in which it developed some specialist software tools based on academic theoretical results. The project was a success and the results are already used extensively in validating large, safety-critical, software for a major aircraft manufacturer. The SME has benefited *directly* by the income derived from its software, reporting over 100% increase in income with very good prospects for the future. The direct economic RoI was therefore reported as large and growing with good prospects for long-term sustainability.

In a few other cases, RoI was also direct but not immediately in the original direction envisaged by the project i.e. the technologies spilled-over in areas other than the originally envisaged application and field, as for example:

A small high-tech Belgian SME, which manufactures diagnostic tools and sensors for environmental and food monitoring applications, was involved in a large FP6 Integrated Project to develop a complicated integrated food monitoring system to reduce food waste and improve overall efficiency and safety. The project developed successfully a plethora of new technologies in this area and was judged a pending success since the application of the whole integrated system will probably only take place after new regulations for food

protection are enacted in the EU. Nevertheless, the SME benefited immediately from its own results from the project by applying them very successfully in related fields in which it is active with significant income from them. It therefore has experienced a significant *direct sustainable* economic RoI and is poised for even greater economic benefits once the system is fully applied.

But in some other cases, the SMEs experienced *indirect* economic impact in a number of different ways, even though the project itself was not successful:

1. The SME benefited by its exposure and training in new skills and new technologies, which led to increased technological capabilities which eventually allowed it to increase its income, as for example:

A medium-sized sheet-metal Portuguese SME was involved as an advisor and potential end-user in an FP5 RD project aimed at reducing the noise of the machinery and operations during manufacturing. This was the first time the company was involved in a transnational project, or any kind of major RD project and had no RD department as it was buying nearly all its technologies. Although the project did not succeed in its technical aims due to unforeseen technical difficulties and complications, the SME reported that it benefited by acquiring new skills and expertise to such an extent that it established an RD department and is now developing its own technologies which are bringing in income. It has thus experienced substantial *indirect sustainable* economic RoI.

2. The SME had a supporting role in a project but it obtained some return on investment by enhanced reputation and new business contacts (customers etc), as for example:

A small high-tech Belgian university spin-off SME was involved in a large FP6 STREP aeronautics project to develop a new technology for aircraft. It did not carry out any actual RD but offered mainly measurement services based on its specialised expertise and its role was minor and supportive. Nevertheless the RoI for this SME was positive owing to the new business it gained with some of the larger partners in the project, with good sustainability.

3. The SME obtained *indirect* economic impact in a direction other than the original plan, by exploiting some side result of the project, even though the project did not meet its technical aims, as for example:

A medium-sized high-tech Belgian SME was involved in an FP5 RD project to develop high-temperature fibres to replace dangerous fibres used currently for fire protection. The project could not reach the technical aims (the fibres developed did not have the planned-for thermal resistance) but the SME exploited some derivative result which led to a different product which is already produced and marketed widely in various applications. The overall RoI is therefore marginally positive but growing and sustainable.

In order to obtain a reliable, semi-qualitative assessment of the RoI, we have used the responses to the summary question "what was the overall value of the benefits obtained from participation in the project", which provide a measure of the overall benefit, in conjunction with the other responses on impact.

The starting point of our analysis was a pattern arising from the case studies, according to which the net effect would be positive in cases where the SME perceived:

- to have obtained very valuable to moderately valuable benefits from the project, combined with
- a high positive to moderately positive impact in one of the parameters used in the investigation.

This empirical finding was used to quantify the degree of positive net effect along the aggregate impact parameters that have been investigated in section 4.3.1.2. The corresponding results are presented in the form of cross-tabulations of answers received for the degree of benefit and impact received: Table 64 corresponds to impact on SME business aspects and Table 65 to impact on SME development and innovation aspects. These tables show responses corresponding to the empirical condition for positive net effect discussed above, while the totals obtained for each impact dimension give a measure of the SMEs that consider the net effect to be positive.

Table 64: Degree of impact on SME business aspects versus perceived added value (percentages are calculated with respect to the total of case studies, that is 120)

Impact Dimension / Degree of Impact	Perceived added value		
Overall Economic Performance	**We obtained very valuable benefits**	**We obtained moderately valuable benefits**	**Total**
High positive impact	3,33%	2,50%	**5,83%**
Moderate positive impact	10,83%	6,67%	**17,50%**
Total	**14,17%**	**9,17%**	**23,33%**

Business Options	We obtained very valuable benefits	We obtained moderately valuable benefits	Total
High positive impact	7,50%	3,33%	**10,83%**
Moderate positive impact	10,00%	18,33%	**28,33%**
Total	**17,50%**	**21,67%**	**39,17%**

Future Developments	We obtained very valuable benefits	We obtained moderately valuable benefits	Total
High positive impact	8,33%	2,50%	**10,83%**
Moderate positive impact	8,33%	16,67%	**25,00%**
Total	**16,67%**	**19,17%**	**35,83%**

Table 65: Degree of impact on SME development and innovation aspects versus perceived added value (percentages are calculated with respect to the total of case studies, that is 120)

Impact Dimension / Degree of Impact	Perceived added value		
Technological Operations	**We obtained very valuable benefits**	**We obtained moderately valuable benefits**	**Total**
High positive impact	8,33%	0,00%	**8,33%**
Moderate positive impact	10,00%	25,83%	**35,83%**
Total	**18,33%**	**25,83%**	**44,17%**

R&D Capabilities	We obtained very valuable benefits	We obtained moderately valuable benefits	Total
High positive impact	8,33%	5,00%	**13,33%**
Moderate positive impact	10,00%	25,00%	**35,00%**
Total	**18,33%**	**30,00%**	**48,33%**

SME Networking	We obtained very valuable benefits	We obtained moderately valuable benefits	Total
High positive impact	11,67%	6,67%	**18,33%**
Moderate positive impact	2,50%	23,33%	**25,83%**
Total	**14,17%**	**30,00%**	**44,17%**

In general terms it is observed that a positive net effect would be expected in view of positive impact on R&D capabilities, technological operations and networking, which is perceived by respectively 48% of the SMEs for the former and 44% for the latter two. A lower but comparable share of SMEs would attribute a net positive effect to positive impact on business options (39%) and future development perspectives (36%), whereas only 23% of the SMEs would relate a net positive effect to overall economic performance. These

quantitative differences should be related to the fact that SMEs would rather see the FPs as an opportunity to enhance their technical and R&D skills, knowledge, networking capacity and to a lesser extent to directly improve business results as previously mentioned in this chapter (section 4.3.1.1). So in order to determine the net effect of participation, the cost of investment, instead of being compared to the actual financial benefits, would rather be measured against benefits in terms of new R&D, technological and networking skills, but also against the increased business perspectives (enlarged/strengthened business options and/or improved future development potential) that can also be related to the improved skills.

While costs of participation can be determined very precisely in terms of time and money spent, the way tangible or intangible benefits are measured may depend on different factors, such as initial expectations, other expectations that have been developed in the course of the project, but also on a longer term view, depending on how commercial products were actually received by the market or, even, how acquired scientific skills or networks or alliances formed as a result of the project could be turned into an initially unforeseen development, positive or negative.

A net positive effect that can be related to financial gains is more likely to be observed for high-tech SMEs that undertake a leading role in the project. As discussed in the previous section, in such a case these SMEs will pursue specific technological and business objectives and will ensure that the project as a whole will lead to concrete results that will very often exceed the cost of investment, whether at short or longer term.

Even when not in the driving seat, high-tech SMEs will seek to take a maximum advantage of the investment in terms of developing skills. At the same time, they will seek to exploit opportunities for direct economic benefits that may come at short or longer term, even in projects that may not lead to specific exploitation plans of the R&D results. This may take the form of either finding new markets for their products or by strengthening or enlarging their customer base with consortium partners, as illustrated in turn in the two examples that follow.

An FP6 project was initiated by a consortium of academic and industrial partners in order to develop a new generation of analytical methods for safety and quality assurance in the agrofood industry. The analytical methods were based on recent advances in Micro and Nanotechnology (MST and MNT). A Belgian micro-SME with strong R&D focus that develops and manufactures diagnostic tools for detecting the contamination present in food products joined the project after the first year. Its role was to test different methods for antibiotics detection and to choose optimal ones for further development and incorporation to the integrated monitoring system aimed to be produced by the project.

The SME became part of some of the IPR of the project in the area of quality and safety monitoring protocols and already exploits it indirectly in many of its current operations.

Eventual full exploitation of the integrated monitoring system will take more time, as commercial exploitation of the technology requires (1) adaptation to of the system to a range of sensor products (2) an important cost reduction to get the food producers to accept the new systems.

The SME has also benefited substantially, since much of the specific technologies they developed (biomaterials) have already been used in other applications areas, with excellent prospects for the future. As a result, the overall Return on Investment for the SME is highly positive and expected to increase in the next few years when the integrated monitoring system is brought in the market.

A high-tech German SME that develops, among other technologies, satellite communication and navigation systems, undertook to support the development of a satellite navigation system, in an FP5 project aiming to develop new systems for Air Traffic Management in Europe.

The project was part of the very large effort towards a high-level air control system, as well as new technologies for air transport in general. The SME considered the project to be a platform for further business contacts with the partners of the consortium.

No direct economic exploitation was expected, but societal impact has been high, leading to a number of follow-up projects. Indirectly, the stronger business contacts have helped to get new contracts between the partners and the SME has especially worked well with a major electronics integrator. The overall Return on Investment is estimated by the SME at more than “a few times higher” than their own contribution to the project.

However, SMEs and especially very small ones are quite vulnerable to adverse economic conditions, which may have negative consequences on the expected benefits. A difficult financial situation for an SME may lead to decreasing its role in a project and so its perspectives to actually receive any advantage against its investment. An example of such a case is presented below.

A very small high-tech company of the UK with expertise in actuators and related specialised systems in specialised industrial and consumer electronics projects, mainly high-tech audio products was partner in an FP6 – STREP project aiming to design and develop innovative transducer systems based on active materials. The SME was invited to the project due to its knowledge and technical expertise of specialised magnetostrictive actuators as applied in audio equipment and its expertise in testing thereof and in the current state-of-the-art in this field. The other partners appreciated the potential of small

specialised companies since such SMEs could bring more innovative solutions to a research project due to their stronger research of new products, patents and any possible outcome to place in the market within the small-medium timeframe.

Unfortunately, due to financial difficulties faced at the time the project was starting, its role and share were diminished significantly. The SME could, therefore, not participate in any of the IPR from the project and was not involved in the exploitation activities. As a result, the impact of the project on the SME was limited, and mainly non-economic, as the new skills and technical information it obtained helped to better follow its own interests in the area of audio equipment. The Return on Investment (RoI) for the SME from its participation in and associated impact from this project was unfavourable. The partners of the project considered that the SME 'could have covered a more important role within the project and later on, if not too busy in restoring its financial situation'.

In general, SMEs entered into FP projects with quite realistic expectations more in terms of R&D and technical knowledge or establishing networks rather than being focused exclusively on financial objectives.

In some cases, like the one shown below, technical expectations that are fully or partly met can lead to positive economic results that may appear after some time as a result of enhanced networking and favourable business conditions.

Based on previous collaborations and IPR, 2 major European airplane engine manufacturers and a University launched an FP5 project aiming at increasing the efficiency of gas turbine engines by improving the abradable seal between the blade and casing and by reducing tip leakage. A Spanish SME specializing in coating (thermal spraying) for metallic parts including parts for aero-engines undertook to carry-out tests of the powders developed and to run industrial validation tests.

The SME had worked with the main partners before but had no previous FP experience. It entered the project in order to improve R&D networking, meet new customers, gain access to partners' know-how and resources for own development and to help in finding solutions to its own problem relating to thermal coatings. At the same time, it was recognized that its involvement was seen as "taking a financial risk".

The project had reportedly a low positive overall effect on the SME when it finished, as the immediate economic benefits were not in proportion to the investment. But since then, further work with the industrial end-users and favourable business conditions enabled to take advantage of the technological benefits. The Return on investment is already positive and projected to increase in the years ahead.

In other cases, especially as far as peripheral end-users are concerned, there may be no concrete outcome, but the knowledge gained can still be considered to outweigh costs, as illustrated in the example below.

A small Hungarian architect's office was invited to participate in a project aiming at the development of software that offers the possibility to simulate sound effects in virtual reality environments at real time conditions. The main industrial sector that was targeted was the game industry, but it was considered that there might be some potential in enhancing current computer-aided design applications with a sound feature.

The SME spent time to define specifications and then to test the application. The prototype that has been actually developed offered some very basic features that could not be envisaged to be used for the purposes of actual applications in architectural design and no further development was envisaged in this area of application after the end of the project.

The SME stated that although there had been no concrete outcome for them, the benefit of knowing that such ideas existed and some initial research had been conducted in order to incorporate sound modelling in architectural design applications was considered as a benefit that was perceived to outweigh their costs of participation.

4.3.4 Sustainability of benefits

E.6.5 To what extent can any positive changes resulting from the intervention be expected to last when beneficiaries are no longer supported (e.g. sustainable structural impacts on the ERA, enhanced international co-operation in R&D activities; registered standards or patents; increase in investment in R&D, etc.)?

The extent by which benefits resulting from the project are maintained over time has been extensively investigated so far, in the context of the different dimensions of impact (section 4.3.1), the exploitation of results (section 4.3.2) and the net effect of project participation (section 4.3.3). The main conclusions of the foregoing discussion as to sustainability are summarised below:

In terms of turnover and profit, direct benefits resulting from project participation are observed for a small number of cases, but when they arise they take some time to show and may increase over time.

1. In those cases where the SMEs reported strong impact on their business networking, the immediate impact on income and profits was more evident and sustainable and reflected new ventures with new customers.

2. In terms of products and services, gains reported concern a greater range of products and services of improved technical quality and reliability and increase in techno-economic and socio-economic competitiveness, that show fair sustainability potential, but are dependent on how fast competition can catch up with the technological advances or on how fast the technology becomes obsolete.

In terms of R&D and innovation, at the end of the project the SMEs increase their R&D activity and report increased prospects for further technological and / or scientific developments and these trends are fairly sustainable. The sustainability in this case becomes even more obvious if one takes into account the positive effect of enhanced RD activities on the development of new products and services.

1. In a wider context, the whole European Research Area (ERA) may be seen as being impacted positively by companies' reported positive impact. This can be likened to a ripple effect: the impact on an SME is distributed to all its customers and collaborators and they, in turn, influence and impact their own networks. This, in many cases, lead to structural impacts on the ERA since the base-line in particular fields is brought higher.

2. The positive feedback effect is also a major factor in sustainability: the impact on the SME influences its customers and collaborators, which in their turn positively influence the SME by their own increased operations.

3. In terms of networking widespread positive impact is observed for the SMEs on both R&D technological and / or scientific networking that has strong sustainability potential further supported by improved reputation as innovators.

4. A major factor regarding sustainability is the enhanced reputation of the SMEs in the market. This was highlighted often by SMEs reporting that, once their "name" in the market had been enhanced by their participation in the project and via their partners, they often experienced a greater number of contacts by new customers.

5. Sustainability of impacts was also found to be indirect in many cases. For example, SMEs reported that their enhanced innovativeness and RD activities, allowed to widen their activities and to be more pro-active in many technological areas, even daring to form joint ventures with other companies in developing a new product or service.

6. Sustainability was also evident in the SMEs statements, during interviews, that they "felt more confident in trying out new ideas and new approaches in their operations" as a result of their participation.

7. The opportunity in meeting and networking with important potential customers was often cited as a crucial reason for participating in projects. Elaborating further, some SMEs mentioned that "they would never have been able to enter into collaborations with some very large companies, without the close-interaction they had during the project". In other words the projects were sometimes seen as a "vehicle for networking", in addition to it being a technological benefit, justifying the initial negative impact (costs) of being involved in a project.

8. Sustainability is also related to the cruciality reported by many SMEs in taking part in the project. During interviews, this was explained by the interviewee as "this project was make or break for us. If we hadn't succeeded in it, we might have been forced to close down". In such cases, the positive impact received by the company was evident in its longer-term survival.

9. The impact reported in some projects on some standards and regulations can be seen as having significant sustainable benefit on the corresponding field or area and the SMEs working in it. This was illustrated in some cases, especially related to security, safety and the environment.

10. The flexibility that is a characteristic of many SMEs also means that they are more able change their direction, according to market needs and demands. This has an indirect effect on sustainability of impacts, often not obvious.

11. The sustainability of impact reported on the SMEs' RD capabilities and activities can be seen as having a direct and indirect impact on the whole ERA development. This is illustrated by the increased employment of RD personnel as well as their increased output in terms of innovative products and services.

However, sustainability of impact was very often threatened by many, mainly extraneous factors. Several dimensions of SME capabilities, or lack thereof, as follows, mean that they are at risk of losing out on such further technology development after the project:

1. Many SMEs reported severe difficulties in exploiting the technologies developed since they could not find the resources to closely follow the subsequent development of a technology where this has not reached a close-to-market stage at the end of a project. In those cases where resources were found, the SMEs reported satisfactory sustainability. In other cases, some SMEs reported that they had to "drop" the technology since they could not develop it on their own.

2. Resources did not only mean financial funding, although this was often the main obstacle, but also human resources, especially for micro SMEs where personnel could not always be found to carry the project forward.

3. Where SMEs pursue an R&D project that is 'critical' to their development and invest heavily in such a project, failure to reach the exploitation stage may actually become critical to the survival of the SME where no follow-up funding is found.

4. SMEs are not always as focused on maintaining close contact with scientific and technology networks as their academic and large company partners are. This is often related to their need to put emphasis on day-to-day operations and cannot always find the human resources to continue with these networks.

5. SMEs tend to find it difficult to regularly and systematically participate in FP projects. In cases where a technology relies on a series of projects for its full development, this has a direct effect on the sustainability of impact for any partners that are not able to participate in all the projects.

6. Sustainability is also related to the size of the company. In larger sized SMEs where the loss of a specialist may be covered by a co-worker the impact is less traumatic than in micro SMEs where a single person is often the only one participating in the project and his/her loss means the end of the skills base for that technology in the company.

7. Sustainability of impact is often influenced negatively by the absence of regulations that would make the new technology obligatory. This was particularly evident in cases of new environmental or safety technologies, either in terms of new measurement capabilities or alternative products or services.

8. Crucially, SMEs are much more susceptible to general economic downturns, something which indirectly and directly can influence the sustainability of technological impacts. This may be balanced somewhat by the impacts in networking and skills, less so for very small micro SMEs.

4.3.5 Impact depending on type of project and SME R&D capacity

E.7.1 Are there differences in terms of impact between SMEs participating in big projects (e.g. IPs) and those in projects more tailored to SMEs (e.g. STREP)? And between SMEs with different capacities (e.g. high-tech SMEs vs. lower tech SMEs, SMEs joining in different phases of the projects, etc.)? If so, why?

Our analysis is essentially based on important parameters such as SME R&D and innovation level, expectations from the project and the different dimensions of impact identified earlier on in this module. In this regard, it is instructive to compare and analyse the answers of the

respondents to the "summarising questions" in the questionnaires, generally aimed as a means to cross-check the answers in the detailed impact parts. These questions give a measure of the overall "feeling" of the respondent and, being isolated from the details, constitute a valuable tool in the analysis.

The starting point of the analysis is to investigate how the interviewed SMEs are distributed in the instruments of FPS examined. As shown in Table 66, the number of micro SMEs in RTD projects of FP5 is about half the total number of SMEs, whereas in FP6 their share is significantly reduced. This fact could be associated with the fact that large projects of the Programme type would rather not create favorable conditions for SMEs to participate, as they would prefer to be part of smaller cooperation schemes with stronger focus on concrete results.

Table 66: Participation of SMEs in FP5 and FP6 instruments in terms of size at beginning of project

SME Size	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 - Integrated project (IP)	FP6 - STREP	Total
Medium (<250 persons and ≤ 50MEuro turnover)	1	14	2	5	**22**
Small (<50 persons and ≤ 10MEuro turnover)		31	3	10	**44**
Micro (<10 persons and ≤ 2MEuro turnover)	2	41	2	9	**54**
Total	**3**	**86**	**7**	**24**	**120**

As shown in Table 67 whereas the RD intensity of the participating SMEs is skewed towards the low-RD side in FP5 projects, it is more balanced in FP6 projects. This may reflect a measure of success in convincing SMEs of the benefits of greater amount of RD, during the FP5 projects. It also reflects the greater emphasis placed throughout Europe on the benefits of spin-off companies (from Universities and Research Centres). In fact, the majority of SMEs declaring high RD intensity in FP6 were spin-off companies, many of which were involved in the actual initiation of the project, in collaboration with the academic partners that gave birth to them.

Table 67: Participation of SMEs in FP5 and FP6 instruments in terms of R&D intensity at beginning of project

R&D Intensity	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 - Integrated project (IP)	FP6 - STREP	Total
≥ 50%	1	11	1	5	**18**
≥30% - <50%		9	2	5	**16**
≥10% - <30%		21	2	5	**28**
<10%	2	45	2	9	**58**
Total	**3**	**86**	**7**	**24**	**120**

The declared reasons and objectives for participating in a project appear to be independent of whether it was an FP5 or FP6 project. As shown in Table 68, in both FPs. The main reason was funding, followed by a number of technological knowledge-related reasons such “new technological field”, “access to partners’ technological knowledge”.

Table 68: Reasons of participation of SMEs in FP5 and FP6 instruments – to be presented in descending order?

Reasons of Participation	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 - Integrated project (IP)	FP6 - STREP	Total
To obtain funding for R&D	1	20	1	5	**27**
To improve technical or R&D capabilities		11	1	3	**15**
To improve R&D networking		8	3	4	**15**
To gain access to partners' know-how and resources		13		1	**14**
To enter a new technological field	1	10		3	**14**
To develop a new or existing product		6		3	**9**
To solve a specific industrial or technical problem	1	5		1	**7**
To obtain funding for exploitation		5			**5**
To find a way to conform to a new		2		2	**4**

technical standard or regulation					
To find customers for own existing products or know-how		3			**3**
To enhance business networking			1	2	**3**
No answer		2			**2**
To enhance R&D or business reputation		1			**1**
To enter a new market			1		**1**
Total	**3**	**86**	**7**	**24**	**120**

Little difference was also seen in the degree of fulfilment of the SMEs' Business Objectives between FP5 and FP6 but STREP participation gave higher overall impact than for IP in FP6, as shown in Table 69. For example, no SMEs reported "to a great extent" in Business Objective satisfaction as compared to 3 for STREPs.

Table 69: Degree of fulfilment of Business objectives

Project fulfilment of Business Objectives	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 - Integrated project (IP)	FP6 - STREP	Total
To a great extent	1	17		3	**21**
Most expectations were fulfilled	1	20	3	6	**30**
Some expectations were fulfilled	1	39	4	14	**58**
Did not meet expectations		10		1	**11**
Total	**3**	**86**	**7**	**24**	**120**

Very useful insight can be gained by the general satisfaction of the respondents by their SMEs' participation. As shown in Table 70, the overall actual benefit of participation, the majority of the interviewed SMEs reported that they "obtained very valuable or at least moderately valuable benefits" and less than 25% reported low value or no benefits. This was the same irrespective of FP but higher impact was found for STREP participation rather than in IPs in FP6. In fact, insights gained during interviews indicate that very few SMEs were dissatisfied by their participation in projects and many of those were in supporting roles in very large FP5 projects. No SMEs in any FP6 project reported "no benefits obtained". This very significant reported overall "added value" was actually reported by a number of SMEs

as being a “driving force” behind their decision to participate in further RD projects, after a successful FP5 participation.

Table 70: Degree of added value perceived by SMEs in FP5 and FP6 instruments

Actual Benefits	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 - Integrated project (IP)	FP6 - STREP	Total
We obtained very valuable benefits	1	20	1	5	**27**
We obtained moderately valuable benefits	2	45	4	11	**62**
The benefits we obtained were of low value		13	2	8	**23**
We did not obtain any valuable benefits		8			**8**
Total	**3**	**86**	**7**	**24**	**120**

The reported impact of participation on overall economic performance and other business aspects of the SME’s operations support all the preceding conclusions. Table 71 shows that almost 65% of all SMEs reported at least some impact on their overall economic performance and on their business operations. In fact, the impact on business prospects (Business Options and Future Development) is even better, with over 70% of the respondents reporting at least some impact and a significant proportion of those reported moderate or even high impact. As before, only small differences were noted between FPs and some evidence of higher impact for STREP participation rather than in IPs in FP6.

These results are also supported by anecdotal evidence from interviews. In many cases, especially small companies and relatively new spin-offs, future business prospects were nearly always reported as being very positive as a result of their participation in the project. In general however, this optimism in the future was less pronounced in cases where the general technological level of the SME was reported as “low” or moderate.

Table 71: Impact of SME participation in FP5 and FP6 instruments – business aspects

Impact on Overall Economic Performance	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact		8			**8**
Moderate positive impact	1	12	1	7	**21**
Low positive impact	1	31	4	9	**45**
No impact	1	35	2	8	**46**
Total	**3**	**86**	**7**	**24**	**120**

Impact on Business Options	FP5 - Demonstration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact	1	9	1	3	**14**
Moderate positive impact	1	26	2	6	**35**
Low positive impact	1	25	1	8	**35**
No impact		26	3	7	**36**
Total	**3**	**86**	**7**	**24**	**120**

Impact on Future Development	FP5 - Demonstration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact		11	1	2	**14**
Moderate positive impact	1	21	3	8	**33**
Low positive impact		31	1	10	**42**
No impact	2	23	2	4	**31**
Total	**3**	**86**	**7**	**24**	**120**

The reports on the overall impact on technological operations and RD capabilities of the SME (Table 72) also supports the responses obtained from the detailed questionnaires. Over 80% of the SMEs reported at least some impact and a large proportion of those reported moderate or even high impact on their operations, and especially on their RD capabilities and scientific and technological networking.

No appreciable differences were noted between FPs and only slightly better for STREP than IPs in FP6. However, anecdotal evidence is clear from interviews that the higher the technological level of the SME, the greater was the impact on its RD activities and operations. As one respondent mentioned “just like crystal growth needs a nucleation seed crystal in a rich environment, so it is for RD development”. In addition, some SMEs with

experience in RD project participation, mentioned that in STREP's their "opinions count, but in IPs, their opinions do not".

Finally, the reported overall impact of participation on networking is found to correlate with the findings in the detailed parts of the questionnaires. In fact, as many respondents mentioned, it is the potential for fresh networking and meeting new collaborators and customers that is often the decisive factor encouraging the smaller SMEs to take part in a project, overcoming their worries about the risks involved, in particular the risk of "distracting members of staff away from production".

Table 72: Impact of SME participation in FP5 and FP6 instruments – development and innovation aspects

Impact on Technological Operations	Type of Project				
	FP5 - Demonstration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact		9		1	**10**
Moderate positive impact	1	30	3	11	**45**
Low positive impact	1	28	3	10	**42**
No impact	1	19	1	2	**23**
Total	**3**	**86**	**7**	**24**	**120**

Impact on Research Capabilities	FP5 – Demon-stration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact		15		2	**17**
Moderate positive impact	3	28	4	13	**48**
Low positive impact		22	3	4	**29**
No impact		21		5	**26**
Total	**3**	**86**	**7**	**24**	**120**

Impact on Networking	FP5 – Demon-stration	FP5 - RTD	FP6 -Integrated project (IP)	FP6 - STREP	Total
High positive impact		14	2	6	**22**
Moderate positive impact	2	26	3	10	**41**
Low positive impact		32	2	5	**39**
No impact	1	14		3	**18**
Total	**3**	**86**	**7**	**24**	**120**

On the basis of the foregoing discussion and the analysis of the case studies, especially the information gathered by the interviews, indicate that STREP projects have a stronger impact on SMEs as they run over time scales and have development objectives that are closer to the SME approach and operation than large research projects.

