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EVALUATION OF AUSTRIAN PARTICIPATION IN THE 4th EU FRAMEWORK PROGRAMME FOR RESEARCH, TECHNOLOGICAL DEVELOPMENT AND DEMONSTRATION

EVALUATION OF AUSTRIAN PARTICIPATION IN THE 4TH EU FRAMEWORK PROGRAMME FOR RESEARCH, TECHNOLOGICAL DEVELOPMENT AND DEMONSTRATION

FINAL REPORT

COMMISSIONED BY BMBWK
AND BMWA, BMVIT, BMLFUW, BMSG

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Foreword

Austria became a full member of the European Union at almost the same time as the start of the 4th EU framework programme (FP) for Research, Technological Development and Demonstration. Therefore, Austria was an equal partner in the FP along with participants from other member nations. The result was reduced entry barriers providing a four-fold increase in participation in comparison to previous FPs. The institution of the European FP has therefore become a very important and meaningful factor within Austrian research and technology policy. As this study will show, for a large part of the Austrian research landscape the FP's characteristic of national border- and organisational transcendence has become a familiar component of research strategies. This development makes the evaluation of Austrian participation in the 4th FP an especially interesting undertaking.

An international consortium was created to execute this study. It was comprised of the Institute for Technology and Regional Policy of Joanneum Research in cooperation with Technopolis Ltd. and VTT (Technical Research Centre of Finland).

This study is broad-ranging and contains not only the results of the primary survey but also an analysis of secondary statistical data. Further, based on many interviews, the first attempt has been made to adequately evaluate the role of the Austrian support infrastructure. The preparation of a study of this scope has only been possible through the help and support of the organisations and people participating. Also, the success of a primary survey depends on the readiness to answer a complete and thorough questionnaire. Thank you to all those who took the time to fill out the survey.

The study also profited from the organisational support of Sektionschef Dr. Raoul Kneucker (BMBWK) and DDr. Franz Pichler (BMBWK) as well as project coordination by Mag. Johanna Ringhofer (BMBWK). We would also like to thank DI Manfred Horvat (BIT), Mag. Josef Säckl (BIT), Mag. Michaela Topolnik (PROVISO), Mag. Martina Hartl (PROVISO), DI Herwig Spindler (FFF), Dr. Leopold Ziegler (BMBWK), Mag. Hubert Spreitzer (BMBWK) and Dr. Gilbert Fayl (European Commission) for their contribution and support. Finally we would like to thank the programme delegates who took time for interviews as well as all members of project support teams.

MMag. Andreas Schibany

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Executive Summary

1. From this evaluation of Austrian participation in the 4th framework programme (FP) conclusions can be drawn regarding the future set-up of Austrian participation where, regardless of all of the changes in the programme philosophy, (in the 5th and possibly also the 6th FP) structural consistency can be found. This applies to:

   - Orientation of the FP toward cooperative, precompetitive and applied research,
   - The general magnitude of the resources to be distributed across the FP in relation to national expenditures, and
   - The central determinants of as well as barriers to participation as need be addressed via the national support infrastructure.

   National research and technology policy must position itself within this critical area and cross over to the European. This evaluation provides orientation and reference points for the creation of this process.

2. The FPs for RTD are a central lever for RTD policy. Recent evaluations credit them with substantial leveraging effects, positive effects on participants as well as the achievement of set political goals at a European level. The FP's scope and character as precompetitive, application-oriented research apparently do not enable them to solve the repeatedly noticeable weaknesses of the European innovation system (too low R&D expenditures, problems in technological competitiveness). For this reason an expansion of the apparatus of the European RTD policy is being discussed ("European Area of Research"). Exaggerated expectations from the FP should also be tempered in regard to a solution for the Austrian problems in the RTD area. Forced participation in the FP should and cannot replace efforts in national technology policy. It can only expand upon these.

3. Austria's participation in the FP increased greatly with its membership and full participation. Nevertheless there is still clear potential for "catching up". Indicators of this are the low intensity of participation as well as the number of researchers and companies not yet participating in the FP - when compared to other newly participating countries (Sweden, Finland). The level of participation is basically determined by the national R&D potential (number of researchers). An increase in this potential – along with the systematic identification of institutions structurally able to participate yet not yet participating – is the main starting point for increased participation.

4. The FPs have become an important factor in the Austrian areas of research and technology. This can be seen not only in the range of financial flows (in comparison to national sources of direct subsidies) but also through increasing internationalisation and inclusion in European innovation networks. The FP also has had an (intentional) effect on European convergence: the structure of participation in the individual countries is essentially determined by the structure of the FP. The different national specialisations only take root to a limited degree. An attempt to influence the structure of Austrian participation would therefore have to be aimed at influencing the structure of the FP.

5. Many of the Austrian participants in the 4th FP are institutions participating for the first time. The predominant majority already have national and international experience in cooperation. Knowledge and trust in project partners was an important condition in forming the consortia. Universities had an important role in building the international R&D networks (also for businesses) both in regard to share of and roll in the participation. Austrian participants played an active role as initiators/coordinators of projects. The

Austrian rate of success in applications is around the European average. Therefore, a substantial increase is not expected. Rejections had a deterring affect for a minority of institutions. The predominant majority is interested in participating further EU programmes. This points to the attainment of a sustainable level in regard to the number of participations.

6. The predominant majority of participants evaluate their participation in the FP positively (positive cost benefit relationship). Businesses tend to be less positive in this evaluation than do universities and non-university research institutions. This is also the case with the evaluation of goals reached in projects. Participation in EU programmes is also of less strategic importance to business than to other participants.

   Generally speaking, intangible results are especially highlighted: reputation/recognition, accumulation of knowledge and accumulation of competence. Tangible results can also be seen but only with mid to long-term effects on the improved competitiveness of business (growth and turnover, success in new markets).

   The additionality of the FP is very high and therefore only a small number of institutions would have executed the project at the same level without support. In regards to ability to create networks, participation results in lasting behavioural additionality and changes in competence, not or only to a low degree but in terms of business strategy and organisation.

7. The relationship between national and EU subsidies was not one of substitution for the majority of participants in the 4th FP. Therefore, these participants took advantage of various sources of national subsidies as well as EU support. With the conclusion of the "catching up phase" in programme participation, the identification of institutions (especially businesses), which perform research and are nationally subsidised but have not (yet) performed an EU project becomes more important.

   The "division of labour" between national and EU subsidises is such that EU projects performed by Austrian participants are more focused on technologically complex continued development in areas of existing technological competence. They are also somewhat more application-oriented than nationally subsidised programmes. A variety of participants, especially among businesses, plan to integrate (also using national subsidies) research results in product and process innovations following the conclusion of EU projects. This has interesting implications for the orientation of national subsidy policy, which is obviously facing the role of off shore basic research on the one hand, and promoting application-oriented research and diffusion on the other.

8. The support infrastructure generally receives a good report card. The BIT is a large institution (in international comparisons), reaches and services a high number of Austrian institutions and receives generally positive evaluations for its service. There are opportunities for improvement across the spectrum of activities (limited demand for support in searching for partners, limited demand for general codified information, higher demand for specific, non-codified information especially in the application phase) as well as in the activities of regional service centres.

9. The effect of nationally underwritten start-up and supplemental financing is also evaluated positively. It reduced the risk for participants and it can be assumed that the quota of participation and the quality of projects trended higher. Questionable is still whether or not the additional financing following a catching-up phase and in light of rapidly growing numbers of participants (exceeding the personnel capacities in subsidy processing) should be strategically restructured (e.g. with the focus on newcomers). Start-up financing faces the questions of outsourcing to a servicing institution, stocking-up on presently non-critical supplies and a stronger focussing of subsidies (for instance the focussed promotion of project coordinators).

1. Introduction

This study represents the second evaluation of Austrian participation in the European Union Framework Programme (FP) for Research, Technological Development and Demonstration. While the first evaluation (Ohler et al., 1997) had to be limited to the time period when Austria was not a full member of the EU, this evaluation covers the entire 4th FP (1994-98). Because of improved sources of data and experience with FP participants, a variety of issues can be dealt with at various levels of analysis. This study is correspondingly broad reaching. Further, this study places new emphasis on the analysis methods used. The study is structured as follows:

A theoretical-empirical frame of references is developed in Chapter 2. With this, empirical results of the primary survey can be measured and interpreted. The embedding of the FP in the international context will be discussed here along with the issue of whether or not the FP provides the adequate solution to the current challenges facing European research and technology policy. The chapter continues with a very thorough discussion of what can be realistically expected from participation in the FP and its effects as well as the limits and possibilities of impact analysis.

The third chapter provides an overview of Austria's presence in the 4th FP. This chapter basically details Austria's participation at the project, participation, coordination, and organisational type levels. Along with the depiction of the returns, a program-specific evaluation is performed. The analysis of participation of all member states attempts to determine whether or not there were significant differences in the patterns of participation of member states and which factors are significant determinants of participation.

Chapter four is concerned with the analysis of the survey. Participating organisations give their feedback as to the general usefulness of the participation. Also, the specifics of patterns of cooperation in European project consortia as well as the goals sought through participation are analysed. This should provide certain sensitivity to the different dimensions of R&D intent at a European level as well as for the expected economic effects from the standpoint of participants. The often-discussed additionality of research subsidies at a European level will also be dealt with here. The results in most analyses have been differentiated by the various types of organisations (universities, non-university research institutions, businesses, and others) in order to respect the heterogeneous nature of participating organisations. Further, the experiences and future behaviour of rejected Austrian project coordinators will be explored.

The fifth chapter explores an interesting aspect of participation by organisational type. Given the fact that universities have played an important role in the formation of networks and the internationalisation of research since the introduction of the FP, chapter five attempts to determine structural characteristics of university departments participating in the 4th FP. It goes on to examine how high that share is and which fields of science are particularly strongly represented in the FP.

Chapter six discusses the Austrian support infrastructure and its corresponding database. A service infrastructure was built up during the 4th FP. Its efforts are directed at programme applicants as well as at a political and administrative level. This chapter not only provides an evaluation of the service providers from the point of view of programme applicants as well as financial support for applicants via national subsidies, it also compares Austria's service infrastructure to that of Ireland, Finland and France.

The seventh chapter explores the Austrian research community's opinion of the 4th FP as a source of external financing in comparison to national sources. Is there overlapping between beneficiaries of national sources of subsidies and participants in the 4th FP? What are the differences between these two groups? With these

questions – national vs. European – the study enters into interesting territory, which has not yet been explored.

2. Dimensions and categories of effectiveness of EU FPs

In order to estimate the effects of Austrian participation in the 4th FP a frame of reference must be set up against which the empirical results of the following modules can be measured and interpreted. At the same time the basic question must be asked: which effects at which levels of the EU FP can actually be expected? In the grand scheme of things the FP only plays a limited role when compared to the entire EU budget (in the time period 1994-98 about 4% of all funds were spent annually on research programmes)[1]. It can be assumed however that such an observation greatly underestimates the meaning of the FP: first of all the share of the EU FP is much higher when compared exclusively to direct national subsidies. Furthermore, the FPs resulted in significant behavioural changes in participants. Alongside the easily measurable financial flows, the analysis of the effects of European cooperation poses a significant challenge.

Chapter two assumes that European scientific-technological development generally suffers from the fact that scientific results are unsatisfactorily leveraged into technological successes (European Paradox).

- The first part of this chapter tries to find empirical evidence either for or against this thesis. In addition, Europe's position within the triad is displayed against the background of general globalisation and internationalisation tendencies. Inner-European disparities can also be seen within this context. The relative strengths and weaknesses of Austria are detailed in a special section.
- The examination of European research and technology policy follows as the second step in the analysis: What are the central goals? Where can the successes of this policy be found given the more or less apparent predominance of the European paradox? Which roles can and should the FP play here?
- In order to seriously evaluate these roles it is necessary to have insight into the effects of the programmes. That means its necessary to know in what ways and via which channels the programme results affect economic and social change. These are not so easy to obtain especially in programmes, which are relatively small in comparison to the economic realms in which they move. Therefore the final section of this module is concerned with the methodological problems of the impact study as well as with the question of which effects can be measured and analysed in which ways.

2.1 Is there a European paradox?

Recent strategy documents issued by the European Commission[2] express great concern about the present situation of research in the European Union. Special note is made of the discrepancy between the notable production of scientific knowledge in Europe (a third of that in the whole world) and the still-existing weaknesses in technological capabilities. These weaknesses manifest themselves primarily as the lower research quota and share of research personnel in comparison to Japan and the USA. These differences continue to increase over time. Furthermore, a rising trade deficit exists in reference to high tech products.

This comparative analysis of Europe with the USA and Japan has meaningful consequences since Europe's position within the triad forms a basis for specific European policy.

These results are individually presented and discussed below.

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[1] See KOM (99) 284

[2] See above all European Commission, Towards a European Research Area, Luxembourg 2000, but also the first European report on the S&T-indicators (1994) as well as the Green Book of Innovation (EK; 1998).

2.1.1 Findings on "technology gaps"

Europe's often quoted "technology gaps" are usually attributed to the following indicators:

- In the period from 1985-95 R&D expenditures in the EU were below 2% of the GDP compared to 2.58% in the USA and 2.64% in Japan. In terms of human resources in scientific and technological areas, the total number of scientists and engineers per 1,000 employees was 4.7 in the EU in 1993, 7.4 in the USA and 9.7 in Japan. In the business sector there were two (2) scientists per 1,000 employees in Europe yet 6 per thousand in both the USA and Japan in 1993.
- There are great differences in the forms of financing of R&D within the triad. The share of state subsidies for financing R&D in businesses was 14.4% in the U.S. and 9.2% on average in the EU in 1998. European businesses use fewer resources for R&D than do their American and Japanese competitors (1.7% of GDP in the manufacturing industry as opposed to 2.2% in the U.S. and 2.1% in Japan).
- In terms of R&D performed by businesses, European businesses spend 1.14% of the GDP for research (1997), while the level in the US and Japan is 2.08% and 2.1% respectively. The annual growth rate at constant prices in the EU is also behind that of the US and Japan.
- The EU's share of registered patents within Europe experienced only limited change in the period from 1987-97. For the year 1997 that level was 46.1% of all patents registered with the European patent office. The US share was 28.1%. The Japanese share was 17.7%. Taken together, the triad is responsible for 91.8% of all patents registered in the European Union. If patent registrations per ten thousand inhabitants are measured, then patent activity in the EU is about 1/3 of that in Japan and 1/2 of that in the US. Four point five patents per ten thousand inhabitants were registered in the US in 1997. The figure was 7.0 in Japan and 2.5 in the EU (also see Table 1).

Table 1: Basic figures of the triad

	USA	Japan	EU
R&D in percent of GDP (1997)	2.71	2.92	1.83
Scientists per 1000 employees (1996), (USA: 1993)	7.4	9.2	5.0
Share of public financing for R&D in business (1998)	14.4	1.3	9.2
R&D in business as a percent of GDP (1997), (USA: 1998)	2.08	2.1	1.14
Registered patents per 10,000 inhabitants (1997)	4.5	7.0	2.5
Share of patent registrations at the European Patent Office (1997)	28.1	17.6	46.1

Source: OECD (1999)

2.1.2 Findings on the scientific strength of Europe

The observation of technology gaps in Europe in comparison to the US and Japan can be contrasted with Europe's productivity in the scientific area. The contrast between technological and scientific results as they relate to investments was first displayed in the report on S&T-Indicators (1994). The results were also compared with the US and Japan for the first time. The previously mentioned European paradox shows Europe's obvious weaknesses. These weaknesses lead to the fact that despite a very well developed scientific basis (measured by publications), the technological results are lower than those of the US and Japan. A comparison of the technological indicators shown below in Table 2 clearly demonstrates this finding.

Of publications within the OECD area, the EU is responsible for 36.9% and the US for 36%. The performance of the EU in comparison to the US is even more noticeable in the annual growth rates for scientific

publications: in the period between 1990-95 scientific publications within the EU rose by an average of 6% annually. In the US that growth rate was 2.3%.[3]

Table 2: Europe's scientific strength (1997)

	Publications/R&D – Expenditures[1]	Rank	Citations/R&D-Expenditures[2]	Rank	Publications/Researchers	Rank
Denmark	16.5	1	76.7	1	11.8	3
Greece	16.4	2	36.5	10	4.2	15
UK	16.0	3	70.5	2	11.2	5
Finland	15.6	4	67.2	3	11.9	2
Ireland	12.9	5	38.2	9	7.0	11
Spain	12.1	6	36.3	11	5.2	13
Sweden	11.3	7	52.3	4	15.7	1
The Netherlands	10.3	8	48.7	6	11.3	4
France	9.8	9	38.3	8	8.4	8
Belgium	9.5	10	41.3	7	9.9	6
USA	9.2	11	49.0	5	9.2	7
Italy	9.0	12	34.0	12	5.6	12
Germany	7.9	13	31.9	13	7.2	10
Portugal	7.2	14	17.9	15	1.8	16
Austria	7.1	15	25.9	14	7.3	9
Japan	3.6	16	11.7	16	4.5	14

[1] The R&D expenditures are those relating to university research (HERD) in millions of US dollars (PPP).
[2] Citations equal the number of citations per publication
Source: OECD (1999), Salter et al. (2000)

2.1.3 Europe's position in the process of the globalisation of research and technological development

The indicators and criteria listed above are not sufficient to create a complete picture of Europe's position. Missing are the indicators as to **how Europe plays a roll in the general process of the globalisation of research and technology.** The criteria and measurements used below to quantitatively record the internationalisation of research and technology as well as to accurately define Europe's position (and those of member states), are generally based on a taxonomy[4] developed by Archibugi und Michie (1995).

The international usage and exploitation of technology

- First clues as to the international distribution of innovation and technology can be found in the data corresponding to the **international trade of high technology products**: In 1970 the total trade in high technology products was 9.5%. By 1995 this share had risen to 21.5%. Europe's position in the triad is unsatisfactory: The EU market share in high technology products fell from 48.6% in 1970 to 33.8% in 1995.
- A further indicator for measuring the spread of codified knowledge shows the recovery of technological knowledge in the form of **patents**: Table 3 shows that between 1985-95 the annual growth rate of foreign

[3] OECD (1999): The knowledge-based Economy. A Set of Facts and Figures.

[4] See: Archibugi, Michie (1995), as well as Archibugi, D., Iammarino, S. (1999).

patent registrations in the entire OECD area grew by 13.3%. This is substantially higher that the growth rate of .9% in the period of 1970-80. This growing trend in foreign patent registrations is therewith also higher than the growth in expenditures for R&D in the business sector. Therefore this trend in foreign patent registrations cannot be directly connected to an increase in business related R&D investments rather it should be viewed as a development of the international usage of the economic yields of innovation. The market for yield-bearing innovations has become global. The rate of diffusion (the relationship between foreign/domestic patent registrations) points to the technological penetration of foreign markets. In the entire OECD area the average number of domestic patent registrations registered in another OECD country was 1 in the year 1981. In contrast, one domestic patent was registered in four other countries in 1996. The table also displays that **the European Union is an importer of technological knowledge**: for each patent registered within the EU in 1981, 1.6 foreign patents were registered. By 1996 this quota had increased to 5.6. In contrast, the USA is a technology exporter: the relationship between domestic and national patent registrations basically remained the same at 50% during the time period in question. In the EU, the rate declined from 38% in 1981 to 15% in 1996.

Table 3: Patent registrations by various indicators [1981 – 1996]

	Foreign patent registrations: Ø growth	Relationship foreign/domestic patent registrations			Relationship domestic/national patent registrations			Diffusion: Relationship external/domestic patent registrations		
	1981 – 93	1981	1993	1996	1981	1993	1996	1981	1993	1996
USA	11.1	0.7	0.9	1.0	0.57	0.53	0.49	2.0	5.4	9.5
EU[1]	8.7	1.6	4.3	5.6	0.38	0.19	0.15	..	3.0	8.0
OECD total	9.6	1.0	1.8	2.3	0.49	0.36	0.30	1.2	2.5	4.3

[1] Excluding Luxemburg
Domestic patent registrations = Registration at the domestic patent office by a citizen of that country
Foreign patent registrations = Registration at the domestic patent office by a foreign citizen
National patent registrations = Foreign and domestic patent registrations
External patent registrations = Registrations in a foreign country performed by a domestic citizen
Diffusion: external patent registrations in year t divided by domestic patent registrations in year t-1
Source: ETAN (1998), OECD (1999), own calculations

- A third indicator when measuring the international exploitation of technological knowledge is the **technological balance of payments**. This indicator attempts to measure a country's standing in the international trade of technological knowledge as well as services with technological backgrounds. In the process payment flows between countries are recorded as long as they have to do with the buying and selling of scientific and technical knowledge. Income and expenditures are most significant in connection with patents, inventions and the licensing of patents and know how. As shown in Table 4 only a few countries are net technology exporters. The United States continues to have the highest trade surpluses followed by Switzerland and Japan. Nevertheless some small, developed economies also manage to achieve surpluses in the trade of intangible international technologies or at the very least they achieve a high coverage quota. Switzerland, the Netherlands (1992) and Belgium are among these countries. The two largest European countries Germany and France are neck and neck with a coverage quota of 75% in 1996. The most recent estimates put the quota at about 80% in 1994. This is a further indicator that the **EU is a significant importer of technological knowledge**.