Other general conclusions regarding the influence of the type of project and technological level of SME, drawing heavily from the interviews, are as follows:

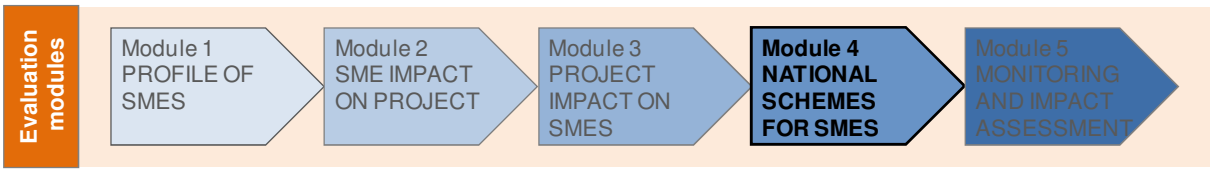
1. SMEs gain more if they are part of the "core group", as often happens in STREP projects, rather than being supporting actors, as happens mostly in IPs or projects aimed at large-scale technologies, such as some of the large aeronautics FP5 projects.

2. SMEs gain more impact in projects close to their "core expertise". This is supported by the stronger direct positive impact of the new technology on the SMEs operations in such cases, but also the enhancement in their reputation, gains of new business networks and direct gains in skills.

3. Impact was greater for SMEs with previous successful participation in RD projects and/or higher previous exposure in high-technologies. This is related to the level of participation that experienced SMEs could offer, obtaining greater benefits as a result.

4. In some isolated cases where the initial technological level of the SME was reported as low, participation gave major impact, since it allowed the company to try and be convinced of the benefits of new high-tech solutions.

4.4 Learning from National R&D funding programmes



The objective of Module 4 is to examine National R&D Programmes with a view to identify successful practices in terms of incentives, mechanisms and effects for the SMEs that would be recommended to consider in future EC funding.

Module 4 deals, therefore, with the following questions:

E.12	How do the results of SME participants in EU funded research projects compare to those of beneficiaries of national research schemes?
E.12.1	Which aspects of the national schemes induce higher SME participation rates and greater benefits for SMEs? What differences can be detected between SMEs from different sectors, with different capabilities and from countries with different economic performance?
E.12.2	How did the economic performance of the control group evolve between the time of application for funding and the time of the investigation? Reasons?
E.12.3	To what extent can the benefits gained by SMEs from national research schemes be directly linked to participation in the programme?
E.12.4	To what extent do SMEs in the control group pursue international R&D activities (e.g. cross-border agreements, EU-wide or global co-operation; any sectoral differences, etc.)?
E.12.5	What is their assessment of the differences of EU programmes and national research schemes? What are the most common reasons for non-participation in EU funded research programmes?
E.8.	What is the added value for SMEs of European research project involvement? To what extent do actions at EU level complement and enhance actions taken at national level?
E.9	What ways and means can be identified to enhance the incentives of the thematic programmes to produce greater benefits for SME participants?

This section starts with an overview of the National Programmes and control group case studies selected, followed by the presentation of the main findings through document search and interviews with programme and project stakeholders. The remaining part addresses each evaluation question in turn. The discussion is concluded with the presentation of the main features an SME-friendly programme would possess as resulting from the main findings of the analysis.

4.4.1 Selection of National Programmes and Control Group Projects

National Research Programmes have been selected on the basis of their similarity with respect to FP5 and FP6 with regards to:

- focusing on collaborative applied R&D between academia and industry
- allowing SME participation and aiming at contributing to the development of their R&D capabilities
- covering a variety of thematic areas.

The list of the National Programmes and their basic characteristics is provided in Table 73. More information on the policy context for each Programme, its target groups, the funding process and the selection criteria used is provided in Annex D.

The choice of specific projects within the National Programmes was guided by the need to cover:

- a variety of thematic sectors for the projects
- a range of R&D capabilities by the SME
- SMEs in the industry and the service sector.

An overview of the control group case studies that we investigated is provided in

Table 74 where key characteristics are presented, concerning the thematic area of the project, the type of activity and level of R&D intensity of the SME, its role in the project, the main areas the project impacted the SME and the degree of involvement of the SME in EU FP projects.

Table 73: List of National Programmes examined

GNP Group[36]	Country	Name of Programme	Implementing Body	Programme Duration	Target Group	Special Features[37]
High	France	Competitiveness cluster policy – FUI	Ministry of Economy, Finance and Industry	2004 - 2011	SMEs, larger enterprises, research centres and educational institutions	• Endorsement by a Competitiveness Cluster
		Competitiveness cluster policy –ANR	the National Agency for Research (ANR)	2004 – 2011 (will be extended thereafter)		
	Germany	Programme Innovation Competence – PRO INNO	German Federation of Industrial Research Associations	2003 - 2007	Private companies, public or non-profit research organisations	• Two-stage selection process • Swift project award process
	Sweden	SAMBIO	VINNOVA – The Swedish Governmental Agency for Innovation Systems	2006 - 2010	Private companies with R&D facilities in Sweden, cooperating with research centres and universities	• Focus on SME needs as a result of a series of policy dialogues prior to Programme launch
	UK	Technology Strategy Board Collaborative R&D Programme (TSB)/ 2004 competitions	Technology Strategy Board	2004 - ongoing	Private companies, public or non-profit research organisations	• Business focused and business led projects • Use of technology road maps • Close follow-up of implementation • Specific payment schemes for SMEs

[36] Classification as per GNP per capita for 2005

[37] Further discussed in following sub-section

GNP Group[36]	Country	Name of Programme	Implementing Body	Programme Duration	Target Group	Special Features[37]
Medium	Ireland	Innovation Partners Programme	Enterprise Ireland	2000 - ongoing	All manufacturing, processing and internationally traded service companies, based in Ireland, who are collaborating with Irish Universities are eligible to participate	• Two-stage selection process • Business focus • Close follow-up of implementation • Increased funding for SMEs
Low	Greece	Joint ventures for research and technological development	General Secretariat for Research & Technology (GSRT)	2002 - 2008	Joint ventures of commercial and industrial enterprises, industrial and academic research	• Designed on the basis of a public consultation • Addressing areas of relevance for national economy • Managed under the financial framework of Structural Funds
	Hungary	Application-oriented co-operative RTD Programme	Agency for Research Fund Management and Research Exploitation and the National Office for Research and Technology	2004 - 2008	Legal entities based in Hungary, comprising enterprises, higher education institutions, research centres, and innovation centres	• Increased funding for SMEs and international cooperation • Managed under the financial framework of Structural Funds

Table 74: Overview of the control group case studies

Country / Programme	SME characteristics	Thematic area of project	SME role in project	Areas of Impact	EU FP experience of SME
France/ Competitiveness cluster policy - ANR	• Service • RTD intensive	Energy - construction	Technology developer	• Diversified products • Technological skills • Networking	No previous experience
France/ Competitiveness cluster policy -FUI	• Industry • Low to medium RTD	ICT	Technology developer	• Technological skills • Networking	Experience in a few EU FPs
	• Industry to high • RTD intensive	Engineering / naval architecture	Initiator and coordinator	• Increased turnover • Increased market share • Technological skills	No previous experience
Germany / PRO INNO	• Service • RTD intensive	Engineering / manufacturing	Initiator and coordinator	• Technological skills • Prototype will receive further funding	No previous experience
	• Service • Low RTD	Engineering / manufacturing	Initiator and coordinator	• Increased turnover • High ROI • Technological skills	No previous experience
	• Industry • Technology leader in niche market	Engineering / transport	Coordinator	• No impact due to high-risk character of project	No previous experience
Greece / Joint ventures for research and technological development	• Industry • Low to medium RTD	Food industry	Technology provider and end user	• Increased turnover • Diversified products • Technological skills	No previous experience
	• Service • RTD intensive	ICT	Coordinator	• Technological skills • Networking	Strong involvement in EU FPs
	• Service	Transport	Coordinator	• Diversified products	Experience in few EU FPs

Country / Programme	SME characteristics	Thematic area of project	SME role in project	Areas of Impact	EU FP experience of SME
	• RTD intensive			• Networking	
Hungary / Application-oriented co-operative RTD	• Service • RTD intensive	ICT (Linguistics, Business processes	Technology developer and end user	• Economic impact through spin-off • Diversified products • Technological skills	Strong involvement in EU FPs
	• Service • low RTD	Transport	End user	• Increased competitiveness • New markets • Technological skills	No previous experience
	• Service • RTD intensive	Biotechnology	Technology developer and end user	• Increased competitiveness • Diversified products • Increased R&D activity	Strong involvement in EU FPs
Ireland / Innovation Partnerships Programme	• Industry • Medium RTD intensive	Food Processing	End user	• Diversified products • New Markets • Increased Turnover • Increased methodological skills	No previous experience
	• Industry • High RTD	Manufacturing of Paints	Initiator and joint technology developer	• Diversified products • Increased competitiveness • New markets • Increased Turnover	No previous experience
	• Service • RTD intensive	Biotechnology	Technology developer and end user	• Increased competitiveness • Diversified products • Increased regulatory skills	No previous experience
Sweden / SAMBIO	• Service • RTD intensive	Biotechnology	Coordinator	• New products • Increased technological knowledge	No previous experience

Country / Programme	SME characteristics	Thematic area of project	SME role in project	Areas of Impact	EU FP experience of SME
				• New markets	
	• Service • RTD intensive	Biotechnology		• New products • Increased technological knowledge	No previous experience
	• Service • RTD intensive	Biotechnology	Coordinator	• Scientific knowledge • Networking	No previous experience
UK / TSB	• Industry • low RTD	Materials/ Manufacturing	Coordinator	• Technological skills • Follow-up R&D projects • Networking	Some involvement in EU FPs
	• Service • RTD intensive	ICT	Coordinator	• Technological skills • Networking	Limited involvement in EU FPs
	• Service • medium RTD	Materials/ Manufacturing	Coordinator	• Technological skills • Networking	No experience in EU FPs

4.4.2 National Programme and Control Group Analysis

French Programmes: Competitiveness cluster policy – FUI and ANR

The two programmes examined are integrated in the Competitiveness Cluster policy that the French Government implements since 2004. Within this context, 71 competitiveness clusters have been created in different geographical areas, as associations of companies (SMEs and larger enterprises), research centres and educational institutions that work under a common development strategy and cooperate in collaborative R&D projects in specific market sectors.

An important common feature of the 2 programmes examined is that applicants must receive the label (meaning a formal endorsement) by a competitiveness cluster, which ensures that the projects to be supported have a business relevance within a wider regional context but also facilitates the generation of project ideas, forming a consortium and preparing a technical proposal according to requirements, with a reduced effort by industrial partners.

In terms of SMEs' participation in R&D collaborative projects, overall results are quite positive:

- over the period 2005-2007, SMEs' participation in FUI represented 25% of projects' participants. SMEs received 20% of distributed funds. These figures are of the same magnitude as the ones for larger enterprises.

- over the same period, SMEs' participation in the ANR fund represented 15% of project participants. SMEs received 13% of distributed funds. The corresponding figures for larger enterprises were 16% and 17% respectively.

On the basis of these figures, FUI and ANR mechanisms seem to be well adapted to the objectives of the different entities (SMEs, larger organisations, research institutions and academia) that participate in the competitiveness clusters.

A great leverage for SMEs is the role played by clusters themselves in helping SMEs writing proposals, forming consortia, as well as in providing various services around projects, such as structuring of lifelong learning on technical and scientific topics, networking activities and raising awareness on innovation. Clusters also play a role in advising consortia on the management of Intellectual Property Rights aspects within projects.

Participation of SMEs and corporations in general is enhanced by the fact that competitiveness clusters represent coherent thematic ecosystems (like, for example, Aerospace, automotive industry, biotechnologies) with a scientific strategy meant to enable

cluster members to reach specific markets, with advanced technologies and innovative products or services. Competitiveness strategies are usually built collectively by SMEs, larger enterprises and research centres.

French clusters also have a strong regional anchorage and benefit from financial support from local authorities. However, the attractiveness of such funds is still put into question because of the relative complexity of the project selection and funding processes (length of selection procedures, justifications, or administrative management).

The control group case studies that were examined were the following:

1. An RTD intensive SME in the area of engineering consulting was called to participate in a project led by a Research Institution, aimed to develop energy audit tools for new constructions. The SME has initiated the project idea and was able to develop a new series of competitive products by integrating the R&D input to its technical and business expertise.

2. A project was initiated by the national railway operator in order to develop support facilities on train access for the disabled. An SME specializing in the design of electronic components undertook to develop the on-board video system, which enabled the company to strengthen its position in the niche market of smart cameras.

3. A highly innovative SME active in the area of robotics developed underwater gliders in order to enter a market dominated by US manufacturers. The strategy adopted was on the basis of a differentiated product that was developed in a project lead by the SME. The consortium was very complementary, with research partners that addressed specific technical problems and end users. The SME has already gained an important market share and has registered increased revenue and profit.

An important success factor in the projects above was previous collaboration among the partners and the favourable environment created by the cluster context. The SMEs acknowledged the benefit of the continuous exchange with the programme management authority, although they sometimes indicated that the participation procedure was not always easy for SMEs to understand or to cope with, especially in terms of dedicating resources to write detailed technical proposals. But they recognised that without the support of the cluster environment they would find it very difficult to participate in R&D projects, no matter how close these would be to their actual needs, as the time needed to develop consortia and prepare proposals on their own would be hard to find.

German Programme: PRO INNO

PRO INNO was one of the Federal Government's programmes with a significant broad impact and can therefore be considered as an essential element in the new 'Central Innovation Programme for SMEs' (Zentrales Innovationsprogramm Mittelstand – ZIM) of the German Federal Ministry of Economics and Technology (BMWi).

On the basis of discussions with Programme and project stakeholders, the success factors of the measure can be summarized as follows:

- projects were in the core strategic focus of the participants and clearly aiming at a marketable product
- participants understood the programme as a facilitator for increasing their innovation and R&D capability through collaboration with research organisations
- the programme provided a framework which was easily accessible and non-bureaucratic with a short reaction time between proposal and project start.

A total of 6.808 applications have received funding. More than 70% of the companies had less than 50 employees. Almost 80% of the companies had an annual turnover of less than 10 million Euros. The programme can, therefore, be considered to have corresponded to the needs of smaller-size SMEs. Important factors for increased participation of SMEs have been the frequency of calls and the swift and straightforward selection process.

The main part of the participating companies was active in the following industries: production of business machines, hardware and equipment, electrical engineering, electronics, machinery construction, metal products, chemical industry, services as well as metal production and processing.

Most of the supported projects (42.8 %) were related to product-oriented innovation processes. 66.5% of them were new developments that were introduced mainly in the domestic market. Technology and service oriented innovations represented a minor share (24.9% and 2.5%, respectively). Their characteristics regarding innovation type (new development vs. improvement) and market (domestic or international) were however similar to the supported product-oriented innovation processes.

The following findings are based on the ex-post Programme evaluation.

- Regarding overall performance:
  - more than 75% of the projects were successfully accomplished
  - less than 10% of the projects could not be exploited commercially
  - the collaboration projects often served to elaborate a technological advantage or facilitate accessing a new field of technology
  - PRO INNO has significantly contributed to a continuation of the SMEs-own R&D activities.
- Regarding commercial exploitation:
  - in 55 % of the projects results have already been introduced to the market
  - 33% of the companies plan to initiate commercialization in the near future
  - only 8.5 % of the project produced results that cannot be used commercially
  - a trend can be observed that larger companies have a rather higher commercial exploitation capability
- Regarding turnover:
  - 75.6 % of the companies could increase their turnover with PRO INNO
- Regarding employment:
  - commercially utilising the innovation activities supported by PRO INNO, an average of 4.6 jobs could be safeguarded and 1.46 jobs could be generated per company, almost one third of them in the R&D area.
  - almost 5,000 jobs could be safeguarded, amongst them more than 900 within R&D. More than 1,500 jobs have been created as a result of commercial utilisation after the funding had ended, almost one third of them within R&D.

The control group case studies that were examined were the following:

1. Four companies, each with less than ten employees, co-operated in a project with the objective of devising an unmanned aircraft with a new, efficient wave propeller drive as a cost-saving solution for surveillance missions. This aircraft prototype was developed but the idea was not further developed as additional funding could not be found for promoting the idea in a market that is rather resistant to innovative

solutions. The leader, an engineering manufacturing company could make new contacts through the evaluation of the prototype-tests. In this way, he managed to find partnerships for the industrial production in Switzerland, where funding and field-tests are secured and supported by the canton. Another partner specializing in the analysis of the conduct of dynamic components has benefited from the technology developed has both increased its simulation capabilities and took over new competence areas. As a result the enterprise's volume of orders increased significantly after the project.

2. An SME providing services to the construction industry has initiated a project aiming to develop a cooling tube chain system as a new technological principle to cool down ultra high temperature ashes and combustion residues in coal power plants. The project was a technical and commercial success, as a large number of the system developed was sold shortly after the end of the project. The sales figures have increased since then, giving a very positive ROI. Moreover, the SME could to a large extent gain new know-how, which has led to the establishment of an own production and a new production hall.

3. An SME producing machineries, mainly for aerial work platforms and elevators participated in a project that aimed to develop transportation facilities to protect personnel from adverse weather conditions in wind power stations and ships. A prototype was developed but it lacked important functionalities mainly because of missing know-how, so it was not favourably received by the market. The SME abandoned the idea, also due to a change in strategy towards a stronger focus on their traditional markets and skills in combination with an intensified internationalization. But another partner of the consortium, that actually originated the project idea continued efforts in this direction and obtained further funding 3 years later that led to commercialisation of the upgraded system.

The companies indicated that they appreciated the fast-track procedure for project selection and noted that the administrative management was well adapted to their capacities. In two of the cases, the crucial factor for participating in a national project rather than an international one was the language barrier. Another motivation for preferring National Programmes was related in one case to the high relevance of the project topic in the German business and social environment, meaning that conditions to meet other interested partners and obtain funding were more favourable.

Greek Programme: Joint ventures for research and technological development

The Programme was designed on the basis of a public consultation, a method that is systematically used to design research programmes and set priorities by General Secretariat

for Research & Technology (GSRT). But in this case the method suffered from two drawbacks: the private sector showed little interest and the consultation was conducted at the final stage of the process where only fine-tuning is possible. As a result, very broad subject areas were adopted mainly following the priorities of the 5th and 6th Framework Programmes, but experience regarding demand in previous programming periods was taken into account.

On the basis of data available from different sources (ex-ante evaluation, interviews with Programme stakeholders), the Programme can be said to have been rather successful in terms of participation of the different actors involved, taking also into account the indicators set-out at the design phase:

- A total of 160 projects have been supported, versus the initial target of 150 projects.
- The largest part of the Programme budget, about 80% was spent by the private sector, with the SME share being close to half of it.
- Initial indications show that targets set for researchers and people with technical and administrative expertise to be employed in the projects – respectively 280 and 160 - would be achieved to a very reasonable extent.

The Programme had no particular focus on SMEs, although a way to facilitate SME participation was to remove certain administrative requirements – e.g. the need to present a detailed motivation for entering the Programme.

On the basis of qualitative information collected during interviews with Programme and project stakeholders the following trends could be observed.

The consortia were usually being formed around partners with a previous experience in FP RTD programmes, usually academic partners and large enterprises. SMEs with such international R&D experience also saw the opportunity to initiate a project and to be involved in the programme. An important factor to form the consortia was primarily previous positive collaboration experience and to a lesser extent reputation in a specific field.

Technology-intensive SMEs saw the Programme as an opportunity to complement their R&D activity in the framework of EU RTD programmes. There have been cases where the projects under this Programme were used to extend the scope of ongoing international research, by forming alliances with national academic partners and end-users in order to explore variations or alternative solutions that have not been foreseen in the international RTD programmes. In other cases, the project under this Programme was the opportunity to conduct the first exploratory phases of an R&D idea that lead into an international RTD proposal.

SMEs with little or no previous R&D collaboration project experience were able to develop networking contacts with larger companies and academic partners and to develop an in-depth understanding of the different research and commercial benefits underlying this process. There are examples of SMEs that on the basis of their experience with this Programme were motivated to submit proposals to EU FPs and to eventually receive funding.

The control group case studies that were examined were the following:

1. A highly competitive SME in the food sector with about 80% of revenue through exports in Europe was invited to participate in a project launched by a public laboratory of quality testing. The project aimed to develop processes for the preparation of traditional foods under industrial conditions that could ensure reproducibility of taste and drastic reduction of preserving agents. The SME was able to develop two new products that are already commercialised and have a positive impact on financial figures. This was their first participation in a collaborative R&D and its positive outcome led the company to focus more on targeted collaborations with research organisations and consider participation in EU FPs.

2. An R&D intensive SME in the ICT sector has initiated a project with aim to develop innovative systems in the area of information tracking with semantic criteria, having in mind their application in television news broadcasting. The consortium comprised specialists in electronic data management and speech processing and a press agency as an end user. The prototype developed will be further funded under FP7 before it reaches the market.

3. An innovative SME in the ICT sector developed in cooperation with a University and a taxi driver association a fleet management system enabling to match client requirements and vehicle availability. The final product is currently being used by the taxi driver association against a modest fee, but the benefit of the company is more in the knowledge acquired in a new sector (transport) and a new field (fleet management systems).

The companies indicated that they have appreciated the opportunity to receive funding for R&D in direct relation to their business objectives. The two ICT companies that have experience with EU programmes indicated that participation procedures of the national programme are quite similar to the EU ones, although a bit more focused on the financial reporting system put in place in the framework of structural funds that reduces the flexibility in case changes would be needed in the technical programme.

Hungarian programme – Application-oriented co-operative research and technology development

The main objective of the measure "Application-oriented co-operative RTD" was to enhance academia-industry cooperation through the formation of consortia, mainly focusing on applied research. The scheme was not particularly designed for SMEs, however SMEs were granted a higher rate of funding: for applied research SMEs were entitled for 70% funding and for experimental development 45%.

Furthermore, if the SMEs participated in a Framework Programme project that was closely linked with the project under the national scheme or if there were international partners included in the consortia, even a higher funding rate could be achieved. Consequently, the total funding for SMEs could reach 75% for applied research and 50% for experimental development.

Although, this national scheme did not provide other specific incentives for SMEs, it can be considered as a successful scheme in attracting SMEs. According to the available statistics, 38% of the participating organisations were SMEs and 34% of the funding was awarded to SMEs.

The respondents from the state-owned Hungarian Development Company (MAG) mentioned that administration of these projects was quite complicated and rather time-consuming, which caused difficulties especially for SMEs. This was confirmed by the respondents of SMEs in the control group studies. The respondents highlighted that usually there were serious delays in the payment. On the one hand, the agency usually received the reporting documents with delay and none of the reports were complete, thus it was necessary to request further information from the consortium. Consequently, this contributed to further delays. On the other hand, the agency did not have enough human resources to handle all the projects.

Another problem that was identified by the implementing agency was the inappropriate coordination some projects had. It was necessary to form consortia in this specific call and in many cases inexperienced organisations undertook the coordination role. This caused problems for all the project partners and rendered the project implementation and administration procedure more complicated.

From the point of view of the implementing agency some difficulties were also encountered. It was mentioned that the measure was meant for the formation of consortia, however the software the agency possesses for recording data on projects is designed for one-beneficiary-projects only. Thus, the agency sometimes faced difficulties with the data recording. In order to overcome this issue, in recent projects of the Economic Development Operational Programme (2007-2013) the contract is concluded with one partner only, in other words, the Authority recognises only one beneficiary and it is the beneficiary's decision and responsibility to organise other partners and distribute the funding.

The control group case studies that were examined were the following:

1. Two SMEs (one specialising in network operation and e-business, the other carrying out R&D in the field of natural language processing) joined forces for the development of translation collaboration tools. The two SMEs had all the capacities and skills that were necessary for the implementation and exploitation of the project. The project led to a greater range of products and services and improved competitiveness of the companies. The spin-off company of the language processing company had a key role in the exploitation of the project results; based on the project it developed software that has established itself as one of the mainstream translation tools.

2. An SME specialising in transport engineering initiated a project with the aim of generating traffic flow parameters in Hungary with sophisticated measurement methods. Through the project (knowledge and data gathered), the SME was able to establish its activities and competitive position in traffic simulation. The SME invited two partners, one having experiences in measuring traffic flow and one state-owned organisation responsible for traffic affairs.

3. A large renowned company in the biomedicine sector initiated a project aiming at enhancing the screening of potential new drug compounds. It invited an R&D intensive biotechnology SME specialising in in-vitro discovery assays. The knowledge emerging from the project enabled the SME to develop new products, services and to establish its own in-vitro screening portfolio, thus increasing the turnover and profit of the SME.

Two main factors clearly contributed to the success of the above projects. Firstly, the call for proposals was very much result oriented, thus the exploitation of the results was an important element from the preparation stage of the project and the partners were committed to the commercialisation of results. Secondly, the consortia were composed of partners with existing cooperation and with a few partners only (the number of partners were limited by the call, max. 6 partners).

Irish programme – Innovation Partnerships Programme

Funding of contract research is considered under this Programme only if a new linkage between industry and an academic partner is being developed and the project impacts positively on the company.

The unique / special aspects of the Programme that set it aside from other programmes are the following:

- The Programme offers the possibility for companies to carry out research at a relatively low level of risk, as typically 75 to 80% of costs can be covered depending on the company size, as mentioned above (please refer to section under Funding).
- It is the only programme in Ireland that is focussed on Research from a company's perspective with the outcomes being specific to company's needs rather than from an academic's perspective where research is generally undertaken with the end goal of publishing a paper.
- The Programme is considered to be of high value because there is considerable investment being made to bring the academic infrastructure in Ireland up to the same quality standards as that in the UK and wider Europe. The aim therefore of the programme is that enterprises will gain access to the academic expertise of the universities and blend it together to develop and build new products and services and bring them to market. Part of the uniqueness is that, as well as building the growth potential of businesses located in Ireland, individual projects also seek to develop the research capacity of universities through the building of capacity and experience of individual researchers.

The programme relies on relationship building by both universities and companies. Enterprise Ireland do not have jurisdiction over the universities or companies in terms of what they want them to do. The programme sets the rules and guidelines and all EI ask is that the universities and companies work within the rules. How they work to the rules is down to the partnership.

The programme has been operating since 2000 (or nine years) and is continuing to evolve, especially now with economies in the world and Ireland changing so rapidly, it is a programme that is still very appropriate with supporting businesses with the challenges they are facing today. The programme has become more successful over time, as the number of companies seeking to engage with the programme is constantly increasing.

The partnerships developed in the programme are maintained in the post-project period, with many of the companies continuing to work and build relationships with the university they have worked with. There were some notable successes from the programme and many companies are returning to access the programme again. The overall budget has been maintained which in itself in this challenging climate is a testament to the programmes success.

The control group case studies that were examined were the following:

1. An R&D intensive SME manufacturing and testing many new innovative decorative and trade paints for interior or exterior use. Participating in this Innovation Partnerships Programme has enabled the company to partner with a leading academic institution to research and support the development of a new range of highly innovative products targeted specifically at reducing omissions that are harmful to people with allergies, for example, asthma sufferers. The project led to the identification of specific materials in paint that gave off omissions harmful to people with allergies. Research was undertaken to identify substitute materials that would not be harmful to asthma sufferers and yet that would still, when formulated in the paint manufacturing process, provide a paint that would exceed the performance criteria of their existing paints in terms of colour choice, location (in terms of ceiling, walls and floor) wearability and cleaning. The company and academic institution went through an iteration of formulations before succeeding in their endeavour to develop a suitable paint.

   The company is now seeking approval and endorsement from relevant accreditation bodies before placing the product on the market. It is very hopeful that the product will succeed and that new markets will be exploited.

2. A micro company providing leading-edge compliance solutions to life-science manufacturers, suppliers and regulators on a global basis across the total lifecycle of a plant. Historically the SME has engaged in the engineering aspects of the plant lifecycle i.e., mainly in the plant and equipment elements of regulation. By participating in the Innovation Partnerships Programme, the company has been able to introduce the element of process into their regulatory support services. The project enabled the company to utilise researchers from the School of Pharmacy, University College Cork to develop a library of process standards that could be integrated with standards for plant and machinery to create a seamless, accessible and re-usable knowledge base for companies embarking on the design, qualification and verification of new or enhanced bio-pharmaceutical manufacturing plants. The project was completed in January 2010 and therefore, according to the SME's interviewee, is too soon to ascertain whether it will achieve the commercial outcomes anticipated.

3. A well-established, small food processing company providing fish products to a general local market. The company had made a relatively large investment in a new retort processing machine that has been utilised for 4 months of the year. The company wanted to maximise this investment and so developed a number of ideas to branch out into the development of new seafood products using the retort process and new packaging methods. Their company's objectives would be to extend the shelf life of the new products to exceed those of their traditional products and develop products that could be stored at ambient temperatures rather than have to

be chilled. The company collaborated with the University College Cork and together submitted an application for support from Enterprise Ireland's Innovation Partnerships Programme. As a result of the collaboration the company has succeeded in developing a number of new products that are currently in the market and continues to collaborate with the university on the development of new products. The project is due to end this coming April 2010 at which time both partners have stated they will have achieved all of the objectives.

All the SMEs interviewed expressed their support for the Innovation Partnerships Programme and congratulated whoever devised the scheme. All felt that is was suitable to their needs and encouraged appropriate engagement between SMEs and Academic Institutions. In some cases they stated that the scheme broke down barriers that had historically prevented SMEs from approaching Universities for help. Universities for their part supported the scheme in that it provided a way for them to provide practical help to SMEs whilst supporting the building of their own research capability.

Swedish programme: SAMBIO

The overall purpose of SAMBIO was to stimulate knowledge-based cooperation between different kinds of partners. Nonetheless, the programme was successful as regards its main goal of identifying and supporting nationally located R&D units within biotech firms that have a potential and a declared willingness to explore new ideas, but do not have the necessary financial resources or competencies.

The current understanding of VINNOVA, the funding agency, is that the majority of the SMEs have achieved their expectations through their project participation. This fulfilment is in respect to both project goals and expectations concerning the partners.

Some firms that have been selected to participate had problems setting up clinical studies but the participants have in general a positive opinion of the programme. The main reasons for this are related to the reduced administrative requirements and to the fact that a means for companies was available to conduct explorative research. The possibility to fund this kind of research did not exist before.

The extensive participation of R&D intensive SMEs indicates that the programme met their need for finding partners with complementary know-how and funding to initiate or continue innovative exploration.

The control group case studies that were examined were the following:

1. A 30-year old SME has only recently grown substantially and has 40 employees with a research intensiveness of 40%. The core business of the SME is to provide instruments and software tools to increase conditions for people with vascular diseases. When it was invited by chance by the nearby university it entered the project with the purpose of enhancing their R & D intensive work of continuously producing new products. Even if the project was only completed one year ago, for the SME it was valuable in introducing a product development that has helped structuring the work.

2. A micro firm (3 employees), that was originally a university spin-off, was informally contacted by a doctoral student. At the invitation there was already a contact established with a larger firm. The three organizations shared mutual ideas about developing a new cell-based pharmaceutical candidate. The university partner got an invitation from VINNOVA to apply for SAMBIO grants. The project that is still running has so far been a success in creating a new product, applying for a patent and the partners are about to discuss the commercialisation.

3. This university spin-off has made international success and has 27 employees spread in five different companies. The R & D investments are located in Sweden and the strategy is continued growth through R & D work with alliance partners. The initiative for applying was taken by the SME who had a new idea. The SME turned to already known relations and formed the project. The project aim of developing a new diagnostic tool has been successfully and smoothly carried through so far. In this case the SME has executed the project as coordinator with strong leadership.

The easy access to funding and informal ways of forming the project themes are the main success factors in this programme. When the project was launched it was already anchored and tailored through ongoing discussions between the biotech industry and relevant academic institutions

UK programme: TSB

The Technology Strategy Board Collaborative R&D programme has no particular focus on SMEs. In fact, until recently, no centralized database existed to capture information about applicants and participants in the different competitions and funding rounds. As a result, very limited information was available. It was only in 2008 that the Collaborative R&D programme was included in 'the wave', a UK national business survey.

The information collected suggests that the profile of TSB Collaborative R&D projects is unusually flat in terms of the participation rate of different types of companies, showing that SME participation is at least comparable to the one of larger companies and academics. The size of projects under the programme varies from very small projects of just one SME and one academic to larger projects of up to around 30 consortium members.

Apart from the recently introduced slightly higher funding rate for SMEs (60% rather than 50%), the TSB does not offer any specific incentives for SMEs to participate. However, some of the new funding procedures in particular, while applying to everyone, were introduced with SMEs in mind. This includes most notably a change in the payment method from a 'hub-and-spoke' model whereby the lead consortium member received all funds and paid these out to the other consortium members towards direct payments to individual consortium partners. This was introduced, because under the 'hub-and-spoke' model, consortium members were often treated on the same basis as any supplier to the lead consortium partners with all the associated payment terms, which could often lead to delayed payments.

Moreover, the TSB has also made a concerted effort to speed up the claiming process by allowing an electronic claim ahead of the paper claim that still needs to be submitted. In addition, the TSB will make exceptions to customary payment terms for SMEs, for instance where consortium payments are being withheld for whatever reason, SMEs can claim hardship and receive payment earlier than the other consortium members in recognition of their specific cash flow vulnerability.

In spite of the fact that no specific incentives for SMEs form part of the Collaborative R&D approach, many consortia in the programme were actually formed around SMEs. This is due to the fact that the strong focus on business-led technology research very often involves the type of SME that formed around 'people with bright ideas', often in the form of university spin-outs. For such businesses, who are looking for a way to progress their innovative ideas, the risk of giving away some of their IP is counterbalanced by the networking effect of participating in TSB projects.

This is very much helped by the fact that the TSB's Collaborative R&D projects have established themselves as a platform for innovative technology development and are therefore closely observed by larger companies on the look-out for promising young start-ups.

Participation of this type of SME is further encouraged by the approach of using technology road maps for the identification of priorities and development of competition themes. This approach closely ties the supply chain for a particular technology into the development process. The road maps allow the TSB Collaborative R&D project competitions to focus on the high risk end of related research activities. This means that the research undertaken is often only possible with TSB support.

In terms of internal project structures, the TSB strongly discourages an academic lead for projects, since this is seen to potentially dilute the commercial focus of projects. Commercial focus is also ensured by using this as a very strong evaluation criterion. Applicants are required to very clearly set out what the precise commercial prospects of the research are and need to provide details of the additionality of the project. At the same time, putting an SME in the lead for a project is also not encouraged, particularly for the larger collaboration projects, because these represent a substantial management effort.

The TSB Collaborative R&D programme does not offer dedicated brokerage services to put SMEs in contact with potential collaboration partners. However, the 'sister programme' of Knowledge Transfer Networks that support closer cooperation activities between academic and industry partners perform such a brokerage function to a certain extent. The TSB respondent recognized that more should be done on this front, but highlighted confidentiality issues involved in sharing research ideas with potential collaborators. SMEs are particularly vulnerable in this respect, because while they will often have strong innovation ideas, they tend to lack a route to market and the funding necessary to get a technology market-ready.

This gap is bridged within the TSB by the responsible technologists, members of staff who look after particular technology areas on a longer term basis, who will maintain informal networking contacts with interested SMEs, larger companies and academic partners. This allows them to gain an in-depth understanding of different research and commercial interests and thus to bring partners together as appropriate.

In the Programme Manager's experience, SMEs in TSB Collaborative R&D projects tend to 'defend their corner quite well' once projects are under way. They are supported in this through regular interactions between the monitoring officer and the project consortium. During the New Project Workshop, which is a compulsory meeting with the officer once a new project is approved and a grant allocated, particular emphasis is placed on the importance of a strong collaboration agreement. This message is reiterated at each quarterly meeting between the monitoring officer and the consortium. The TSB's experience suggests that if a project does not succeed in successfully involving the SME, it will often fail altogether.

Project monitoring is undertaken for the project as a whole and draws on a regular update of the initial selection criteria of risk, scope, time and cost. During project operation, these are monitored in terms of how well the project is run and how the state of the technology is progressed. Reporting requirements for projects are tied to project performance so that where projects perform well, reporting requirements are scaled down, but escalated for projects in which issues arise. This ensures that appropriate monitoring and support resource is available for those projects that need more attention.

SME drop-outs from projects are not recorded, but appear to be very low. The TSB experience suggests that SMEs' experience in Collaborative R&D projects tends to be

positive. Generally speaking, if SMEs struggle in delivering projects, this is due to internal company problems. A key benefit for SMEs apart from the specific research results consists in the way they are being exposed to a commercial environment and the associated complex project management experience.

The TSB respondent felt that the Collaborative R&D project experience lived up very well to SME needs and business objectives. Initial results from the wave business satisfaction survey certainly suggest high satisfaction levels. The fact that much of the investment is made in a very early R&D stage means, however, that some SME participants can be 'a little naïve' at times, due to the fact that they are early start-ups and often do not have sophisticated project management experience or systems.

The main added value of Collaborative R&D project participation for SMEs derives from the fact that more often than not they will come away from such a project with a credible product that is backed by a lead customer and/or a producer. This provides them with a route to market as the key outcome from project participation. Moreover, just as many larger companies observe TSB Collaborative R&D activity to identify promising young enterprises, venture capital firms have also come to recognize the potential of the programme as a screening device for their marketing activities. Success in a TSB project has come to be seen as an important criterion for investment decisions.

Barriers for SMEs to establish relationships with larger companies and enter collaborative projects do exist in some sectors. Few SMEs are present in pharmaceutics-related projects, for instance. Some sectors are characterized by a 'closed shop' culture, such as for instance the automotive sector, in which SMEs do exist, but they are often founded by big companies as spin-out operations. The TSB is able to act as a door opener in such sectors and the TSB respondent was of the opinion that in these sectors, the TSB programmes are 'the best route in they'll get'.

The control group case studies that were examined were the following:

1. A high-tech SME which provides R&D, laboratory testing and consultancy services on polymer materials for engineering systems and structures initiated a project to address the need for quantitative inspection methods in the examination of masts and spars for the marine industries. The specific project enabled the SME to produce calibrated methods for inspection and issue guidelines through the Maritime and Coastguard agency. The project contributing to a company strategy to increase exposure to new markets. The company did increase its exposure in the energy, marine and renewable markets as a result of the project.

2. A R&D intensive SME providing software solutions in the public safety, utilities and manufacturing design sectors launched a project aiming at developing a 3D visualization tool which could be used during a major incident. Participation in the project raised the SME's profile and increased the amount of knowledge within the company. It also leads to acknowledgement of the importance of R&D which has led

to a dedicated team of 7 full time employees in R&D activities. The company's reputation for innovation has also been increased.

3. A very small engineering consulting company undertook to coordinate a project aiming to introduce a new process enabling to preferably align filler materials in composites used in different applications in the chemical industry. The consortium included a manufacturer, a material supplier and a university. The project could produce the design of manufacturing equipment with multiple uses, the re-design of equipment to bring the production costs down and an application for a patent (jointly between the SME-coordinator and the project partner). Further research was deemed necessary in order to further commercialise the process and efforts are deployed in this direction by the consortium partners.

The SMEs were of the opinion that TSB is aligned with their business interests as the focus is essentially on a concrete outcome. A concern was raised on the fact that the scheme would rather push the Universities to commercial activities taking away resources from their academic functions.

4.4.3 Aspects of National Programme that enhance SME participation and benefits (Evaluation question E.12.1)

The common characteristic of the 7 national programmes examined is that they were designed in the framework of national policies to promote private sector competitiveness, by Ministries in charge of economic development. The schemes promote collaboration of enterprises with academia and it is important to underline that in most cases the accent is placed on the potential of the final R&D result to have a direct benefit for the participating companies, which is reflected in the evaluation procedure through related criteria that in some cases have relatively high weighting factors.

Although in most cases the national programmes are not SME specific, they put emphasis on the potential to produce direct outputs to be exploited by the industrial partners. Within this context, cases in which a specific technological problem was at the origin of the project were more frequent than those concerned with explorative research. As a result of this, but, also of the fact that there were more strict requirements on exploitation potential in the proposal evaluation, quite detailed exploitation plans were developed at early stages and were continuously monitored throughout the project, whereas in many FP projects the exploitation of the research results often comes as an afterthought at the closing stages of the project or even later.

In general terms, the national programmes examined would be well tailored to SME needs as shown by participation rates and qualitative observations on benefits received by the

SMEs. It could be argued that although in most cases the programmes were not SME specific, SMEs have been attracted by the business focus of the programmes.

However, a direct comparison with FPs on SME participation and benefits would not be meaningful, as objectives, scope, scale, etc. that are important drivers may vary substantially from one case to another. Nevertheless, the foregoing analysis of national programmes identified some crucial aspects that seem to enhance SME participation and benefits as discussed below.

Providing a framework to support cooperation and project maturing

The French cluster policy, supported by the FUI and the ANR fund, is today considered to be playing a crucial role at the national level in creating territorial innovation dynamics and giving SMEs access to collaborative research. Although it is very comparable to FP programmes, the fact that the funds are provided in the framework of a dedicated support policy, enhances SMEs involvement in technological partnerships on the topics covered by the clusters thanks to the very specific incentives and support provided by the clusters themselves. The networking facilities provided by the clusters as well as coaching sessions on how to organise and develop project ideas are considered to be a valuable support for SMEs, as they not only help them to focus on R&D areas in direct relation to their objectives, but also to reduce time needed for preparing proposals and administratively managing the project. Also, the 'cluster endorsement' increases the success rate for cluster members, which reduce risk for the SMEs involved in the programme.

Adapting project objectives to SME needs

The TSB Collaborative R&D programme in the UK recognises that large companies and academic partners will often have a different set of objectives compared to SMEs. As a result, the specific dynamics of interaction between these different partners characterizes the complete continuum of project selection, administration and monitoring arrangements. Ranging from the technology road map approach that identifies the high risk technology commercialization opportunities and thereby specifically targets young start-up companies via careful networking and brokerage activities with an eye on any confidentiality issues and a close watch on project performance in terms of producing anticipated technological results to a particular emphasis on embedding partners' respective commercial interests in a collaboration agreement, the TSB uses a number of tools to ensure that the interests of SMEs and other consortium partners are aligned in project design and implementation. This could be transferred to the European level, by bringing more clarity to the consortium structure and in particular an emphasis on clarity when it comes to IP issues and commercialization arrangements.

Moreover, the competition structure and selection procedure for the TSB Collaborative R&D projects uses an element of 'self-identification' of high technology start-ups and SMEs as opposed to general incentive structures for the participation of SMEs. The extent to which this is relevant to the FP programmes that may pursue slightly different policy objectives to the TSB Collaborative R&D programme will need to be established, but in terms of the selection rigour, this appears to be more effective than introducing specific incentives.

Direct benefits for SMEs in terms of economic performance and technological development through participation in R&D collaborative projects would seem to be enhanced by the continuous interaction of the stakeholders involved at the programme design phase. A best practice example in this area would be the Swedish SAMBIO that was designed through a continuous dialogue with potential programme participants that have been actively involved in the whole project cycle process. Along these lines, the public consultation process that is used in the Greek Joint Ventures for Research programme is useful in incorporating SME specific needs in programme design.

Adapting the selection process to SME time scales

SME participation can be enhanced by a swift selection process, which is more adapted to the time-scale of the SME operation cycle. This has been identified as a success factor in the German PRO-INNO Programme, the Irish Innovation Partnerships Programme and the TSB of the UK. The two-stage approach, whereby a screening is conducted on the basis of a project concept can also attract SMEs, as the time to be invested in proposal writing corresponds to a lower risk, once the project concept has received a positive feedback.

Providing financial incentives in line with SME needs

Increasing funding for SMEs would certainly enhance SME participation as is the case of the German PRO-INNO, the Hungarian Application-oriented co-operative RTD Programmes and, recently, the TSB of UK. But new features of this latter Programme that would seem very well adapted to the SME context are the new payment methods, allowing payment to individual consortium partners, combined with an electronic claim ahead of the paper claim and exceptions to customary payment terms for SMEs.

4.4.4 Benefits of SMEs from participation to National Programmes and evolution of their economic performance (Evaluation questions E12.2 and E12.3)

Participation to national programmes could be linked to benefits in a similar way as with FP projects. Similar to what is observed in FPs, an important factor that contributes to the successful involvement of SMEs in terms of benefits is project focus, which in the case of national programmes was more application oriented. Also, the degree by which the objectives of the SMEs that were partners to the project were aligned to the project was higher than in FPs, meaning that these SMEs had clear roles, very often in relation to their core business.

High-tech SMEs in most cases took the initiative to start and to coordinate the project. As with FPs, the prospects would tend to be even better for projects that were built on past R&D activities either in collaborative projects or in-house.

An overview of the main benefits received by the SMEs in the control group is presented in Table 75.

Table 75: Overview of main benefits for SMEs in the control group case studies

GNP Group[38]	Country	Number of projects	Direct economic benefits	New products / markets	Technological and R&D skills	Networking
High	France	3	1	2	3	3
	Germany	3	1	2	2	1
	Sweden	3		2	3	2
	UK	3		1	3	3
	Total High	**12**	**2**	**7**	**11**	**9**
Medium	**Ireland**	**3**		**2**	**3**	**2**
Low	Greece	3	1	2	2	1
	Hungary	3	1	3	3	2
	Total Low	**6**	**2**	**5**	**5**	**3**
Overall Total		**21**	**4**	**14**	**19**	**14**

The limited set of data available does not allow for a more detailed statistical analysis or quantitative comparisons with results obtained for the focus group. But on the basis of the control group case studies overview it is, nevertheless, possible to provide some further insight to the kind of benefits SMEs receive from National Programmes.

[38] Classification as per GNP per capita for 2005

As shown in Table 75, the main benefits were in the area of developing new technological and R&D skills that in most cases were aligned with the companies' core business. There is a strong focus in the development of new products / markets. Direct economic benefits that are already perceived are reported for a smaller number of cases, but most of the cases where new products / markets have been developed are expected to have a positive impact of financial performance in the short term, as the projects have been designed with a strong exploitation objective.

The low figures observed for direct economic benefits in the Zone 1 countries (high GNP group) is related to the higher complexity, but also a more important degree of risk undertaken, due to the fact that high-tech SMEs would more frequently explore drastically new technologies as they operate in a more competitive environment. Success of the endeavour in such cases would seem to depend on the technological and scientific mass accumulated in the consortium. There are cases where high risk projects did not lead to any concrete result because it was discovered that more research capacity would have to be mobilised. But in other cases it was possible to develop new products in knowledge intensive sectors that could find their place in very competitive international markets.

4.4.5 Participation of Control Group SMEs in international R&D activities (Evaluation question E.12.4)

No distinct patterns could be observed other than an apparently deeper involvement of SMEs from Zone 3 countries in EU Framework Programmes, but there is not enough statistical basis to confirm this trend.

4.4.6 Differences between EU and National Programmes and added value for the former (Evaluation questions E.12.5 and E.8)

Compared to the average National R&D project, FP projects are considered by SMEs to be very rewarding in terms of:

- complementing very low national research funding in many countries such as the Baltic states, Hungary, Greece, Portugal, Poland, Slovakia and others
- enhancing scientific and technological reputation of the SMEs beyond the borders of their country,
- international technological networking for solving problems that require expertise beyond the borders of their country,
- international business networking, especially in the case of high-tech export-oriented SMEs which wish to expand their markets and, mainly

- technological and business added value, provided that the SME finds the appropriate conditions to exploit the project results, such as application oriented project, role of the SME in the project, further funds in most cases etc.
- marketing new technological developments to partners from other countries,
- complementarity and enhanced potential for extending a technology beyond the borders of their country,
- being a natural extension of a successful national project to other countries

On the other hand, SMEs reported that participation in FP projects is often:

- very risky in terms of low success rate, which often discourages companies from taking part because of the large amount of work (and cost) involved in preparing the proposal
- complex and costly to run, especially in terms of administration and monitoring (reporting, meetings etc)
- frustrating in terms of delays in receiving funding
- more long-term oriented in terms of getting the results applied
- riskier in terms of having to share the IPR developed with partners from different countries, adding to a certain amount of confusion and complication (since every country has different IPR laws)
- frustrating in terms of having to deal with different cultures and languages, sometimes leading to misunderstandings and delays

The analysis of the National Programmes presented earlier on in this section supports the conclusion that actions at the EU level in the field of research are complementary to national initiatives could be drawn in the general policy direction to promote cooperation between companies and universities and in terms of themes covered.

In particular:

- National programmes place the emphasis on particular problems and challenges of the originating country which may or may not be important for other countries. These include agricultural, cultural and transport problems.
- EU projects deal with transnational and "generic" challenges and problems common to many EU states and those that require international expertise to resolve, for example environmental, health and security projects.
- The scale of EU projects is usually much larger than what would be possible in National Programmes, reflecting the greater complexity and cost of tackling generic challenges at EU level.
- Projects often tackle standardisation and regulatory challenges for all EU countries (e.g. in the materials or environment protection areas), are only possible at EU FP level
- In particular niche areas, e.g. advanced sensors for environment or for health, few if any countries have both the scientific and technological expertise and entrepreneurial background to develop new technologies and take them to the market. EU FP projects address such problems effectively
- In some cases involving the need for streamlining various countries' operations (e.g. a project on developing Europe-wide tracking of goods), only an EU FP project can offer the necessary transnational emphasis
- Projects involving bench-marking or normalisation of regulations, e.g. in the food sector, are best handled by EU FP projects, to ensure widest possible applicability.

In general, action taken at national level should rather be designed with view to supporting broader national objectives. In this respect, progress is still to be made in the area of promoting at the national level actions taken at EU level. One way could be to foresee specific national / regional incentives targeting commercial take-up of products and services developed by SMEs in the framework of EU FPs.

4.4.7 Incentives to produce higher benefits to SMEs – characteristics of an SME friendly programme (Evaluation question E.9)

Considering the results of the analysis of the Case Studies and the numerous comments and observations of the SME representatives, "an SME-friendly programme" would be characterised by:

- Less administration load: fewer reports, fewer meetings, more straight-forward forms and procedures
- No delays in getting the initial funding (time-to-contract?) – maximum should be 2-3 months after signing. Many SMEs reported that they found extreme difficulties in funding the first 6 or more months of the project with own funds
- Possibility for recouping (what is this? Recuperating?) at least some of the costs incurred at the proposal preparation stage (how? Reimbursement or higher sum for administrative costs?)
- Better access to advisors (EC) Project officers to resolve intra-project conflicts, e.g. regarding decisions by coordinators, etc. is this some kind of an emergency service?
- Better access to advisors (EC IPR helpdesk?) regarding IPR and exploitation strategy
- Advisory and financial support to enable the SMEs to take their technology over the "last mile" to the market. This mainly includes funding and advice for an industrial prototype for demonstration. There should be a way of applying for this support even before the end of the project, so as not to lose the momentum and the expertise. A committee of market experts should then assess the proposal quickly and cover follow-up funding for the exploitation partners. This funding could also be in the form of a guarantee to funding bodies (banks, VCs etc).
- Advisory and financial support for carrying out market studies and market research to identify new areas for applying their technologies ("spill-overs")
- Better support for finding project partners online, e.g. by having access to a complete database of European SMEs and potential research providers in the various fields?
- More support for small-scale, short-term early-stage proof-of-technological-concept proposals, perhaps involving only 2-3 partners (e.g. 1 research, 1 implementer and 1 end-user)
- Emphasis on problem-solving rather than major technological breakthroughs, which translates to more emphasis on smaller ("CRAFT" like, SME specific measures) projects rather than larger, cumbersome IPs with many partners
- Advisory, legal and financial support for protection of their IPR with clearer limits on large partner powers in any project

4.5 Summary of Case study findings

The following paragraphs provide a snapshot of the findings from our analysis so far. We have grouped the findings under their respective objectives from the Terms of References.

Objective 1. To identify the profile of SME participants in the Thematic Programmes of FP5 and FP6

0. This report provides for the first time a comprehensive assessment of SME participation to FP5 and FP6 based on an investigation of 120 case studies in FP5 and FP6 as well as a number of projects from selected National Programmes with similar characteristics to the EU FPs.

1. SME participation (unique organization) has increased from 16,4% to 16,9% from FP5 to FP6. However, mostly because of the smaller role of SMEs in the instrument IP, their share in funding has decreased from 13,2% to 12,4% - a decrease of 6%.

2. For FP7, based on thematic programmes initial analysis, the outlook is that participation should remain stable or increase slightly whereas funding share should increase due to the increase in SME funding to 75%.

1. The New Instruments introduced in FP6 had a mixed impact on SME participation.

1. The "top-down"approach, the longer term objectives, the increase in project size have led to a marginalization of SMEs. Integrated projects were clearly dominated by Higher Education and research organisations. On average 4.2 SMEs participated in IPs. In these consortia, the SMEs often had the role of technology provider (e.g. providing Software) or the role of minor development partner. The major part of the budget was allocated to research and the organisations conducting this research. As such, the budget allocated to SMEs in Integrated Projects was significantly smaller that within the STREP. Within IPs, SME had a budget share of 11,5% (16,8% participation), were as their share in STREPs was 13,8% (16,9% participation).

2. Looking at the average level of FP funding per participation, we find an increase from FP5 to FP6 for SMEs. In FP5, an SME received on average almost €170,000 per project participation; however, in FP6, this number climbed to €220,000 per SME project participation, an increase of almost 30%.

2. Some thematic programmes have developed specific activities to increase SME participation and good practices have been identified such as:

1. "SME goes Health": this initiative consisted in organizing dedicated awareness workshops, mobilizing the NCP network, development of a proposal matching database. Similar focused awareness activities have taken place in AERO

2. Specific SME calls in the Health thematic programme, in the NMP with a special SME-IP call, in AERO with the SME-led STREPS, the "First User Action" for INFSO

3. Initiation of specific support Actions (AEROSME and ECARE SSAs)

Although numerous activities have taken place, interviews with the thematic directorates suggest that the personal commitment of heads of unit to increase SME participation is the key to success. Tailoring awareness as well as programme focus to SME characteristics and priorities increases certainly SME participation. This should be reinforced with the next generation of program.

3. Both FP5 and FP6 managed to involve a fair diversity of SMEs as far as their R&D capability and their size is concerned

Altogether the FP attracted both small, younger (less than 10 years old) R&D intensive SMEs and medium-sized, older, less R&D intensive ones.

1. 67% of the participating SMEs in FP6 are smaller than 50 employees (63% in FP5). 20% had a head count of more than 50 and /or a turnover of more than €10 million.

2. Half of the participating SMEs have R&D expenditure below 10% of their turnover while around one-quarter of the SMEs have R&D expenditure at above 30% of their turnover.

3. More than half of both the micro and small enterprises describe their R&D expenditure as being higher than 10%.

4. Only about one-quarter of the medium-sized enterprises can be regarded as somewhat R&D intensive.

4. SMEs see their involvement with EU funded projects as an opportunity to look into non vital but promising issues.

1. When SMEs respond that they had a need to advance their knowledge in their main field of activity, the complexity of issues to be resolved was such that these were well beyond their own expertise and capabilities.