Table 4: Technological Balance of Payment: Margin (income/expenditures)

	1991	1992	1993	1994	1995	1996	1997
Austria	0.26	0.29	0.28	0.28	0.25	0.26	0.27
Belgium	0.82	0.90	0.92	0.94	1.21	1.31	1.26
Finland	0.16	0.22	0.27	0.24	0.15	0.14	..
France	0.71	0.72	0.71	0.73	0.73	0.75	..
Germany	0.79	0.72	0.70	0.80	0.80	0.75	0.85
Italy	0.60	0.55	0.57	0.58	0.77	..	..
The Netherlands	0.82	1.01	..	..	..	..	..
Portugal	..	..	0.33	0.26	0.26	0.34	0.36
Spain	0.28	0.25	0.46	0.10	0.07	0.08	0.15
Sweden	1.88	..	1.89	..	..	..	..
U.K.	1.01	1.08	1.12	1.17	1.19	0.81	..
Switzerland	2.60	2.42	2.70	2.31	2.20	1.89	2.20
Japan	0.94	0.91	1.10	1.25	1.43	1.56	1.90
USA	4.42	4.04	4.31	4.56	4.38	4.18	3.58

Source: OECD (1999)

Scientific – technological cooperation

An increase in cooperation can be seen in the scientific sector (e.g. co-authorship of scientific publications) as well as within the business sector via the creation of strategic-technological alliances.[5] Over the last few years there is also a growing trend in the cooperation between the scientific and economic sectors.

- Cooperation between scientists plays a major role in the international spread of knowledge. An analysis of scientific publications shows a growing trend in scientific cooperation in publishing. This phenomenon is noticeable in all of the fields of science and in most countries. Over the last two decades the share of publications with international co-authors has gone up 200% in comparison with the total growth of publications in the natural and engineering sciences of 20%. Table 5 shows that in 1995 an average of 1/3 of all publications in EU countries were published with international co-authors. The United States and Japan have lower shares. This points to a **high level of internationalisation within the European scientific system**. It should be noted that a serious comparison is somewhat difficult since cooperation within Europe would have to be detailed separately. Since it can be assumed that most international co-authors from Japan and the United States can be found within the triad, the higher growth rates for these countries in comparison to the EU indicate that the internationalisation within the EU is not happening at a substantially higher rate than that in Japan or the US. Secondly there is an indication that the internationalisation of the EU cannot necessarily be interpreted as Europeanisation.

Table 5: Share of publications with international co-authors in %

	1985	1990	WR 85-90	1995	WR 90-95
EU	18.4	24.7	34%	32.5	32%
Japan	7.1	9.8	38%	14.4	47%
USA	9.2	12.2	33%	17.5	43%

Source: ISI

- The "science linkage" is an indicator of the connection between science and technological development: it measures the average number of citations from research papers found on the first page of patents. The proposition is that patents resulting from basic research are a direct indication of the industrial relevance

[5] Hagedoorn, J. (1996)

of that basic research. Recent studies[6], with the analysis of literary references in patents, point to an ever-tightening relationship between science and technology not only in the US but also in Europe. Nevertheless, this method of measurement also has a limitation, which must be respected when used: the interweaving of literary references does not reflect a causal relationship. Further, the tendency to patent as well as the opportunity to patent is quite different from technology to technology.

2.1.4 Interpretation and summary: weaknesses in execution or research deficits?

Given the ever-increasing internationalisation of research and technology and an ever-tightening relationship between science and technology, Europe can be characterised as having the following strengths and weaknesses within the triad:

Europe's strengths	Europe's weaknesses
• Good position in scientific publications (albeit no longer as clear as with citations) • High level of international publications (interpretation is however problematic)	• Overall low research quota and few scientists especially in business areas; • Low patent activity; • Importer of technological knowledge; • Bad and worsening position in trade of high technology products; technological trade deficit; • Poor position in patent registrations in foreign countries

This profile, which can be labelled as "weak in execution", suggests that Europe is strong in basic research and lacking the ability to transform this strength into technological success. But this picture is incomplete for several reasons:

1. Shows a glimpse of various research quotas as well as of the number of scientists indicating that Europe has deficits on the input side as well.

2. The finding of scientific strength is based on a relatively weak empirical foundation: the relative strength in publications is only relevant for citations on a limited basis. It can be assumed that the various scientific systems and different traditions within the university systems play an important role here. Further, there are differences especially between the individual scientific disciplines: the EU, in comparison with the USA, shows scientific strength in traditional disciplines. Yet in newer disciplines like molecular biology and biomedicine the USA leads (OST, 2000:360). This finding therefore places conditions on the general assumption that Europe is relatively strong in all scientific disciplines.[7]

3. The relatively weak position of Europe in the world's technological knowledge markets is more troublesome, despite increasing internationalisation, than the relative weaknesses based on "traditional" indicators like R&D quotas or numbers of scientists.

[6] Narin et al., (1997), Narin et al., (1995), Pavitt, K. (1997)

[7] Pavitt, K. (2000)

4. Reduces the diagnosis of "weaknesses in execution" to a linear connection between science, technological development and innovation. This is misguided given the ever-increasing relationship between science and technology. Europe's technological weaknesses can however be partially rooted in the fact that the cooperation between the various participants in the innovation system is faulty and that the scientific system is quite separated from the other parts of the innovation system.

   In any case it must be noted that Europe is characterised by a relatively weak position in the worldwide markets for knowledge and technology along side its general weaknesses in research.

1.1.1 Inter-European disparities and the special traits of Austria

The diagnosis of Europe's technological weakness within the triad was a major consideration in the creation of the FP and legitimised subsidising European research. At the same time it is assumed that Europe is a homogenous whole. Furthermore, the FP is given too much weight.[8] It is difficult to draw conclusions from the diagnosis of technological gaps in the face of the US and Japan and it is hardly possible to attribute such holes to Europe as a whole.

The situation detailed above is much more diverse when individual examinations of the member states are performed. What is revealed that the Inter-European situation is very heterogeneous and that the phenomenon referred to as "the European paradox" presents an aggregation of very different national situations. The diversity of Europe can be attributed to the specifics of the national innovation systems (NIS). This diversity also explains the difference in volume in R&D expenditures, certain patterns of specialisation or specific forms of cooperation among participations in the innovation system. Strength can also lie therein: the possibility to take advantage of specialisation, complimentary or synergy affects of national R&D expenditures. On the other hand there is always the risk that limited resources are spread in the countries among too many participants having similar goals and functions. The result is reduced efficiency. In order to find a way out of the detrimental effects of fragmentation, discussions recently began concerning the creation of a European research area. [9]

Along with the extreme differences in research quotas within the EU the most significant differences occur because **of the different sizes of the domestic markets**. That is why countries like Germany and France have a very different profile than smaller, open economies like the Nordic countries, the Benelux countries and even Austria.

The basic RTD indicators indicate that Europe is quite heterogeneous. The execution of R&D within Europe is split among the individual participants in different ways (see Table 6). The most significant difference is that the business sector is likely to play a more important role in large or research-intensive countries than in smaller, less research-intensive member states. The weight of those sectors financed by public funding goes up given a lower RTD quota (based on GDP). Over 25% of research is performed within the universities in Austria, Belgium, Greece, The Netherlands, Portugal and Spain.

[8] See: Pavis, K. (1998)

[9] See: European Commission (2000a)

Table 6: R&D Expenditures in the EU member states [the values refer to 1997 unless otherwise stated]

		Gross expenditures for R&D in % of gross domestic expenditures for R&D				
	R&D in % of GDP	Public sector	Business sector	University sector	Private yet non-profit sector	Domestic patent registrations/10,000 INH.
Austria	1.82[f,g]	8.9[a]	55.9[a]	35.0[a]	0.3[a]	2.3
Belgium	1.57[c]	3.8[c]	67.4[c]	27.3[c]	1.5[c]	0.9
Denmark	2.00[f]	14.7[f]	63.4[f]	21.0[f]	0.9[f]	2.5
Finland	3.11[f]	13.0[e]	67.8[e]	19.2[e]	0.5	4.6
France	2.18[e]	19.5[e]	62.0[e]	17.1[e]	1.4[e]	2.3
Germany	2.29[e,g]	14.6[e]	67.8[e]	17.6[e]	-	5.5
Greece	0.49	24.2	23.1	52.3	0.4	0.4[d]
Ireland	1.41[g]	7.4	73.3	18.6	0.7	2.2
Italy	1.05[f]	21.2[f]	53.8[f]	25.1[f]	-	1.2[d]
Netherlands	2.04	17.1	54.6	27.3	1.0	1.6
Portugal	0.63	24.2	22.5	40.0	13.3	0.1
Spain	0.90[f,g]	17.3[e]	49.1[e]	32.4[e]	1.1[e]	0.6
Sweden	3.70	3.5	74.8	21.5	0.1	4.7
U.K.	1.83	13.8	65.2	19.8	1.3	3.1
EU	1.81	15.3	62.9	20.9	0.9[c]	2.5

Source: OECD (2000), ÖSTAT
a: 1993, b: 1994, c: 1995, d: 1996, e: 1998, f: 1999, g: national estimate

Austria's position within Europe can be summarised as follows (see above all Polt et al., 1999):

- The **R&D quota** has stagnated in Europe in recent years. This also applies to Austria. The country remains below the EU average despite a positive correction of its R&D quota.[10] Finland and Sweden show a noticeable increase in their quotas given an already high level at the beginning of the 1990's. An increase from a somewhat lower level is found in Denmark and Ireland.
- Austria demonstrates a high share of **innovative companies** (along with Germany, UK and Ireland). These companies rather perform small innovation projects and aim for incremental innovation. Despite above average expenditures, the output is consistent with the European average.
- Austrian manufactured goods production generally takes place in traditional areas and is marked by below average technological sophistication. Aside from Greece, which trails the other countries substantially, Austria, Portugal and Spain are last in the EU in terms of **technological intensity in production structure**.
- The **technological balance of payment** shows great deficits (see Table 4)
- The relationship between R&D content **of imported precompetitive and capital expenditures** and direct R&D expenditures in Austria is higher than in larger countries. Still it corresponds to the typical values for small, open economies. There are no indications of extraordinarily strong leveraging effects from imported technologies. In reference to the above-mentioned **rate of diffusion** (relationship of external patent registrations to domestic, see Table 3) Austria rates a mere 11.1 – just above the EU average but far behind other small economies: the diffusion rates in Belgium, Finland, The Netherlands, Denmark and Sweden are more than twice as high.

[10] Exact data for Austria from Statistik Österreich's complete survey will be available at the end of 2000. According to current estimates the quota is currently 1.79%.

- The **quality of scientific output** can be termed above average: Austria is in second place behind the UK in publications, specifically those in the natural and engineering sciences (weighted using the number of research personnel). Publications with international co-authorship have gone up dramatically in recent years. Austria is well above the EU average of 32.5% with a value of 41%. That puts the country even with other small economies such as Portugal, Belgium, Denmark and Ireland.

Basically, Austria has a generally "European" profile. Strengths lay in more or less incremental innovation and in more traditional sectors, but there are nonetheless notable scientific achievements. In reference to technological competitiveness, the weaknesses and the degree of internationalisation keep Austria behind comparable small economies.

2.2 European research and technology policy against the backdrop of current challenges

Is European RTD policy - specifically the FP - in light of these results, an adequate answer? Can it be expected that this policy will lead to a continued strengthening of technological development in Europe and thus to a catching up process within the triad?

To answer these questions, basic data on European RTD policy will be presented and the goals and intentions thereof analysed. The present results of studies of European RTD policy (above all the results of the "five year assessments"[11]) create the backdrop for a critical analysis.

2.2.1 Basic data on European RTD policy

The common activities of research and technological development have been developing rapidly since the middle of the 80's, especially with the introduction of the first FP. **Annual expenditures for the RTD programmes rose from 974 million ECU in the year 1995 to 3,099 billion ECU in 1998**.[12] Spread over the running time of the FP programme, the first FP (1984-88) had a 2.41% share of the EU household. The share rose to 4% of the EU household by the 4th FP.[13] The relative increase in common expenditures for RTD can on the one hand be attributed to the raise in share of the total household and on the other hand to the decline in public RTD expenditures (measured against the total public expenditures of member states).

The question of how the European RTD programme is weighted in the context of national research subsidies in the member states is above all dependent upon the level at which the EU FP is compared. If the FPs are compared to all research expenditures in the EU, their share is just above 2%.[14] However a valid estimate of the position of the EU research expenditures can be obtained when the resources spent in connection with tenders within the FPs are compared to the share of direct, public RTD expenditures at national levels.[15] If EU resources are compared to the total, direct, public RTD expenditures, the EU is ranked 4th behind the three largest member states with a share of about 10% of all direct, public RTD expenditures. What becomes apparent is that the financial means available through the EU are not insubstantial especially in comparison to smaller member states even though 2/3 of all public European RTD financing still comes from the three largest member states.

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[11] See Assessment Panel (2000)

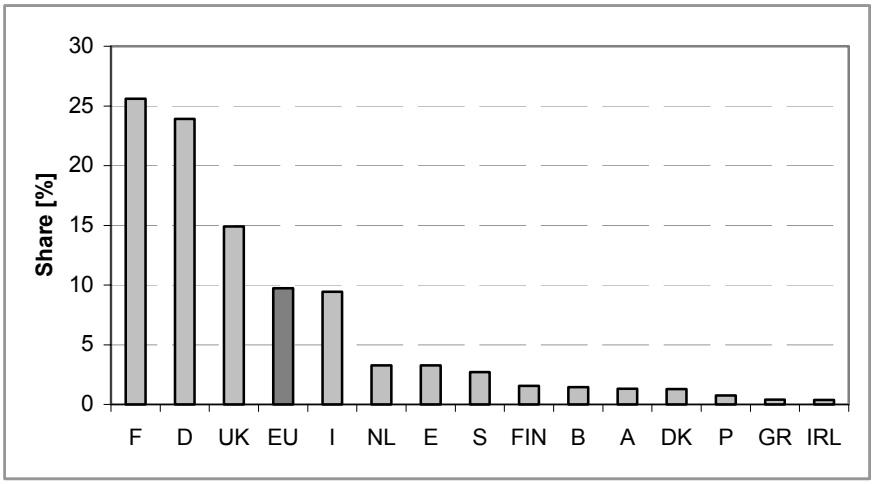
[12] At 1992 price levels.

[13] See: KOM (99): Activities of the European Union in the area of research of technological development, annual report

[14] The following data refer to the year 1996.

[15] According to OECD statistics sub-total government funding is comprised of the sum of direct government + general university funds. For this calculation the direct government funds were taken as a basis, meaning resources from public funds which were directly awarded.

Figure 1: EU FP share of direct, public RTD subsidies [1996]



Source: OECD (1999); Own calculations

2.2.2 Analysis of European RTD policy

At the inception of a single currency union, Europe was in a phase of macroeconomic stability and convergence. Even in the frame of increasing convergence of some indicators of prosperity (e.g. the GDP per capita) the debate about the coordination of research and technology policy, which was still being set within the individual states, emerged. The issue of coordination of the individual policies and the EU policy in the area of research came to the forefront because of the increasing interdependence of national research and innovation systems, the expansion of local and regional systems and border-transcending sectored systems. The debate about the creation of a truly European research and innovation system can, in this regard, be understood to be an important process with the FP forming the core. [16]

The 4th FP (1994-98)

The 4th EU FP for R&D ran from 1994 to the end of 1998. It represented a financial volume of about 13.3 billion ECU. Compared to the 3rd FP, which had a budget of 6.4 Billion ECU, the 4th FP brought with it double the resources for research and development and was therefore much more extensive than its predecessors.

The objectives for the EU's research and technology activities in the 4th FP were based on the goals of the 3rd FP with some additional strategic objectives added. Those include:

- Strengthening the scientific and technological basis of European industry,
- Promotion of international competitiveness of common industry as well as the promotion, spread, and marketing of research results, and
- The support of other common policies and thus the objectives of the entire community, for instance helping achieve the promotion of lasting development and the improvement of quality of life of all community members.

The 4th FP was structured so as to follow four "activities". These created the basis for the working programme, the tenders and the selection of projects by the European Commission. The first activity comprised the largest

[16] See: Caracostas and Soete (1997)

area differentiated by 15 selected areas of technology (specific programmes). The other three "horizontal activities" cover the areas of international scientific cooperation, the spread and usage of research results as well as the continuing education of scientists and promoting their mobility.

The major changes to the 5th FP come from a problem solving approach originating from the parliament. That means that the programme should react to the major socio-economic challenges facing Europe.

Three sets of criteria are relevant to goal setting at the FP level. These refer to:

- European value added (i.e. the extra value which is created when the programme is implemented at a European level instead of at a national level)
- Social goals
- Economic development and scientific-technical progress

Table 7 shows that despite changes in objectives and areas of concentration there is still certain continuity in the content of the 3rd, 4th and 5th FPs.

Table 7: The FP: structure and budgetary provisions

Third FP Programme	*MECU*	Fourth FP Programme	*MECU*	Fifth FP Programme	*MEuro*
I. Enabling Technologies		Activity 1		Thematic Programme 2	
. Information and Communications Technologies				User-friendly Information Society	*3600*
Information Technologies, Esprit 3	*1517*	Information Technologies, IT	*2062*		
Communication Technologies, Race 2	*548*	Advanced Communication Technologies and Services, ACTS	*671*		
Development of Telematics Systems of General Interest	*426*	Telematics Applications	*913*		
. Industrial and Materials Technologies				Thematic Programme 3	
Industrial and Materials Technologies, Brite/Euram	*762*	Industrial and Materials technologies	*1737*	Competitive and Sustainable growth	*2705*
Measurement and Testing	*66*	Standards, Measurement and Testing	*184*		
lanagement of Natural Resources				Thematic Programme 4	
3. Environment				Energy, Environment and Sustainable Development	*2125*
Environment	*316*	Environment and Climate	*573.5*		
Marine Science and Technology, MAST 2	*117*	Marine Science and Technologies	*243*		
. Life Sciences - Biotechnology				Thematic Programme 1	
Biotechnology	*184*	Biotechnology	*596*	Quality of Life and Management of Living Resources	*2413*
Agriculture and Agro-Industry including Fisheries, AIR	*373*	Agriculture and Fisheries	*658*		
Biomedical and Health Research	*149*	Biomedicine and Health	*374*		
Life Sciences and Technologies for Developing Countries	*125*				
5. Energy				Nuclear Energy	*979*
Non-nuclear Energies, Joule 2	*259*	Non-nuclear Energy	*1039*		
Nuclear Fission Safety	*69*	Nuclear Fission Safety	*171*		
Controlled Thermonuclear Fusion	*521*	Fusion	*846*		
		Transport	*263*		
		Targeted Socio-economic Research (TSER)	*112*		
		Activity 2		Horizontal Programme 1	
		Co-operation with Third Countries and International Organisations, INCO	*575*	Confirming the International Role of Community Research	*475*
		Activity 3		Horizontal Programme 2	

		Dissemination and Optimisation of Results (Innovation)	*312*	Promotion of Innovation and Encouragement of Participation of SMEs	*363*
anagement of Intellectual Resources		Activity 4		Horizontal Programme 3	
. Human Capital and Mobility, HCM	*556*	Stimulation of the Training and Mobility of Researchers, TMR	*792*	Improving Human Research Potential and the Socio-economic Knowledge Base	*1280*
Joint Research Centre Programmes	*545*	Joint Research Centre Programmes	*959*	Joint Research Centre Programmes	*1020*
		Competitive S&T Support to Community Policies	*136*		
	6600		***13215***		***14960***

Source: Five-Year Assessment, Brussels 2000.

The **goals** are clearly formulated and priorities set so that the ambitious attempt to allow European research programmes to focus on **specific European** and **social contexts** is recognisable. Nevertheless at the FP level it is unavoidable that the objectives are very general. What is missing is a firming up of and an operational execution of the goals at the individual programme and activity level. Further, there are no clear hypotheses formulated in reference to intended chains of effect and about which interim steps and correlations are desired so that the general goals can actually be reached.

This **lack of clarity in regard to impact hypotheses** when the goals and programmes are being formulated makes it difficult to assess success or failure of the programmes via evaluation.

2.2.3 Previous evaluations of the FP

In 1999 the European Commission commissioned the ATLANTIS research institute with a pan-European analysis of participation in the 3rd and 4th FPs. ATLANTIS surveyed 12,000 participants. Below is a summary of conclusions drawn from the 2,275 surveys returned:

- **Priority for applied research, results not directly for commercial use**: The research projects were mainly concentrated on applied research where manufacturers or service industries were the end users of the results. It was rare though that the results of the project were immediately commercially usable after the project. In most cases, further research or other market-related activities were necessary before new products or processes would be introduced. Both academic and industrial partners agree that the usefulness of the participation in the project outweighs the costs.
- **Increasing competitiveness and internationalisation:** The projects contributed to an increase in competitiveness as well as to the continued internationalisation of the participating organisations.
- **"Academic results" are important:** "Academic results" (publications, dissertations, etc.) were also found to be very important, although even the research institutions did not want their contribution as limited to this heading.
- **Far reaching results**: Participants reported results beyond the purely economic regarding the implementation of other EU policies, cohesion and improvement in the quality of life as well as environmental protection.
- **Main effect – growth in competence**: The participants declared that an increase in their scientific and technological competence and capacities was the most important effect of the project. Employment effects remained insignificant.

- **High strategic content**: Participating organisations maintained that the projects were strategically important and within the core interests of their institutions.
- **High additionality**: A fair number of the projects would not have been performed without EU subsidies. Six out of 10 participants answer that the project would not have been executed. A mere 3% stated that the project would have been performed in exactly the same way with the same partners even without subsidies.
- **Stable partnerships:** Partners intend to continue their cooperation either in other projects within the FP or in continued research using their own resources.
- **"Knowledge" and "networking" goals are most important and most achieved:** The goals viewed as most important and also as best achieved had to do with "knowledge" and "networking". The second most important goals in both areas were "strategic management" and "exploitation"[17].
- **Few failure factors:** Among the factors, which contributed to hindrances, were intrinsic technological difficulties and lacking resources. Only a few participants reported problems related to partnerships.