2. The projects SMEs participated in tended to be in the "nice to have" category (around 60% say the FP project was important but not critical or of limited / peripheral interest). The projects were not related to immediate commercial outcomes.

3. The respective project nevertheless belongs to the SME's core technical competence (around 80% had previous experience in the technology of their respective FP project) and they considered a joint effort as necessary to improve their knowledge in that area.

4. SMEs were often involved with the aim of *exploring promising applications* or *adding to their know-how* rather than with the aim of *immediate exploitation possibilities.*

5. There is no clear indication of significant differences between Zones, Thematic programmes and business sectors as far as SME needs and business objectives and impacts are concerned with two exceptions

1. STREP projects have a stronger impact on SMEs as they run over time scales and have development objectives that are closer to the SME approach and operation than large research projects.

2. Almost a quarter of Zone 2 SMEs consider that the project did not meet their expectations.

6. However, there are differences between SMEs based upon their strategic objectives and their degree of involvement in the FP project, which led us to develop a typology of FP participating SMEs.

- As discussed above, we conducted an additional level of analysis through clustering the cases based on the various dimensions as expressed in the case studies. On this basis, we identified two main groups of SMEs involved in FP5 and FP6 projects based on general approach towards and expectations from participation in FP projects:
    - Technology Developers
    - Technology Networkers

Objective 2. To assess the role of SMEs in and their contribution to the project implementation and project outcome under FP5 and FP6

7. SMEs do bring added value both to the proposal and to the execution of the project by bringing in complementary, specific or unique assets.

1. Qualitative analyses of the case studies show that SMEs were often "head-hunted" by coordinators for their technical skills and expertise and for their scientific knowledge.
2. Coordinators considered that SMEs played a "crucial" or "important but not crucial" role in the execution of the project (more than 70%) and in achieving the eventual outcomes (around 75%).
3. SMEs themselves responded that a high or moderate positive impact of their contribution to the Project did arise from their technical skills and expertise (more than 80%).

8. SME roles during the execution of the project tend to be focused on "making a difference" using their unique expertise and know-how.

1. Around 70% of SMEs acted as technology developers or service and technology providers and mostly brought a high R&D capability to the project. These SMEs were clearly chosen to join a project based on their technical know-how and specialist expertise.

2. When the project was SME initiated, SMEs consistently played a crucial role during the project's execution.

3. When the project was in need of field based expertise and end-user knowledge, SMEs tended to go even beyond their call of duty to bring in this type of expertise.

4. When the project was dominated by research partners and looking to extend knowledge boundaries, SME focused then more on their own particular tasks.

5. Where SMEs pursued specific technological objectives, they either played a strong role in ensuring that the project as a whole lived up to these expectations, or – where this was not possible because they were not in the driving seat or the project was too large for them to reign in the wider consortium - many of them tended to be quite resourceful in identifying and exploiting pockets of specific expertise and partnerships that could help them achieve their specific objectives.

9. When SMEs objectives with the FP project are more specific, problem solving oriented, the impact of an SME on project outcomes tends to be very positive.

1. Coordinators (almost 80%) responded that SMEs' overall contribution to the project outcome was highly or moderately positive.

2. Coordinators (and thus the other project partners) were more satisfied with the SME's contribution when the SME had a specific purpose for entering the project – to obtain funding for a specific R&D project, to improve technical or R&D capabilities, or to develop a new or existing product - as opposed to just improving networking.

3. Case studies analysis suggests that many SMEs perform a task that is important for the project as a whole. These tasks tend to be aligned with their existing competencies and resources. However SMEs are less pivotal in translating the outputs from these tasks into project results. This tends to be strongly driven by academic or larger companies involved.

10. SMEs are generally satisfied with their participation and contribution during the project although not optimistic about exploitation.

1. More than 75% of the SMEs were of the opinion that the project achieved its technological objectives and aims to a high or very high extent; however, less

than 50% considered that the project achieved its exploitation objectives and aims to a high or very high extent.

2. All findings point to the fact that actual commercial exploitation is not one of the coordinators' key concerns, in particular, when they are academics.

3. In spite of this, almost 80% of SMEs considered their participation a very positive or moderately positive experience and would consider participating in other projects.

4. Around 80% of SMEs responded that most or some expectations were fulfilled; while around 75% responded that they obtained very or moderately valuable benefits through project participation.

11. SMEs participate in the exploitation of results when exploitation occurs in the course of the project. However, their capability to (lack of resources both financial and human resources to seek new partnerships for further work) to pursue exploitation after the project is completed is rather limited.

1. The take-up of the results understood as direct economic benefits was linked to the level of technical achievement of the project.

2. However, when SMEs identified clearer and shorter term business opportunities through the exploitation of the results, they did not hesitate to use their new IPR or establish new partnerships to develop their capacity.

3. The main factors that contribute to the successful involvement of SMEs in the exploitation of results are the project focus, followed by the level of R&D and Technology intensity of the SME and the project alignment with SME objectives (including the role of SMEs in projects, such as coordinator for example). The case studies suggest that there are several dimensions of SME capabilities hampering their ability to actually get involved in exploitation after the project (see section 4.2.3). Ensuring such participation is therefore vital.

4. Moreover, we can expect that SMEs will be more active in the exploitation of results for projects focused on applicative research. However, they may lack technical or financial means to validate their technology or products. We can envisage in this case that FP projects, when promising in terms of potential innovative products or services, could be followed by a facilitated access to tools such as demonstration activities, testing, prototyping. This could be implemented in a second phase of the concerned projects.

Objective 3. To obtain evidence on the economic and social impacts of EC funded research project involvement on SMES in FP5 and FP6 in comparison with that of national research schemes

12. Almost 50% of the SMEs experience positive economic impact arising from participation in FP5 and FP6. This impact increases over the time after the end of the project in the case of turnover and profit and is sustainable in the case of time to market, technical quality and / or reliability of products and socio-economic competitiveness.

1. In general, we found that a) the more the FP project is critical for the SME and b) the more the SME's and the project's objectives were aligned, the more pronounced are the economic and/or business impacts for the SME.

2. Around 15% of the SMEs stated that there was moderate or high positive impact on turnover at the end of the project (up to around 30% in 3-5 years from now). The same goes for profit.

3. Sustainable and increasing with time impact on revenue and profit is essentially observed for micro and small enterprises with a strong R&D and technology base that very often have initiated the project and played an important role as technology developers. On the other hand, low or no benefits in terms of income and profit are mostly observed for larger SMEs. In fact, these SMEs would rather focus on enhancing R&D capabilities and technological skills rather than increasing their financial figures.

4. Around 50% of the SMEs experienced a positive impact on their marketing capability, entering new sectoral markets and roughly 33% saw their position improved in new geographical markets.

5. About 60% of the SMEs report that they obtained a greater range of products and services, a gain that is sustainable for a period extending at least a few years after the end of the project.

13. Participation in FP projects gives a boost to R&D and innovation in most SMEs and this is sustainable for a significant share of them 3-5 years from now.

1. More than 90% reported a positive impact on technological and / or scientific competitiveness, which is expected to be sustained for around 60% of the SMEs in 3 – 5 years from now.

2. Similarly almost 60% of the SMEs increased their R&D activity and almost 75% of the SMEs reported increased prospects for further technological and / or scientific developments as a result of participation in the projects, which is expected to be sustained for most of these in 3 – 5 years from now.

3. Around 25% of the SMEs not only increased their R&D activity but also their R&D expenditure over the last 3 years.

4. Around 75% introduced new technologies into the SME's operations over the past three years and around 25% attributed this at least partly to the project in which they participated.

5. FP project participation has a widespread positive impact on both R&D technological and / or scientific and business networking, but also on scientific and / or technological reputation with more than 80% of SMEs reporting such impacts, which in fact are moderately sustainable over the following years.

14. The impact of participation on the overall economic performance as well as on business options is more pronounced for two types of SMEs:

1. SMEs that engaged in projects on critical technologies or opening new directions (23% of SMEs) and among them part of the micro SMEs.

2. SMEs whose objectives have been reached to a great extent or when most of their expectations were fulfilled.

15. The impact of participation on SME technological operations and research capacity is more pronounced in two types of SMEs:

1. Again SMEs engaged in projects on critical technologies or opening new directions regardless of their R&D intensity.

2. But also SMEs with low R&D intensity (less than 10% of staff in R&D), regardless of the criticalness of the project for them.

16. SME assess the net impact of their participation from a technological and R&D perspective rather than from an economic and business perspective.

1. SMEs would rather see the FPs as an opportunity to enhance their technical and R&D skills, knowledge, networking capacity and to a lesser extent to directly improve business results

17. A positive net effect is perceived by SMEs when they consider having had a positive impact on R&D capabilities, technological operations and networking, (respectively 48% of the SMEs for the former and 44% for the latter two). A lower but comparable share of SMEs would attribute a net positive effect to positive impact on business options (39%) and future development perspectives (36%), whereas only 23% of the SMEs would relate a net positive effect to overall economic performance. **The impact of participation is sustainable in the case of R&D and innovation related impacts. It takes more time to show in the case of business impacts and these are less sustainable.**

1. In terms of R&D and innovation, at the end of the project the SMEs increase their R&D activity and report increased prospects for further technological and / or scientific developments and these trends are fairly sustainable. The sustainability in this case becomes even more obvious if one takes into account the positive effect of enhanced RD activities on the development of new products and services.

2. In terms of turnover and profit, direct benefits resulting from project participation are observed for a small number of cases, but when they arise they take some time to show and may increase over time.

3. A major factor regarding sustainability is the enhanced reputation of the SMEs in the market. This was highlighted often by SMEs reporting that, once their "name" in the market had been enhanced by their participation in the project and via their partners, they often experienced a greater number of contacts by new customers.

18. The control group of National Programmes identified some crucial aspects that seem to enhance SME participation and benefits.

1. Similar to what is observed in FPs, an important factor that contributes to the successful involvement of SMEs in terms of benefits is project focus, which in the case of national programmes was more applied research oriented. Also, the degree by which the objectives of the SME partners were aligned to the project was higher than in FPs, meaning that these SMEs had clear roles and responsibilities, very often totally in line with their core business.

2. FP projects are considered by SMEs to be more complex, more long-term oriented, and somewhat riskier from a scientific and technical point of view, but more rewarding in terms of scientific reputation, international networking and, mostly, technological and business added value, provided the project reaches its objectives.

Four aspects were identified as supporting SMEs:

1. Providing a framework to support cooperation and maturing of the project
2. Adapting project objectives to SME needs
3. Adapting the selection process to SME time scales
4. Providing financial incentives in line with SME needs

Objective 4. To identify ways of enhancing thematic programme incentives to produce greater benefits for SMEs

19. National programmes in Member States that promote short to longer term RTD collaboration of enterprises and academia are implemented in the framework of broader policies to support private sector competitiveness.

In such programmes it is very often observed that the accent is placed on the potential of the end R&D result to have a direct benefit for the participating companies, which is reflected in the evaluation procedure, through criteria of varying relative importance.

Although such national programmes are not usually designed with a specific SME focus, they may include incentives to enhance SME participation, by addressing specific areas of concern. One such area is alignment of programme design with SME objectives, like providing individual support to the constitution of the consortia and the responses to the calls for tenders, networks sessions, using tools to clarify IP issues and commercialization arrangements and providing support in raise of risk capital to accelerate SMEs development. This can be done through continuous interactions between SMEs and program managers to identify and support relevant thematic / business areas. Another area is "bureaucracy. Although a minimum of bureaucratic control is necessary to ensure a transparency and accountability of public funds, this word is too often used in many reports on FP programmes in describing barriers to SME participation. Amongst the barriers that are cited : initial documents required at the time of the response, length of the selection process, heaviness of the reporting at each reporting period, required audit of accounts... In addition to financial incentives in the form of increased funding for SMEs that has been adopted in FP7, good practices of some national programmes that could be taken on board by the FPs would be:

1. A swifter selection process, reducing time-to-contract, which would align the proposal-project cycle with the intrinsic time-scales of SME operation. Indeed, SMEs are concerned with their capacity of putting new products on markets in relatively short periods of time (related, in some cases, to the stakeholders'' expectations on the Return on Investment or in other cases with turnover and profitability issues). It is often said that the length of the selection process is, in the end, a great obstacle to their investment in collaborative research because it is too long compared to their business cycles.

2. A two stage approach to proposals, eventually supported by coaching to adopt the technology road map approach, which would decrease the uncertainty of investment in time and resources required for the preparation of full technical proposals, once green light is received to proceed with a mature project concept. The technology road map approach would indeed put in perspective the expected results in economic terms and according a certain time scale (5-10-15 years) of research projects. This approach would 1) encourage SMEs to consider each research project as a potential source of innovative products or services, that be sold on international markets and to quantify the expected results and 2) objectivate SMEs' research choices and legitimate research as a strategic activity for the SMEs' business.

3. New methods for shortening the financial management aspects, on the basis of electronic claims and allowing payments to individual partners, which would reduce cash-flow difficulties for SMEs associated with long payment delays.

5 Policy Recommendations

It is largely recognized (see chapter 2 in this report) that all types of SMEs, including those with low to medium R&D capabilities, are faced with strong global competition and a need to raise their knowledge, innovation and research intensity; expand their business activities into larger markets; and internationalise their knowledge networks. FPs are however designed for big players. Among these, RTD participation is more important than industry, and within industry, the bigger players are favored to joint consortia. Although the role of SMEs in the economy and the importance of their involvement have been recognized in the FP, critical voices on the part of SMEs and SME stakeholder groups[39] pinpoint the fact that these programmes tend to benefit the 14,000 industrial "big players" leaving SMEs with a relatively low proportion of the available FP budget. FP has also been criticized for its focus on pre-competitive (basic) research and not so much on applied research, closer to the market and where SMEs have greater presence and interests.

The successive FPs have taken this issue into consideration. Among the numerous developments of the FPs, changes targeting an increased SME involvement in terms of funds received, have taken place in three directions:

1. *The introduction of SME involvement targets from 10% of research funding including the budget of the SME-specific measures in FP5 to a minimum of 15% of funding under thematic priorities (excluding the SME-specific measures) in FP6.* In order to help achieve these targets, funding for SMEs was increased from 50% to 75 % of eligible costs under FP7. These targets have sometimes been called "arbitrary"[40] and insufficient to increase SME participation. Furthermore, these targets do not take into consideration the number of participating SMEs (basically unchanged since FP5) but the funding SMEs receive.

2. *The evolution of the instruments as well as the successive definitions of work programmes are mainly driven by the intent to reinforce the high level knowledge creation objectives of the FPs.* SME-relevant instruments or themes are more of a reactive complement to the core strategy than a strategic objective. Moreover, the different measures and initiatives taken by the thematic areas are independent actions and not part of a long term overarching strategy aimed at involving SMEs.

[39] e.g. UEAPME-The European Association of Craft, Small and Medium-sized Enterprises

[40] See FP6 ex post evaluation report : http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/fp6_ex-post_evaluation_expert_group_report.pdf#view=fit&pagemode=none

3. *The progressive creation of a voice for SMEs within the Commission's services.* This started with the SME Interservice Task Force during FP6 to monitor SME participation and is now continued with the increasing policy orientation of the SME Unit.

FP evolution regarding SMEs has thus clearly been the history of an adaptation within a strong strategic framework of scientific excellence that has not been altered. The emphasis has continuously been clearly on "scientific excellence", "industry relevance" and "economic impact" not being key issues. It is in this context that we have conducted this impact study. Five main findings from our project should be highlighted to better understand the policy recommendations:

1. SMEs do bring added value both to the proposal and to the execution of the project by bringing in complementary, specific or unique assets (see summary statements 7, 8 and 9). They are recognized as an important link between industry and science.

2. The sheer number of participating SMEs is no longer a key issue. The number of participating SMEs has increased from 16,4% to 16,9% from FP5 to FP6. Although their share in funding has decreased from 13,2% to 12,4% (i.e., still beyond the 15% target), the outlook in FP7 is that participation should remain stable or increase slightly whereas funding share should increase due to the increase in SME funding to 75%. This does not mean that participation efforts should not be continued, but that impact should now become the important strategic issue.

3. SMEs usually enter the FP with both technical and business objectives. More than 90% of the investigated cases reported a positive impact on technological and / or scientific competitiveness; just half of them have experienced a positive economic impact. Moreover, while SMEs are generally satisfied with their participation and contribution during the FP projects, they generally are not optimistic about exploitation (see summary statements 11 to 17).

4. Among the participating SMEs, it is the group of "Strategic Innovators" (section 4.1.1) that have their objectives best aligned with those of the FP. These SMEs play an important role in FP projects, often making a substantial contribution to the project as a technology provider. In general, the technology output is competitive to highly competitive and the level of exploitation is high or very high. As a result, the FP's impact on the SME's overall economic performance, including business options, is also high. However, these SMEs represent only 21,7% of all participating SME.

5. Two main routes have been identified to increase impact for these other groups of participating SMEs: bridging the exploitation gap ("Exploitation seekers" - 12,5%; "Experienced technology networkers"–20%) and developing research themes better suited to SME business preoccupations ("Translators"–17,5%; "Curious and helpful" – 23,3%).

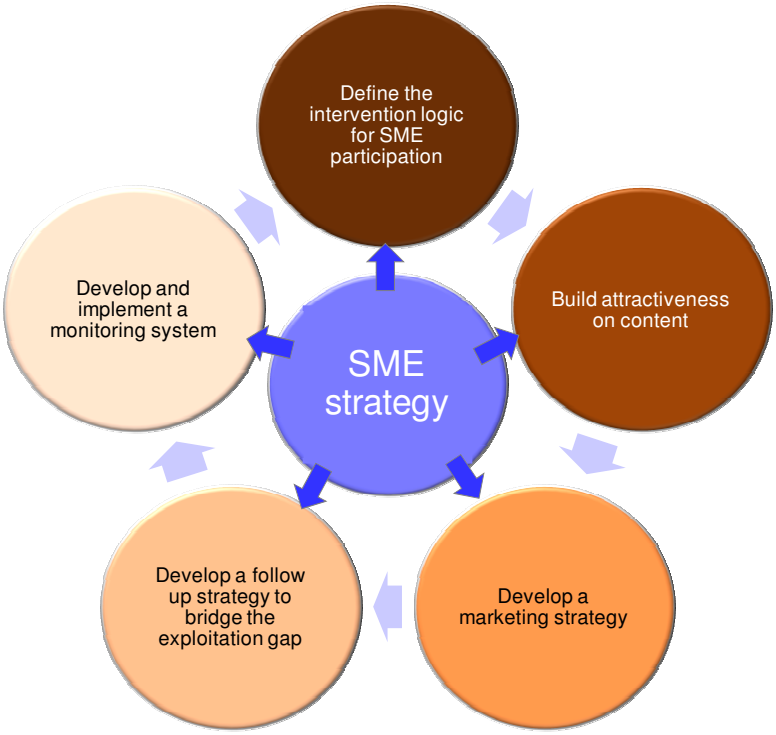
The FP developments discussed above show that the need to adapt the FPs in line with SMEs needs has been taken into consideration. Now that the quantitative objectives are almost achieved (15% target almost reached; 13.4% as of end of 2009), it is time to turn to more qualitative objectives (innovation, providing impact for participants and for related industry). However, to develop these objectives, the adaptation of the FPs within its current strategic framework (and constraints such as pre-competitve research, more "research" than "development" focus, long-term objectives, complex procedures) will not be sufficient.

If the European Union intends to make a significant difference for SMEs in research and innovation and in turn for the European economy that is achieving the EU 2020 objectives, and if the recent development from "research" to "research and innovation" for the distribution of portfolios within the College of Commissioners is of increased importance, **the Commission needs to define, implement and monitor an SME strategy within the Framework Programme for Research** as it is one of the most powerful instruments to achieving such goals through research and innovation.

What is an SME strategy in our interpretation? It is a strategy that will aim at recognizing that SMEs do bring value to the projects and should be included in the FP thematic domains suited to their needs. It is a strategy recognizing that business impact is as important as knowledge development for SMEs and that both can go hand-in-hand provided the structure of the FP better suits their needs. This strategy should also allow the Commission to define its qualitative objectives regarding the intended impact for SME participation in order to complement the quantitative targets set so far.

This strategy is made of five components that are complementary to each other. They should all be designed and implemented once the strategy has been developed.

In the following pages we discuss the five components which this strategy should include.



Operational Recommendation 1: Define the intervention logic for SME participation.

Today there is no overall intervention logic for SME participation defining the precise dimensions of impact on SMEs envisaged for the Framework Programmes. The only input indicator is that of the 15% budgetary target to be allocated to SMEs from the framework programme budget. Furthermore, we have shown that there are different types of SMEs participating in the Framework Programmes. This intervention logic should, therefore, also discuss the different SME target groups that are relevant for the Framework Programmes.

Impact can be identified and we have assessed their nature and trend in this report, although it is much more difficult to measure them precisely; but without intervention logic it is not possible to say whether these impacts are satisfying or not, whether the Commission has reached its objectives since objectives were not defined in this dimension. Along with the 15% budgetary target, new, impact related targets need to be defined along the following lines:

- SME assessment of the achievement of knowledge creation/development and business objectives
- Actual exploitation activities taking place either in the course of the project or right after the project (see below for a discussion on “bridging the exploitation gap”)
- Impact assessment could also be considered, but our experience shows that it is always difficult to quantify the impact.

This strategy should also include an understanding of the actual and potential policy, strategic and operational linkages between the Framework Programmes and other European Programmes (e.g. CIP) as well as stepping up efforts with member states to create added value with ERA-NETS and other networks.

The national programmes reviewed for SMEpact suggest that they have a clearer focus on exploitation and successfully attract SMEs with the potential to translate research into commercial products and services. Similarly focus of FP needs to be put more on business/industry relevance and on providing impact for industry participants, including small enterprises, especially in the light of participation figures that reveal (after data cleaning) that SMEs are the biggest segment of clients of the FPs. The key issue here is about bridging the gap between pre-competitive research and the market.

In order to do this, an in-depth policy debate will need to clarify the conceptual and strategic linkages between the FPs and other R&D and innovation related programmes at the European and national level (e.g. ERANets, CIP, Pro Inno). In particular:

- The strategic objectives of the FPs with regard to exploitation need to be clarified and their alignment with the strategic objectives of other programmes needs to be established.
- Potential institutional and operational linkages for programme management need to be clarified and developed.

Operational Recommendation 2: Build FP attractiveness for SMEs on content and develop call measures in line with the SMEs role in their respective value chains

The attractiveness of the Framework Programmes for SMEs cannot be mainly built on financial (75% funding) and supporting measures. As SMEs play specific roles in value chains, their thematic concerns are thus very specific.

There are two main directions to be taken:

- **Translate the intervention logic developed into specific approaches for each thematic area.** Thematic areas deal with different industrial, competitive and structural contexts. It is thus natural that the way they try to develop a culture of SME friendliness is different. However, our findings have identified the fact that this culture is more shaped and driven by the willingness of directorate staff and their individual knowledge of SMEs' particular needs and circumstances (*see summary statement N°3*) than by a general policy commitment to SMEs. It seems preferable to embed the different measures and initiatives in a long term overarching strategy aimed at involving SMEs.

We thus recommend that a set of minimum requirements is defined and implemented in each thematic area complementing the 15% budgetary target. It would be the responsibility of each thematic area to translate these minimum requirements into context specific actions.

- The **content and call measures** could include the development of a strategic analysis of the thematic priorities in order to identify and specifically develop SME targeted themes (see *summary statement N°6 on the criticalness of projects in which SMEs are involved)*. Not all priorities, even within one thematic area are suitable for SME RTD involvement. Because of the industrial structure, the level of magnitude of required investments, and the dynamics of large companies themselves, some areas are more suitable than others. An example of this approach is given in the TSB Collaborative R&D programme[41] by the use of road maps for the identification of priorities and competition themes, closely tying the supply chain for a particular technology into the development process.

- **"SME specific calls"** (*see summary statement N°2 for an analysis of the impact of new instrument IP*) would not necessarily be restricted to SMEs but the themes would be SME specific, with a shorter research horizon (1 to 2 years), smaller budget, limited number of partners and limited efforts to write proposals. The management and administrative workload should also be significantly decreased in these calls.

- **SME-STREPs and SME-IPs** introduced during FP6 by the directorates Health, NMP and Aerospace are a first step in that direction but should be further developed.

- **More "SME sensitive"** evaluation experts should participate in the evaluation groups.

- **Reengineer the proposal and management processes of FPs to decrease costs for Commission services as well as for SMEs.**

  Another way to increase attractiveness is to decrease the cost of participation for SMEs. Lean management techniques could be used to revisit all administrative and management processes and dramatically improve their cost – value balance (*See summary statement 4*). Various good practices have been identified such as:

  - Implementation of a two-stage proposal process (notably in the mainstream instruments) in order to avoid SMEs considering that the investment in the development of a fully-fledged proposal is too high to participate. A two-stage

[41] see national programs – UK TSB programme

proposal is also much closer to current good practice in innovation management processes. The first step should be "light" enough to allow more proposals to be submitted, yet developed enough to allow evaluation experts to indicate whether the proposal should be further developed or not.

- A swifter selection process, which would align the proposal-project cycle with the intrinsic time-scales of SME operations for SME specific calls.
- New methods for shortening the financial management aspects, on the basis of electronic claims and allowing payments to individual partners, which would reduce cash-flow difficulties for SMEs associated with long payment delays. (see UK – TSB programme)
- Other areas of improvement could include shortening the time to contract and to payments.

Operational Recommendation 3: Create awareness through the design and implementation of a new marketing strategy to attract not only more but the right type of SMEs to play important roles in FP projects

To improve the conditions for SMEs through FP, it also has to be demonstrated that the best-in-class SMEs, in their respective value chains, do participate. Best-in-class will participate because the Programme will have become more attractive. There is a need to identify and specifically target these SMEs in their respective value chains and approach those that are crucial in their respective sectors in order to present the new opportunities and potential benefits of participation in the FP.

We thus recommend complementing the new attractiveness strategy with a more proactive, marketing strategy.

The existing awareness-raising and SME support networks (e.g., NCPs and EEN) should also be better utilized for the purpose of proactive marketing. These activities should be conducted bearing in mind the need to attract a fair diversity of SMEs (*see summary statement 5*).

Additionally, new networks are also appearing in Member States to improve conditions for SMEs. For instance, many European countries and regions have developed or are developing cluster policies and cluster organizations. New stakeholders are playing a role in mobilizing SMEs on technology related issues, such as the French "Pôles de compétitivité". Commission services should also better leverage its knowledge of these players and improve its strategy to mobilize them into targeted marketing strategies. For example, the Commission already has several on-going activities to facilitate the ability to find information on cluster, cluster organizations, and participating firms and other organizations, eg The European Cluster

Observatory (http://www.clusterobservatory.eu). Clearly, resource availability will need to be evaluated, especially with regards to the ability of present services to perform the new tasks and whether they should be further strengthened through training or other means.

Operational Recommendation 4: Develop a follow-up strategy to bridge the gap between knowledge creation and exploitation

We have identified five main types of SMEs that have different strategic objectives and needs in terms of the impact they expect to achieve from their participation in FP projects. We recommend that the Commission develops a follow-up strategy in order to reap the benefits from the participation of these different types of SMEs. (The identification of different types of SMEs will be done through the monitoring system presented below in Operational Recommendation 5.)