The "Five Year Assessment" panel also evaluated the activities of the last five (5) years (i.e. during the 4th and 5th FPs). Their evaluation found the activities to be positive and resulted in a recommendation that the FP be **continued and expanded**.

Collaborative research is seen as a special component of the FP, which is valued by both academic and industrial partners. Other successful traits of the FP include: the formation of networks, continuing education and training, and the inclusion of SMEs.

There was criticism of the programme administration: Procedures should be simplified and made easier for applicants.

The panel's recommendations regarding the future makeup of the FP can be summarised as follows:

- The **socio-economic relevance** of research should continue to be in the foreground. Also, the key actions should remain as a way to lend more focus to the programme.
- The strong focus of **collaborative RTD projects** should continue and should be accompanied by other activities.
- **Excellence** and the participation of outstanding researchers should be emphasised.
- Participants should be encouraged to execute **riskier** projects.
- Steps should be taken to promote the **mobility** of researchers within the Union as well as between the Union and other countries.
- The support of **generic**, competence-building RTD activities should be increased.
- The focus on research activities supporting **other policy areas** within the EU should be strengthened.

[17] See also the categorization of goals in KENS (Knowledge, Exploitation, Networking and Strategic Management) in the Irish study (Guy et al, 1999). The taxonomy included here is used in many evaluations and can be traced back to the Alvey Evaluation in 1991.

2.2.4 The future: Beyond the FP

In March 2000 the Union met in Lisbon and set the goal to become the most competitive and dynamic knowledge-based economy in the world. With that, RTD policy became one of the central focuses of future European strategies.

New strategy papers issued by the European Commission – above all the statement of basic principles on the European research area (EC 2000) – as well as major expert opinions (see above all the results of the Five Year Assessment) attribute Europe's pending loss of stature within the triad to the combination of a feared loss of economic strength and the relative decline of scientific excellence. For this reason it is not only important to improve and expand the FP but also to create a broader European strategy for research and technological development. This would serve as a basis for far-reaching activities for the Union as well as its member states:

> "*Our main message is that if the European Union wants to face the challenges of the new economic situation and attain the goals outlined by Heads of Government in Lisbon,* ***the FP Programme alone is not enough to implement European research and technological development (RTD) policy.*** *It needs to be complemented by other tools*." (Five-year assessment, 2000, our emphasis)

Additionally, the panel defines what steps can be taken above and beyond the FP:

- First, the panel recommends a substantial increase in public budgets for RTD so that Europe's research quota (share of public and private RTD expenditures as a percent of the GDP) can increase to a level of 3% over the next ten years.
- Second, the RTD policies of member states should be coordinated and redundancies eliminated.
- The third point is concerned with EU expansion. Here, the panel recommends an active European RTD strategy, which takes the needs of the new Eastern and Central European countries into account. In the short term, the RTD activities of these countries should be supported via the use of existing scientific materials.
- Fourth, the panel recognises the urgent need to actively address the threat of a bottleneck caused by lacking qualification.
- Finally, the Commission should give innovation policy a prominent place and priority within the scope of its regional structure and cohesion policy.

The recommendations of the ETAN Expert Working Group are similar:

> *"In responding to the challenges, the S&T policy of the community (i.e. the RTD FP Programme) alone will be clearly* ***overloaded.*** *The integration of different policy areas and the use of indirect policy measures (e.g. competition, standards, or labour market defragmentation) towards a European innovation policy should be at the top of the policy agenda." (ETAN 1998, our emphasis).*

2.2.5 Summary: what can be realistically expected from participation in the FP?

The positive evaluation of the FP is essentially based upon the fact that the participating organisations found that collaboration in international partnerships was good and valuable.

Therefore, participation in the FP had considerable effects on **"intangible assets"** like the enhancement of competencies and the set-up of research networks. **"Tangible" assets** like new products and processes,

methods, standards etc. are mentioned far less often. Mentioned less still are effects like **increased turnover or employment effects**. These results are found not only in the above-mentioned Europe-wide Atlantis survey, but also in all national "impact studies", the 4th FP and other previous studies. This is due to the timing of the surveys - directly after the project. At this time, one can only speculate about possible commercialisation and effects of the projects. Further, it is only in the rarest of cases that a direct, causal relationship can be established between a specific research project and an increase in sales. Where such assessments have been attempted the results have been unreliable and yielded little thus indicating that the effects are rather limited (see also Georghiou 1999). Expectations of faster and shorter-term economic effects would be inadmissible since the FPs are geared toward the precompetitive. For this reason the added value of the FP lies in the formation of *institutional settings* for the formation of dynamic networks, which extend beyond "simple" R&D coops. Therefore each R&D cooperation in too close a proximity to the market would have to be examined from a competitive policy standpoint. The following section attempts to deal with this topic within the scope of this work.

Another interesting result – which is not so easy to interpret – is that the project is simultaneously credited with **high additionality and high strategic content**[18]. This contradicts the idea that there should be a natural trade-off: if projects and activities are of central importance to the innovation- and research strategies of an organisation, they are executed independently of the availability of financial subsidies. In this case, a Swedish study is also relevant (see NUTEK 1995). Based on intensive interviews with Swedish companies the study showed that the participation strategy of industrial partners has changed in recent years: while in the 2nd and 3rd FPs companies more or less participated in any project when they were approached, with the 4th FP the EU projects were more and more within the companies' strategic core. Companies also more often took the initiative and a coordination role.

It must be noted however that despite the opinion stated, above all by the "Five-Year Assessment Panel", that FP contents are good and valued by participating organisations (with the exception of pending, necessary improvements to organisation and execution), the programmes are **insufficient** to improve Europe's technological competitive capacity within the triad. This assessment is important and above all helpful in tempering excessive expectations with respect to the effects the FP. If the stated goal is to eliminate or at least to diminish Europe's often cited "weak execution" or "weak research", European research programmes like the FP (precompetitive research and with a focus on international collaboration) can only make a small contribution if any at all. Even more to the point: if a weakness in execution is the correct diagnosis, the FPs are insufficient therapy. If however the topic is a merging of European countries into a European research area centred on European network building and the building of common competencies, the FP provides the right scope. This is affirmed by all studies to date[19].

2.3 Opportunities and boundaries of the impact study

The previous section showed the targets and intentions of European RTD politics as well as current proposals for the development of the FP. The main topic for the ongoing analysis is which methods for recording effects are available and what must be principally noted in the interpretation of the impact study.

[18] This result is also not only found in ATLANTIS but also in the Irish and Finnish studies.

[19] In reference to goal setting for internationalisation, substitution effects must be taken into account: to what degree are projects with other partners – especially from the US – abandoned in favour of cooperation with European partners. This has not been studied yet.

2.3.1 Economic net effects versus gross effects at the participant level

The goal of a national impact study is the establishment of programme effects at the national economy and society levels as well as at the level of national politics. Chapter 7 is concerned with the analysis of the political system and the question of the coherence of national and European policy. All other chapters are more or less exclusively concerned with the effects of 4th FP on the Austrian economy and society. The chapters record the effects at the programme participant level (micro level), at the level of individual markets and fields of technology (meso level) and at the level of the total economy (macro level).

The macro level is particularly demanding from a methodological standpoint. Firstly, there is a multitude of influencing factors at various levels. Secondly, the methods to record and evaluate these influencing factors are inaccessible. Thirdly, in programmes of relatively low volume (in comparison to total economic magnitudes like value added and employment) it must be considered whether or not such effects actually breach the threshold of perceptibility.

> "*Macro impact is very likely to be lost in the noise of effects arising from other inputs to RTD and the stages beyond*." (Georghiou, Bach, 1998)

Table 8 shows effects to be considered when one want to arrive at real net effects at the total economic level from an observation of gross effects at the participant level:

Table 8: The calculation of economic net effects

	Private, gross effects at the participant level
+/-	Indirect effects (intended and unintended)
-	Carry-over effects
=	**Private net effects**
+	Spill-overs (effects on non-participants)
-	Crowding-out effects
=	**Economic net effects**

Such net effects can be measured using two methods:

- First, the relationship between research spending and output magnitudes can be measured with **macro-economic production functions**. Regardless of the fact that externalities cannot be recorded in this way, there are many objections with respect to the usability of this concept when it comes to the effect of public research spending, more so with comparatively smaller programmes in relation to remaining public and private research spending. (see e.g. Georghiou and Roessner 2000).
- Secondly the attempt can be made to measure **the social and total rates of return** from research expenditures and from the investment in certain technologies. In the process, consumer and producer incomes are ascertained and added. This method assumes that demand and supply curves can be constructed and that they vary based on the observed investments in research and technology. Regardless of the fact that it is difficult to completely evaluate externalities, the calculation of supply and demand curves is only possible with much effort for little technological investment – the effects of basic research or from completely new products and processes cannot be recorded in this way (see e.g. Cozzens et al. 1994).

Within the scope of the given analysis this problem is dealt with as follows:

Instead of trying to record total economic effects, the given analysis is focused on a comprehensively and internationally comparable record of the results and effects of ***the 4th FP at the level of participating businesses and research institutions****. This is also the approach used by studies performed to date. Nevertheless during the interpretation of the results it must be considered that the net effects of the 4th FP on the Austrian economy remain widely detached.*

Still, given these limited but more realistic objectives, some methodological difficulties with the impact study remain. These are analysed below. In addition, the dealings with the various difficulties are discussed within the scope of the given analysis of Austria's participation in the 4th FP.

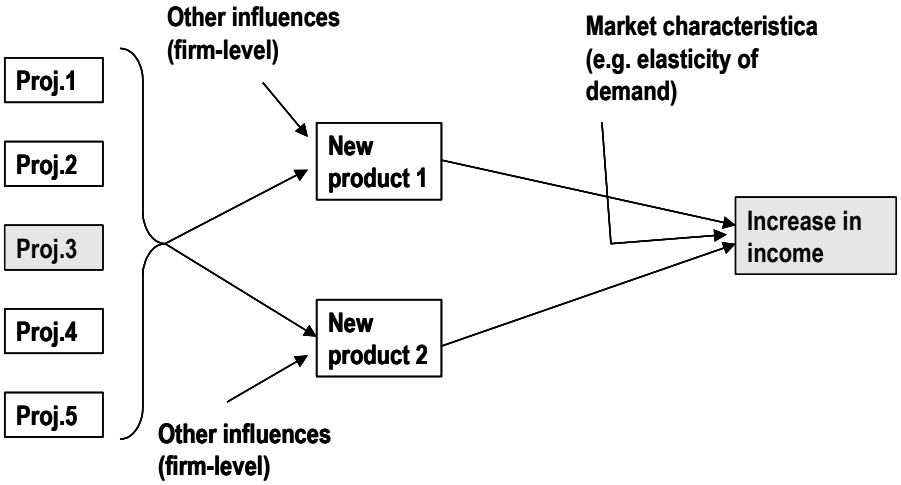
2.3.2 The problem of attribution

The main question at the centre of every impact study is: to what extent are the measurable effects really the result of the programme, i.e. causally attributable to participation in the program?

This question is anything but trivial especially in contexts with mostly intangible programme goals like increasing competence and the formation international networks. For instance a participant can report that a project was a total failure in regard to the technological targets of the research project. Still, a new partner was met in the process and in subsequent activities with that partner a highly successful product has been developed and marketed.

The problem of attribution has different aspects. The following graphic attempts to display this:

Figure 2: The problem of attribution



- First, EU research projects frequently turn out to be one of many projects within a company's **research portfolio**. If these projects are complementary then new products or processes resulting from research activities are hard to attribute to this one project.
- Second, **indirect effects** can play a major role. While direct effects are directly related to the programme goals, indirect effects come about when the effects go beyond the programme goals – for instance when the research project enhances the reputation of the firm or contributes to improvements in management. These can lead to an improvement in the company's competitive position.

- Third, rising turnover, increased value added or cost savings are generally **the result of multiple influences** both internal and external to the firm. The research activities themselves are generally only a small part of these. Whether or not an improved process or a successfully introduced new product lead to a mid-range increase in value-added is, for instance, greatly dependent upon how quickly competitors react to the new situation or the level of demand elasticity.

  Within the scope of the given analysis the problem is dealt with as follows:

  The battery of questions as to the goals, reaching the goals and the effects refer expressly to the EU project. Despite the above-mentioned problems with attribution, we try as best we can to make a connection between the participation in the EU project and the resulting effects achieved and goals reached.

2.3.3 Additionality

The problem of additionality is closely related to the problem of attribution ("*another minefield for evaluators*" (Georghiou 1999)). When it is difficult – given the above-mentioned reasons – to attribute the research project with a monetary return in the form of actual value added created etc., it is just as difficult to define the difference brought about by the project. This should answer the question, which arises after additionality: what would have happened without the project.

The concept of additionality is of central importance to the European context due to reasons stemming from competitive policy and subsidy control. The office in charge of competition wants to assure that the EU subsidies are awarded in addition to other public and private funds and do not replace them. At the same time, the offices in charge of research and industry see the requirements for additionality as fulfilled when the subsidies lead to an increase in total research expenditures.

This combination of a politically explosive nature and conceptual difficulty has several consequences:

- First, the additionality of European programmes is almost always examined in evaluations.
- Second, the participants are regularly surveyed. Less often, a control group is used.
- Third, based on the above-mentioned difficulty, "the next question" – what would have happened without the project? – is usually rephrased. The question then refers more to the **input-additionality** than to the **output-additionality** and is: "would you have executed the research project without the EU subsidy?"

Asked in this way the result is generally **very high values for the additionality of the programme,** since by definition the project would rarely have been carried out in exactly the same way – namely as a European project in international collaboration with many partners. Therefore, the dimension of **behavioural additionality** is usually explored in addition to this question, i.e. it is asked, if the project would have been carried out differently without the EU subsidies (not as quick, less international, smaller scale, etc.). This behavioural-additionality can be expanded by another strategic dimension by asking if the existence of the EU project influenced the RTD strategy of the institution.

All previous studies at the national and international levels (see the above-quoted ATLANTIS study and the current studies from Finland and Ireland and see the "impact studies" from earlier FPs) show, that this kind of

the surveying results in very high additionality without providing a satisfactory answer to the question, what would have happened without the subsidies[20].

Nevertheless it can be expected that the domestic subsidy situation plays a certain role here – e.g. how the national situations adapt to the European situation and which complementary- and substitution strategies are pursued by national governments.

Within the scope of the given analysis this problem is dealt with as follows:

First, at project rejection, the strategy, which the participating organisation would have pursued, is surveyed in detail. Second, additional batteries of questions complement this core question about additionality: one question relates to the general – and above all strategic – changes as a result of project participation. Another relates to the characterisation of the project in comparison to nationally subsidised research projects. On this basis it is possible to make more differentiated statements about additionality.

2.3.4 Goals reached, results and effects: an attempt to differentiate

Evaluations frequently distinguish between "output", "outcome" and "impact". One can define the terms by comparing the results. This is done by determining if the results occur immediately (e.g. publications) or if they are intermediary or "final results" like patents, prototypes or new products and processes. "Impacts" or effects on the other hand are ascertained in other dimensions: **effects are the result of the interaction between the results of the observed project and the economy or society.** They are registered in economic magnitudes such as changes in value added, improved competitive position, etc.

A second distinction often found in evaluations concerns the **division of targets into different categories.** Normally, the importance of the goals is examined, as is the extent to which the goals were achieved. Both of these sets of questions are then placed alongside each other – one battery of questions regarding goals and one regarding results and effects.

Within the scope of the given analysis the following strategy is preferred:

To keep the questionnaire as short as possible no distinction is made between goals reached and project results. Unintentional effects are recorded using an independent question. The goals are divided into:

- intangible (immaterial) goals like attaining new knowledge or access to new research networks,
- resource-related goals and
- tangible (material) goals.

While this method deviates from the frequently used "KENS"-cataloguing of goals, the information content is far greater. This is due to the fact that the time dimension can be accounted for in the same question, which measures tangible goals. In this way, a very thorough record of the different intangible effects is achieved while at the same time getting an indication of the project results in a given time span.

[20] It is also so in the interpretation of the Irish study that the high additionalities are likely the result of lacking national RTD subsidies. In Finland there are similar values yet with above average national subsidy efforts.

The effects are dealt with in a separate question with the same time dimension (as with the tangible results) as a basis.

Most studies come to the hardly surprising conclusion that the **intangible effects** are highly significant (see e.g. the ATLANTIS study, but also the available national studies):

> *"Highly skewed success pattern and new complex benefits rise from knowledge generation and networking ... a broader view of effects is needed if under-valuation is to be avoided" (Georghiou 1999)*

> *"intangible, infrastructural effects, such as learning new skills and catalysing new network relations are the impact most often mentioned ... /Further research is needed/ .. to assess the longer-term importance and evolution of the networks created .. " (Luukkonen 1998)*

In which way, to what extent, over what time and via which channels do intangible effects become tangible outputs (be they publications, patents or new products and processes) and consequently commercial returns? These are questions at the centre of the FP debate at the European level. This is understandable given the explicit goal of strengthening European competitiveness. Yet due to the precompetitive focus of the programme, this goal can be reached only indirectly and with delay.

Within the scope of the given analysis and for several reasons, this question cannot be seriously and completely answered:

- *First, because it is a one-time-only survey performed at a specific point in time, the time dimension is not of sufficient reliability (see particularly 2.3.5)*
- *Second, there is the above-mentioned problem of attribution (see 2.3.2)*
- *Third, indirect effects cannot be recorded using standard surveys even when they are clearly noticeable at the individual participant level[21].*

In connection with categories of goals, the participants are asked to assess the effects of participation on the organisation/institute in order not to completely neglect this topic, which is of central importance to the impact studies. It is crucial that this question is based on a temporal structure.

2.3.5 Survey timing

Many of the tangible project results first appear long after the project has been concluded. This is especially true in precompetitive research projects where further developments are necessary after the project in order to achieve products or processes, which can be used commercially. Effects on macroeconomic level are noticeable later since spillovers frequently need a very long time to develop.

On the other hand effects are all the more difficult to attribute to a research project the longer it is past. In addition changes in responsibilities and the organisation itself frequently lead to the situation that after a few years, nobody can be found in an organisation who can provide information about a particular research project.

[21] Methods, which attribute the direct and indirect effects of research programmes at the individual company output magnitude (e.g. Creation of value) level, are based on interviews (see for instance the very detailed BETA method, used in the evaluation of BRITON-EURAM or the experiences of the EUREKA evaluation in Georghiou 1997).

Best case, this problem is combated with a **continuous evaluation approach**: a survey immediately after the project is complemented by a short effects-report to be repeated at regular intervals once the project has been carried out. Such an evaluation system with the following three main elements was instituted during the Belgian presidency of EUREKA:

- **Final report:** survey of participants immediately after the end of the project. Among other things, the expected commercial execution is surveyed.
- **Market impact reports:** a short questionnaire which only repeats the parts of "final report" concerning commercial execution, is sent to participants who filled out this section of the "final report". This questionnaire is repeated 1, 3 and 5 years after the conclusion of the project.
- **Partially structured interviews:** additional interviews are used to obtain more detailed, qualitative information. The interview timing is usually three years after project end.

An interesting result of this procedure was, that **the extent of the actual commercialisation was far less than had been expected in previous years**. The interviews also confirm that the paths to commercial success are too complicated to be recorded with a questionnaire and secondly, frequently appear completely differently than the company expected (see Georghiou 1997).

Within the scope of the given analysis, we deal with the problem as follows:

Since the projects of the 4th FP began as well as ended at different points in time, the timing of the survey is not identical to the project conclusion. Some projects already ended some time ago or are still underway. In order to arrange the projects according to their timing structure the project end date is used. In reference to results and effects and within the scope of the given analysis it is only possible to inquire as to effects which have already occurred and which are expected to occur during certain periods of time (next 3 years and after 3 years). Follow-up surveys at later dates and conducted according to the evaluation approach by EUREKA would of course be very helpful.

2.3.6 Summary and consequences of the analysis

The **participant survey via questionnaire** is at the centre of the evaluation design. As detailed separately above the available national and international surveys were gathered at the start of the questionnaire design process. The point was to provide as good a basis as possible for comparing results. Still, in certain well-reasoned cases deviation was allowed.

Based on the – justified – concentration on the participant survey, some of the dimensions of programme effects (particularly spill-overs) are absent. Further, indirect effects are very difficult to record by means of standardised questionnaires.

The questionnaire is built according to the following principles:

- Best possible comparability with other national and international studies.
- Clear, answerable formulation of questions.
- Adequate dealings with the important intangible effects.
- Clearer correlations between goals, results and effects of the projects including the time dimension factor.
- More serious dealings with the subject of additionality.

Non-participants can find useful tips among the group of “unsuccessful applicants” which was also surveyed. This information contains valuable information as to additionality, which tended to be overestimated in conventionally designed studies. However, based on its varying characteristics, this group cannot be considered a control group.

3. Austria's role and presence in the 4th FP

The following chapter provides an overview of Austria's presence in the 4th FP. Simple, descriptive data analyses are mainly used. The Austrian presence is analysed in terms of project, participations, players (kinds of organisations) and coordinators as well as Austria's networking with other member countries on a project basis. Further, there is an overview of monetary returns resulting from Austrian participation in the 4th FP.

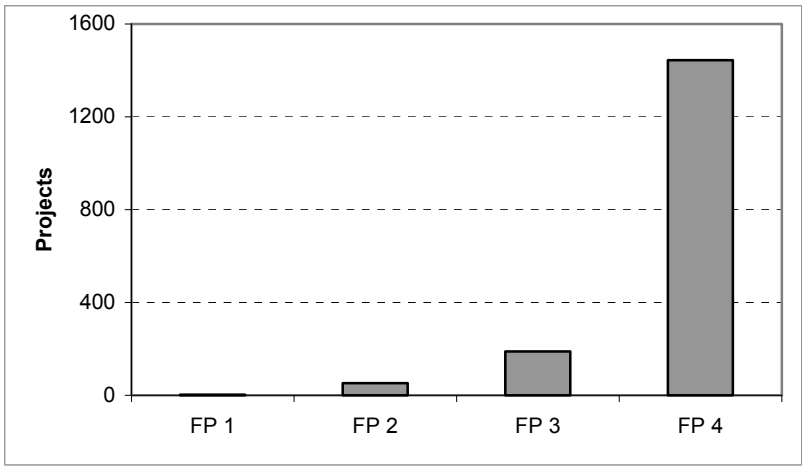
For the empirical analysis of Austria's participation the data from BIT's INNOman database are used. This includes all available data on projects both applied for and successful with Austrian participation (see Säckl et al., 2000). Since a relatively short list of participants exists for individual programmes these programmes have been aggregated into programme groups. This allows for meaningful cross-tabulations. From reasons of comparability and for a more exact assessment of Austrian networking in the European research landscape, official CORDIS data from the European commission will be used in comparing the countries. PROVISO has prepared the CORDIS so as to eliminate double calculations wherever possible.

3.1 Austria's presence in the 4th FP: basic facts

In the entire 4th FP 2,320 Austrian organisations were represented in project proposals. Of these, 1,009 organisations had successful applications totalling 1,444 projects and 1,923 participations. On average there were 1.33 Austrian participations in projects with Austrian presence. A total of 7,164 participations in project proposals and 1,923 successful participations yield a success rate of 26.8%. Membership in the EU has resulted in a quantum leap for Austria's participation in the FPs: in FPs 1, 2 and 3 Austria had a mere 328 participations in 282 projects. The number of participations and projects increased fourfold in the 4th FP (Figure 3).

Cooperative research projects and studies are among the most important types of projects with about 1,200 subsidised participations (60%). They are closely followed by preparatory-, accompanying- and support activities with 285 (approx. 15%) and concerted actions and networks with approximately 270 participations (or just over 14%). Intended demonstration and scholarships (including participations which could not be categorised) comprise only about 100 (resp. 5%) of all Austrian participations.

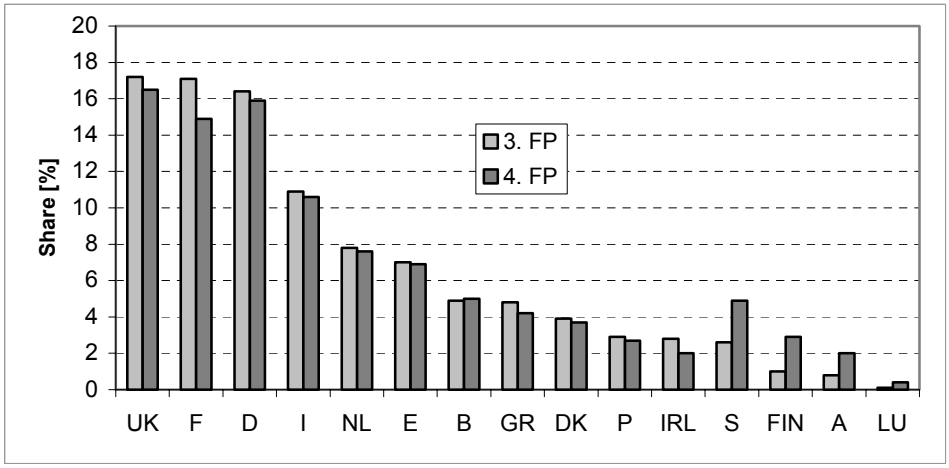
Figure 3: Austria: number of projects within the FP



Source: BIT

The share of participation of all countries shifted in favour of the new member countries with the 4th FP. As Figure 4 shows, the share of participations in the 4th FP drops for most member countries with the exception of all new member countries as well as Luxembourg. The new member countries were able to markedly increase their shares while Finland was most successful, tripling its share of total participations. Austria's share rose by a factor of 2.5 with Sweden clearly behind with a factor of 1.9. In the 4th FP Austria's share is still below that of comparable countries like Finland, Denmark and Portugal. Austria achieves almost exactly the same share as Ireland.

Figure 4: Participation of member countries: development from FP 3 to FP 4 (shares in percent)



Source: Gusmao (1999)

Austria has an 8.7% share of all successful projects as 1,444 projects have Austrian participation. Compared with 5,680 proposed projects with Austrian participation and an 8.2% share of all projects proposed, the successful project share is a bit higher.

All returns from participation in 4th FP amount to over 192 million Euro (~ 2.65 billion ATS) and represent a share of 1.99% of all planned resources for indirect programmes[22]. Measured in this way, Austria's returns are even with Ireland's. This provides interesting opportunities for comparison in regard to the shares of the various types of organisations participating as well as in relation to participation.

[22] The calculation of Austrian returns refers to the data and calculations from the BIT (as of September 1999).

Austrian coordinators submitted 1,124 project proposals. Of these, 270 coordinators were successful. The majority of successful coordinators were from industry (47%) while 26% of coordinators were from universities. The share of coordinators from non-university research institutions is 17%. With 60 coordinators in successful project proposals the ICT programme group has the highest share of Austrian coordinators.

In total, Austria is represented by 1,009 organisations in the 4th FP. Fifty percent of those are commercial businesses, 28% are universities and 13% are non-university research institutions.

Table 9: Austria's presence in the 4th FP, an overview (activities 1-4)

	Project proposals	Approved projects
Participations	7,164	1,923
Projects with Austrian participation	5,680	1,444
Coordinators	1,124	270
Organisations	2,320	1,009
Returns		192,627 million Euro (2.65 billion ATS)

Source: BIT

3.2 Participation by type of organisation

Austrian organisations were represented a total of 7,164 times in proposals. Of these, 1,923 were successful. That is a success rate of 26.8%.

At the participations level, industry had a 39% share of all Austrian participation followed by universities with 31% and the non-university research institutions with 15%.

As Table 10 shows, a total of 2,320 Austrian organisations took part in project proposals in the 4th FP. More than half of the participating organisations come from industry, 24% from universities and 12% from non-university research institutions. This relationship also exists at the successful project proposal level at which 1,009 organisations were participating. The following table provides an overview of the distribution of organisations by type in the 4th FP. If one looks at the organisations with successful project proposals, one sees only slight differences in comparison to the distribution of proposals submitted.

Table 10: Number of organisations by type

	Proposals submitted	Distribution	Successful projects	Distribution	Participations	Distribution
Industry	1,216	52.4%	499	49.5%	750	39%
Universities	560	24.1%	280	27.8%	604	31%
Non-university institutions	292	12.6%	127	12.6%	297	15%
Other[23]	249	10.7%	101	10.0%	222	12%
Unknown	3	0.1%	2	0.2%	50	3%
Total	2,320	100%	1,009	100%	1,923	100%

Source: BIT

If however one looks at the distribution in reference to successful participations one notices very clear differences. This is due to the fact that the average number of participations per organisation clearly varies between the different types of organisations. Industry averages 1.5 participations, university departments 2.1 and non-university research institutes average 2.3 participations.

[23] "Other" includes clubs as well as administrative institutions at different levels.

3.3 Participation by company size

BIT data available allow for differentiation – albeit rough – by company size. The differentiation is made between large companies (with 500 or more employees) and middle and small companies (under 500 employees). It should be noted however that the employment figures are not known for all companies. It was possible to assign the organisations in the category "not possible" to the correct industry and company; nevertheless, an estimate of size was not possible (see Table 11).

Table 11: Number of participations by industry, by size

		Participations by businesses with more than 500 employees	Participations by businesses with less than 500 employees	Participations by businesses where size estimation not possible	Total
Proposals submitted		579	1,554	279	2,412
Successful proposals		181	547	22	750
Distribution of successful participations		24%	73%	3%	100%
By programmes (successful):					
1. Activity	ICT	63	134	11	208
	IMT	54	202	5	261
	BIO	10	53	1	64
	Environment	1	13	-	14
	Energy	34	97	2	133
	Transport	16	21	1	38
	TSER	-	-	-	0
2. Activity	INCO	1	7	-	8
3. Activity	Innovation	2	15	2	19
4. Activity	TMR	-	5	-	5
Σ 4th FP		181	547	22	750
Distribution		24%	73%	3%	

Source: BIT

A clear concentration on both the ICT and IMT groups can be observed at the programme group level. Sixty-three percent of all industry participations can be credited to these two programme groups. Energy is in third place with 133 successful participations (17.7%). This means that about 80% (!) of all (successful) participations take place within the three largest programme groups.

If one looks at the number of all successful participations, 73% take place in companies with fewer than 500 employees. Here there are great differences at the programme level[24]. With 42% and 30% shares in participations by large companies, the programmes Transport and ICT demonstrate above average values. On the other hand IMT and Energy are clearly dominated more by SMEs (77%, resp. 73%).

The success rates of both size classes vary only to a small extent. Approximately 31% of all proposals submitted by large enterprises ended with successful participations. The value for SMEs was about 35%. Consequently there is no marked, systematic correlation between size and the likelihood of success – at least not at the highly aggregated level of a mere two classes defined by business size.

[24] Examining the shares by number of workers employed only makes sense for larger programmes.

3.4 Participation by program

Austria has 1,923 participations distributed with great variety among the individual programmes. At the same time, the distribution at the project level is almost exactly the same as at the participations level. Austrian participation in the individual programmes is displayed in Table 12. It shows industrial and material technologies (BRITON/EURAM) ahead of the others with 324 successful participations (17% of all Austrian participations). The information technology programme ESPRIT is next with 234 successful participations (12%) followed by FAIR (agriculture and fishery) and the "activity 4" – for the education and mobility of scientists (TMR) each with 140 successful participations (7%). In total, these four programmes represent 43% of all participations.

Table 12: Austrian participation by programme group

		Successful projects with Austrian participation	Percentage distribution of the projects	Share of the total number of projects, Europe-wide	Successful Austrian participations	Percentage distribution of the participations
1. Activity	TELEMATIK	89	6.2	12.2	173	9.0
	ACTS	23	1.6	8.2	33	1.7
	ESPRIT	179	12.4	8.7	234	12.2
	BRITE/EURAM	242	16.8	10.4	324	16.8
	SMT	59	4.1	12.7	71	3.7
	ENVIRONMENT	88	6.1	11.0	105	5.5
	MAST	4	0.3	2.9	5	0.3
	BIOMED	104	7.2	15.2	136	7.1
	BIOTECH	46	3.2	9.1	62	3.2
	FAIR	107	7.4	12.1	140	7.3
	JOULE	74	5.1	12.6	109	5.7
	THERMIE A	51	3.5	10.8	68	3.5
	THERMIE B	83	5.7	16.7	89	4.6
	NFS	17	1.2	8.6	18	0.9
	TRANSPORT	48	3.3	14.9	80	4.2
	TSER	31	2.1	19.4	35	1.8
2. Activity	INCO	48	3.3	5.6	54	2.9
3. Activity	INNOVATION	24	1.7	4.3	46	2.4
4. Activity	TMR	127	8.8	3.1	140	7.3
Total 4th FP		1,444	100.0	8.7	1,923	100

Source: BIT

Participations by programme group and type of organisation

Because of the objectives, the individual programme groups are of varying attractiveness to different types of organisations. Table 13 shows both the absolute number as well as the relative share of participations by type of organisation in programme groups. It can be observed that different types of organisations dominate the different programmes:

- Industry has a 66% share of the programme group IMT followed by Transport (about 48%), ICT and Energy (each 47%).
- The universities clearly dominate the TMR programme with 72% followed by INCO (51%), BIO (48%) and Environment (47%).
- The non-university organisations dominate one single programme, namely the TSER Programme with 54% (relatively small based on the number of participations).

Table 13: Successful Austrian participations by type of organisation and programme group

		Absolute number of participations						Share of participations in %					
		IND	UNI	NURI	OTHER	unknown	Total	IND	UNI	NURI	OTHER	unknown	Total
1. Act.	ICT	208	101	59	72		440	47.3	23.0	13.4	16.4	0.0	100.0
	IMT	261	84	41	9		395	66.1	21.3	10.4	2.3	0.0	100.0
	BIO	64	163	71	6	34	338	18.9	48.2	21.0	1.8	10.1	100.0
	Environment	14	52	31	13		110	12.7	47.3	28.2	11.8	0.0	100.0
	Energy	133	41	21	89		284	46.8	14.4	7.4	31.3	0.0	100.0
	Transport	38	17	19	6		80	47.5	21.3	23.8	7.5	0.0	100.0
	TSER	0	14	19	2		35	0.0	40.0	54.3	5.7	0.0	100.0
2. Act.	INCO	8	28	14	5		55	14.5	50.9	25.5	9.1	0.0	100.0
3. Act.	Innovation	19	3	3	5	16	46	41.3	6.5	6.5	10.9	34.8	100.0
4. Act.	TMR	5	101	19	15		140	3.6	72.1	13.6	10.7	0.0	100.0
Total		750	604	297	222	50	1,923	39.0	31.4	15.4	11.5	2.6	100.0

Source: BIT

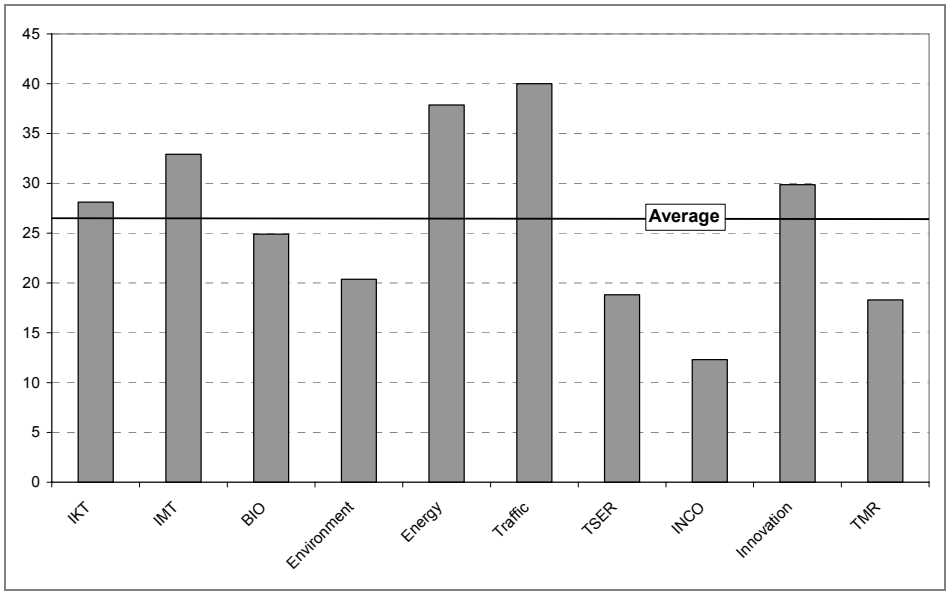
It should be noted that the shares of the different types of organisations also vary markedly. To account for this, a so-called Chi-square-test was calculated. This test examines if the distribution of a multi-dimensional cross-table deviates with any statistical significance from the zero-hypothesis of equal distribution. The basis of the test creates a comparison of the observed distribution with the distribution, which should result given equal distribution. The actual observed frequency in one cell of the cross-table is compared with the corresponding expected frequency value[25]. The results of the Chi-square-test show a statistically significant correlation between type of organisation and programme type in relation to project participations. The margin of error is clearly below the normal critical value ($p < 0.01$).

3.5 Success rates by programme group

The success rates (relationship between successful participations and participation in project proposals submitted) vary greatly between the programme groups (Figure 5). The average success rate is 27%. The highest success rate comes from Austrian participation in the Transportation programme with a 40% share of successful participations. The Energy programme yields a success rate of 38%. In Austria's most important programme in terms of the number the participations (and also of the rate of returns), the IMT, a success rate of 33% is achieved. The success rate in the second most important programme, the ICT, is 28%. The success rates for INCO (12.3%), TMR and TSER (each approx. 18%) are particularly low. But, from a quantitative volume standpoint, the last two programmes mentioned are of comparatively less significance. Based on this criterion, "activity 2" INCO performs worst. The following depicts the results for the specific programmes of "activity 1": 45% of participations in proposals submitted were successful in the energy programme for nuclear safety (NFS). This programme only represents 1% of all Austrian participations. The success rates for the two biggest programmes BRITON/EURAM and ESPRIT are 34% and 28% respectively. Figure 6 shows the absolute number of participations (submitted and successful).

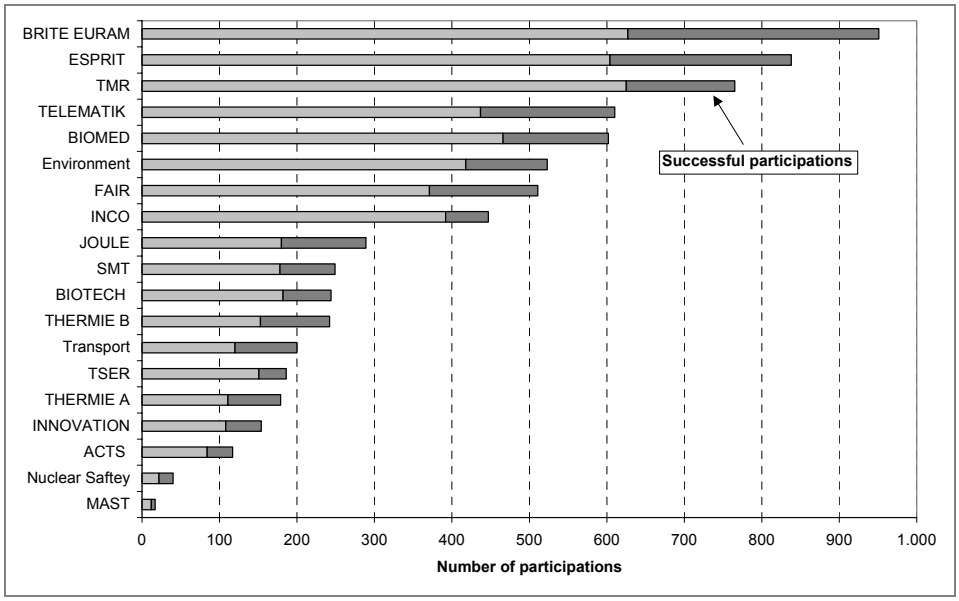
[25] The expected value for a cell is calculated by multiplying both peripheral sums and dividing that product by the total sum of the cross-table.

Figure 5: Success rates by programme group



Source: BIT, internal calculations

Figure 6: Austrian participation by programme (absolute values)



Source: BIT

Success rate by type of organisation and programme group

The differences in success rates are not very distinct at the organisation level. The value for industry is approximately 31%, followed by 28% for non-university research institutions and universities with 26% (the category "other organisations" attains an success rate of 34%). Interestingly enough, the success rates specific to the programme groups distinguish themselves between the individual types of organisations likewise not excessively – with the exception of some smaller programmes and some extreme cases (e.g. in Transport, where the non-university research institutions have an unusually high success rate of 56%). For instance, in the most (quantitatively) significant programme group, ICT, the success rates for the three types

of organisations - industry, universities and non-university research institutions - range between 27% (industry) and 28% (non-university institutions) (see Table 14). The low success rate of the universities in the TSER programme is noteworthy. Here, the non-university research institutions are clearly ahead of the universities with a 23% success rate versus 18%.

Table 14: Programme- and organisation-specific success rates by participations (in percent)

		IND	UNI	NURI	OTHER	Unknown	Total success rate
1. Activity	ICT	27.1	27.6	28.0	32.6		28.1
	IMT	33.5	31.5	30.8	42.9		32.9
	BIO	30.2	30.5	31.8	18.2	9.6	24.9
	Environment	18.9	19.5	19.0	36.1		20.4
	Energy	39.0	36.3	30.9	39.0		37.9
	Transport	39.2	29.8	55.9	50.0		40.0
	TSER	0.0	18.4	23.8	9.1		18.8
2. Activity	INCO	11.6	10.8	16.3	15.2		12.3
3. Activity	Innovation	33.3	30.0	33.3	25.0	27.6	29.9
4. Activity	TMR	62.5	27.3	28.4	68.2	0.0	18.3
Success rate		31.1	26.0	27.7	34.3	7.0	26.8

Source: internal calculations based on BIT data

3.6 Participation by province

At first glance, the shares of participations in the provinces naturally reflect their varying sizes. (number of businesses, universities, non-university research institutions and other institutions) (see Table 13). Nevertheless there are some interesting peculiarities, which are not merely the result of size (in the above sense):

- Vienna – not surprisingly – has the largest share of most programme groups. Especially above-average shares (measured against the entire Viennese share of 41%) are found in the TSER and Transport (each 74%) programme groups, TMR (57%), INCO (56%) and BIO (49%). These above average shares are mainly due to Vienna's university departments (TSER, TMR, BIO). Vienna has strong below-average shares in Energy (25%) and IMT (27%). The last programme group is generally the one with most even distribution across the individual provinces.
- With 25% of all Austrian participations, Styria achieves the highest share of all provinces in the programme group Energy (against the Styrian share of Austria of 18%). Upper Austria is third with a 12% share. Upper Austria's highest shares at the programme group level are found in Energy (about 22%), IMT (18%) and ICT (approx. 16%).