In this context, different complementary routes can be taken:

4. *Opening new routes to exploitation at the end of FP projects*. Our findings (*see summary statement N°10 and 11*) show that if exploitation does not take place in the course of the project itself, SMEs often have difficulties to actually exploit results after the project. This exploitation gap is particularly important in the group of SMEs we have called "Exploitation Seekers". While the technology outcome of their projects is technically and economically competitive, it does not reach the exploitation stage because it would need further demonstration and validation activities. Thus, these projects could benefit from further support in order for the project to achieve exploitation of promising results and improve the impact of the project on the SME. One option could be the development of an Exploitation Fund for the Framework Programme. Another option would be the identification of an industry-dedicated scheme that would support activities that bring research results closer to the market for the benefit of (especially) Strategic Innovators (21,7%) and Exploitation Seekers (12,5%).

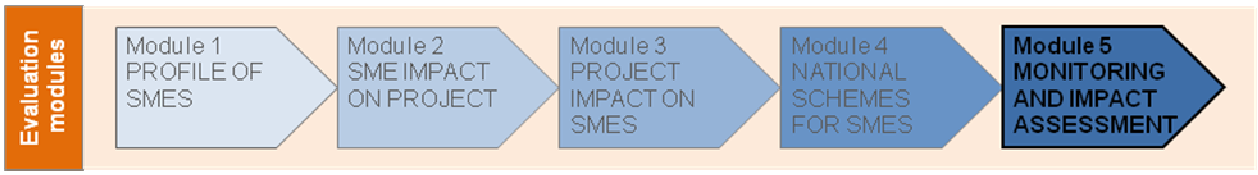
5. *Specific awareness campaigns for Translators, Curious and Helpful and Technology Networkers, aiming at promoting the new focus of FPs on exploitation.*

6. *The development of a "retention" scheme towards "Curious and Helpful" SMEs (23,3%).* These SMEs have proven that they can contribute to the success of R&D projects although the impact of the project is disappointing for them *(see summary statements N° 7 and 8)*. They are thus already interested in the FP and in developing their R&D capability. They are potentially "good partners". Suggesting to them to participate in the newly developed "specific calls" or presenting them as "good partners" to relevant stakeholders might help them benefit from future participation.

Operational Recommendation 5: Develop and implement a monitoring system

Establishing a monitoring system that can be used to characterize the impact of the FP on industry and on other policy areas will be necessary to support many of the other policy recommendations. This includes the ongoing collection of information of project input and output parameters as well as the identification and characterization of a set of dimensions of impact on SMEs. This monitoring system should also be used to characterize the participating SMEs and implement the relevant follow up strategy. More details are provided as regards this operational recommendation in Chapter 6.

6 Monitoring and Impact Assessment of SME participation in projects under the EU Framework Programmes



Module 5: Monitoring and impact assessment of SME participation in projects under the EU Framework Programmes, of the current project envisages developing criteria and output / impact indicators for the monitoring of SME performance and project outcomes under the thematic programmes for future monitoring and impact assessment purposes. In order to create a sound basis for the development of criteria and indicators, the overarching EU Commission approach to evaluation as the headline discipline that monitoring and impact assessment falls into is set out briefly in the following, before considering the indicators and data collection aspects in some detail.

6.1 Background to the use of evaluation approaches for EU Commission activities

The monitoring and impact assessment of the role of SMEs in projects funded under the European Framework Programmes need to be positioned within the wider context for evaluation and monitoring for European Commission funded activities more generally. A 2007 Communication to the Commission provided a refined framework for such activities[42]. The communication reinforced the role of evaluation in the context of the financial framework 2007-2013 as the key tool to provide rational, structured and systematic means of informing decision making in complex interventions and policy arenas.

The strategic planning and programming cycle and activity based budgeting (ABB) form the backdrop to monitoring and evaluation efforts. Together, they facilitate and call for reinforced assessments of past progress and related use of resources. Evaluation therefore needs to take account of the objectives of these tools and ensure it provides results that can be fed into them.

Initially, the focus was on evaluating ABB[43]-activities. However, it became clear that 'due to the complexity of such ABB-activities, which often embrace several different policy

[42] SEC(2007)213, COMMUNICATION TO THE COMMISSION FROM MS GRYBAUSKAITÉ IN AGREEMENT WITH THE PRESIDENT; Responding to Strategic Needs: Reinforcing the use of evaluation

[43] ABB=Activity Based Budgeting

instruments, it will most often be necessary to carry out individual evaluations at a more disaggregated level.'[44] The communication therefore calls for evaluation at different levels including at the level of thematic issues.

Moreover, ex ante impact assessment was introduced and, as a rule, it is expected to be applied to all legislative and policy-defining proposals in the Commission's annual Work Programme. Impact assessment in this instance refers to the ex ante assessment of expected impacts of a new policy. This translates into the need for all monitoring and evaluation tasks to 'ensure maximum coherence and synergy with the pre-existing evaluation framework, in particular with the ex-ante evaluation requirement under the Financial Regulation' Regulation' based on reliable (enough and good quality) data (available under FP7 based on PIC and up to date due to the establishment of the Participant Portal).

While a thematic approach to monitoring and evaluating the impact of FP projects on SMEs is highly desirable, as a result of this overarching role attributed to monitoring and evaluation, any monitoring and evaluation framework to be developed and adopted for this purpose will need to be aligned with any potential pre-existing impact assessment or other evaluation framework.

6.1.1 Monitoring and evaluation approach

As the Commission communication clearly states, a meaningful evaluation needs to be based on clearly defined objectives. Only on this basis can past progress and the related use of resources be monitored and evaluated. It outlines how evaluation should assist in:

- translating political priorities into meaningful objectives and indicators, based on the experience gained from previous interventions/policies […];
- the efficient allocation of resources, as evaluation results can be used to justify existing or new initiatives and to arbitrate between competing demands for activities,
- the reporting on results achieved […] thus complementing and enriching data emanating from monitoring exercises;
- identifying gaps (or missing links) and emerging needs.'[45]

[44] SEC(2007)213, COMMUNICATION TO THE COMMISSION FROM MS GRYBAUSKAITÉ IN AGREEMENT WITH THE PRESIDENT; Responding to Strategic Needs: Reinforcing the use of evaluation, p. 7

[45] Ibid, p. 10

Evaluation is thus seen as a way to enrich the information obtained through monitoring approaches. However, both of these activities depend on a clear statement of political objectives and indicators.

A recent European Court of Auditors audit of the overarching evaluation system for the FP projects specifically considers the extent to which this is the case for the Framework Programme. The ECA Special Report states that: '*The intervention logic for the FPs has not been explicit. […] Article 163 of the Treaty, stating the need to strengthen the scientific and technological base and become more competitive should provide the starting point for such an intervention logic for the FPs. This would need to be made more specific with regard to the different scientific areas covered by the FPs and the different instruments used.*'[46]

The report further quotes the 2004 5-year Assessment Panel (external expert panel - 5YA panel) as follows: '... panels like ours are asked to fill a gap between, on the one side, evidence mainly collected at project level and, on the other side, the higher level socio-economic goals of research policy. However, at the moment the link is difficult to make due to the way the FP is planned. It lacks an explicit logic connecting the highest objectives to the specific research and knowledge goals.'[47]

The European Court of Auditors report further highlights that the lack of a coherent intervention logic makes it difficult to trace policy objectives from the high level programme level through work programmes and calls for proposals all the way to individual projects. As a result, the development of robust performance indicators is also being hindered.

The Terms of Reference for the SMEpact project clearly set out that the research undertaken is expected to contribute to a further refinement and the operationalisation of a clearer understanding of the role of SMEs in FP projects. However, while the present project can make a contribution to the clarification of policy objectives and can use the analysis of the 120 case studies undertaken to make suggestions for corresponding indicators, there is a clear need to develop coherent policy objectives that go beyond a target for SME funding of a **minimum of 15% of funding under thematic priorities (excluding the SME-specific measures**

The monitoring and impact assessment indicators therefore need to take three dimensions into account:

- *They need to be a contribution to an expression of a refined policy objective for the participation of SMEs in FP projects that is informed by the findings of the current*

[46] Special Report No 9/2007, concerning "Evaluating the EU Research and Technological Development (RTD) framework programmes - could the Commission's approach be improved?", p. 18

[47] Quote p. 18 of ECA audit report of "Five year Assessment of the European Union Research Framework Programmes, 1999-2003", Report of the Independent Expert Panel chaired by Erkki Ormala (15 December 2004): Section 6 "Evaluating the Framework Programme", p. 19.

research project;

- *They need to make the FP selection process more robust in its consideration of the role of SMEs in project applications and*
- *They need to be designed to operationalise the further testing of these policy objectives by increasing the understanding of the role of SMEs in FP projects over time.*

Against this general background and considering impact assessment more specifically, the Council of the European Union concluded during the Council meeting Brussels, 29 May 2009 on the evaluation and impact assessment of European Research Framework Programmes (FPs)[48] to call on the Commission to take steps to establish a basis for "ex-post impact assessments" of FPs. This should include a database of project results (outputs, outcomes and impacts), which, to the extent possible, should be based on open access and should be made available so that independent experts can carry out further studies and analyses. Such a database would also be useful for SMEs to check for potential partners and the coordinator in the light of their successes with research results and exploitation.

Combining this call with the overarching approach to evaluation translates into the need to develop a monitoring and impact assessment framework that is driven by clear policy objectives and based on a set of indicators related to specific project results in terms of outputs, outcomes and impacts.

6.1.2 Monitoring impact assessment indicators

The ECA report goes on to specify the nature of the indicators and corresponding data that will be required to move towards a clearer tracing of policy objectives down to individual projects. According to the report, indicators and data need to be specified for three main dimensions as follows:

- The nature of participants;
- The efficiency of programme management and
- The effectiveness of programme and project implementation in moving towards policy objectives.

[48] 2945th COMPETITIVENESS (Internal market, Industry and Research) Council meeting Brussels, 29 May 2009

Clearly, the first two in particular depend crucially on the Commission's internal data collection and IT systems. As a result, the precise nature of the data used for different performance areas and indicators will ultimately depend on the viability of data collection.

Nevertheless, some key requirements for a refinement of the monitoring and impact assessment framework can be spelt out. In the first instance, both monitoring and impact assessment need to be guided by overarching policy objectives.

A working definition of the high level objectives regarding SME participation emerging from the research undertaken for the SMEpact project can be spelt out as follows:

- Achieving and maintaining a consistent level of SME participation (target of 15% in terms of budget and participation);
- Aligning SME participation with the specific industrial, competitive and structural contexts for different thematic areas;
- Achieving appropriate impact on different types of participating SMEs.

With these policy objectives in mind, monitoring and impact assessment activities need to feed into each other to ensure that progress towards these policy objectives is tracked and necessary adjustments made against two time horizons:

- At the micro management level of projects and work programmes
- At the macro management level of thematic programmes and FPs.

Monitoring activities will be the key tool for micro management activities. They will need to enable regular minor adjustments in the interaction with SMEs in awareness-raising activities and with SMEs and the project consortia they participate in during the project selection and management process. Monitoring will thus mostly need to work on the basis of an accepted intervention logic and focus on measuring the outputs of clearly defined activities that are framed in the intervention logic.

Impact assessment exercises on the other hand offer an opportunity for deeper reflection on the findings obtained from regular monitoring activities. They thus need to go beyond measuring outputs by linking outputs with outcomes on the one hand and policy objectives on the other and establish the continuum and 'read through' from objectives to outcomes. This in turn will need to be designed to test the assumptions underpinning the monitoring activities (e.g. in this instance, testing the findings regarding the six groups of SMEs emerging from the current research project) so that evaluation results can help refine and adjust the broad approach adopted.

These considerations can be translated into the following monitoring and impact assessment framework:

6.2 Monitoring Framework

1. **Monitoring needs to start as early as the application and selection stage for FP projects.**

   - Application levels should be monitored in order to assess the effectiveness of SME engagement tools.

   - The ratio of successful and unsuccessful SMEs and projects with SME participation should be monitored in order to assess the effectiveness of the application process.

2. **Project selection procedures should make use of:**

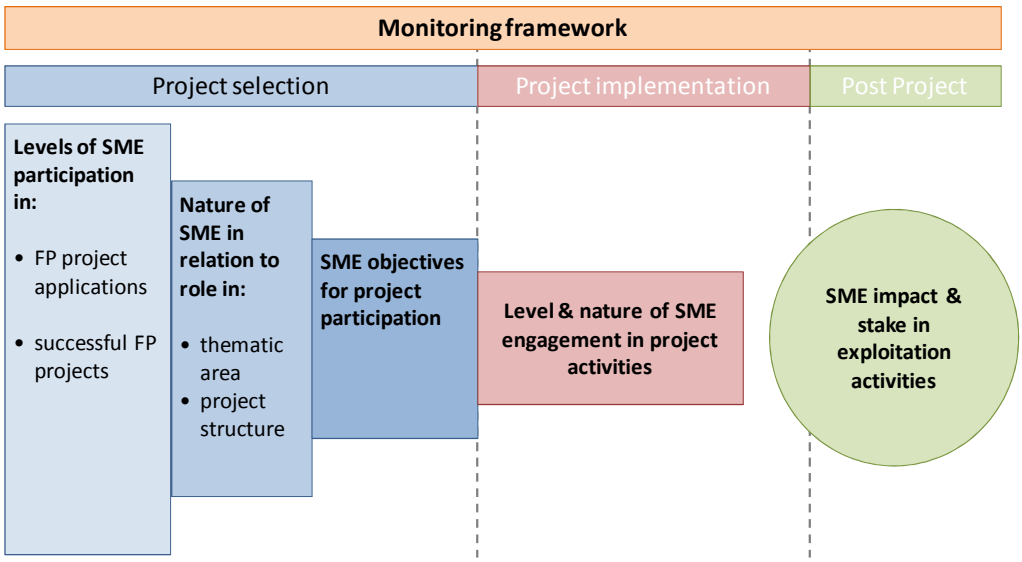
   - monitoring criteria regarding the different types of SMEs and the corresponding types of benefits and impacts that they are likely to obtain through project participation in relation to the consortium structure and

   - SME objectives in pursuing participation in an FP project consortium.

3. **Project management procedures should monitor the nature and extent of actual SME engagement in undertaking the project tasks during the implementation of the project, preferably also for the coordinators and the other participants.**

4. **Post-project phase: The impact of project participation on an SME and specifically the extent to which a participating SME is involved in the exploitation of results should be monitored 2-3 years after project completion.**

The following diagram illustrates how the monitoring framework would cover the project selection, implementation and post-project interactions between the European Commission and SMEs:



Graph 3: Monitoring framework

6.3 Impact Assessment Framework

As set out above, the impact assessment task goes beyond regular monitoring activities but will need to make use of the data collected for monitoring. Keeping in mind the policy recommendations derived from our research and in order to establish the continuum from policy objectives to outcomes, two key impact assessment dimensions for the participation of SMEs in FPs emerge, namely:

- A process dimension related to the notion of 'SME friendliness' and the corresponding intermediate outputs and
- A results dimension dealing with the outputs to be achieved by individual programmes and projects and the associated impact on project outcomes and SMEs themselves.

Each impact assessment dimension can be associated with a set of headline criteria or performance areas as follows:

1. SME friendliness

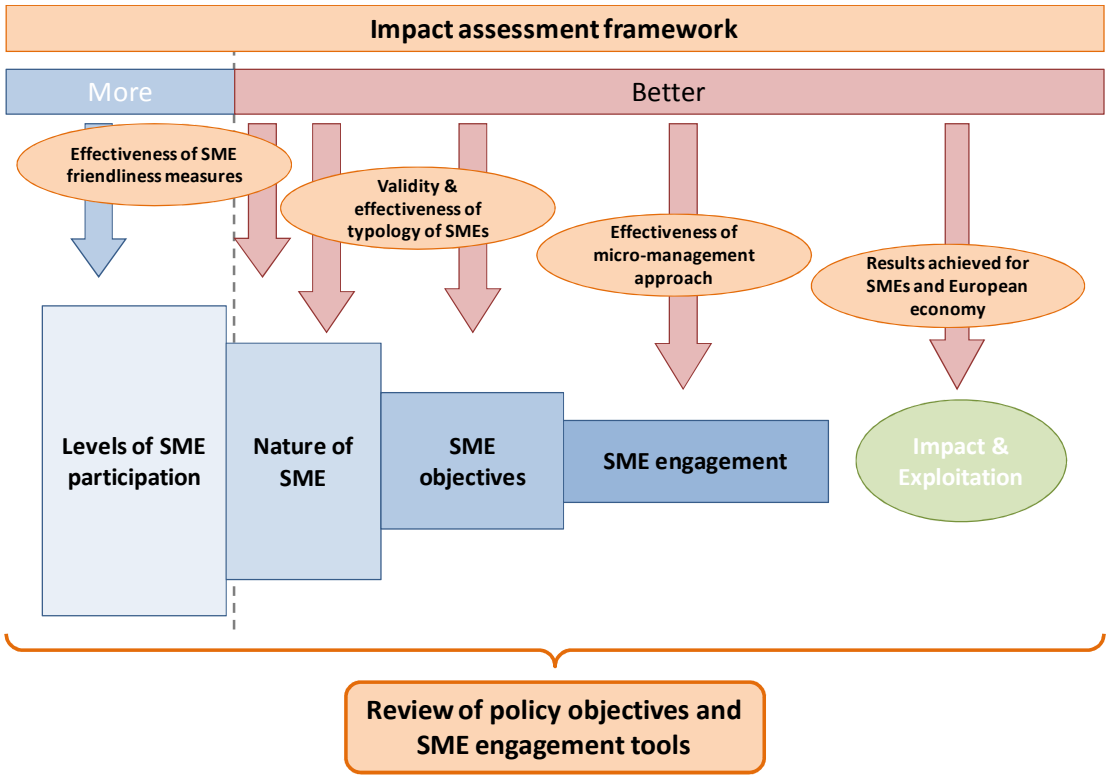
- Reach of communication and awareness raising activities
- Effectiveness of 'bottom-up' processes to identify specific SME 'niches' in FP work programmes

- Effectiveness of processes for identification of key SMEs in thematic areas
- Number and appropriateness of SME specific calls
- Appropriateness of investment in proposal writing
- Appropriateness of project selection process to encourage SME involvement

2. SME impact

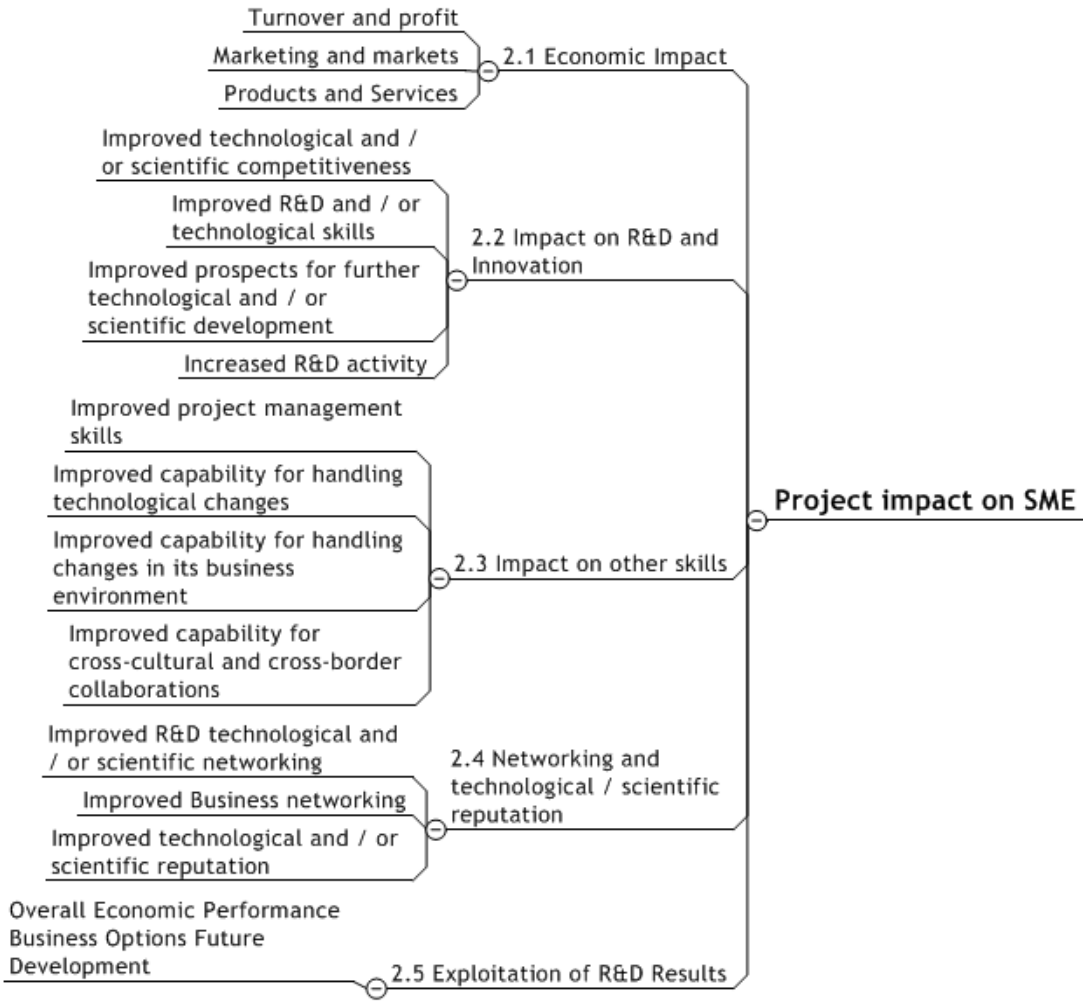
- Impact of FP participation on different types of SMEs in various project settings
- Impact of different types of participating SMEs on FP projects
- Effectiveness of tools to increase SME participation in exploitation of results
- Effectiveness of SME retention measures

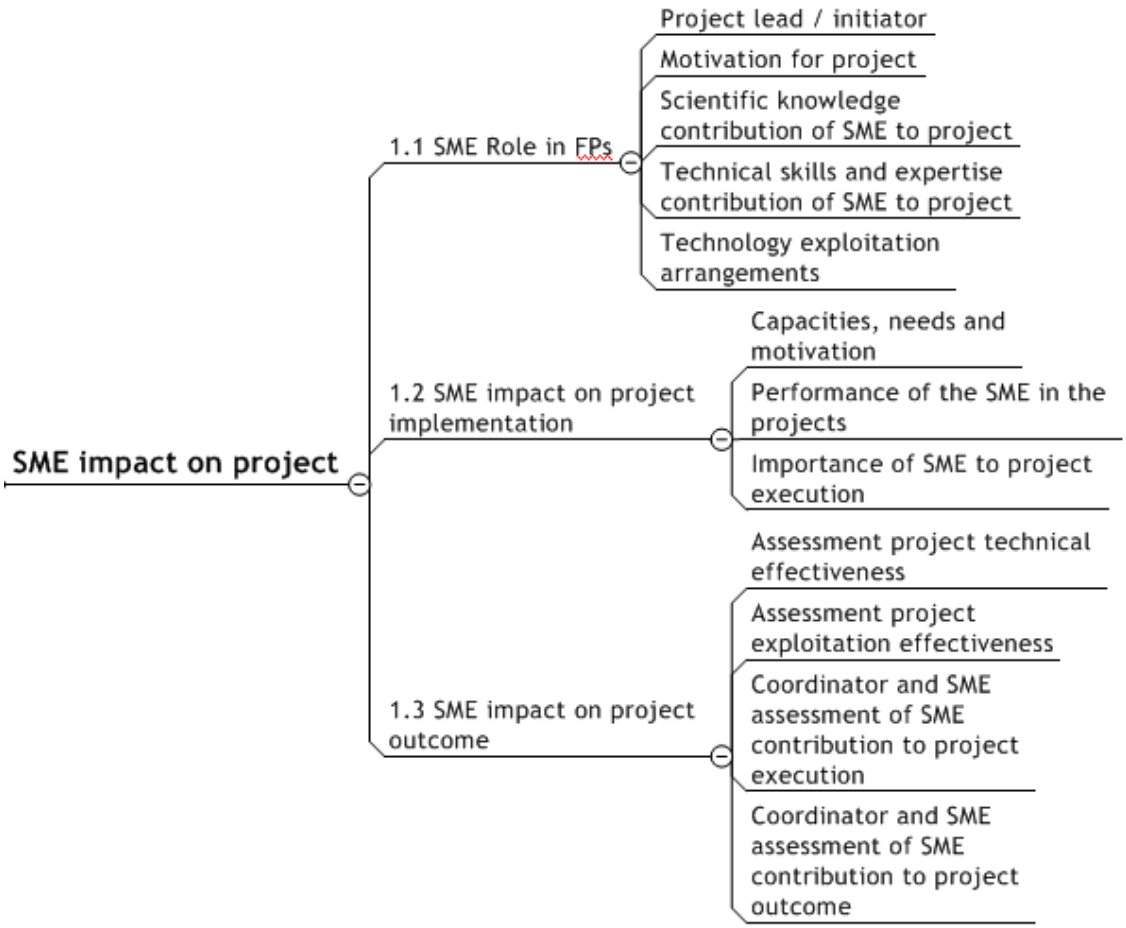
Each of these performance areas will need to be associated with indicators and appropriate measurement tools to complement existing monitoring data will need to be developed. The different impact assessment dimensions are illustrated in the following diagram:



Graph 4: Evaluation framework

Within the here conducted impact assessment exercise a set of indicator has been developed, tested and applied. The main dimensions were the “SME Impact on the Project” as well as the “Project Impact on the SME”.





6.4 Criteria and output / impact indicators for the monitoring of SME performance and project outcomes

E11.	**How can the data collection system be improved to be better suited for the purposes of monitoring and impact assessment of SME participation under the thematic programmes?**

In approaching the issue of actual data collection, the FP6 data collection and monitoring system was reviewed in interviews with the respective EC representatives and through a literature research.

In FP7 a continuous monitoring system is put in place. As stated in the "The Second FP7 Monitoring Report", from 1st October 2009:

"The Commission shall continually and systematically monitor the implementation of the Seventh Framework Programme and its specific programs and regularly report and disseminate the results of this monitoring."[49]

Further it is said that:

"Monitoring of implementation management would be ensured by operational senior management within the Commission on a continuous basis with annual check points and using a common set of management performance indicators. Adequate resource would be given to this process. The annual results of this exercise will be used to inform senior management and as an input to the ex post assessment exercise."

Such a system needs to gather information that allows following the rate of participation of SMEs, the funding received and the impact resulting from their participation.

To be able to continuously follow the involvement of SMEs for future monitoring and impact assessment exercises, a continuously updated and quality assured information base is needed. Therefore the project team recommends introducing two dimensions for the collection of data and the monitoring system:

Dimension 1: Statistics

Not all the data needed for performing SME related analysis is available in CORDA even though the information has been collected either during the PIC registration or the contract negotiation. The PDM contains this information. As of today, the PDM cannot be used for statistical analysis. This has to be performed through CORDA.

The following table shows data relevant for SME participation analysis and already (partly) existing in CORDA or the PDM.