Table 15: Successful participation in the provinces by programme group (rates in %)

Activity	Programme group	B	K	N	O	Sa	St	T	V	W	Unknown	Absolute total
1. Act.	ICT	0.5	3.0	5.5	15.9	4.3	18.4	3.4	1.6	45.9	1.6	440
	IMT	0.3	4.1	16.7	18.2	3.3	20.8	7.1	1.3	27.3	1.0	395
	BIO	0.3	1.5	10.7	3.6	2.1	10.9	8.3	1.8	48.8	12.1	338
	Environment	0.0	0.0	12.7	4.5	3.6	18.2	13.6	1.8	45.5	0.0	110
	Energy	0.7	4.9	10.2	21.8	4.2	25.0	7.0	0.7	24.6	0.7	284
	Transport	0.0	0.0	2.5	2.5	2.5	15.0	3.8	0.0	73.8	0.0	80
	TSER	0.0	2.9	8.6	2.9	5.7	5.7	0.0	0.0	74.3	0.0	35
2. Act.	INCO	0.0	0.0	14.5	1.8	0.0	27.3	0.0	0.0	56.4	0.0	55
3. Act.	INNOVATION	2.2	0.0	13.0	6.5	6.5	15.2	2.2	2.2	13.0	39.1	46
4. Act.	TMR	0.0	0.0	4.3	3.6	0.7	14.3	10.7	0.0	57.1	9.3	140
	Total	0.4	2.5	10.1	12.1	3.3	18.0	6.5	1.2	41.4	4.4	1,923

Source: BIT

3.7 Monetary returns

The monetary returns to Austrian organisations from participation in 4th FP were altogether 192.6 million Euro (2.65 bill. ATS).[26] This represents an Austrian share of about 2% of all EU resources for the 4th FP (excluding resources promised for the JRC). The ESPRIT programme achieves the most returns with about 37 million Euros (approx. 19%). Second is BRITON/EURAM (30.4 million Euro and approx. 16%) followed by TELEMATICS (17.9 million Euro, approx. 9%). The smallest programmes by returns are MAST (0.9 million Euro and 0.5%) and NFS (1.4 million Euro and 0.8%).

By comparing the respective Austrian shares of the total EU resources for the given programme with Austria's average share of 2%, it can be determined if a programme in Austria is represented above or below average with regard to monetary returns (see Table 16). The programmes INNOVATION (Austrian share of all EU resources of 5.2%), THERMIE A (3.7%), THERMIE B (2.8%), SMT (2.6%), and TELEMATICS (2.5%) are particularly above average. On the other hand in the MAST (0.5%), ACTS (1.0%), INCO (1.0%) and NFS (1.1%) programmes, relatively low returns were achieved in comparison to the Austrian average.

[26] BIT data as of September 1999

Table 16: Monetary returns at the programme level (in '000 Euro) – as of September 1999

	Program	EU-wide returns	Returns to Austria	EU share (in %)	Austrian share (in %)	Austrian share of the EU
1. Activity	TELEMATIK	727,873	17,905	7.5	9.3	2.5
	ACTS	644,216	6,648	6.7	3.5	1.0
	ESPRIT	1,932,500	36,959	20.0	19.2	1.9
	BRITE/EURAM	1,595,376	30,366	16.5	15.8	1.9
	SMT	156,060	4,021	1.6	2.1	2.6
	ENVIRONMENT	498,553	9,928	5.2	5.2	2.0
	MAST	183,138	913	1.9	0.5	0.5
	BIOMED	336,057	5,856	3.5	3.0	1.7
	BIOTECH*	400,113	7,496	4.1	3.9	1.9
	FAIR	543,748	10,942	5.6	5.7	2.0
	JOULE**	480,525	10,739	5.0	5.6	2.2
	THERMIE A	436,220	16,096	4.5	8.4	3.7
	THERMIE B	76,985	2,143	0.8	1.1	2.8
	NFS	130,000	1,446	1.3	0.8	1.1
	TRANSPORT	249,599	6,060	2.6	3.1	2.4
	TSER	91,500	2,096	0.9	1.1	2.3
2. Activity	INCO	317,000	3,102	3.3	1.6	1.0
3. Activity	INNOVATION	112,600	5,877	1.2	3.1	5.2
4. Activity	TMR	758,314	14,033	7.8	7.3	1.9
Total 4th FP		9,670,466	192,627	100.0	100.0	2.0

* EU-wide details are missing the sum for the 4th call

** In the EU-wide details the research unit JOULE as well as the demonstration unit (THERMIE A) and the supporting measures unit (THERMIE B) are recorded in one sum.

Source: BIT

Each Austrian participation costs an average of about 100,000 Euro (1.37 million ATS). The programme level shows, as expected, a broad range in regard to the average size per participation. Leading in returns per participation is the Energy programme with 234,000 Euro per participation. This high value is mainly due to the high share of the demonstration unit THERMIE A. ACTS is second with just over 200,000 Euro per participation. MAST (183,000 Euro) and ESPRIT with 158,000 Euro per participation are third and fourth respectively. BIOMED is last with 43,000 Euro per participation. At the aggregated level, the highest average returns per successful participation were achieved in the programme group ICT with about 140,000 Euro. Programme groups TSER and INCO with just 60,000 and 56,000 Euro respectively bring up the rear.

It is interesting to note that when measured by absolute returns Ireland is even with Austria[27]. Nevertheless the division of returns as well as participations provides a very heterogeneous image: with 1479 participations in the 4th FP, Ireland lies clearly below the number of participations of Austrian organisations. Given equally high resource returns, the yield is a return/participation of 129,600 Euro for Ireland, thus markedly higher (by about 30%) than the Austrian average (Table 17, Figure 7). The higher returns per participation in Ireland can either be attributed to the fact that, Ireland generally takes part in projects with higher volumes or that the Irish share of the projects is on average higher than Austria's (of course, a combination of both components may also lead to the higher average returns).

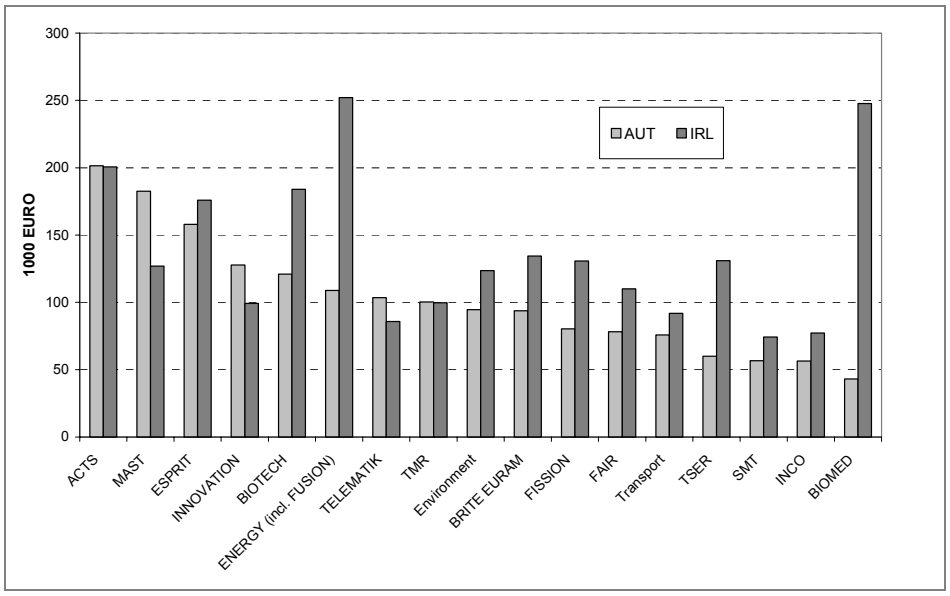
[27] The secondary statistical analysis of the Irish impact study is based on a database prepared by Forfas (The National Policy and Advisory Board for Enterprise, Trade, Science, Technology & Innovation).

Table 17: Comparison of the monetary returns of Austria and Ireland

		Austria			Ireland		
		Distribution of returns	Distribution of participation	Returns per participation in K Euro	Distribution of returns	Distribution of participation	Returns per participation in K Euro
1. Activity	ICT	31.9	22.9	139.8	38.5	35.4	141.1
	IMT	17.9	20.5	87.1	17.8	18.9	122.3
	BIO	12.6	17.6	71.9	17.1	16.1	138.3
	Environment	5.6	5.7	98.6	5.9	6.2	125.2
	Energy	15.8	14.8	107.1	4.9	2.7	233.9
	Transport	3.1	4.2	75.8	0.9	1.4	91.9
	TSER	1.1	1.8	59.9	1.3	1.3	130.9
2. Activity	INCO	1.6	2.9	56.4	1.9	3.2	77.2
3. Activity	INNOVATION	3.0	2.4	127.8	3.0	4.0	99.3
4. Activity	TMR	7.3	7.3	100.2	8.4	11.0	99.6
Total		100	100	100.2	100	100	129.6

Source: BIT, Guy et al. (1999)

Figure 7: Monetary returns per participation: comparison of Austria and Ireland



Source: BIT, Guy et al. (1999)

Monetary returns by type of organisation

If one examines the returns by type of organisation it becomes clear that businesses achieve the greatest share (42.1%) with 81.1 million Euro. They are followed by universities with 65.9 million Euro (34.2%) and non-university research institutions with about 28 million Euro (14.5%). As expected, there are differences between the programme groups with respect to this ranking. This is because the number of participations demonstrates a systematic relationship between the type of organisation and the programme group. Business is clearly the leader in programme groups ICT, IMT, Energy, Transport and INNOVATION with regard to mid-term returns. The universities lead in programme groups BIO, Environment, Transport, INCO and TMR, the non-university research institutions in TSER (Table 18).

Table 18: Austrian organisations and dedicated resources (in K Euro)

Activity	Programme group	IND	UNI	NURI	OTHER	Unknown	Total
1. Activity	ICT	31,541	15,253	8,136	6,582		61,512
	IMT	22,068	8,593	3,433	294		34,387
	BIO	3,368	15,550	3,607	138	1,631	24,294
	Environment	650	6,163	2,924	1,104		10,841
	Energy	17,300	5,161	3,064	4,898		30,424
	Transport	2,623	1,717	1,634	86		6,060
	TSER	0	1,014	1,055	28		2,096
2. Activity	INCO	405	1,828	604	264		3,102
3. Activity	INNOVATION	2,774	312	1,053	1,738		5,877
4. Activity	TMR	404	10,292	2,457	881		14,033
Total 4th FP		81,133	65,884	27,966	16,013	1,631	192,627

Source: BIT

Differences, with respect to the level of the average returns, are also apparent among the different types of organisations. While industry and universities (with an average of 108.2 and 109.1 K Euro respectively) are able to earn equally high returns per successful participation, non-university research institutions (94.2 K Euro) and even more so the “other” institutions (72.1 K Euro) are well below the Austrian average of 100.2 K Euro. The average returns by type of organisation and programme group are not uniform (Table 19). For instance industry is able to achieve the highest returns per participation in the ICT programme group. At the same time the universities or non-university research institutions achieve the highest average returns in other programme groups. Examining the trend does however lead to the conclusion that the final group, "other“, (with some exceptions in smaller programme groups) consistently achieves the lowest average returns.

Table 19: Average returns (per participation) by type of organisation and programme group (in K Euro)

Course of action	Programme group	IND	UNI	NURI	OTHER	Unknown	Total
1. Activity	ICT	151.6	151.0	137.9	91.4	-	139.8
	IMT	84.6	102.3	83.7	32.6	-	87.1
	BIO	52.6	95.4	50.8	23.0	48.0	71.9
	Environment	46.4	118.5	94.3	84.9	-	98.6
	Energy	130.1	125.9	145.9	55.0	-	107.1
	Transport	69.0	101.0	86.0	14.3	-	75.8
	TSER	-	72.4	55.5	14.0	-	59.9
2. Activity	INCO	50.7	65.3	43.1	52.9	-	56.4
3. Activity	INNOVATION	146.0	104.1	351.0	347.7	0.0	127.8
4. Activity	TMR	80.8	101.9	129.3	58.7	-	100.2
Total 4th FP		108,2	109.1	94.2	72.1	32.6	100.2

Source: internal calculations based on BIT data

3.8 Austrian coordinators

Austria participated in 1,444 subsidised projects of which 270 were coordinated by Austrian organisations. Finland’s share of coordinated projects is 18.2% while Ireland’s is 17%. The distribution of coordinators by type of organisation reveals a clear excess of coordinators from industry. Table 20 shows that nearly half of the Austrian coordinators come from industry while 26% come from universities and 17% from non-university research institutions.

Table 20: Austrian coordinators by type of organisation

	Proposals submitted	Distribution	Successful proposals	Distribution	Success rate
Industry	461	41%	126	47%	27.3%
Universities	376	33%	70	26%	18.6%
Non-university institutions	204	18%	45	17%	22.1%
Other	83	7%	29	11%	34.9%
Unknown	0	0%	0	0%	
Total	1,124	100%	270	100%	24.0%

Source: BIT

There is a clear difference between the category industry (where 27.3% of all coordinators are successful) and universities (where a mere 18.6% are successful) when measured by the relationship of proposals submitted to those successful. Non-university institutions are in the middle with 22.1%. Most successful however is the very heterogeneous "other" category with almost 35% of all coordinators successful. In total Austrian organisations have a success rate of 24%.

With 60 coordinators (of them 31 from industry) the ICT programme group is, quantitatively, most significant followed by IMT (49 Austrian coordinators) and Energy (47 coordinators). With the exception of some smaller programme groups, coordinators from industry comprise the most significant group in all programme groups (see Table 21).

Table 21: Coordinators by programme group and type of organisation

		IND	UNI	NURI	OTHER	Total
1. Activity	ICT	31	15	11	3	60
	IMT	38	4	5	2	49
	BIO	15	20	5	0	40
	Environment	3	9	4	1	17
	Energy	24	3	4	16	47
	Transport	4	4	4	0	12
	TSER	0	1	2	1	4
2. Activity	INCO	4	5	5	1	15
3. Activity	Innovation	7	0	2	4	13
4. Activity	TMR	0	9	3	1	13
Total		126	70	45	29	270

Source: BIT

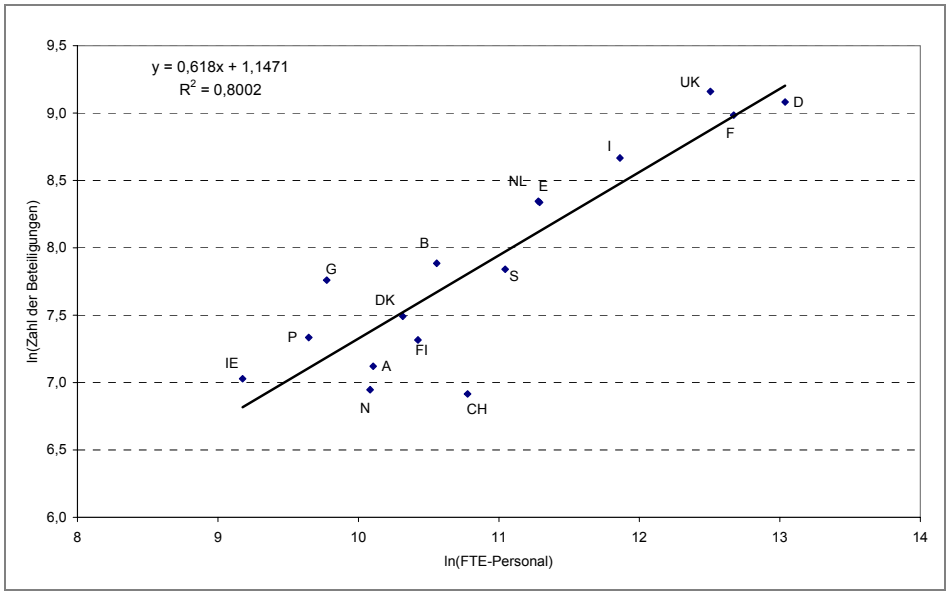
3.9 Participation in the 4th FP, an international comparison

An international positioning of the individual countries with respect to their participation in 4th FP must, understandably, account for the size differences between the participating countries. Therefore, Figure 8 shows the number of participations in the separate countries given the respective number of RTD-personnel.[28] It actually shows an impressive relationship between these two factors: The number of RTD-personnel can explain 80% of the variance in relation to the number the participations ($R^2 = 0.80$). The other 20% are then due to other factors not discussed here. The trend-line shows if a country has the expected number of participations given its size (measured in RTD-staff). Countries below the line have "too few" participations and vice versa. Not surprisingly, non-EU members Norway and Switzerland lie furthest below the trend-line. Further, all new member states (i.e. those joining in 1995, namely Finland, Austria and Sweden) also lie below the line. Therefore their number of participations is (still) less than would be expected based on their RTD-

[28] The absolute values have been rounded to facilitate graphic display.

personnel. The fact that Austria lies clearly below Finland and especially Sweden along the trend line indicates that there is still potential for a "catching-up" process in Austria and that the learning process as it relates to participation in the 4th FP occurred somewhat slower than in the other two neo-member states.

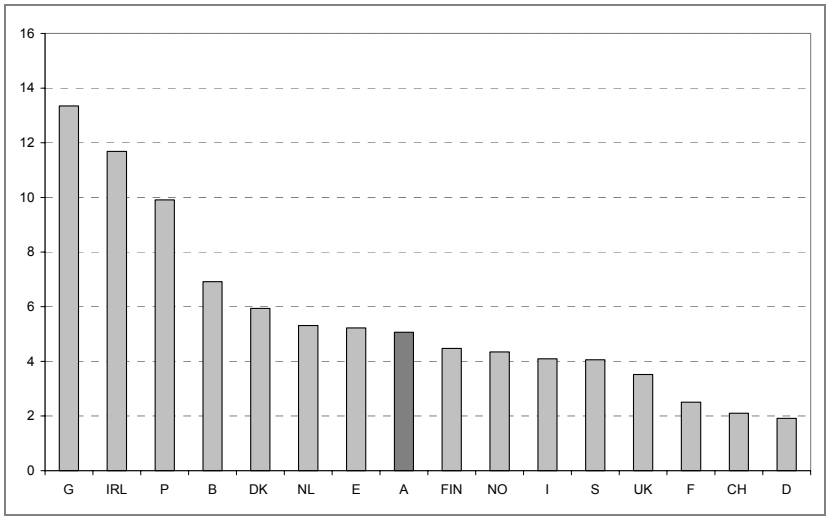
Figure 8: Relationship between R&D staff and the number of successful participations



Source: internal calculations based on data from PROVISO and OECD

Another way to clear away the varying factors among the participating countries is of course an examination of intensities, e.g. how many participations are achieved per 100 RTD-employees. Corresponding information can be found in Figure 9. The differences are considerable. They range from scanty under 2 participations per 100 RTD-employees in Germany to somewhat over 13 participations in Greece. The average of all participating states lies at 2.5 participations per 100 RTD-employees. With an intensity of 5.1 participations Austria is clearly above the average (which, based on "weighting" the larger countries like France and Germany is brought down). In non-weighted comparison, Austria is merely in the middle of the pack.

Figure 9: Number of participations per 100 RTD-employees

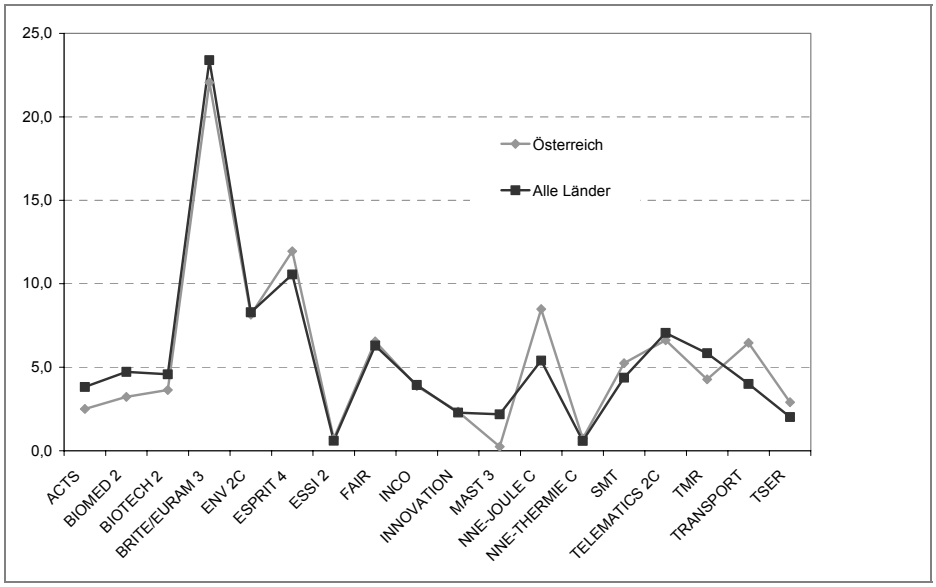


Source: internal calculations based on data from PROVISO; OECD

3.9.1 International patterns of participation

Comparing the distribution of Austrian participations across the programmes with the distribution of all participating countries is quite revealing. Figure 10 shows that the Austrian pattern of distribution is very similar to the European pattern. Those programmes, which achieve the highest shares across Europe, also achieve the highest shares in Austria. The correlation coefficient between the distributions is 0.96.

Figure 10: Percentage distribution of successful participations in the programmes: Austria-EU



Source: PROVISO

The correlation matrix for participation profiles in Table 22 also shows a very uniform pattern of participation between the separate countries. The only exceptions are Luxembourg, Norway and Switzerland – none of which are EU member states. This indicates limited differences between countries in terms of programme participation (in terms of the share individual programmes have of the total number of participations of the given country). Austria's correlation coefficients range between 0.61 (Austria – Luxembourg) and 0.96 (Austria – Spain or Germany). They generally lie above 0.9. This also applies to most other countries. The participation of any nation shows a correlation coefficient on average over 0.95 to the EU average and

therefore strong similarity. Exceptions are the non-member states as well as Ireland (0.89) and Denmark (0.85).

This similarity leads to the conclusion that the participation is essentially determined by the structure, i.e. the endowment of the individual programmes. This is further supported by chapter 2's reference to the heterogeneousness and diversity of specialisation and research expenditures within Europe. None of that is recognisable in the patterns of participation – on the contrary. Over the course the FP, a high level of convergence could therefore be achieved in participation. There were a few exceptions: it is not surprising that Austria is represented below average in its participation in MAST – the programme for oceanic sciences.

The resulting high correlation in the participation of the member states, determined by structure and above all the finances of the individual programmes, seems absolutely understandable. But it only becomes interesting with the resulting implications. Based on the recognition of growing technological specialisation within Europe (see chapter 2), participation in the FP could have reflected this development – an opinion supported by the European Commission.

> *All Member States participated intensively in the 4th FP Programme. The participation of the Member States in the different specific programmes, however, varied specifically as a function of their scientific and technological specialisation* (European Commission, DG Research: Towards a European Research Area, Science, Technology and Innovation, Key Figures 2000, p. 83).

It should be noted that the data collected by the commission (on the participations in the programmes in all countries) shows a high correlation comparable to our results, whereby this empirical basis also suggests a different conclusion than that obtained by the European Commission.

Table 22: Correlation matrix for participation profiles of participating countries

	AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	NO	PT	ES	SE	CH	GB	EU
AT	1																	
BE	0.94	1																
DK	0.87	0.79	1															
FI	0.94	0.93	0.85	1														
FR	0.94	0.98	0.8	0.91	1													
DE	0.96	0.97	0.82	0.92	0.98	1												
GR	0.91	0.89	0.79	0.9	0.87	0.86	1											
IE	0.83	0.93	0.7	0.85	0.89	0.85	0.87	1										
IT	0.95	0.96	0.8	0.95	0.98	0.98	0.9	0.87	1									
LU	0.61	0.68	0.38	0.59	0.62	0.64	0.72	0.68	0.68	1								
NL	0.94	0.93	0.88	0.95	0.95	0.95	0.82	0.81	0.94	0.5	1							
NO	0.77	0.72	0.78	0.82	0.75	0.72	0.84	0.72	0.81	0.52	0.76	1						
PT	0.93	0.96	0.83	0.94	0.94	0.94	0.88	0.88	0.94	0.63	0.93	0.77	1					
ES	0.96	0.97	0.83	0.93	0.98	0.97	0.92	0.91	0.98	0.69	0.93	0.81	0.97	1				
SE	0.95	0.95	0.88	0.96	0.96	0.97	0.84	0.84	0.97	0.58	0.99	0.78	0.95	0.96	1			
CH	0.76	0.71	0.78	0.77	0.76	0.74	0.75	0.69	0.79	0.36	0.75	0.74	0.64	0.75	0.76	1		
GB	0.92	0.95	0.82	0.9	0.99	0.97	0.83	0.84	0.96	0.55	0.96	0.73	0.93	0.95	0.96	0.74	1	
EU	0.96	0.98	0.85	0.95	0.99	0.99	0.90	0.89	0.99	0.63	0.97	0.79	0.96	0.99	0.98	0.78	0.98	1

Source: internal calculations based on Data from PROVISO

Wherein lie the reasons for this high correlation of participation behaviour in the individual countries?

- The structure of the FP determines participation when for instance programmes with vast financial resources also show high participation by all countries. This explains the high percentage share of participation in programmes like Brite/Euram or Esprit.

- The high correlation can be explained by a further structure effect. The European Commission does not promote single participations in the FP. If this would be the case, the national patterns of specialisation would be found in the FP. The European Commission furthers **projects,** which are submitted by consortia from several countries. The subsidy of a project results in the promotion of participation by several countries thus explaining the high correlation. In furtherance of this thought, if only project consortia from the 15 member states would be subsidised, this would yield a correlation coefficient of 1. Since most project applications fall somewhere between these extremes, on the one hand certain specialisations can be observed in the countries (see the following chapter) while on the other hand the high correlation in participation is explained.

3.9.2 Austrian specialisation

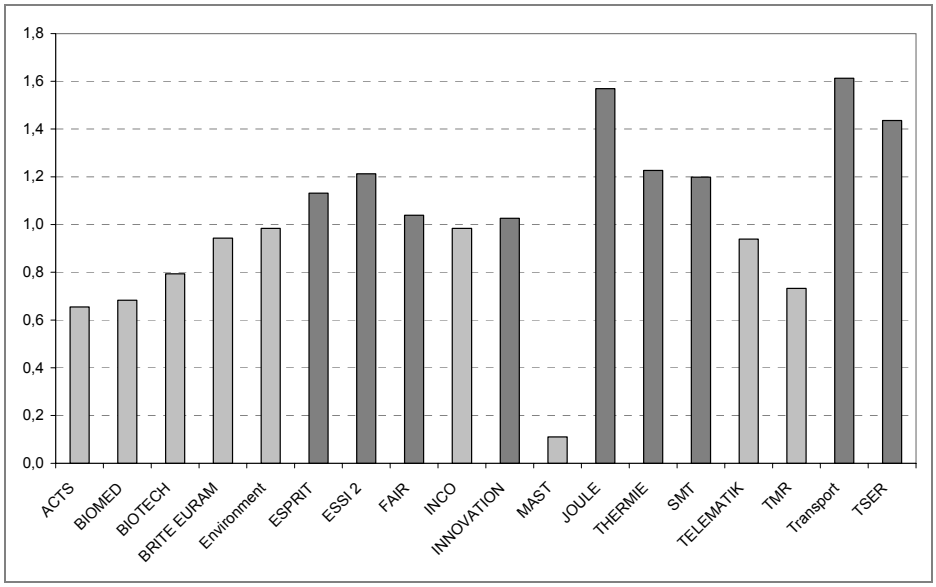
In order to be able to appraise the (relative) patterns of specialisation in Austria in regard to participation in the separate programmes, so-called RCA values have been calculated. This index (*RCA ... Revealed Comparative Advantage)* was developed in empirical foreign trade research and measures above- (as well as below-) average participation in a programme in comparison to the total share of all participations. It is formally defined as follows:

$$RCAj = \frac{\frac{B_{ij}}{\sum_j B_{ij}}}{\frac{\sum_i B_{ij}}{\sum_i \sum_j B_{ij}}}$$

where B_{ij} is the number of participations of country i in programme j. The RCA value compares the share of a programme within a country with the share this programme in a given group of countries. If the RCA value of a programme is over 1, this programme has above average representation in all participations in comparison to the total national share. Figure 11 shows the RCA values for Austria for the programmes specified. Programmes in which Austria has values over 1 are projects where Austria displays relative strengths. Deficits exist in programmes with values under 1 as Austria's participation is (relatively) under represented.

Austria has the highest RCA values (approx. 1.6) in programmes Transport and Joule. These are followed by TSER (approx. 1.4) and THERMIE, ESSI 2, SMT (each 1.2) as well as ESPRIT (approx. 1.15). The lowest RCA values - and therefore the greatest relative deficits – are found in the MAST (0.1), ACTS, BIOMED (each scanty over 0.6), TMR (approx. 0.75) and BIOTECH (0.8) programmes.

Figure 11: Austria's RCA-values in the specific programmes



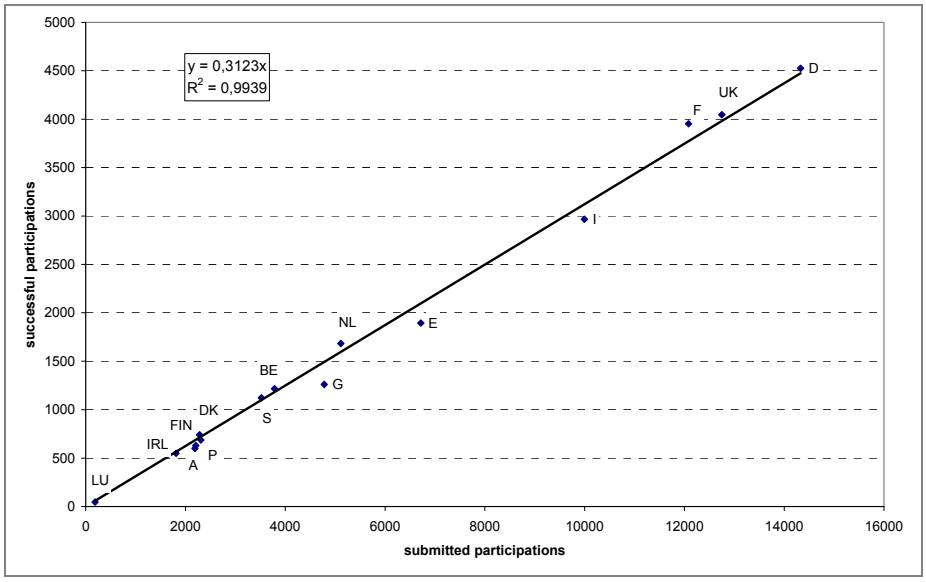
Source: internal calculations based on Data from PROVISO

Austria's relative specialisation must be viewed against the background that – as shown in the correlation analysis discussed above – the differences in the patterns of participation between Austria and the other participating states are altogether very small. Therefore it must be assumed that the respective endowments for the programmes from the EU have a decisive influence on the distribution of the national participations. Marked deviations for Austria are above all found in MAST (where Austria as an interior country is hardly represented) as well as in ACTS, BIOMED and BIOTECH where Austria faces below-average representation. They are also found in THERMIE and CARRIAGE (where Austria sees above-average representation).

3.9.3 Comparison of the success rates

The observation of high similarity in the patterns of participation of the separate countries leads to the speculation that success rates across the countries are similarly high (or low). The following Figure 12 completely supports this hypothesis. With an R^2=0.99, the relationship between submitted and successful participations for all of the countries lies nearly on one trend-line.

Figure 12: Success rates by country



Source: PROVISO; the data apply to the following programmes: Environment, TSER, ACTS, ESPRIT, Brite Euram, Transport, Joule

All the same, the diagram shows an amazing result. When, as submitted above, the number of researchers is an essential, explanatory determinant of participation, Greece represents an obvious contradiction. Greece has twice as many participations as Finland and is ahead of Sweden and Belgium. Measured by the number of researchers, Greece is in first place. This is a long-discussed phenomenon and the reasons for Greece's strong presence are difficult to pin down and this study does not go into further detail. The fact is however, that the European FP is an important source of financing and finances 15% of all R&D in Greece (GERD). Despite this strong presence, Greece's success rate is among the lowest at 26%, thus not confirming a suspicion of *selection bias* during project selection. Austria also lies below the trend-line with just over 27%. The line depicts a success rate of 31% for all countries.

As similar as the success rates across the countries are, within the programmes, they vary. Austria has its highest success rate in TSER and the Transport programme places in the upper third. In the IT-related programmes ACTS and Esprit, Austria is below the European average (see Table 23).

Table 23: Success rates by countries and programmes

	Environment	TSER	ACTS	Esprit	Brite Euram	Transport	Joule
AT	22.3	26.1	25.7	27.1	23.2	42.5	30.1
BE	25.8	22.0	41.0	32.3	29.0	38.3	32.1
DE	29.9	22.8	36.8	32.0	29.9	38.8	29.3
DK	31.2	24.7	37.0	34.5	24.3	43.0	34.8
ES	24.1	16.9	33.0	30.6	24.7	37.3	24.8
FI	25.9	24.0	44.8	27.1	23.7	42.5	35.0
FR	28.7	23.2	36.4	33.3	29.6	46.9	30.7
GB	29.7	22.7	37.2	32.2	30.1	36.8	30.6
GR	19.5	17.8	32.5	27.3	20.6	32.6	29.2
IE	28.7	17.1	35.9	33.4	28.8	40.4	12.8
IT	25.2	18.0	39.1	31.5	27.8	33.1	24.5
LU	0.0	18.1	30.0	25.9	30.2	0.0	20.0
NL	29.1	24.6	37.8	32.7	30.1	44.1	32.8
PT	21.3	19.6	36.3	28.2	26.2	36.9	33.4
SE	26.9	24.2	35.5	31.2	31.9	38.4	33.1

Source: PROVISO

3.9.4 Austria's cooperative relationships in the 4th FP - cooperation with 3rd countries

Table 24 shows that the trans-national components of cooperation between countries play a great role. These relationships are not exclusive to the member states. In the course of the 4th FP cooperative relationships with the new member countries were established in common programmes – even if only to a very small extent. Nevertheless, it is the case with Austria that across all programmes most cooperative relationships exist with the large member states, especially Germany with 20%. Great Britain, France and Italy are about even, each representing between 10% and 12% of all Austrian cooperative relationships. The national degree of networking at the European level is however low: about 5% of all cooperative relationships apply to relationships between Austrian participants. This can also be explained by the structure of EU projects. Less often partners from one country join together. Instead partners try to achieve a high degree of integration with other member states.

Cooperative relationships to the new member countries represent 2.1% in the 4th FP. It is expected that this share will markedly increase over the course of the 5th FP.

Table 24: Austria's cooperative relationships in the 4th FP

	Cooperative relationships (%)
Germany	20.0
U.K.	11.7
France	10.1
Italy	9.7
Netherlands	6.3
Spain	5.8
Austria	4.7
Sweden	4.6
Belgium	4.4
Greece	3.3
Denmark	3.3
Finland	3.1
Switzerland	2.6
Portugal	2.3
Ireland	2.0
Norway	1.6
Hungary	0.7
Czech Republic	0.4
Slovenia	0.4
Poland	0.4
Luxemburg	0.3
Slovak Republic	0.2
Bulgaria	0.1
Others	2.0
Total	100.0

Source: CORDIS according to PROVISO calculations (as of 04/2000)

A separate activity (Activity 2), INCO, was created in the 4th FP with the goal of promoting collaboration with third countries (non-EU countries). The INCO programme is focussed on scientific-technical collaboration with Central and Eastern Europe (CEE) and the newly independent states of the former Soviet Union (INCO-Copernicus-Programme) and the collaboration with so-called developing countries (INCO-DC-Program). The predominant share of the participation from the CEE states is found in the INCO-Copernicus-Programme. Within the INCO programme however, resources were allotted for the participation of CEE countries in specific programmes.

Table 25 shows the successful participation of the CEE countries in INCO programme projects with Austrian participation. Here it can be seen that, as calculated across all the other programmes, the predominant share of Austrian cooperation partners in the INCO Programme comes from Hungary (23%). Fourteen percent of all cooperation partners in INCO come from the Slovak Republic as well as from the Czech Republic.

Table 25: Successful participations of the CEE states in projects with Austrian participation in the INCO Programme

	INCO	
	Participations	Distribution [%]
Hungary	28	22.8
Slovak Republic	17	13.8
Czech Republic	17	13.8
Poland	15	12.2
Bulgaria	14	11.4
Romania	13	10.6
Slovenia	13	10.6
Lithuania	3	2.4
Latvia	2	1.6
Estonia	1	0.8
Total	123	100

Source: BIT

3.10 Benchmark figures of Austrian participation in EUREKA and COST

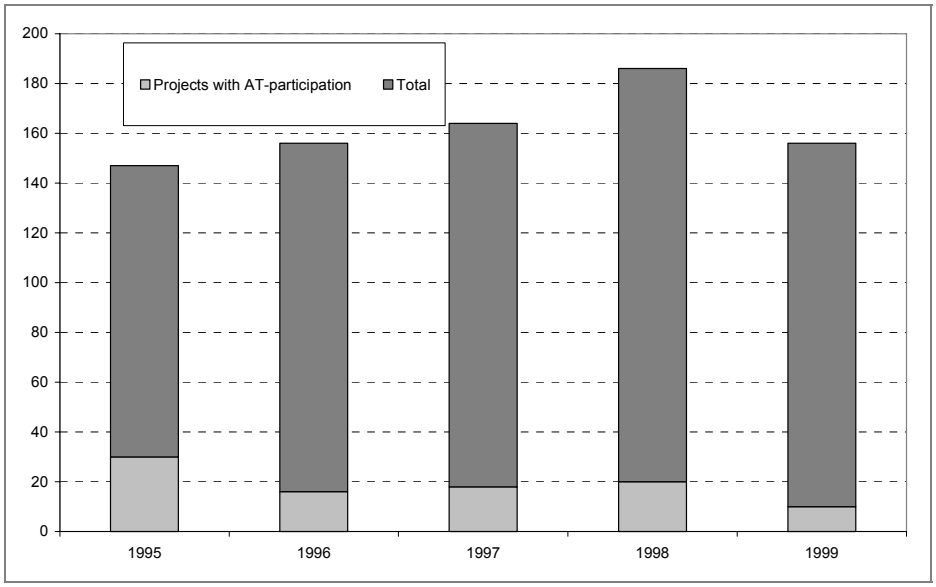
EUREKA

EUREKA is an economics-oriented European research cooperation founded in 1985 by 17 western European countries and the European Union. Today, a majority of the Easter European countries along with the EU and EFTA states comprise the 29 EUREKA members. However, EUREKA's general goal has remained unchanged: the strengthening of the competitive capacity of European industries on civilian, international markets.

One of the considerable advantages of EUREKA is the "bottom-up" approach. It allows the project participants the choice of project content and scope, to set the date the project begins as well as the selection of project partners. Along with initiation of project ideas by companies as well as researchers themselves, the subsidy process also differs from the FP. EUREKA projects can be subsidised with public funds if necessary. That, however, is independent from the attainment of EUREKA status. Requests for public financing take place via the national R&D subsidy procedures. Therefore the national subsidy criteria are valid. In Austria, the EUREKA budget of the FFF covers approximately 80% of the subsidy volume. Since 2000, the FFF commands a separate EUREKA budget with approximately 80 million Austrian Schillings available for allowances and loans to subsidise Austrian EUREKA participation.

Since the beginning of the EUREKA Programme, Austrian partners have participated in 249 projects. This number includes completed, current as well as aborted projects. In total, Austria has participated in approximately 12% of all EUREKA projects. Figure 13 shows the number of Austrian projects in relation to the total number of EUREKA projects for the period 1994-98. Of the 809 projects, Austria was (is) participating in 94.

Figure 13: Number of the EUREKA projects [1995-99]



Source: BIT

Given this, the synergy as well as the relation of EUREKA to the FPs becomes an interesting point of inquiry. Such associations to the FPs can go in two directions:

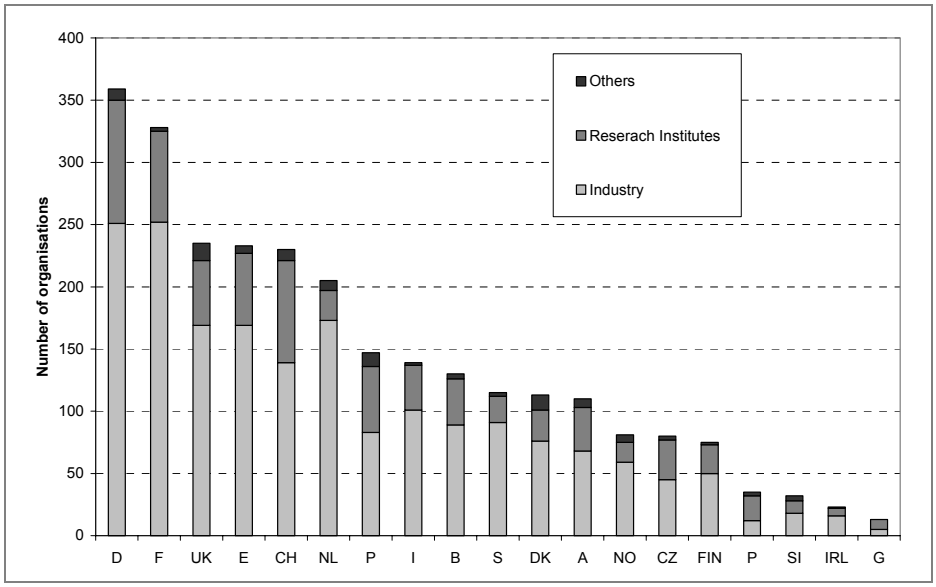
- Project proposals denied by the FP (because of, for instance, too close proximity to the market) and submitted to Eureka;
- as well as projects from so-called cluster projects or large-scale projects carried out in the FP.

From 1995-99 Austria participated in 30 EUREKA projects connected to the FP as secondary projects.

In recent years the weighting of projects has shifted from strategic, large-scale projects – with high costs and long duration - on average ATS 523 million / 70 months – to market-oriented, shorter and smaller projects with average costs of ATS 27.5 million and an average length of 24 months. This reflects the increasing participation of SMEs in the recent past.

Figure 14 below shows the number of organisations, by type of organisation, in projects from the year 1998. It shows that EUREKA above all appeals to industry. Of the nearly 3,000 participants (companies and research institutions), two thirds were from industry, where 61% were SMEs (i.e. 42% of all participants). Further, almost 25% of all participants are from two of the largest countries (Germany, France), followed by the U.K., Spain, Switzerland and the Netherlands. Altogether these countries account for about half of participants.

Figure 14: Number of organisations in the EUREKA projects [1998]



Source: EUREKA annual report 1999

In 1998, Austria was represented in EUREKA projects by 110 organisations, of which 68 were companies (of them 44 SMEs) and 35 research institutions (of them, 24 were universities).