[49] Based on Article 7(1) and 6(1) of the EC and Euratom FP7 Decisions 33

Table 76: Project Data Information FP5 and FP6 from eCORDA

Criteria	Project Data Information FP5 and FP6 from eCORDA			
	Available in FP5 data	Available in FP6 data	Available in FP7 data	Comment
Organisation	yes	yes	yes	Not cleaned. SME organisation several times in the DB. FP7: unique organisations available if PIC has been applied
Type of organisation	yes	yes	yes	Not cleaned. Many organisations that are industry are classified as OTH (other). FP7: SME flag in CORDA
Location: Low, medium or high performance region (NUTS2) and low, medium, and high performance country.	yes	yes	yes	In FP5 for 77% and in FP6 for 93%. FP7: Yes, if PIC has been applied
Area: The thematic area(s) in which the SME is participating.	yes	yes	yes	Always available
Instrument: The instrument of the project(s) in which the SME is participating.	yes	yes	yes	Always available
Role: Coordinator or Participant	yes	yes	yes	No Contact Details of Project Participants in FP5 data – desk research done for the case studies (focus group)
Size: Micro, Small or Medium (number of employees)	partially	partially	PDM	In FP5 0% and in FP6 27%. This data based on self declaration and therefore not reliable. FP7: Available through the PDM but only flag if larger or smaller than 250 employees available in CORDA
Age (date of registration)	no	no	PDM	Available through the PDM but not migrated to CORDA
Type: Industry or service	no	no	no	CORDA does not distinguish between industry and service types. FP7: Partly available through the PDM but not migrated to CORDA
NACE or other industry code (as NACE is not fully available for all countries)	partially	partially	partially	FP5 85% and FP6 32%, format is different between FP5 and FP6. FP7: Partly available through the PDM but not migrated to CORDA
R&D intensity	no	no	no	Not covered by the PDM

Key issues:

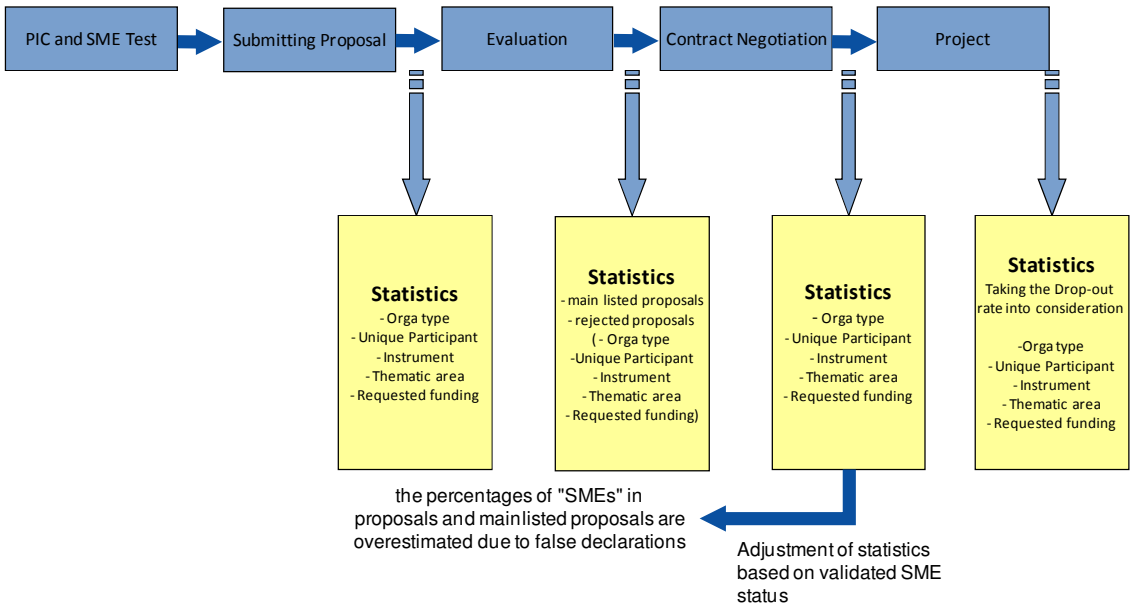
Migrating all the relevant information from the PDM to CORDA would facilitate more detailed analysis on the profile of the participating SMEs:

Utilising the date of registration of an SME, the number of employees would allow for further analysis on the profile of the participating SMEs.

Utilising the NACE code would allow for further investigation on the industry and distribution between service and industry companies.

In addition to the statistics performed by the Interservice SME Task Force and described in their progress reports, statistics on the number of participating SMEs based on unique organisations could be performed. Today, all reports on the profile of Framework Program participants are based on participations.

This would lead to the following process:



Graph 5: Data gathering process

1. When organisations create their PIC number, the SME test should also be done simultaneously to ensure that the participants are aware of the demands being classified as SME. The validation of this test takes place in any case only after the positive evaluation of a proposal.

2. After the submission of the proposals, statistics can be undertaken, to gain information about the participant's profiles (unique participants). Indicators are: organisation type, instrument, thematic area, requested funding.

3. After the evaluation, statistics in regard of "main-listed proposals" and "rejected proposals" can be done. As the status of an SME will be validated at this stage, a percentage figure on the "false declarations" can be calculated and used to adjust the statistics in the steps 1 and 2.

4. Statistics after contract negotiations. In some thematic areas the drop-out rate of SMEs can be significant, which means that the budget will be allocated to the other partners in the consortia. This is treated through amendments to the contract. At the end of a project, the financial contribution towards SMEs might be lower than in the beginning of the project start. Therefore an additional statistic round could be undertaken to derive the correct SME participation rate and financial distribution.

5. All these steps can only be done if the central databases, CORDA and the PDM as well as the IT structure of the Commission allow these kinds of steps and statistical approach. This means that all relevant date in the PDM is available for statistical analysis in CORDA.

Dimension 2: Impact assessment

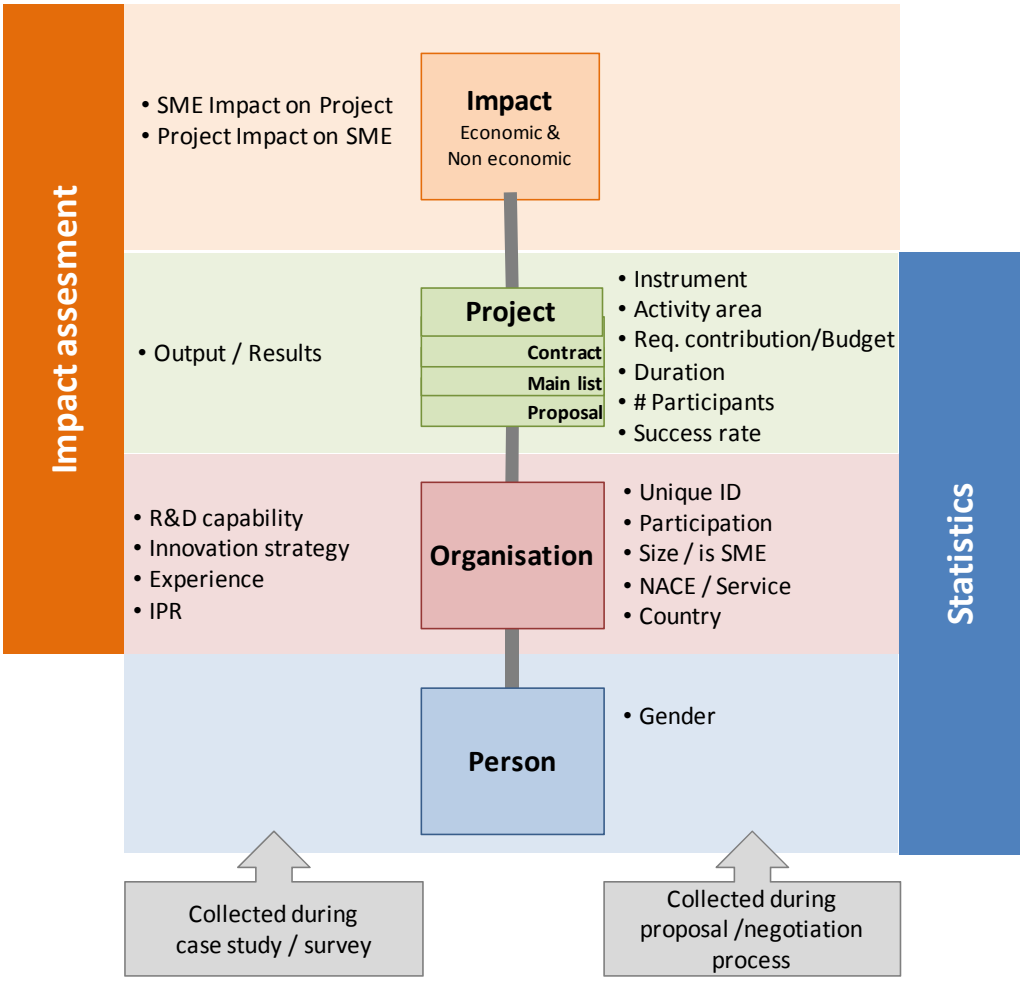
As was outlined above, a clear mandate from the Council of the European Union for the European Commission to establish a basis for ex-post impact assessments of FPs exists.

The Health Directorate (RTD-E) is working on a comparable database called Health competence. HealthCompetence.eu is a pan-European Research Information System making key information accessible on all projects funded by the EC within Health Science in the 6th and 7th Framework Programmes (FP6 & FP7). The information includes the projects' results in terms of publications, patents and technology offers, and is an open source of information for the stakeholders, such as project coordinators, scientists, technology transfer officers, research administrators, policy makers & programme managers within academia, industry, the EC and other funding agencies. Similar databases in other thematic areas would form a basis for regular SME impact assessments.

The experience of SMEpact shows that the effort needed to ex-post evaluate the impact of funded projects increases significantly with the time elapsed since the project finished. However, the earliest that all the impact dimensions can be evaluated is some time after the end of the project. SMEpact has found that a suitable timeframe for conducting an impact assessment is 1.5 to 3 years after the finalisation of the project. Longer timeperiods after the finalization of the project significantly increase the problems of reaching the people involved in the project for interviews due to employee turnover/mobility.

Future assessment should be undertaken in two stages:

A standardised set of questions which can be statistically analysed should be sent to the participating SME two years after the end of the project. These questions should cover the effects the participation had on the SME in regard to the economic, technological and networking aspects. Further a similar questionnaire covering the impact the participation had on the project should be sent to the coordinator. This would lead to a continuous collection of data which can be aggregated and analysed. Further this information would complement the reports performed by the SME Unit.



Graph 6: Impact assessment and statistics

In a further step, this analysis should be complemented with a case study based approach allowing getting more insights into the impact of an SME on a project and the impact on the SME from participation in the project. This should be done for defined time periods e.g.

every two years. Case study selection should be representative and built upon the gathered questionnaires for the selection.[50]

It has to be noted though, that if not outsourced, this will increase the already high administrative burden on the directorates or the unit in charge of this collection. It is therefore advisable to contract this task for the duration of the frame work program or to establish a central service (e.g. a unit within each directorate general) for this purpose within the Commission services.

[50] It is likely that through the introduction of the new participant portal, http://ec.europa.eu/research/participants/portal/appmanager/participants/portal, the process of monitoring and evaluation will be clearly supported.

Annex A - Research Questions

The Terms of Reference identify twelve headline evaluation questions and associated sub-questions as follows:

E.1 What is the profile of SME participants in research projects under the respective thematic programmes (e.g. sector, country, research capability (high-, medium, low-tech), number of employees, level of annual turnover, etc.) in FP5 and FP6?

E.1.1 Can any differences between sectors and / or any trends be detected in the type of participants EU funded research programmes attract? If so, why?

E.2 At which stage of the project and in which role is SME participation more apparent under the respective thematic programmes? What are the reasons?

E.2.1 What is the percentage of SMEs that participate in projects directly as research partners and that of those participating indirectly via dissemination or take-up actions in later stages of the projects? What are the reasons for possible differences between the thematic programmes in this respect?

E.2.2 What percentage of projects was initiated and / or co-ordinated by research performing SMEs? What might be the reasons?

E.3 What added value did SMEs bring to the project?

E.3.1 How do SMEs perform in the projects (e.g., capacities; needs and motivation; role, degree of participation, input in the project, etc.)? Are there differences between the thematic programmes in this respect? If so, what are the reasons?

E.3.2 How satisfied are the other participants with the involvement of SMEs?

E.3.3 To what extent did SME participation contribute to the success or failure of the project?

E.3.4 What results and practices are more apparent in projects co-ordinated by research-performing SMEs?

E.4 How do SME participants assess their involvement in projects under the thematic programmes?

E.4.1 To what extent did SMEs reach their overall objectives (e.g. scientific, financial, exploitation objectives, etc.) through project participation? If not, why?

E.4.2 What are the main success and / or failure factors for projects? Is there a direct link between the level of technical achievement and the actual take-up of results by SMEs? If not, how can a possible gap be bridged?

E.4.3 To what extent were the expectations of SMEs concerning the participation in the thematic programme fulfilled (e.g. in terms of whether information on the ways and means of participation, and support actions and services were well-established, co-operation with other participants, return on investment, etc.)?

E.5 What illustrative practices can be identified with regards to SME involvement in research projects (in terms of e.g. input, project management, networking, dissemination and exploitation of results, etc.)?

E.6 To what extent can the economic and social benefits identified for SMEs be directly attributed to project participation?

E.6.1 What are the main areas of impact for an SME participant? What direct benefits can be identified?

E.6.1.1 What impact did project participation have on SME participants in terms of e.g. product / service / process development and diversification, innovation, regulatory issues and licensing, productivity, time-to-market, commercial output, market share, competitiveness, investment in R&D, turnover, etc.?

E.6.1.2 What impact did project participation have on SME company size, structure, demographics (e.g. employment and income profile; changes in sector, number and type of jobs and functions; project management resources) and on company infrastructure?

E.6.2 What additional impact did project involvement have on SMEs (e.g. competences and training; improving and expanding international networks [geographical and sectoral and contacts; organisation and method learning)?

E.6.3 How successfully did SMEs get involved in the exploitation of research results?

E.6.4 What is the net effect when comparing the benefits received with the costs of participation (e.g. return on investment; benefits vs. costs; immediate gains vs. long-term effects)?

E.6.5 To what extent can any positive changes resulting from the intervention be expected to last when beneficiaries are no longer supported (e.g. sustainable structural impacts on the ERA, enhanced international co-operation in R&D activities; registered standards or patents; increase in investment in R&D, etc.)?

E.7 How successful were the respective framework programmes in 1) involving SMEs in European research and in 2) providing benefits for SMEs?

E.7.1 Are there differences in terms of impact between SMEs participating in big projects (e.g. IPs) and those in projects more tailored to SMEs (e.g. STREP)? And between SMEs with different capacities (e.g. high-tech SMEs vs. lower tech SMEs, SMEs joining in different phases of the projects, etc.)? If so, why?

E.7.2 Did the formulation of an "SME Strategy" under FP6 result in greater impacts on the SME participation rate and benefits for SMEs compared to FP5?

E.7.3 To what extent did project participation under the respective thematic programmes correspond to the needs and business objectives of SMEs? What are the differences in this respect between SMEs in different sectors, SMEs with different capabilities and SMEs from countries with different economic performance?

E.7.4 What good practices within the thematic programmes can be identified (e.g. level of funding, needs and absorptive capacity of the target group considered, etc.) to reach and go beyond the 15% target budget allocation?

E.7.5 Compared to the results of the investigation of FP5 and FP6, do the thematic programmes under FP7 have the potential to produce better results for SMEs in this respect?

E.8. What is the added value for SMEs of European research project involvement?

E.8.1 To what extent do actions at EU level complement and enhance the impact of actions taken at national level?

E.9 What ways and means can be identified to enhance the incentives of the thematic programmes to produce greater benefits for SME participants?

E.9.1 How to design, structure and communicate research programmes to address SMEs better? What alternatives can be provided?

E.9.2 How can SMEs be best involved to achieve greater benefits under the thematic programmes?

E10. What criteria and indicators can be established for the monitoring of SME performance / output and the impacts of participation on SMEs?

E11. How can the data collection system be improved to be better suited for the purposes of monitoring and impact assessment of SME participation under the thematic programmes?

E.12 How do the results of SME participants in EU funded research projects compare to those of beneficiaries of national research schemes?

E.12.1 Which aspects of the national schemes induce higher SME participation rates and greater benefits for SMEs? What differences can be detected between SMEs from different sectors, with different capabilities and from countries with different economic performance?

E.12.2 How did the economic performance of the control group evolve between the time of application for funding and the time of the investigation? Reasons?

E.12.3 To what extent can the benefits gained by SMEs from national research schemes be directly linked to participation in the programme?

E.12.4 To what extent do SMEs in the control group pursue international R&D activities (e.g. cross-border agreements, EU-wide or global co-operation; any sectoral differences, etc.)?

E.12.5 What is their assessment of the differences of EU programmes and national research schemes? What are the most common reasons for non-participation in EU funded research programmes?

In order to develop a suitable structure for the presentation of the evaluation results, the project team has used the 5 evaluation modules presented in the Terms of Reference to group the above headline evaluation questions and associated detailed questions, as indicated in the table below.

Allocation of research questions to evaluation modules, showing the research approach & tools employed

Research Approach	**Module 1:** Profile of SMEs	**Module 2:** Impact of SME participation on projects	**Module 3:** Impact of participation on SMEs	**Module 4:** National schemes for SMEs in the field of research	**Module 5:** Monitoring and impact assessment
Focus Group Case studies	E.1 E2.1 E2.2	E.2 E.3 E.4 E.5 E7 (E.7.3)	E.6 E7 (E.7.1)	E.9	
EC Stakeholders Scoping Interviews on FP SME strategy				E.7 (E.7.2, E.7.4 and E.7.5)	
Review of National Research Schemes			E.8	E.8.1 E.12 (E.12.1)	
Control Group Case studies				E.12 (E.12.2, E.12.3, E.12.4 and E.12.5)	
EC Stakeholders Scoping Interviews					E.10 E.11
Programme Stakeholders workshop					E.10 E.11

The table above also shows how each evaluation question is related to the research approach and tools used as well as the timing for providing results in terms of reporting.

Annex B: Profile of participating SMEs in Framework Programme 5

The following tables give an overview of the profile of participating SMEs in Framework Programme 5 (FP5). This document covers the following FP5 thematic areas and instruments:

- Thematic areas: Overview based on FP5 projects in the instruments Research project and Demonstration project and the five thematic areas:
    - Energy, Environment and Sustainable Development (EESD-ENERGY + EESD-ENVIRO),
    - Competitive and Sustainable Growth (Growth),
    - User-friendly information society (IST),
    - QOL Quality of life and management of living resources (QOL)
- Instruments: Research project, Demonstration project
- The organisation types used are: SME, LARGE (not an SME), HES (Higher Education), HSP (Hospital), N/A (not available), OTH (other), REC (research organisation)
- These figures have a confidence level of 95%.

Table 77: Overview of Organisations, Participations and Funding in FP5

Absolute numbers	SME	LARGE	HES	HSP	OTH	REC	Total
# Organisations	4288	2790	1152	215	1886	1611	**11.942**
# Participations	6115	7532	12250	390	2713	8186	**37.186**
# Funding in €	1.036.413.222	1.960.201.531	2.677.954.576	72.565.291	485.034.093	1.646.487.789	**7.878.656.502**

Table 78: Percentages of Organisations, Participations and Funding in FP5

Percentages	SME	LARGE	HES	HSP	OTH	REC	Total
% Organisations	35,9%	23,4%	9,6%	1,8%	15,8%	13,5%	**100%**
% Participations	16,4%	20,3%	32,9%	1,0%	7,3%	22,0%	**100%**
% Funding	13,2%	24,9%	34,0%	0,9%	6,2%	20,9%	**100%**

Table 79: Organisations per thematic area in FP5

Organisations	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	563	496	256	7	252	188	**1.762**
EESD-ENVIRO	315	209	489	1	383	465	**1.862**
GROWTH	1443	1184	450	11	362	465	**3.915**
IST	1728	1007	660	50	819	419	**4.683**
QOL	531	347	602	165	199	661	**2.505**

Table 80: Participations per thematic area in FP5

Participations	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	745	986	745	9	298	676	**3.459**
EESD-ENVIRO	379	314	2124	1	517	1788	**5.123**
GROWTH	1902	2804	1970	11	557	1506	**8.750**
IST	2455	2817	3395	71	1094	1633	**11.465**
QOL	634	611	4016	298	247	2583	**8.389**
Total	**6.115**	**7.532**	**12.250**	**390**	**2.713**	**8.186**	**37.186**

Table 81: Funding per area in FP5

Funding per area in €	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	126.652.163	227.456.006	139.255.009	4.391.940	66.825.113	117.534.351	**682.114.582**
EESD-ENVIRO	42.856.119	47.730.010	351.545.680	457.476	41.823.890	264.547.902	**748.961.077**
GROWTH	294.908.929	826.795.391	434.154.905	1.332.264	113.293.111	293.907.341	**1.964.391.941**
IST	495.082.229	752.237.594	823.397.149	11.323.571	235.592.927	388.112.828	**2.705.746.298**
QOL	76.913.782	105.982.530	929.601.833	55.060.040	27.499.052	582.385.367	**1.777.442.604**
Total	**1.036.413.222**	**1.960.201.531**	**2.677.954.576**	**72.565.291**	**485.034.093**	**1.646.487.789**	**7.878.656.502**

Table 82: Percentage of Organisation per thematic area in FP5

Organisations	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	31,9%	28,2%	14,5%	0,4%	14,3%	10,7%	**100%**
EESD-ENVIRO	16,9%	11,2%	26,3%	0,1%	20,6%	25,0%	**100%**
GROWTH	36,9%	30,2%	11,5%	0,3%	9,2%	11,9%	**100%**
IST	36,9%	21,5%	14,1%	1,1%	17,5%	8,9%	**100%**
QOL	21,2%	13,8%	24,0%	6,6%	7,9%	26,4%	**100%**

Table 83: Percentage of Participants per thematic area in FP5

Participants	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	21,5%	28,5%	21,5%	0,3%	8,6%	19,5%	**100%**
EESD-ENVIRO	7,4%	6,1%	41,5%	0,0%	10,1%	34,9%	**100%**
GROWTH	21,7%	32,0%	22,5%	0,1%	6,4%	17,2%	**100%**
IST	21,4%	24,6%	29,6%	0,6%	9,5%	14,2%	**100%**
QOL	7,6%	7,3%	47,9%	3,6%	2,9%	30,8%	**100%**

Table 84: Percentage of Funding per thematic area in FP5

Funding	SME	LARGE	HES	HSP	OTH	REC	Total
EESD-ENERGY	18,6%	33,3%	20,4%	0,6%	9,8%	17,2%	**100%**
EESD-ENVIRO	5,7%	6,4%	46,9%	0,1%	5,6%	35,3%	**100%**
GROWTH	15,0%	42,1%	22,1%	0,1%	5,8%	15,0%	**100%**
IST	18,3%	27,8%	30,4%	0,4%	8,7%	14,3%	**100%**
QOL	4,3%	6,0%	52,3%	3,1%	1,5%	32,8%	**100%**

Table 85: SMEs per country in FP5

Code	Country	SME organisations	% SME organisations	Total organisations	SME participations	% SME participations	Total participations
AT	Austria	127	37,6%	337	179	20,7%	865
BE	Belgium	156	36,2%	432	254	18,5%	1378
CY	Cyprus	17	34,4%	50	30	30,6%	97
CZ	Czech Republic	48	30,1%	158	58	17,1%	340
DE	Germany	794	42,5%	1869	1039	18,0%	5785
DK	Denmark	112	34,8%	321	167	16,1%	1033
EE	Estonia	4	13,1%	29	4	5,2%	83
ES	Spain	330	36,6%	900	488	19,0%	2562
FI	Finland	102	38,9%	263	140	15,0%	932
FR	France	422	29,9%	1410	623	12,4%	5041

GR	Greece	195	42,4%	459	357	21,4%	1670
HU	Hungary	31	24,0%	129	38	14,8%	254
IE	Ireland	54	41,5%	131	74	16,1%	457
IT	Italy	445	36,1%	1233	670	17,9%	3740
LT	Lithuania	4	12,3%	31	4	8,2%	45
LU	Luxembourg	13	42,0%	30	18	37,4%	47
LV	Latvia	5	19,2%	25	5	13,1%	36
MT	Malta	1	6,7%	9	1	3,2%	18
NL	Netherlands	231	36,6%	631	323	15,1%	2146
PL	Poland	32	14,1%	227	50	10,0%	502
PT	Portugal	86	35,7%	242	123	18,8%	656
SE	Sweden	162	36,9%	439	225	15,3%	1475
SI	Slovenia	16	24,0%	65	19	11,3%	169
SK	Slovakia	9	16,5%	52	8	7,3%	113
UK	United Kingdom	528	40,7%	1297	743	15,4%	4811
	Total	**3.924**		**10.769**	**5.640**		**34.255**

Table 86: Number of Organisations per instrument in FP5

Organisations	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	4085	2640	1135	204	1672	1590	**11.326***
Demonstration project	267	236	112	19	250	84	**968**
Total	**4.352**	**2.876**	**1.247**	**223**	**1.922**	**1.674**	**12.294***

The total in Table 92 differs from the total in Table 77. This is because organisations in Table 92 are listed per project type. Organisations participating in both project types are counted twice.

Table 87: Number of Participations per instrument in FP5

Participations	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	5817	7231	12091	369	2429	8056	**35.993**
Demonstration project	298	301	159	21	284	130	**1.193**
Total	**6.115**	**7.532**	**12.250**	**390**	**2.713**	**8.186**	**37.186**

Table 88: Funding per instrument in FP5

Funding in €	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	968.109.772	1.861.650.776	2.650.268.632	66.475.662	397.173.161	1.630.363.525	**7.574.041.528**
Demonstration project	68.303.451	98.550.754	27.685.944	6.089.629	87.860.932	16.124.264	**304.614.974**
Total	**1.036.413.222**	**1.960.201.531**	**2.677.954.576**	**72.565.291**	**485.034.093**	**1.646.487.789**	**7.878.656.502**

Table 89: Percentage of Organisations per instrument in FP5

Organisations	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	36,1%	23,3%	10,0%	1,8%	14,8%	14,0%	**100%**
Demonstration project	27,6%	24,4%	11,6%	2,0%	25,8%	8,7%	**100%**

Table 90: Percentage of Participations per instrument in FP5

Participations	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	16,2%	20,1%	33,6%	1,0%	6,7%	22,4%	**100%**
Demonstration project	25,0%	25,2%	13,3%	1,8%	23,8%	10,9%	**100%**

Table 91: Percentage of Funding per instrument in FP5

Funding	SME	LARGE	HES	HSP	OTH	REC	Total
Research project	12,8%	24,6%	35,0%	0,9%	5,2%	21,5%	**100%**
Demonstration project	22,4%	32,4%	9,1%	2,0%	28,8%	5,3%	**100%**

Table 92: Results per thematic area and instrument in FP5

		Unique organisations		Funding	
Thematic area	**Instrument**	**SME number**	**SMEs % in area**	**in €**	**% funding for SMEs**
EESD-ENERGY	Research project	410	32,6%	68.014.274	**14,9%**
	Demonstration project	187	28,5%	58.637.889	**25,7%**
EESD-ENVIRO	Research project	305	16,7%	41.930.890	**5,6%**
	Demonstration project	11	31,2%	925.230	**20,1%**
GROWTH	Research project	1424	36,9%	291.112.183	**15,1%**
	Demonstration project	21	28,3%	3.796.746	**10,1%**
IST	Research project	1707	37,0%	491.337.807	**18,3%**
	Demonstration project	37	25,8%	3.744.422	**24,6%**
QOL	Research project	520	21,0%	75.714.618	**4,3%**
	Demonstration project	15	16,2%	1.199.164	**6,2%**

Table 93: Type, Size, Role and multiple participations per instrument in FP5 - these are SMEs only, right?

		type		size			role		multiple participations	
Thematic area	**Instrument**	**industry**	**service**	**micro**	**small**	**medium**	**coordinator**	**participant**	**single**	**multiple**
EESD-ENERGY	Research project	37%	63%	27%	44%	29%	11%	89%	79%	21%
	Demonstration project	16%	84%	29%	37%	33%	24%	76%	84%	16%
EESD-ENVIRO	Research project	25%	75%	33%	43%	24%	12%	88%	83%	17%

	Demonstration project	0%	100%	100%	0%	0%	0%	100%	100%	0%
GROWTH	Research project	48%	52%	24%	36%	40%	11%	89%	76%	24%
	Demonstration project	57%	43%	25%	50%	25%	0%	100%	100%	0%
IST	Research project	22%	78%	31%	43%	26%	10%	90%	77%	23%
	Demonstration project	25%	75%	18%	45%	36%	15%	85%	94%	6%
QOL	Research project	37%	63%	30%	41%	29%	5%	95%	86%	14%
	Demonstration project	80%	20%	0%	20%	80%	20%	80%	100%	0%

Table 94 Projects coordinated by SMEs in FP5

Role	SME coordinated projects	% of project coordinated by an SME	Number of Projects
Coordinator	545	12,6%	4.339

Table 95: Multiple participations in FP5

Organisations	SME	LARGE	HES	HSP	OTH	REC
having 1 project	3326	1904	465	154	1555	828
having multiple projects	962	886	687	61	331	783
Total	**4.288**	**2.790**	**1.152**	**215**	**1.886**	**1.611**

Table 96: Percentage of Multiple participations in FP5

% Organisations	SME	LARGE	HES	HSP	OTH	REC
having 1 project	77,6%	68,2%	40,4%	71,6%	82,4%	51,4%
having multiple projects	22,4%	31,8%	59,6%	28,4%	17,6%	48,6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 97: Size of SMEs in FP5

Category	organisations	participations
Small	28,98%	25,91%
Medium	41,18%	41,50%
Large	29,84%	32,59%
Total	**100%**	**100%**

Table 98: Industry vs. Service companies in FP5

SMEs	% SME organisations	% SME participations
industry	34,80%	31,18%
service	65,20%	68,82%
Total	**100%**	**100%**

Annex C: Profile of participating SMEs in Framework Programme 6

The following tables give an overview of the profile of participating SMEs in Framework Programme 6 (FP6). This document covers the following FP6 thematic areas and instruments:

- Thematic areas: / IST / NANO / AERO / FOOD / SUSTAIN / CITIZEN
    - 1. Life sciences, genomics and biotechnology for health (LSH)
    - 2. Information society technologies (IST)
    - 3. Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices (NANO)
    - 4. Aeronautics and space (AERO)
    - 5. Food quality and safety (FOOD)
    - 6. Sustainable development, global change and ecosystems (SUSTAIN)
    - 7. Citizens and governance in a knowledge-based society.(CITIZEN)
- Instruments: Integrated Projects (IP) and Specific Targeted Research Project (STREP)
- The organisation types used are: SME, LARGE (not an SME), HES (Higher Education), HSP (Hospital), N/A (not available), OTH (other), REC (research organisation)
- These figures have a confidence level of 95%.

Table 99: Overview of Organisations, Participations and Funding in FP6

Absolute numbers	SME	LARGE	HES	HSP	N / A*	OTH	REC	Total
Organisations	4.262	2.765	1.236	122	17	1.459	1.414	**11.275**
Participations	5.706	6.931	11.312	320	18	2.077	7.458	**33.822**
Funding in €	1.267.950.848	2.321.346.268	3.571.959.631	103.516.942	7.365.584	482.618.520	2.499.793.900	**10.254.551.693**

Table 100: Percentage of Organisations, Participations and Funding in FP6

Percentages	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
% Organisations	37,8	24,5	11,0	1,1	0,2	12,9	12,5	**100,0**
% Participations	16,9	20,5	33,4	0,9	0,1	6,1	22,1	**100,0**
% Funding	12,4	22,6	34,8	1,0	0,1	4,7	24,4	**100,0**

Table 101: Organisations per thematic area in FP6

Organisations per area	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	489	229	422	74	0	76	284	**1574**
2. IST	1363	1065	621	32	8	518	312	**3919**
3. NANO	1089	606	438	18	0	88	248	**2487**
4. AERO	373	295	220	3	0	116	173	**1180**
5. FOOD	242	158	315	20	2	92	263	**1092**
6. SUSTAIN	1031	807	599	7	7	644	585	**3680**
7. CITIZENS	27	9	360	2	1	36	177	**612**

Table 102: Participation per thematic area in FP6

Participations per area	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	647	418	2183	210	0	98	1263	**4818**
2. IST	1797	2811	3319	49	0	702	1689	**10367**
3. NANO	1259	906	1443	21	8	115	926	**4678**
4. AERO	527	1050	698	3	0	197	595	**3070**
5. FOOD	245	227	729	25	2	114	641	**1983**
6. SUSTAIN	1205	1506	2164	10	7	812	2072	**7776**
7. CITIZENS	27	14	776	2	1	39	272	**1130**

Table 103: Funding per thematic area in FP6

Funding per area in €	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	190.982.273	139.521.316	901.901.960	76.360.063		22.188.920	544.606.568	**1.875.561.100**
2. IST	425.224.887	974.391.892	1.140.258.161	12.195.126	2.766.371	130.816.619	639.384.626	**3.325.037.683**
3. NANO	257.082.805	240.903.735	479.636.728	4.599.888		29.153.304	327.754.813	**1.339.131.274**
4. AERO	117.870.089	468.861.661	183.702.888	657.900		53.792.625	193.096.239	**1.017.981.401**
5. FOOD	33.985.872	42.671.673	233.782.420	6.818.232	755.990	23.656.997	203.178.558	**544.849.742**
6. SUSTAIN	239.728.868	453.274.600	517.052.175	2.437.926	2.383.723	217.937.270	556.493.995	**1.989.308.557**
7. CITIZENS	3.076.053	1.721.391	115.625.299	447.806	1.459.500	5.072.785	35.279.101	**162.681.935**
Total	**1.267.950.848**	**2.321.346.268**	**3.571.959.631**	**103.516.942**	**7.365.584**	**482.618.520**	**2.499.793.900**	**10.254.551.693**

Table 104: Percentage of organisations per thematic area in FP6

% Organisations per area	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	31,1	14,6	26,8	4,7	0,0	4,8	18,0	**100,0**
2. IST	34,8	27,2	15,8	0,8	0,2	13,2	8,0	**100,0**
3. NANO	43,8	24,4	17,6	0,7	0,0	3,5	10,0	**100,0**
4. AERO	31,6	25,0	18,6	0,3	0,0	9,8	14,7	**100,0**
5. FOOD	22,1	14,5	28,8	1,8	0,2	8,4	24,1	**100,0**
6. SUSTAIN	28,0	21,9	16,3	0,2	0,2	17,5	15,9	**100,0**
7. CITIZENS	4,3	1,5	58,8	0,3	0,2	5,9	28,9	**100,0**

Table 105: Participations of organisations per thematic area in FP6

% Participations per area	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	13,4	8,7	45,3	4,4	0,0	2,0	26,2	**100,0**
2. IST	17,3	27,1	32,0	0,5	0,0	6,8	16,3	**100,0**
3. NANO	26,9	19,4	30,8	0,4	0,2	2,5	19,8	**100,0**
4. AERO	17,2	34,2	22,7	0,1	0,0	6,4	19,4	**100,0**
5. FOOD	12,4	11,4	36,8	1,3	0,1	5,7	32,3	**100,0**
6. SUSTAIN	15,5	19,4	27,8	0,1	0,1	10,4	26,6	**100,0**
7. CITIZENS	2,3	1,2	68,7	0,2	0,1	3,5	24,1	**100,0**

Table 106: Percentage of funding per thematic area in FP6

% Funding per area	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
1. LSH	10,2	7,4	48,1	4,1	0,0	1,2	29,0	**100,0**
2. IST	12,8	29,3	34,3	0,4	0,1	3,9	19,2	**100,0**
3. NANO	19,2	18,0	35,8	0,3	0,0	2,2	24,5	**100,0**
4. AERO	11,6	46,1	18,0	0,1	0,0	5,3	19,0	**100,0**
5. FOOD	6,2	7,8	42,9	1,3	0,1	4,3	37,3	**100,0**
6. SUSTAIN	12,1	22,8	26,0	0,1	0,1	11,0	28,0	**100,0**
7. CITIZENS	1,9	1,1	71,1	0,3	0,9	3,1	21,7	**100,0**

Table 107: Results per instrument in FP6

Organisations per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	2.430	1.804	918	62	16	944	974	**7.148**
STREP	2.316	1.523	946	92	1	674	946	**6.498**

Table 108: Participations per instrument in FP6

Participations per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	2.913	3.839	5.398	129	17	1.222	3.797	**17.314**
STREP	2.794	3.093	5.914	191	1	855	3.661	**16.508**
Total	**5.706**	**6.931**	**11.312**	**320**	**18**	**2.077**	**7.458**	**33.822**

Table 109: Funding per instrument in FP6

Funding per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	755.691.717	1.654.254.715	2.086.108.292	54.434.956	7.365.584	356.500.291	1.632.460.479	**6.546.816.033**
STP	512.259.131	667.091.553	1.485.851.339	49.081.986	0	126.118.230	867.333.420	**3.707.735.659**
Total	**1.267.950.848**	**2.321.346.268**	**3.571.959.631**	**103.516.942**	**7.365.584**	**482.618.520**	**2.499.793.900**	**10.254.551.693**

Table 110: Percentage of organisations per instrument in FP6

% Organisations per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	34,0	25,2	12,8	0,9	0,2	13,2	13,6	**100,0**
STP	35,6	23,4	14,6	1,4	0,0	10,4	14,6	**100,0**

Table 111: Percentage of participations per instrument in FP6

% Participations per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	16,8	22,2	31,2	0,7	0,1	7,1	21,9	**100,0**
STP	16,9	18,7	35,8	1,2	0,0	5,2	22,2	**100,0**

Table 112: Percentage of funding per instrument in FP6

% Funding per inst.	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
IP	11,5	25,3	31,9	0,8	0,1	5,4	24,9	**100,0**
STP	13,8	18,0	40,1	1,3	0,0	3,4	23,4	**100,0**

Table 113: Results per thematic area and instrument in FP6

Thematic area	Instrument	Unique organisations		Funding	
		SME number	SMEs % in area	SME in EUR	SMEs % in area
1. LSH	IP	209	23%	93.109.496	8%
	STREP	337	30%	97.872.777	14%
2. IST	IP	701	30%	232.599.972	12%
	STREP	808	33%	192.624.915	15%
3. NANO	IP	753	45%	194.271.163	24%
	STREP	393	33%	62.811.642	12%
4. AERO	IP	181	26%	64.535.493	10%
	STREP	235	31%	53.334.597	13%
5. FOOD	IP	167	21%	25.823.769	7%
	STREP	82	16%	8.162.104	5%
6. SUSTAIN	IP	533	22%	143.598.536	10%
	STREP	581	30%	96.130.332	17%
7. CITIZENS	IP	11	4%	1.753.289	2%
	STREP	16	3%	1.322.764	2%

Table 114: Results per thematic area and instrument in FP6 – only SMEs

Thematic area	Instrument	Type		Size			Role		Participation	
		industry	service	micro	small	medium	coordinator	participant	single	multiple
1. LSH	IP	42,0%	58,0%	30,4%	46,1%	23,5%	0,9%	99,1%	81,7%	18,3%
	STREP	40,6%	59,4%	23,8%	53,0%	23,2%	11,5%	88,5%	79,6%	20,4%
2. IST	IP	34,8%	65,2%	27,3%	37,8%	34,8%	3,3%	96,7%	80,2%	19,8%
	STREP	35,4%	64,6%	30,6%	43,7%	25,7%	7,9%	92,1%	82,0%	18,0%
3. NANO	IP	67,2%	32,8%	17,8%	40,0%	42,2%	3,5%	96,5%	90,6%	9,4%
	STREP	59,3%	40,7%	20,4%	43,2%	36,4%	6,3%	93,7%	88,2%	11,8%
4. AERO	IP	47,2%	52,8%	19,3%	38,5%	42,2%	1,8%	98,2%	80,7%	19,3%
	STREP	52,4%	47,6%	26,8%	41,8%	31,4%	10,6%	89,4%	83,0%	17,0%
5. FOOD	IP	44,9%	55,1%	19,6%	41,2%	39,2%	0,0%	100,0%	95,9%	4,1%
	STREP	52,9%	47,1%	33,3%	29,6%	37,0%	1,9%	98,1%	98,1%	1,9%
6. SUSTAIN	IP	45,3%	54,7%	23,2%	37,3%	39,5%	3,2%	96,8%	86,2%	13,8%
	STREP	47,6%	52,4%	23,0%	38,9%	38,1%	8,3%	91,7%	91,2%	8,8%
7. CITIZENS	IP	50,0%	50,0%	28,6%	71,4%	0,0%	0,0%	100,0%	100,0%	0,0%
	STREP	26,1%	73,9%	50,0%	33,3%	16,7%	16,7%	83,3%	100,0%	0,0%

Table 115: Results per country in FP6

Country	Code	SME organisations	% SME organisations	Total organisations	SME participations	% SME participations	Total participations
Austria	AT	125	38,8	323	179	19,4	921
Belgium	BE	154	37,2	413	223	18,1	1.232
Cyprus	CY	13	36,1	35	14	19,7	71
Czech Republic	CZ	70	39,2	178	85	18,9	446
Denmark	DK	107	40,0	268	132	17,3	761
Estonia	EE	18	35,2	50	22	19,8	111
Finland	FI	111	49,9	223	132	19,2	689
France	FR	416	35,8	1.160	633	15,8	4.002
Germany	DE	723	42,2	1.714	957	17,1	5.595
Greece	EL	119	40,1	297	207	18,4	1.128
Hungary	HU	55	30,4	180	65	15,1	427
Ireland	IE	52	40,5	129	58	16,8	343
Italy	IT	440	40,3	1.091	670	19,9	3.368
Latvia	LV	4	14,2	29	5	7,3	62
Lithuania	LT	12	22,4	55	13	12,4	101
Luxembourg	LU	9	25,7	36	11	20,0	55
Malta	MT	4	39,3	9	4	16,7	24
Netherlands	NL	217	39,1	556	276	14,9	1.849

Poland	PL	78	25,5	307	89	12,3	722
Portugal	PT	78	41,3	189	100	20,1	498
Slovakia	SK	13	23,5	54	12	10,7	112
Slovenia	SI	32	31,9	100	36	14,9	241
Spain	ES	300	40,0	750	412	18,3	2.246
Sweden	SE	174	48,3	359	232	18,2	1.273
United Kingdom	UK	482	46,6	1.035	616	16,6	3.717
Total		**4.232**		**11.354**	**5.177**		**33.822**

Table 116: Multiple participations in FP6

Organisations	SME	LARGE	HES	HSP	N / A	OTH	REC	Total
having 1 project	3350	1905	491	72	16	1185	702	**7721**
having more than one project	912	860	745	50	1	274	712	**3554**
Total	**4262**	**2765**	**1236**	**122**	**17**	**1459**	**1414**	**11275**

Table 117: Percentage of multiple participations in FP6

% Organisations	SME	LARGE	HES	HSP	N / A	OTH	REC
in 1 project	78,6	68,9	39,7	59,0	94,1	81,2	49,6
multiple projects	21,4	31,1	60,3	41,0	5,9	18,8	50,4
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 118: Size of SMEs in FP6

Category	Size	SME Organisations	% SME Organisations	SME Participations	% SME Participations
Small	<= 10 employees, <= 2 million turnover	631	25,2	803	22,3
Medium	<= 50 employees, <= 10 million turnover	1009	40,3	1478	41,0
Large	<= 250 employees, <= 50 million turnover	862	34,5	1321	36,7
Total		**2502**	**100,0**	**3602**	**100,0**

Table 119: Type of industry in FP6

SMEs	% SME Organisations	% SME Participations
Industry	33,16	28,67
Service	66,84	71,33
Total	**100,00**	**100,00**

Table 120: Role of participating SMEs in FP6

Role	SME coordinated projects	% of project coordinated by an SME	Number of Projects
Coordinator	286	11,8%	2.426

Annex D: National Programmes examined

France – Competitiveness cluster policy: FUI and ANR

Policy context

France decided in 2004 to integrate the key factors of competitiveness into its new industrial policy. The "Pôles de compétitivité" policy focused its actions to support innovation on the concept of competitiveness clusters. The result was the establishment of 71 competitiveness clusters, defined, for a given geographical area, as:

- an association of companies (SMEs and larger enterprises), research centres and educational institutions,
- working in partnership (under a common development strategy),
- generating synergies in the execution of collaborative R&D projects in the interest of one or more market sectors.

The aim of this policy is to encourage and support projects initiated by the economic and academic players in a given geographical area. It has a specific focus on SMEs considering that their R&D and innovation capacities will, in particular, benefit from collaborative research and partnerships with major corporations, research centres and educational institutions.

Within this context, there are two programmes that were identified and further investigated:

- the unified inter-ministerial fund for collaborative R&D (Fonds Unique Inter-ministériel - FUI) and
- the fund of the National Agency for Research (ANR).

The national competitiveness cluster policy was initiated in 2004 and implemented in 2005 for a first period of 3 years. A second period of implementation started in 2009 for another 3 years. After 2011, if this policy measure comes to an end, the FUI will cease to exist. As the ANR fund is not only associated to the competitiveness policy, it is expected that it will be pursued after 2011.

The purpose of FUI is to support applied research efforts targeting to develop products or services that can be brought to the market in the short to medium term.

FUI contributors are the Ministries of Industry, Defence, Infrastructures, Agriculture, Health and Spatial Planning.

The National Agency of Research (Agence Nationale de la Recherche – ANR) aims to support projects with significant upstream research components, including spin-off projects, in the framework of programmes that have as objective to translate socio-economic requirements into research requirements. In this context, ANR launched a specific programme to support initiatives under the competitiveness cluster policy.

Thematic areas covered by FUI

- Aeronautics
- Agro-food
- Consumer goods
- Bioresearch, biotechnologies and pharmaceutics
- Chemical
- Energy
- Engineering
- Materials
- Mechanics
- Photonics
- Health and nutrition
- ICT
- Transports including automotive

Thematic areas covered by the ANR fund

- Energy and environment
- Engineering
- Health and biology
- Information technologies and sciences
- Processes and security
- Social sciences
- Sustainable development

The French government has put in place a mechanism to monitor results of its national cluster policy in terms of participation of SMEs in collaborative projects. All clusters are committed to updating indicators on their activities and outcomes each year. Those indicators allow a better ongoing evaluation of the policy's success.

Target Groups

Collaborative research and development (R&D) is designed to assist the industrial and research communities to work together on R&D projects in strategically important areas of science, engineering and technology.

The target group is composed of SMEs, larger enterprises, research centres and educational institutions.

Funding

FUI amounted for 720 million Euro for the 2006 – 2008 period and was incorporated in the Business Competitiveness Fund (FCE) under the Ministry of Economy, Finance and Industry. Over the same period, the ANR fund offered 545 million Euros dedicated to collaborative research projects that are developed in the context of the competitiveness clusters policy.

FUI finances 45% of real costs for companies and research organisations. The average budget of projects is 1.4 million Euros. The ANR fund can finance up to 48% of real costs. The average budget of projects is 0.656 million Euro.

Given the positive results to date, the French government decided to allocate to the national competitiveness policy 1.5 billion Euros for the period from 2009 to 2011. Most of this allocation will be oriented towards collaborative R&D projects funding through the FUI.

Selection process

Projects funded by the FUI and by the ANR fund are selected on the basis of calls for proposals:

- two per year for the FUI: 9 calls for projects have been launched since 2005 for the FUI. About 70 to 100 projects are selected for each call
- several thematic calls for projects have been launched by the ANR at different intervals since the beginning of implementation of the competitiveness cluster policy.

An important common feature of the 2 programmes is that applicants must receive the label (meaning a formal endorsement) by a competitiveness cluster.

Additional selection criteria for the evaluation of R&D project proposals to be funded under FUI include:

- extent by which results create added value, economic activity and jobs,
- degree of innovation in the project's technological content, with emphasis on the development of new products or services that can be launched on the market in the short to medium term,
- degree of the project's consistency with the cluster's development strategy.

Projects supported by the ANR fund should include at least 1 SME, 1 larger enterprise and 1 public research organisation. As the ANR programme focuses on pre-competitive research, the additional selection criterion is based on the evaluation of the project's scientific standards.

Germany - Programme Innovation Competence (PRO INNO)

Policy context

In 1999, the German Federal Ministry of Economics and Technology (Bundesministerium für Wirtschaft und Technologie, BMWi) initiated the funding programme 'Programme Innovation Competence - PRO INNO, as successor of 'Funding of research collaborations in medium-sized enterprises' (Förderung von Forschungskooperation in der mittelständischen Wirtschaft - FOKO). PRO INNO ended in 2003. In 2004, it was continued with a modified funding principle as PRO INNO II.

The BMWi commissioned the German Federation of Industrial Research Associations (Arbeitsgemeinschaft industrieller Arbeitsvereinigungen Otto von Guericke e.V.) to be PRO INNO's promotor. The Federation is still responsible for the program's entire administration.

PRO INNO aimed at improving the innovation capabilities of small and medium-sized enterprises (SMEs) in order to strengthen their competitiveness in international markets and thereby to contribute to further economic growth and employment in these enterprises. In particular the programme aimed at promoting:

- collaboration projects between companies
- collaboration projects between companies and research organisations
- collaboration projects for companies that commissioned a research organisation with a R&D task or projects implying an exchange of personnel

The Programme also supported companies carrying out in-house projects in the form of 'initial projects'.

Fields covered by the Programme

- Automated manufacturing
- Biotechnology
- Engineering
- Environmental technology
- Information and communication technology
- Manufacturing processes
- Quality measurement

Target Groups

The Programme targeted SMEs, but, also public or non-profit research organisations in Germany which have been collaboration partners of applicant companies.

Funding

PRO INNO did not provide 100% funding. The companies themselves had to contribute the major part of the budget, ranging from 25 to 50%. Base contribution was 25% of the eligible costs. If the participant was an SME in line with the SME definition of the EC, the contribution rate increased by 10%. Further increases in the contribution rate were granted if the firm was located in the eastern part of Germany or if there was a cooperation with an organisation outside of Germany. In total the contribution rate could reach 50%. Eligible costs were staff costs for those working in the project as well as cost for external R&D. The maximum funding amount for an SME was 300.000 Euro. The maximum amount for one project was 450.000 Euro.

With this form of governmental funding, the risks of the companies were not entirely eliminated but only reduced. Based on a survey conducted in the framework of the ex-post evaluation of the Programme, more than 80% of the companies stated that they could realise their innovation projects only due to support provided by the Programme. Moreover, the governmental grants contributed to either a faster realisation of the projects or to an implementation at a larger scale. It is important to stress that only 3% of the companies that have been part of the survey indicated that the funding did not have any impact on their project realisation.

Selection process

Companies that were eligible to participate were small and medium sized enterprises (SMEs) with business in Germany, less than 250 employees, an annual turnover of maximum 40 million Euros or an annual balance sheet figure of maximum 27 million Euros.

The selection process was straight forward resulting in an answer within 2 month. There was the possibility for a pre-screening of a project idea based on a two page description. That pre-screening was informal via phone and mail and gave a non binding indication if the overall idea was eligible for funding and fitted the rules of the program.

Selection Criteria

- the degree of focus on new products and technical services
- the degree of focus on new fields of technology
- the need for funding in order to undertake the project
- the degree of technical risk
- the number of new jobs and new market perspectives
- the financial status of the applicant
- the availability of sufficient number of qualified technical/research focused employees

Sweden – SAMBIO

Policy Context

The SAMBIO programme is part of a wider national policy decision to support firms in cooperating with researchers at universities and research institutes within the industry sector of biosciences, with the overall purpose of increasing the innovation level in Sweden, based on already existing research bases in Sweden.

The design of the program was aligned with how VINNOVA generally works. They have continuous calls for dialogues realised in formal invitation for discussions complemented by informal meetings with individual actors. It means that initiatives are taken both from industry and academic actors, eventually being realized through a new program design handled by VINNOVA.

The SAMBIO programme was clearly communicated as collaborative projects between firms and academic institutions once it took the shape of a formal

programme. It was launched in 2006. Three announcements have been made in 2007, 2008 and 2009, and the official end is 2010.

The programme's intention and selection criteria were derived from ongoing policy discussions about how to strengthen existing research bases in Sweden. In particular the programme wanted to support new ideas financially, so they could be explored and result in exploitable ideas, that eventually would lead to increased employment and economic development.

The programme has not been evaluated using a structured approach. The projects that have been financed are monitored on a yearly basis through required reports about goal achievements. But VINNOVA is currently intending to develop a more thorough and long-term monitoring approach. No particular actions are so far decided, but there is interest in learning from EU and other funding institutions in these matters.

Target Groups

The programme was not specifically supportive to SMEs, even if they turned out as the natural target group since global pharmaceutical companies like Pharmacia-Upjohn or AstraZeneca have decreased their R&D intensity in Sweden.

Funding

The budget spans over 85 million SEK, or 8.7 million euro[51]. The total budget spans over more than the double since the participating companies are expected to contribute with at least the equal sum as the project budget.

Selection Process

To attract R&D intensive SMEs the programme was presented as an invitation to enhance the possibilities of exploring new ideas. Much confidence was expected from the SMEs as creators of technologically innovative ideas.

The SMEs that were selected for funding all had a clear new research idea. This was selected from its newness, technological innovativeness and exploitation potential. Emphasis on innovation was integrated in the selection process, which means that the idea should be a new road for exploration differing from the SMEs current work. This was expressed in the programme as 'originality'.

[51] 1 SEK = = 0.1023 Euro

The targeted SMEs should have more than 25 employees and a substantial focus on R&D in Sweden. Projects including post docs and with a high innovativeness and originality were prioritized.

Projects that were not considered as having a production potential in Sweden were not selected. The voice of the SME was more important than the proof of the scientific quality by the academic partners. In that sense the 11 projects selected (about ¼ of the total amount of applications) were successful in being based on particular confidence in SMEs as vehicle in the development and exploitation of new ideas.

UK - Technology Strategy Board Collaborative R&D programme (TSB) / 2004 competitions

Policy Context

A heightened policy interest in the commercial exploitation of scientific research as a key driver of productivity has been an important factor in UK economic development policy since the 1980s and 90s. The Collaborative Research project funding scheme thus needs to be seen against the background of an incremental refinement of the policy rationale for public sector funding for R&D in the UK. The focus on university spin-outs moved towards a broader national innovation system view and an emphasis on achieving greater involvement of the business base in exploiting scientific research. Alongside this, a reappraisal of the specific market failures encountered in relation to R&D and innovation meant that earlier approaches of making funding available for individual company R&D projects and a fairly broad scope of technology areas gradually moved towards an approach that focused on support for collaborative R&D and on early stage technology (starting with the LINK programme).

The introduction of the Collaborative Research Project scheme formed part of a larger package of R&D support introduced as a result of a root and branch overhaul of the business support landscape generally including R&D support. The new business support products included:

- Knowledge Transfer Partnerships (KTPs)
- Support for Collaborative R&D and
- Support for Knowledge Transfer Networks

The Technology Strategy identifies business research, technology and innovation priorities for the UK and translates this into an appropriate allocation of funding across these priorities and the most appropriate way to support them.

In detail, the Technology Programme aims:

- to help grow R&D in sectors where the UK economy is strong
- to develop new sectors through the creation and growth of R&D intensive small and medium-sized enterprises, and
- to support the use of technology in areas important to the future of existing and emerging sectors in the UK.

The specific objective of the Collaborative Research & Development project competitions is to assist the industry and research communities to work together on Research & Development projects in strategically important areas of science, engineering and technology. In order to do this, these projects are designed to prime the flow of the latest knowledge and thinking from the UK's science, engineering and technology base to business. The Collaborative R&D programme supports three categories of research, namely pure or oriented basic research, applied research and experimental development.