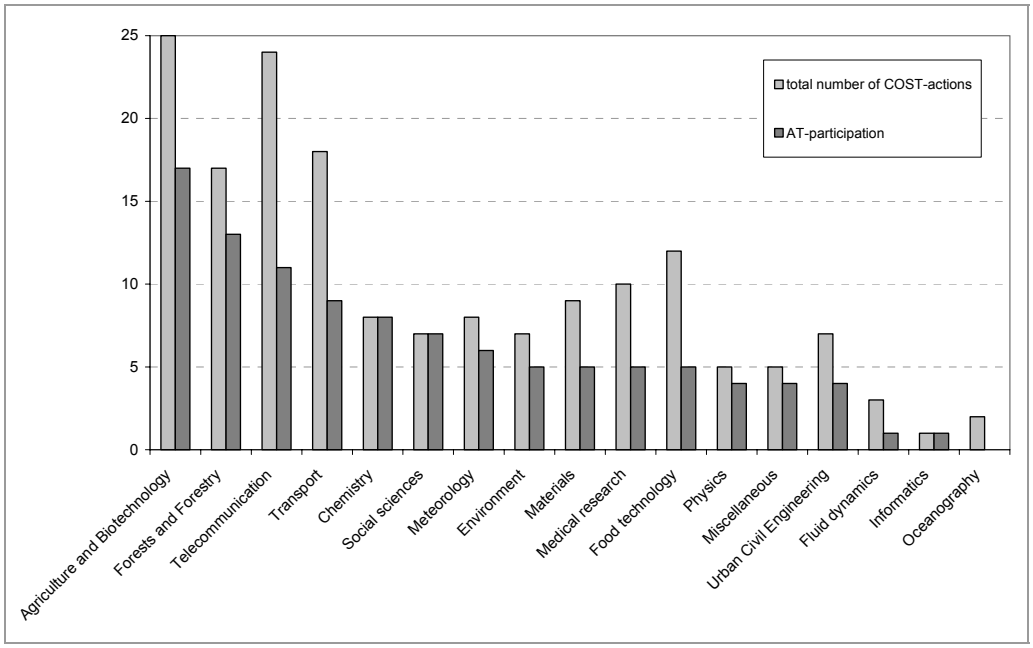
COST

COST is a European forum of cooperation coordinating nationally financed research projects at a European level. Austria has been a part of this research cooperation since 1971. At present, there are 32 member states (including the 15 EU members). The COST research topics are wide-ranging from basic research to industrial application whereby multiple- and interdisciplinary fields are particularly addressed. The COST research initiative is executed within the scope of concentrated activities, the so-called COST actions, in which COST-member states can participate at their own discretion.

By the qualifying year 1999 164 COST actions had run. They are divided into 16 domains. Austrian research teams took part in 104 of the 164 actions (63%). That places Austria in the middle of the field in comparison with other COST states, yet around 24% below the total average share of participation. Of the 15 EU states, only Greece, Portugal, Ireland and Luxembourg are behind Austria.

As Figure 15 shows, the Austrian emphases were identical in absolute numbers with the thematic emphases of COST – nevertheless oriented toward the relative participation quota with strong representation in the fields chemistry (100%), social sciences (100%) as well as physics (80%), forest economy (76%) and meteorology (75%).

Figure 15: Number of COST promotions in comparison to the number of Austrian participations [as of June 1999]



Source: BIT

4. Analysis at the micro level

The following chapter essentially contains the analysis of a survey performed via questionnaire. The results of a written survey of participants by means of a standardised questionnaire will be presented and analysed. The results of the survey also serve as the basic data needed to answer most of the questions raised in the other chapters. A variety of problems as well as expectations are tied to such a written survey. Chapter 2 explained in detail how the given analysis deals with such problems and wherein the realistic expectations of an impact study lie. There are also clues as to the background of the individual batteries of the questionnaire.

Within the scope of this evaluation two questionnaires were developed and sent to different groups of participants.

- One questionnaire was sent to all successful participants in the 4th FP. It attempts to ascertain individual benefits of participation as well as specific information relevant to the formation of the consortium, information sources used etc.[29] (**Successful Group**)
- The second questionnaire was sent to all unsuccessful Austrian Coordinators of project consortia. The backdrop - the question of how researchers evaluated their experience with denied project proposals. What were the reasons for the rejection from the point of view of the applicant? Since both questionnaires contain a certain number of identical questions, comparisons can be made between both groups (successful versus unsuccessful participants). (**Group of rejected coordinators)**

A control group method was not used for reasons of cost. The questionnaires were created in close collaboration with all participants in the study. In particular, collaboration with the Finnish and British project partners makes possible comparison with the results of their respective evaluations. Before distribution, the questionnaires were submitted to the client as well as to BIT and PROVISO for comment. The feedback received denoted a high level of engagement.

The length of the questionnaire as well as the high response rate provided ample data as well as numerous possible associations between the various issues. To avoid an explosion of combinations, the attempt is made to attach the results of the survey to those issues, which are decisive for delicate European research cooperation.

4.1 The course of the survey

The selection of groups, the successful and the unsuccessful participants, ensued via the BIT based essentially on the criterion of existing address material in the INNOMAN database. Each questionnaire referred to a participation in a particular project. The project title, the acronym as well as the name of RTD programme were specified on the questionnaire to create an unequivocal reference for the recipient. Each questionnaire was accompanied by a cover letter from the client. Distribution of the questionnaire to the successful participants occurred via InTeReg. BIT sent out the questionnaires for the unsuccessful Austrian project coordinators, with the completed questionnaires returned to InTeReg.

[29] See the attached questionnaires.

The total number of questionnaires sent out to successful project participants was 1,851. Since many institutions (and also some individuals) took part in multiple participations in the course of the 4th FP (and may still be executing some projects) the number of institutions receiving surveys falls to 922 (at the company level as well as institutes/business areas at universities and non-university research institutions). The rate of return in this group was 506 questionnaires, a yield of 27.3%.

In the group of rejected Austrian project coordinators, 831 questionnaires were sent out to record 549 institutions. The return rate for this group was 146, a yield of 17.6% (see Table 26).

Table 26: Rate of return by type of organisation

	Successful participations			Rejected coordinators		
	Approached	Returning	Quota	Approached	Returning	Quota
Industry	741	156	21.0	317	43	13.6
University departments	599	177	29.5	303	56	18.4
Non-university institutions	303	123	40.6	157	34	21.7
Other[30]	208	50	24.0	54	13	24.0
	1,851	506	27.3	831	146	17.6

Source: self-conducted survey

Table 27 provides an overview of the split of companies responding from the group of successful participants by size class as well as R&D activities. Accordingly, more than a third of the responding companies are from small (1-99 employees) as well as large companies (more than 500 employees). Another 23% of the companies have between 100 and 500 employees. Further, 62% of companies indicated that they have an internal R&D department.

Table 27: Characterisation of industry [successful]

1-99 Employees	37%
100-249 Employees	13%
250-499 Employees	10%
Over 500 Employees	40%
Own R&D department in-house	62%
Austrian company w/out foreign office	42%
Austrian company w/ foreign office	39%
Subsidiary of a foreign company	19%

Source: self-conducted survey

Of all participating organisations, 33% (163 from n=482) already have experience with previous EU FPs. Non-university institutions are prominent in this group, as nearly half have already participated in earlier FPs.

4.2 Experience with cooperation

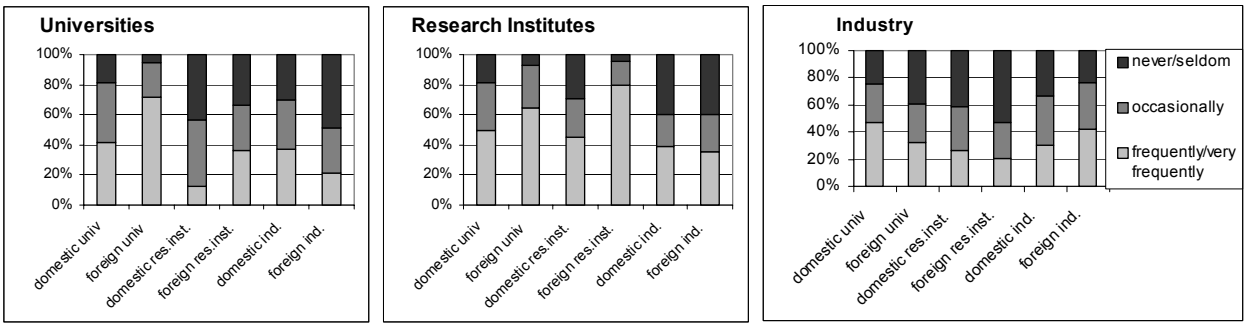
In the past, the most common cooperative partners for university departments were departments from foreign universities (see Figure 16). University departments participating in EU FP projects are evidently more internationally oriented. Further, it can be assumed that these existing contacts and cooperations with foreign university partners are an important basis for the materialisation of cooperative (and likewise multi-nationally-oriented) EU projects. About 72% of university departments responding said that in the past they cooperated frequently or very frequently with foreign universities while a mere 5% of university departments never had or only rarely had cooperative relationships with foreign universities. Cooperation with foreign universities is also

[30] The "other" category records associations and administrative institutions at various levels.

more frequently mentioned than cooperation with Austrian universities (41% frequently/very frequently; 18% never/seldom).

With regard to collaboration between Austrian university departments and businesses, the relationship between national and international cooperation is exactly the opposite: 37% reported intense experience cooperating (frequently/very frequently) with Austrian companies, while the share for foreign companies is clearly lower (22%). As such, the relationship is opposite in regard to the cooperation with domestic or foreign companies. Thirty percent (49%) of those answering said that in the past they never or seldom cooperated with domestic (foreign) companies. More recent studies of the interaction between the scientific- and business sectors have shown[31] that such interactions require long-term mutual trust that is also based on different kinds of interaction (personal contacts, common research projects, expertise, joint supervision of master's theses/dissertations etc.). This is of course easier to build up with domestic firms, as the transaction costs are of course lower.

Figure 16: Cooperation experience by type of organisation



Source: self-conducted survey

Seventy-nine percent of non-university research institutions said that in the past they had frequently or very frequently cooperated with non-university research institutions in the foreign countries. The second-highest value is found in conjunction with foreign universities (65%). Clearly, non-university institutions show a high level of internationalisation in regard to cooperative efforts. Conversely, Austrian cooperative partners are comparatively less frequently listed as partners in cooperation (Austrian universities: 49%; Austrian companies: 39%; foreign companies: 35%). Interestingly, with just about 40% each, Austrian companies and foreign companies are most often listed as not having been or having been infrequent cooperative partners in the past.

The Austrian universities predominate as cooperative partners of industry[32]. Forty seven percent of responding companies said they had cooperated with Austrian universities frequently or very frequently in the course of past research and innovation activities. In reference to this value, foreign companies follow them, somewhat surprisingly, at about 43%. Non-university research institutions play the least significant role here (Austrian: 27%; Foreign: 21%).

In summary, it can be said that independent of the type of organisation, the participants of the EU FP already have cooperative experience. In particular, the universities and non-university research institutions have a distinct tendency toward international cooperation. Austrian universities also predominate as cooperative partners for Austrian business. This confirms the assertion that the universities are the driving force in building and maintaining international R&D networks.

[31] Schatinger et al. (2001), Schibany et al. (1999)

[32] It should be noted that the question was aimed at the level of the researching organisational unit, not the company as a whole (in the case of the company as, if applicable, the corresponding R&D department)

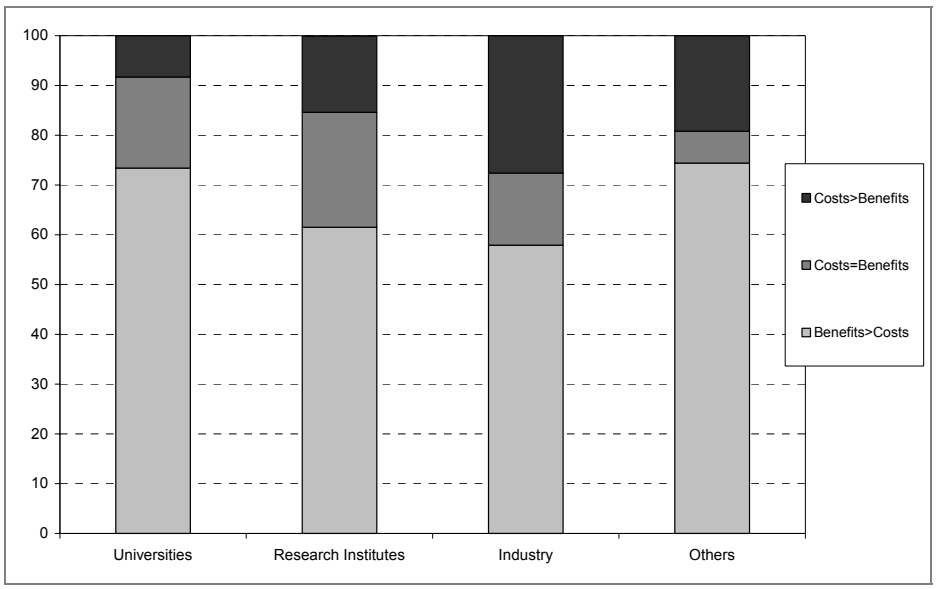
4.3 General assessment of the benefit of participation

The following chapter summarises the results of the survey, which concern the general assessment of participation in 4th FP. This assessment has been measured according to three indicators:

- An evaluation of the relationship between total costs of the participation and the benefit received from the participation.
- To what extent the goals stated in the subsidy contract with the European commission were reached.
- The ranking of the EU project in the context of the innovation- as well as research strategy of the company/unit.

The general assessment of Austrian participation in the 4th FP is absolutely positive: 66% of participants estimate the benefits of their participation outweigh the resulting costs. Seventeen percent see a balanced relationship between benefits and costs and only 17% judge the relationship to be negative. A comparison of the categories of organisations however yields a heterogeneous picture (see Figure 17). Universities and the category "other" were the most positive in rating their participation. A substantial 27% of participating companies said the expenditures outweighed the benefits. This is most certainly due to industry's heightened awareness of the costs of participation. The opportunity costs of participation in the FPs play a lesser role for the universities as for companies.

Figure 17: Cost / benefit comparison by type of organisation [%]



Source: self-conducted survey

Along with the distinction between the separate types of organisations, experience with earlier FPs is also relevant to assessing the benefits of participation. This yields some interesting results. The group of participants having no experience with earlier FPs rated the benefit-costs relationship more positively than the group which had participated in the 2nd or 3rd FP. Sixty-eight percent of "*newcomers"* judged the benefits to be higher than the costs. In contrast, this value for the group of the "*experienced* "was 60%. Twenty-three percent of the *experienced* said the relationship was balanced (see Table 28). This is most likely due to the fact that organisations with experience with FP participation make a "more realistic" assessment of benefits than do *newcomers*.

Table 28: Cost / benefit analysis depending on participation in FPs 2 or 3 [in %]

	Cost > Benefit	Cost = Benefit	Benefit > Cost
Already participated in FP 2 or 3	16.7	23.1	60.2
No experience in previous FPs	17.7	14.0	68.3

Source: self-conducted survey

Further, the question of reaching the goals agreed to with the European Commission paints a positive picture (see Table 29): almost 49% of participants were able to attain all the targets laid out in the subsidy contract. Another 44% largely reached their goals. The remaining 7% of participants reached their targets in part or not at all. Analysed by type of organisation, the result is similar to that above: the majority of participants from university and non-university sectors were able to reach the agreed-upon targets. Fifty percent of industry participants widely achieved their goals.

Table 29: Reaching the goals set out in the subsidy contract [%]

Were the goals in the subsidy contract with the EC reached....	Universities	Non-univ. Inst.	Industry	Other	Total
Yes, completely	49	60	37	59	49
Mostly	49	35	48	32	44
Partially	2	5	10	7	6
No	-	-	5	2	1
Total	100	100	100	100	100

Source: self-conducted survey

Out of the general costs-benefit analysis emerges the question of the place of the EU project in relation to the entire research- and innovation strategy of the company or institute. This is a decisive issue for participation in the FP: the aim of stabilising competitive capacity (implied by a strong application-orientation) can be inconsistent with a precompetitive focus as well as lead to problems in cooperating in a research consortium. If all project partners have the right to divide IPR (*intellectual property rights*) among themselves, this has effects on the nature and type of projects executed in cooperations. Research results obtained in cooperation and having the characteristics of public goods are useful to all and not exclusively to one project participant.

EU projects are crucial to the strategies of 38% of all participants. For 54%, participation bolsters other innovation activities and EU projects are of little significance to 8.4%. Here, there are great differences between the types of organisations (see Table 30). The majority of companies (62%) see the significance of EU projects in the support of other innovation activities and 26% indicate that the projects are of vital importance. This can be seen in that companies do not carry out strategically important projects at a European level but participation mainly supports other (strategic) innovation activities. Thereby, on one hand the precompetitive status is preserved and on the other hand FPs present companies with the opportunity to carry out research activities in cooperations, which may be of strategic significance in the future. Such knowledge is increasingly developed in larger consortia and contributes to competence building. In contrast, universities and non-university institutes credit EU projects with much greater strategic significance – which depicts a causal relationship with scholarly research. The FPs represent an essential source of financing for many universities. This will be examined more closely (see Chapter 7).

Table 30: The status of the EU project by type of organisation [in %]

	Universities	Non-univ. Inst.	Industry	Other	Total
The EU project					
is of central importance	44	45	26	37	37.7
supports other innovation activities	52	46	62	52	53.7
is of little importance	4	9	12	11	8.6
	100	100	100	100	100

Source: self-conducted survey

4.4 The composition of the Austrian project teams

4.4.1 Number of employees

Table 31 contains the average size of a project team based on number of employees. Based on all types of organisations, the average is 5.8 employees per project. With 7.7 employees per project, industry has, on average, the highest number of team members per project. The remaining types of organisations lie between 4.5 (other) and 5.4 (non-university research institutions). The differences in project size are therefore not so distinct among these types of organisations.

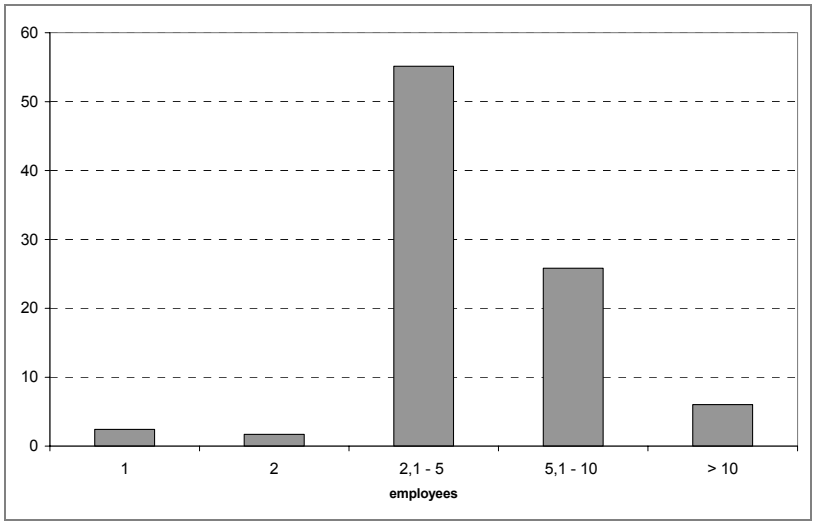
Table 31: Average size of the project team

	N	Maximum value	Average
University	60	12	5.0
Non-university research institutions	47	36	5.4
Industry	44	70	7.7
Other	16	12	4.5
Total	167	70	5.8

Source: self-conducted survey

It should be noted that the average can be distorted by runaways. This applies particularly to industry, where a few organisations reported the occasionally high number of project employees (the peak value for companies was 70, while merely 12 for the universities and other, and 36 for non-university research institutions). Therefore staff size classes have been created to provide an overview of the distribution of projects across the various size classes. The results are presented in Figure 18 based on five different size classes.

Figure 18: Distribution of projects by employee number class



Source: self-conducted survey

Small projects with a single project staff member hardly play a role. Their share amounts to a mere 2.4%. Given the organisational complexity of international cooperation projects, this is not surprising. The highest share belongs to projects of medium size with a number of staff between two and five. These projects of "typical" size represent 55.1% of all projects, followed by projects with six to 10 employees (25.8%). Six percent of all projects have a staff of 10 or more. This dominance of mid- to large projects can also be seen as an indicator – against the backdrop of the "mosaic" structure of the Austrian R&D landscape – of the significant value of EU FP projects to the institutions performing R&D in Austria.

4.4.2 Share of females

Raising the share of women researchers is a stated goal of EU as well as Austrian research policy. In order to gain insight into the status quo integration of female Austrian researchers in the EU FPs, appropriate questions were added within the scope of the survey to complement the available gender-related data from BIT.

According to the BIT address database, the share of women is 7.8% across all types of organisations. Differentiated by type of organisation, the share of women (at least at the project contact level) in industry is lowest at a mere 2.1%. The values for non-university research institutions and universities at 6.8% and 8.9% respectively are about average. The high share of women in the "other" category is noteworthy at 24.1% (see Table 32).

Table 32: Share of women project contacts by type of organisation

	Female (in %)	Male (in %)
Non-university research institutions	6.8	93.2
Other	24.1	75.9
Universities	8.9	91.1
Industry	2.1	97.9
Total	7.8	92.2

Source: internal calculations based on BIT data

One disadvantage of the available BIT data is, that the data refer to the respective project manager. At universities it is frequently the director of the institute or the department chair. It is at this level in the university hierarchy that the share of women in Austria is still very low. The tendency is similar in the non-university

research sector and also in industry. Therefore, a pure observation of the gender ratio at the project manager level is not enough to gain true insight into the actual integration of female researchers in EU projects.