Thematic areas covered by the Programme

- Advanced Composite Materials and Structures
- Smart Materials and Related Structures
- Low Carbon Energy Technologies
- Bio-processing
- Bio-Based Industrial Products and Processes
- Data and Content Storage, Management, Retrieval and Analysis
- Disruptive Technologies in Electronics and Displays
- Design, Simulation and Modelling
- Pervasive Computing, including Networks and Sensors
- Sensor and Sensor Systems for Environmental Applications
- Waste Management and Minimisation
- Optoelectronics and Disruptive Electronic Technologies
- New and Renewable Energy
- Inter-enterprise Computing
- Technologies to support Environmentally Friendly Transport: Automotive

Target Groups

Collaborative research and development (R&D) is designed to assist the industrial and research communities to work together on R&D projects in strategically important areas of science, engineering and technology. These are defined as areas from which successful new products, processes and services can emerge and that address specific technology priorities of critical importance to the growth of the UK economy.

The TSB Collaborative R&D competitions are entirely business focused and projects must be business led. This must be clearly articulated in the business benefits and exploitation opportunities identified for project applications.

Consortia had to involve two or more collaborators, at least one of which had to be from industry.

Funding

The Technology Programme as such started in February 2004 and is still in operation with 2 or 3 competitions each year. The projects selected for the three case studies are all from the competitions organised in April and November 2004 with an overall budget of £50 million and £80 million respectively[52].

Over 700 Collaborative R&D projects received investment since 2004, amounting to over £1 billion, about half from the Technology Strategy Board and half from the businesses involved.

For the early competitions including the 2004 competitions, grant levels for Collaborative R&D varied according to the type of research undertaken with up to 75% for basic research projects to 50% for applied research and 25% for experimental development.

More recently, the balance of TSB-funded projects has moved towards a greater focus on the applied end of research. Moreover, a special funding rate of up to 60% has been introduced for SMEs.

Selection Process

Projects are awarded funding on a competition basis. Regular competitions for specified technology areas are held at least twice a year. There is a two-stage

[52] Subsequent competitions included: April 2005 (£100 million), Autumn 2005 (£63 million) and Spring 2006 (£80 million). In total, 350 projects have been supported across a number of technology areas for the competitions organised from 2004 to 2006.

application process for all projects – an Outline Application followed by a Full Application for projects successful at the Outline stage.

On the basis of the outline application, the TSB will check eligibility and undertake an initial assessment of the project proposal. As a result of this, a project will either be invited to submit a full application or will be rejected. While a briefing meeting at the Outline Application stage is optional, a compulsory briefing meeting is held in preparation for the full application.

The TSB has adopted a condensed time scale for each competition so that the overall process of applying for project funding from the initial outline application stage to a decision on the full application and project initiation takes only around 20 weeks.

Selection Criteria of the Programme

Three main selection criteria were applied:

- Criterion 1: Project Overview and Relevance to the Competition for Funding
- Criterion 2: Potential Impact and Risk
- Criterion 3: Project Organisation and Management

A number of key dimensions within these criteria are important to keep in mind:

- Additionality: TSB competitions place a lot of emphasis on the notion of additionality. Applicants were required to outline why funding is critical to project initiation, the quality of results and the scale and timing of potential benefits as well as explaining the particular market context that made Technology Programme support necessary and what opportunities would be missed if the Technology Programme did not support the project?
- Industrial and commercial need: Applicants were expected to indicate the industrial and commercial relevance of the proposed project and to highlight the scale of change/impact this project would have.
- Exploitation of results: Applicants were required to demonstrate the possible commercial exploitation of the project and the potential transferability of the results, e.g. possible applications / markets / processes or products.

Ireland – Innovation Partners Programme

Policy Context

Two particular policy documents, Strategy for Science, Technology and Innovation; and Building Ireland's Smart Economy, A Framework for Sustainable Economic Renewal have been launched during the timeframe of the Innovation Partnerships Programme and set out a framework and an ambitious set of actions to reorganise

the Irish economy. Explicit within these documents was the need for Ireland to establish an environment where academic institutions and companies can work collaboratively in partnership to undertake research and development in new products and services that are internationally renowned. The aim of the Innovation Partnerships Programme was to support such collaborative research.

Under this Programme, grants will be awarded to researchers in the University Institutions to undertake research and development projects in collaboration with one or more industry partners.

The Programme is administered by Enterprise Ireland (EI).

Target Groups

The programme has been introduced not to discriminate against any sector or grouping of companies based in Ireland. Therefore all thematic areas and sectors are targeted. The Programme Manager of the Innovation Partnerships Programme cited a diversity of sectors supported including companies operating in sports, paint manufacturing, aerospace, ICT, food, bio pharmaceutical being supported.

All manufacturing, processing and internationally traded service companies, with an operating base in the Irish Republic (under the care of a County Enterprise Board, Enterprise Ireland, Údarás na Gaeltachta or the IDA) who are collaborating with Irish Universities are eligible to participate.

Funding

As far as the grant regime is concerned a small company employing up to 50 people with a turnover of equal to or less than €10million can receive up to a maximum grant aid of 80%. For medium sized company the maximum grant aid is 75%. This is very attractive for companies in that the risk of undertaking R&D for the company is relatively low in terms of the overall cost of the project.

Since 2004 the amount of grant aid awarded year on year has steadily increased from €1.892 million in 2004 to €6.888 million in 2009. Similarly the number of projects supported has increased from 35 in 2004 to 48 in 2009. On average the amount of grant aid awarded per project has also seen a steady increase from €54,000 in 2004 to €143,000 in 2009. From 2004 to 2009 there have been a total of 303 projects supported with grant aid totaling €26.282 million.

Today, Enterprise Ireland is approving between 2 and 7 projects a month. In the current climate of cutbacks and budget cuts, the Innovation Partnerships Programme is maintaining its budget position, which is a testament to the success of attracting companies onto the scheme and the success of the projects over the past years.

Selection Process

Pre-HPSU (high potential start-up) & HPSU companies can seek funding to participate in Innovation Partnerships once a set of conditions is met (please refer to Box below).

Conditions of participation

- The research must come under the category of Collaborative Industrial Research
- The academic partner will own any Foreground IP produced during the project and will facilitate a licensing agreement with the company partner
- The total project cost does not exceed €300,000
- HPSUs must have a Business Plan developed and shared with their assigned Development Advisor before seeking to enter the programme
- Funding: The maximum funding allowed for contract research projects is €250,000 and repeat contract research projects between a company and a department or school are not accepted
- The company must make minimum cash contribution of 20% of the total project cost.
- Depending on the grant allocated by EI, a 20% cash contribution may still leave a funding gap for the company to fill. This can be covered by the company via cash or in-kind contributions
- In-kind contributions may be donations of new equipment to the third level institution, company staff moved into the third level institution to support the project on a full or part-time basis or the supply of specialist materials essential for daily tasks
- All purchases remain with the institution on project completion
- There must be a robust contract agreement between the company and third level institution dealing with the responsibilities of both parties
- Typically salaries should be at least 60% of the project cost
- Materials and equipment should normally be no more than 20-25% of the total cost
- The travel budget should never exceed 10% and necessity is often questioned
- A small amount towards consultancy can be considered if justified and generally not above 10% of the total project cost

Research is limited to a 24 months' timeframe:

- Projects normally run for 12-18 months. Applicants should justify and clearly align the work packages with the timeframe outlined for the proposed work.
- Applicants should justify why a 24-month project is necessary. The funding of

a Masters student alone is not a reasonable justification as other sources of funding are available for this purpose. Enterprise Ireland wants to see the project outputs transferred to the company in the shortest time possible.

Proposers must first submit an Outline Proposal of the work to be undertaken. This is quickly revised and feedback will be presented on the eligibility of the proposal and any particular considerations, which should be taken into account when formulating the full proposal. The Outline Proposal will form the basis of the Abstract of the Full Proposal. The abstract of the full proposal must be non-confidential.

When the full proposal is received by Enterprise Ireland it will go through a pre-approval stage. This stage is to review proposed grant rates and financial costing.

The Proposal will then be subjected to a technical evaluation by experts in Enterprise Ireland and / or external evaluators. The objective is to ensure that the project is feasible, can be completed in the time available with the resources requested and will have identifiable benefits for both the company and the Third Level Institution.

If there are issues identified during the technical assessment stage, a dialogue may take place between the proposer(s) and the evaluator for the project. The programme manager facilitates this dialogue by handling all written communication between the two parties.

This written procedure and the resulting documentation forms an important part of the presentation of the proposal to the Industry Research and Commercialisation Committee (IRCC) which approves projects on behalf of Enterprise Ireland.

In cases where the Enterprise Ireland Contribution exceeds 100,000 euro, the assessor will be expected to meet the Project Initiator (PI) at their laboratory. This allows the PI to present the project to the assessor and the assessor can review the laboratory equipment and facilities.

The evaluation is a cornerstone of each proposal and presentation to the IRCC cannot be circumvented. In the event of a negative recommendation and the proposer disagrees with the technical evaluation, the proposal may be presented to two further technical evaluators. A final recommendation will be made based on the majority view.

A commercial assessment is undertaken by the company's Enterprise Ireland Development Adviser. Following a positive recommendation by the evaluator, the proposal is presented for approval to the Industry Research and Commercialisation Committee.

The Committee is chaired by Enterprise Ireland's Director of Science & Innovation and comprises members drawn from academia and industry, as well as the Office of Science & Technology, Higher Education Authority, Enterprise Ireland and Forfás.

Aspects considered during the evaluation

- The research fund must be spent within Ireland and the economic impact in Ireland must justify the research investment.
- The academic partner(s) and at least one industrial partner should be based in Ireland.
- At least one academic researcher is required to justify an innovation partnership.
- The research must be of commercial benefit to at least one company in Ireland.
- The industrial partner must have resources to fund and commercialise the research.
- The research should be Industrial Research of a quality sufficient to count towards an MSc or PhD (although the researcher does not need to be actually undertaking a research degree).
- The research should build on established strengths of the research team
- A project should not duplicate work already known to be in progress in Ireland, or already performed in other countries when the results can be obtained effectively in other ways.

There are strict **Intellectual property rules** associated with the programme. For example with High Potential Start Up companies, as these are defined in the terminology used by Enterprise Ireland, if a certain level of maturity is not reached, the company is not entitled to seek ownership of IP in the Programme. Companies are entitled to seek an exclusive licence, or an equivalent, from the academic partner to acknowledge their cash input into the project and their risk taking in getting involved in the project. However if they are an established company they can seek to own the IP, share it or leave it with the colleges to licence. This aspect is examined by Enterprise Ireland on a case-by-case basis.

The company has to provide a cash contribute of at least 20% to the overall cost of the project. This would be a declaration of intent from the company. The fact that a company is contributing hard cash to the project would indicate that they have a strong vested interest in completing the project. The approach encourages both stakeholders, the company and the academic institution, to complete the project. Any contribution from the company over 20% can be provided in kind, however it is preferable that the 'top up' contribution from the company is in cash as it makes the

monitoring of their actual contribution that much easier. Where a company states that they will, for example, provide certain materials, factory time etc, this has proved in the past to be difficult to document.

The primary **method of engagement** with companies is through talks at local college hubs where companies from the locality are invited to attend, Talks are given within Enterprise Ireland, the web site, or direct calling to companies. Presentations are also given by representatives of other national organisations such as the Irish Development Agency (IDA), County Enterprise Boards and Shannon Development, who often signpost companies to Enterprise Ireland to encourage them to avail of the programme. EI look at each prospect on a case-by-case basis taking into account funding received to date, their performance with that funding, and where they are currently receiving funding from and for what purpose to ensure that there is no double funding taking place.

Each Enterprise Ireland client is allocated a Development Advisor. Their role is to work with the company and help the company to grow. Their role is also to signpost the company to the most appropriate supports available whether that is financial support or otherwise be it grant aid, skills development, training, trade missions, mentorship schemes or any other means of support.

The Innovation Partnerships Programme has two staff directly involved in the management and implementation of the programme. These two staff allocates their time visiting companies and colleges, hosting them on site and having meetings with them to encourage their participation in the programme.

In the current climate of cutbacks and budget cuts, the Innovation Partnerships Programme is maintaining its budget position which is testament to the success of attracting companies on the scheme and the projects successes over the past years.

Regaring the **systems used for monitoring SMEs participation and performance**, a formal review and impact assessment of the Innovation Partnerships Progarmme is presently being undertaken to gather a macro view of the programme's performance. At a micro level, 6 monthly reports and final project reports are submitted to the programme's management. The programme's management also engage with Enterprise Irelands development advisors and occasionally with the companies themselves, in particular when problems have surfaced. Commercialisation specialists from within Enterprise Ireland would engage with the stakeholders to offer advice and support on the commercialisation aspects of the project.

Greece - Joint ventures for research and technological development

Policy Context

As indicated in the 2008 ERAWATCH country report for Greece, Greece is one of the EU countries with the lowest spending on R&D, both in absolute values and as a percentage of GDP. In 2006, R&D intensity, measured as a percentage of GDP, remained around 0.58%4 which is significantly below the EU average of 1.84%.

The major contribution to project-based public R&D funding, corresponding to about 20% of R&D public support, comes from EU funds. Almost half of it comes from the EU Framework Programmes, while the rest comes from the Structural Funds. At the same time, research intensity of the private sector remains low, reflecting the structural characteristics of the Greek economy: despite high growth rates over the last 10 years, the expansion of the economy is not innovation-driven and the contribution of technology intensive sectors to value added is marginal.

In this context, a topic that has been high in the research policy agenda for the last 20 years was the development of mechanisms with the two-fold objective of enhancing the private sector innovation activity and of bringing closer the research community and the business sector for developing a research activity that would be more adapted to the country's economic specialisation. Efforts have included the design of specific instruments, the most important being the "Joint ventures for research and technological development in sectors of national priority" aimed at promoting co-operation between research and the business sector through long-term R&D projects.

This Programme was part of the Operational Programme Competitiveness of the Greek Structural Funds. The rationale was to support the various actors of the National Innovation System with a long run perspective by promoting:

- co-operations between enterprises and research entities in RTD projects in selected fields of importance for the national economy
- an innovation friendly environment for enterprises, and
- employment of researchers.

These collaborations aimed at the development of innovative products and services in selected sectors of the Greek economy that have been identified to correspond to national development priorities.

Areas covered by the Programme (national development priorities)

- Renewable energy sources and energy saving
- Culture- knowledge intensive tourism
- Food- agricultural development & aquiculture
- Transportations
- Health- biomedicine, diagnostic and therapeutic methods
- Informatics - ICT
- Structured environment and seismic danger management
- Natural environment and sustainable development
- Materials technologies
- Advanced production systems
- Spinning mill products
- New forms of business administration

The programme was implemented in the period from 2002 to 2008 by the Greek Ministry of Development / General Secretariat for Research & Technology (GSRT), with funding from Structural funds (ERDF, ESF) and the private sector.

The programme supported research projects in:

- Basic research with the aim to broaden the scientific and technical knowledge that will be available to all interested parties without restrictions
- Industrial research aiming at the development of new products, services or production methods
- Pre-competitive research with the goal to qualify the specifications of industrial research results for the development of new products, services and new production methods.

The monitoring and evaluation mechanism for this Programme followed the one foreseen for the Operational Programmes of Structural Funds. However, the main interest of the detailed monitoring approach lies in the supply side focusing on absorption of funding and on the production of outputs versus planning. The Programme has been subject to an ex-ante evaluation, with emphasis on the level of the Operational Programme and its measures, where more than one intervention (programme) is included. An ex-post evaluation is foreseen to be conducted in 2010.

Target Groups

Beneficiaries of the project were joint ventures of commercial and industrial enterprises of all sizes, industrial research and technological development

organisations, public enterprises, common benefit organisations, non profit institutions, as well as universities and all research institutions.

Legal entities from other EU and non-EU countries were not eligible to participate.

Funding

The overall budget of the programme was 180 million Euros. The budget of each project was in the range of 0.4 to 2.5 million Euros, while project duration was typically between 2 to 3 years. The share of public funding ranged from 50% for private enterprises to 80% for research and academic institutions.

Selection Process

The selection process comprised two stages, a check for completeness of the application and a technical evaluation.

Check for completeness - standard requirements

All proposals have to:

- be compatible with the general objectives of the Operational program of Competitiveness
- be submitted on time to the Implementing Agency according to the pre-defined format
- have an entity as main contractor and one person as Scientific Advisor
- include the balance sheets of the last 3 years of the participant enterprises
- include a report presenting the incentives for large enterprises to participate in the programme, duly supported by quantitative data – no such requirement for SMEs
- include curriculum vitae of proposed staff, as well as reference tables for EU and/or national research programs in which enterprises of the consortium have already participated
- include an undersigned consortium agreement
- propose a total budget for the project within the limits specified in the call for proposal and the programme implementation guide
- include formal declaration of all consortium entities that this specific proposal submitted for financing has not been financed by other entities.

The proposals going through the check for completeness were evaluated by a committee appointed by the Implementing Agency, in which also participated a representative of the federation of Greek industries, but without vote. The following selection criteria were applied:

- the experience and reliability of the consortium, accounting for 35% of the total evaluation marks, on the basis of participation of consortium members in other EU and national research & technological development programmes
- the method to achieve project results, their viability and prospects to create new sustainable research positions, accounting for 30% of the total evaluation scores.

Proposals were ranked according to the evaluation mark they receive. The threshold of projects to be funded was determined by the budget allocated to each thematic area of the call. The decision for funding was signed by the Head of the Implementing Agency. Contracts were signed among the Implementing Agency, the contractor and the participant entities.

Details of the implementation and monitoring process

The implementation of each project was based on the methodology and work process defined in the proposal. Funding was provided in three instalments. The first instalment was pre-paid when the contract was signed and corresponded to 40% of the approved public expenditure for the project. The second instalment was equal to 50% of the approved public expenditure and was paid after the mid-term assessment of the project. The remaining 10% was paid after the end of the project, following acceptance of the final deliverables and certification of the project by the Implementing Agency.

The monitoring process included quarterly progress reports, an interim progress report and a final report.

The quarterly progress reports gave an account of technical progress, possible deviations from initial plans and ways of how to deal with them and programmed activities for the next report period. The reports also presented resource utilisation tables and financial data according to the breakdown of the financial proposal. The interim progress report provided:

- analytical technical description of the project progress
- presentation of perspectives for the following phases
- discussion of the problems faced with during implementation and solutions given or proposed
- financial data for each participant and in total, according to the breakdown of the financial proposal, supported by payment receipts

Acceptance of the interim progress report led to payment of the 2nd instalment.

The final report was submitted within two months after the end of the project. It comprised

- a full technical review of achievements
- copies of all deliverables produced during the project, including theoretical and technical

studies

- financial data supported by payment receipts
- a report describing the exploitation plans, together with property rights and patent issues
- an extended summary of conclusions, achievements and prospects to be used for dissemination and publicity.

Acceptance of the final progress report led to project certification by the Implementing Agency and payment of the last instalment.

Hungary - Application-oriented co-operative RTD Programme

Policy Context

The scheme "Application-oriented co-operative RTD activity" is part of the Economic Competitiveness Operational Programme (ECOP) of the Community Support Framework (also known as the first National Development Plan, 2004-2006).

ECOP aimed at broadening and expanding the basis of economic development in Hungary and had four strategic directions:

- Investment promotion (Priority 1)
- Development of small and medium-sized enterprises (Priority 2)
- Research & development, innovation (Priority 3)
- Development of the information society and e-economy (Priority 4).

The Priority "Research & development, innovation" included the support of strategically important research and technology developments in co-operation between R&D organizations and the corporate sector. This means the creation, testing and application of new products, instruments, procedures and services in areas that contribute most to the competitiveness of the Hungarian economy. An important task was the development of the research conditions, infrastructure and institutional co-operation between publicly financed and non-profit research sites, promoting efficient R&D performance and creating the necessary conditions for joining the European Research Area.

To promote the emergence of R&D results in the business sector, and to increase the competitiveness of companies, the Operational Programme aimed at strengthening the corporate and regional innovation capabilities, corporate research activities and

research infrastructures, and support knowledge and technology intensive enterprises, as well as the development of R&D co-operation and network building.

Priority 3 was organised in three measures:

- Supporting of application-oriented co-operative research and technology development (3.1)
- Improvement of the conditions of research, technology transfer and co-operation at publicly financed and non profit research facilities (3.2)
- Reinforcement of corporate R&D capacities and innovation skills (3.3).

Measure 3.1, which actually corresponds to the Programme under investigation, provides support for applied research and technology development resulting in the development of higher value, modern, marketable products, procedures and services. By supporting well-defined concrete research projects, it promotes the development and testing of new info-communication procedures, equipment and services, the creation of new materials and high-value biotechnology products, services and the development of products and technologies serving to prevent or reduce environmental pollution. Research projects carried out in co-operation between public and non-profit research institutions and the corporate sector are favored.

The Programme was managed by the Agency for Research Fund Management and Research Exploitation and the National Office for Research and Technology[53], on behalf of the Ministry of Economy and Transport.

Areas covered by the Programme:

- material sciences, manufacturing technologies and equipment: nanotechnology, and manufacturing technologies
- biotechnology: industrial applications, applications in human and veterinary healthcare, and food safety
- electronics, measurement and control technologies: intelligent sensors and controls, system and application technology

[53] Originally the Agency for Research Fund Management and Research Exploitation acted as Implementing Agency. In February 2008 the Agency was merged into the National Office for Research and Technology. Some of the administrative tasks relating to the Economic Competitiveness Operational Programme have been overtaken by the state-owned Hungarian Development Company (MAG Zrt).

- energy technologies: energy efficiency, fuel cells, application of renewable resources
- information and communication technologies: technology and application development, innovative IT applications
- environmental technologies: status analysis, air, water and soil cleaning techniques, waste material treatment
- transport technologies: road safety, infrastructure and logistic systems

The Programme provided support for academy-industry cooperation to increase the number of new products, services and technologies developed by Hungarian companies in the specified fields of technology.

The Programme aimed to enhance:

- direct support to businesses through R&D grants
- knowledge transfer through research contracts, licences and IPR
- R&D cooperation between academic-research organisations and enterprises, through joint projects and Public Private Partnerships (PPP)
- support to sectoral innovation in manufacturing

Project Monitoring, Reporting and Sustainability

In order to measure the outcome of the projects, each consortium was obliged to report its results using certain indicators in the periodic reports, such as:

- number of scientific and technological results (e.g. prototypes, patents, etc.)
- number of developed products, tools, processes, services, materials, technologies and their exploitation/commercial possibilities
- dissemination activities (website, number of publications, presentations, etc.)
- utilisation of project results in higher education
- number of international cooperation schemes created by the project
- additional R&D and innovation resources used for the implementation of the project
- new jobs created or safeguarded
- only for enterprises: economic value resulting from the project

These indicators were recorded in a database, which facilitates the analysis of quantitative project results. However, this system does not allow the recording of data at the level of the participants. Therefore it is difficult to identify economic benefits for the participants and monitor the SME participation and performance.

As for the reporting process, the consortium had to submit periodic activity reports every six

months within 15 days after the end of the respective period. Furthermore, a more detailed "work phase report" had to be submitted after concluding each work phase together with a financial statement and a "request for payment".

An important feature of the ECOP projects was project sustainability. It is stipulated in the contract of projects under the Programme that beneficiaries are obliged to keep record of the projects for 5 years after the project has ended and every year the beneficiaries need to submit a "project sustainability report". The reports should contain the project results emerging after the end of the project; more specifically they need to report according to the following indicators:

- number of scientific and technological results
- number of products, services or technologies exploited
- number of dissemination activities
- number of results utilised in higher education
- number of international cooperation created by the project results
- gross value added (for industrial partners)
- new jobs created

In case, the beneficiaries do not submit these reports, the contracts have to be withdrawn by law. The respondents of MAG Zrt explained that they have difficulties in collecting these reports but the beneficiaries so far have sent the reports, although sometimes with huge delays. Until now, it was not necessary to withdraw a contract and make the beneficiaries pay back the funding.

Target Groups

The programme was open for legal entities based in Hungary, comprising enterprises, including SMEs, higher education institutions, research centres, other non-profit research organisations and non-profit technology and innovation centres.

Organisations from the European Union and countries associated to the Framework Programmes were eligible to participate, but not as leaders of the consortium and were not entitled to receive funding.

The maximum number of project partners in a consortium must not exceed six.

Funding

The total available budget was committed in 2004, with projects being funded (and disbursements made) through 2007. The original budget earmarked for the scheme was 28 million euro to be distributed among the foreseen 140 winners. Due to the popularity of the scheme and the apparent demand, resources were re-allocated, thus granting 58 million euro to 274 winning applicants for the duration of 1-3 years.

The grant levels varied according to the type of organisation and type of activity carried out in the frame of the project. For public and non-profit organisations the

maximum reimbursement rate for eligible costs was 100%. For enterprises, the maximum reimbursement rates of eligible costs were:

- 100% for fundamental research
- 60% for applied research
- 35% for experimental development.

The reimbursement rates could be increased in the following cases:

- if the project was related to a Framework Programme project, the rate could be increased by 15%
- for SMEs rate the of funding could be increased by 10%
- in case of international cooperation, the rate of funding could be increased by 10%.
- these rates could be pooled, however the total funding for applied research could not exceed 75% and for experimental development 50%.

The organisations participating in the projects were required to contribute with own resources to the implementation of the project. The minimum grant amount was 40.000 euro, while the maximum grant available was 400.000 euro.

Advance payment of 75% was granted to the participants, which was paid to the beneficiaries in three instalments over the project period, after submitting the periodic reports. Originally only public and non-profit organisations were entitled for advance payment but in the course of the project implementation this condition was extended to all participants.

Selection Process

The scheme has been implemented by publishing a call for proposals and the projects were selected on a competitive basis.

Proposals that met the formal requirements were evaluated first by independent experts. Each proposal was evaluated by two experts along scientific, social and economic criteria. At least 1 point for each individual criterion needed to be acquired. In case a project application acquired less than a total of 40 points, it was rejected. Based on the acquired points the independent experts produced a recommendation for projects to be funded.

Further evaluation of the selected projects was made by a committee, consisting of representatives of the ECOP's Managing Authority, the relevant ministries, professional and regional bodies and external experts. The committee could accept the proposal without changes, or accept it with a decreased budget, or reject it. The evaluation committee met following the deadline for application.

Based on the evaluation of the committee, the head of the ECOP's Managing Authority decided about funding.

The Managing Authority and the Agency for Research Fund Management and Research Exploitation could also perform on-site evaluations prior to signing of the contract, during the term of the contract, prior to the acceptance of the financial report, and when the project was completed.

Successful applicants were to submit data for monitoring purposes for the Managing Authority's Monitoring Committee on a regular basis, as specified by the contract. The reporting periods covered 3 or 6 months.

Criteria for the evaluation of proposals

- Scientific and economic criteria
  - quality of project objectives, expected results, economic impacts (max. 10 points)
  - quality of work plan, measuring of results, quality control, risk analysis (max. 10 points)
  - allocation and justification of the resources (max. 10 points)
  - quality of the consortium and the coordinator (max. 10 points)
  - quality and experience of the individual participants (max. 6 points)
  - innovative character and significance of the project (max. 10 points)
- Social criteria
  - expected social impacts (max. 2 points)
  - contribution to sustainable development and environmental protection (max. 2 points)
  - contribution to equal opportunity and gender issues (max. 2 points)
  - contribution to the reduction of regional disparities (max. 2 points)
  - measures for the dissemination and exploitation of project results (max. 2 points)
  - involvement of young researchers (max. 2 points)
  - job creation (max. 2 points)