Table 33 contains the results of the survey. The total share of women is 35.4%. On average, two women take part in any EU FP project. As was the case with the project contacts, there are distinct differences in the share of women among the types of organisations. The lowest share of women (just as with the project contacts) is found in industry projects – a mere 27.7%. The highest share of women is found in non-university research institutions (42.8%) followed by "other" with 40.3% and the universities with 34.1%. The low share in industry is most certainly due to the low share of women in technical and technically-oriented natural science disciplines. That leads to, among other things, a low share of women in the research departments of companies.

Table 33: Integration of women in the EU FPs

	Share of women from the total number of employees (in %)	∅ number of women per project	∅ total number of employees
Universities	34.1	1.8	5.0
Non-university research institutions	42.8	2.3	5.4
Industry	27.7	2.0	7.7
Other	40.3	1.7	4.5
Total	35.4	2.0	5.8

Source: self-conducted survey

With regard to these results, some notes on methodology are necessary. An exact analysis of response behaviour showed that data about the number of female project staff members was systematically, more frequently omitted (i.e. not answered and not even answered with 0) than data concerning male project staff. These had to be classified as "missing values", although it is quite probable that some (unknown) percentage does not truly qualify as a "missing value" but rather 0 female project staff. The given values in Table 33 are therefore maximum values. The actual number of female staff is apparently less.

4.5 The project consortium – creation, initiative, makeup

Austrian research organisations take the initiative in forming project consortia. In just over 31% of the project participations (see Table 34) the initiative to form the consortium came from the queried organisational unit from - an indication of the already active integration of Austrian organisations in the European research landscape.

The great significance of existing network relationships becomes clear, when one considers the insights of project participants with respect to their project partners. A mere 7% of those surveyed stated that they were unfamiliar with any future project partner. On the other hand, 47% of those surveyed knew more than 50% of their project partners before the formation of the consortium. Another clue as to the stability of network relationships is also the fact, that only about 26% of those surveyed had not maintained cooperative relationships with any project partners before forming the consortium. Fifty four percent had cooperative experience with at least one (but less than 50% of partners) and about 21% with more than half their project partners.

This also explains why only about 11% took advantage of external institutional support in searching for partners.

Table 34: Creation of project consortia

The initiative to create the consortia came from the survey recipient	31%

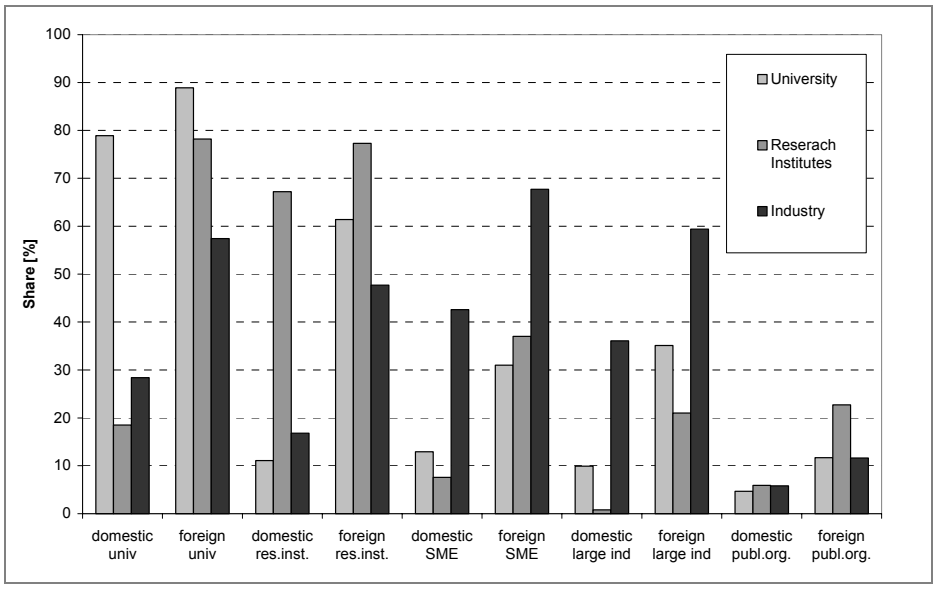
	None	Less than 50%	More than 50%
Partner in the consortium who knew the participants before project preparation	7%	45%	48%
Were previous cooperation partners	26%	54%	21%

Source: self-conducted survey

4.6 Patterns of cooperation

The FPs contribute *qua* structural and institutional characteristics to the Europeanisation of research. The results of the survey show that Austrian companies cooperate with foreign organisations more frequently than with domestic organisations – which is not surprising given the normal composition of project consortia. Usually there are more foreign partners than domestic partners participating in the consortia. Figure 19 shows the composition of project consortia with Austrian participation. It reveals that the composition of the consortia have organisation-specific characteristics: Austrian universities seek mainly other universities as cooperative partners (and thereby more foreign than Austrian). Sixty-one percent of Austrian universities also said they had collaborated with foreign research organisations. Collaboration between industry and Austrian universities is however less intense – 28% of Austrian companies indicated that Austrian universities were in the consortium. On the other hand 57% of Austrian firms said they had collaborated with foreign universities, nearly equal to the participation of large, foreign enterprises (59%).

Figure 19: Composition of the project consortia with Austrian participation [in %]



Source: self-conducted survey

Literature now makes a further distinction between horizontal and vertical cooperation in regard to partners collaborating in R&D. Horizontal cooperation is understood to mean cooperation between competitors (and in some theoretical works also cooperation with research institutes as well as universities). Vertical cooperation

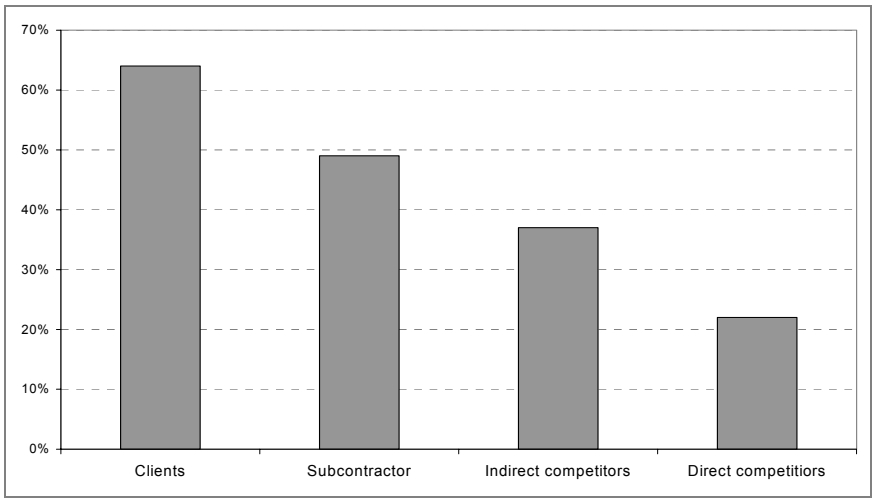
between two companies at different levels of the value chain in the same branches of trade. This usually means cooperation between subcontractor and/or clients[33].

Analysis of the survey shows an unequivocal tendency toward vertical networks in the business sector, i.e. companies mainly cooperate with clients and subcontractors. The structure of the project partners from industry is displayed in Figure 20. The majority of cooperative partners are clients (over 64%) and subcontractors (about 50%). This shows that existing network relationships in the area of economic activities along the value chain are also reflected in the companies' R&D. As cooperative partners, subcontractors/customers therefore play an important role as sources of information and competence carriers in the innovation process. The share of companies taking part in vertical forms of cooperation is higher in Austria than in Finland: there 44% of companies indicated cooperation with clients and 25% with suppliers.

Cooperation with competitors clearly plays a lesser in Austria and in Finland. Figure 20 differentiates between indirect competitors (companies with similar products but active in other markets) and direct competitors (companies with similar products, active in the same markets). Thirty-seven percent of companies indicated that they entered into a project consortium with indirect competitors during the 4th FP. Twenty-two percent of companies surveyed also cooperated with direct competitors within the scope of participation in the 4th FP.

These results also provide an interesting clue as to a development in the history of the FPs: development clearly went from being mission-oriented, a more horizontal orientation in the composition of consortia (as introduced in the ESPRIT programme) to the promotion of heterogeneous project consortia as well as the integration of the users of innovation activities. [34]

Figure 20: Characterisation of other companies in the consortium [specified only by company]



Source: self-conducted survey

4.7 Orientation of project activity

The characterisation of the primary content orientation of an EU project includes a wide variety of heterogeneous goals and orientations. At the same time the results of the survey are quite similar to the results of existing evaluations (see for example Guy et al., 1999 for Ireland). In Ireland as in Austria, the primary focus is on applied research paired with *development* in companies as well as *basic research* at

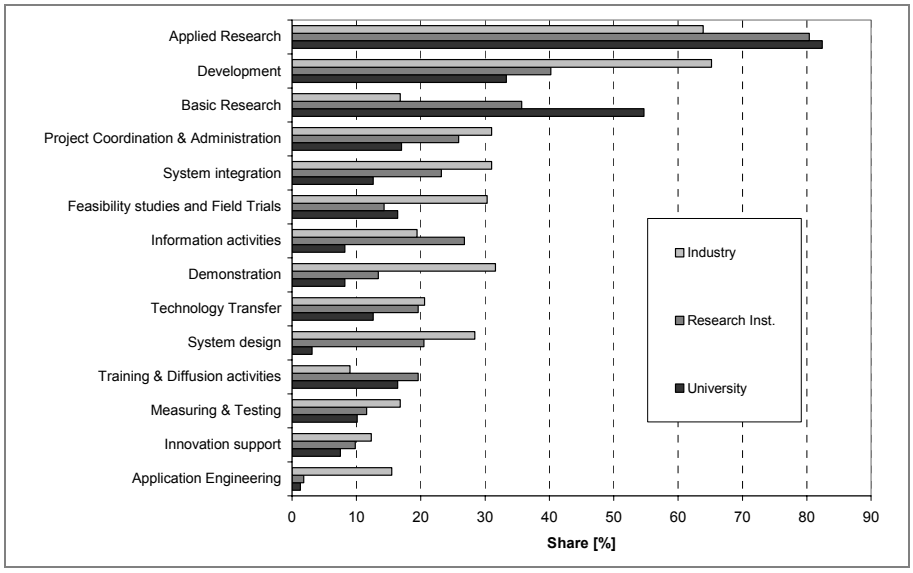
[33] See: M. Dodgson (1994)

[34] For the history of the development of the ESPRIT programme, see Schibany, A. (1996)

universities at the other end of the spectrum. Calculated across all categories of organisations, 72% of all participants classified their work as applied research. With their participation, businesses also cover the entire spectrum of innovation processes as well as innovation-related activities: 31% of companies indicated that system integration (developmental work on *the integration of important system components*) and 30% feasibility studies/field studies as well as demonstration were characteristic of their activities. Along with applied research, universities have another focus – basic research (55%).

The results are a further indication, that participation in EU FPs has taken its place in the applied, precompetitive area. It is also interesting to note that the FPs are broad-reaching enough to cover all areas relevant to innovation.

Figure 21: Primary orientation of activity in the project by type of organisation [in %]



Source: self-conducted survey

4.8 Goals – Outcomes – Impacts

4.8.1 Goals

The most important results of previous impact studies and evaluations of participation in the FPs[35] showed that intangible learning effects, the expansion of the existing knowledge base as well as network effects were the most often mentioned effects and stimuli for participation.

Limited by the precompetitive orientation of the FPs, the exchange of knowledge and insight within the scope of R&D cooperation could contribute to an expansion of competence for participating organisations. Further, international cooperative projects also offer young scholars the chance to work at an international level.

Previous evaluations therefore reached the conclusion that the FPs only contribute indirectly to one of the biggest EU Commission goals – strengthening competitive capacity. For the majority of participants, the FPs serve very different functions – depending on very organisation-specific aspects. They are not focussed on

[35] See for instance: Reger, G. et al. (1995); Georghiou, L. et al. (1993); Luukkonen, T. (1998)

short-term, directly applicable, commercially viable results. Instead, they have mid- to long-term effects on competitive capacity.

Nonetheless, the recently completed Finnish evaluation[36] shows that participating business' expectations in regard to usability of results and market-related results have risen "*... thus indicating a potential shift towards greater business orientation in the FP programmes*.[37]" About 40% of participating Finnish companies were able to release results of EU projects which were directly, commercially viable. This is a high share, when one considers that the path from research study to commercial use is complex and non-linear. Luukkonen et al. (2000) analyse these results to the effect that the orientation of the FPs has changed, in regard to the expectations of participating companies, toward heavily market-oriented goal-setting.

Based on these results, a classification for categories of goals was developed for the Austrian survey. Table 35 shows the grouping of the targets into intangible (immaterial), resource –oriented and tangible (material) goals. Included within the intangible goals category are the so-called knowledge-related- (gaining new knowledge, expansion of the existing knowledge base) and network effects (internationalisation, cooperation). In total, 32 categories of goals have been used.

Table 35: The classification of goals

Target groups	Nr.	Goals
Intangible (immaterial) goals	1	Entry into new fields of technology, research and development
	2	Gaining new knowledge
	3	Expansion of the existing knowledge base
	4	Supporting employee qualifications
	5	Image improvement
	6	Access to new research networks
	7	Access to complementary expertise
	8	Monitoring competition
	9	Expansion of own existing research network
	10	Internationalisation of R&D activities
	11	Cooperation with industry
	12	Cooperation with universities or other R&D institutions
	13	Information and benchmarking
	14	Improved access to foreign markets
	15	Development of new market segments
	16	New strategic alliances
Resource-oriented goals	17	Access to additional sources of financing
	18	Cost-sharing with project partners
	19	Joint use of R&D infrastructure
	20	Risk sharing with project partners
Tangible (materiel) goals	21	New or improved services
	22	New or improved products
	23	New or improved processes
	24	Prototypes
	25	New methods or test procedures
	26	Norms and standards
	27	New software

[36] Luukkonen, T. et al. (2000)

[37] Luukkonen, T. (2000): Old and New Strategic Roles for the EU Framework Programme; paper presented at the EUROPOLIS workshop, Maastricht, April 2000.

28	Publications
29	Dissertations
30	Patents
31	Licenses
32	Spin-off foundings

In a first step, the frequency within the separate goal categories was compared with all types of organisations. The resulting ranking leads to an unequivocal result: across all types of organisations, 83% of all participants ranked both of the intangible goals *gaining new knowledge* and *expansion of the existing knowledge base* as very important or important goals/motives for participation in the FP. These are followed by the resource-related goal *access to additional sources of financing* in third place. Other goal categories with high values are network-related targets: *cooperation with universities*, *internationalisation of R&D activities* as well as *image improvement.*

Goals with the lowest ratings included competitive monitoring, patents, licenses and spin-off foundings. Table 36 provides an overview of the most important targets across all categories, as well as the respective types of organisations. It shows that for all three types of organisations, the intangible goals (*gaining new knowledge*, e*xpansion of the knowledge base*) receive highest marks.

Table 36: Ranking of the most important goals and motives for participants - frequencies

Goal/Motive		Share of answered Org. (%)		
	Overall ranking of organisational categories	Very important/important	average	Less so/not important
Expansion of the existing knowledge base	1	83.9	12.6	3.4
Gaining new knowledge	2	83.8	13.0	3.2
Access to additional sources of financing	3	74.8	12.9	12.3
Image improvement	4	71.5	17.5	11.0
Cooperation with universities or other R&D institutions	5	70.2	18.6	11.2
Publications	6	65.5	15.2	19.2
Internationalisation of R&D activities	7	63.7	18.6	17.5
Entry into new fields of technology, research and development	8	57.8	21.8	20.4
New methods or test procedures	9	55.7	18.1	26.0
Access to new research networks	10	55.4	23.2	21.4
New or improved products	11	53.6	10.6	35.5
New or improved services	12	50.4	14.8	34.8
Access to complementary expertise	13	50.0	27.9	22.1
Expansion of own existing research network	14	49.6	27.7	22.8
Patents	29	17.0	17.3	65.0
Licenses	30	13.6	16.0	70.4
Competitions monitoring	31	12.9	18.1	68.9
Spin-off foundings	32	11.8	8.4	80.2

Source: self-conducted survey

The FP is precompetitive and is organised based on cooperation, which results in the intangible goal categories receiving high marks. Nevertheless, for all three types of organisations the highly ranked goals also include those, which are decisive for competitive capacity as well as provide the actual motive for participation. New and improved products for companies and publications for universities and non-university institutions are essential targets as well as motivation for participation. In this respect, both of the highest rated categories (*gaining new knowledge, expansion of the existing knowledge base)* are not such that they discriminate between the different organisations: all participants can simply agree on these categories of goals, because every participation in a research programme leads to new insights and must expand the knowledge base.

Nevertheless, recent studies show that the precompetitive orientation of EU projects must not conflict with market-related goals of participation (see Luukkonen, 2000)[38] *"...that the precompetitiveness as a project or participation attribute is independent of technology or market orientation and that the FP Programme participation by firms continues to be mainly precompetitive*."

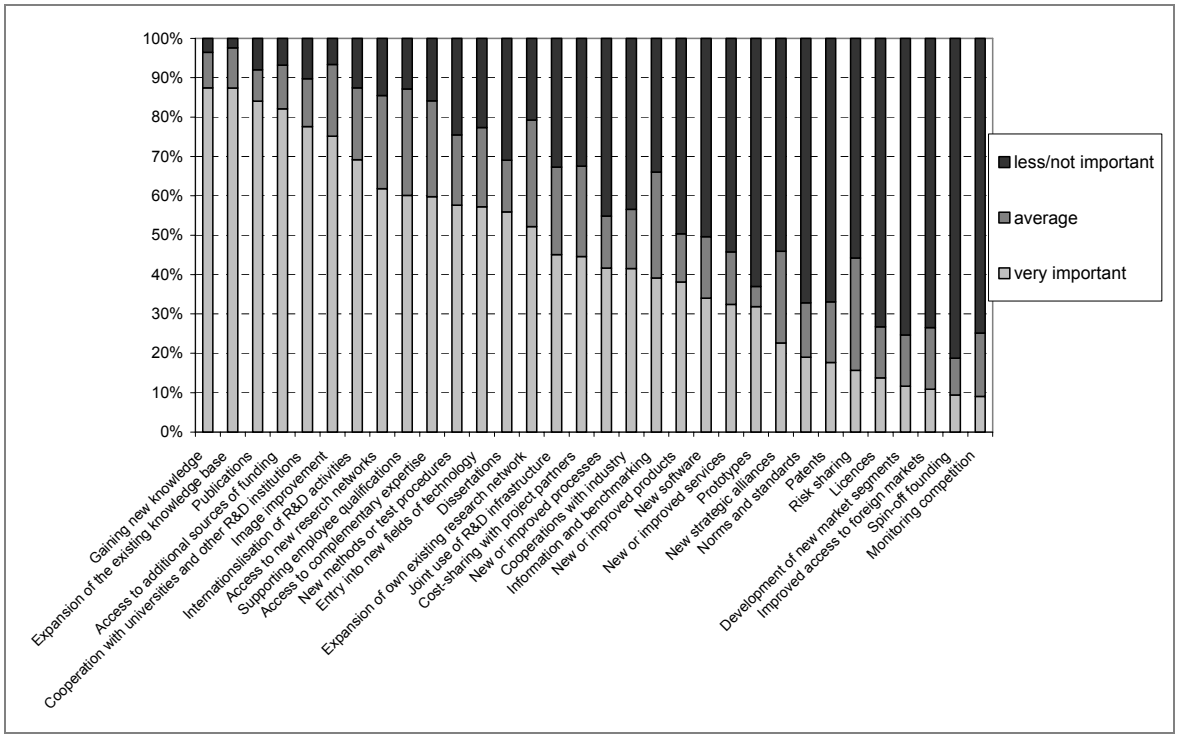
The following three figures show the valuation by share of the goal categories by type of organisation. The evaluation of the universities (Figure 22) confirms the results of the ANTLANTIS study: "academic results" like publications (84%) as well as dissertations (56%) were listed by universities as important/very important goals of participation. This goes hand in hand with enhancing employees' qualifications (60%). Further, the FPs also have an important financing function – 82% see the EU as important source of financing. This actually applies to all participants - an absolutely rational and understandable motive. The high share of university departments, which rate the internationalisation of R&D, access to new research networks, and cooperation with universities or other R&D institutions as important motivations, underlines the degree of the "Europeanisation" of research.

The network effect is even more distinct in non-university institutions (Figure 23): in total, all network-related motives (including *new strategic alliances*, which hardly play a role in universities) can be found in the 11 most-named goals. The most mentioned output-related targets are likewise publications (79%) as well as new methods and test procedures (66%). It should also be noted that non-university research institutions were more interested in cooperating with other R&D institutions (78%) than with industry. This motive was only rated important/very important by 38%.

Seventy-four percent of the industry participant group (Figure 24) listed new or improved products as important or very important motivations in participation. Sixty percent see process development and 55% the development new or improved services as important motives. These motives are clearly tangible and output-related goals. In addition, the cost factor plays an essential role: the predominant majority lists as important the FPs as an additional source of financing (69%) as well as cost sharing with the project partners (60%). A further interesting motivation can be seen in the fact that companies seek cooperation with universities and other R&D institutions. Some 60% of companies responding say this kind of cooperation is an important motive. Compared with the other two participant categories, industry also rates the risk factor higher: 42% see risk sharing with project partners as an important goal. Analysis of the responses shows that participation in the FPs is also a question of image: two thirds of companies responding and three quarters of both universities and non-university institutions associate participation with image improvement. This result is confirmed by the evaluation of Irish participation in the 4th FP (see Guy et al., 1999). A possible explanation (which unfortunately cannot be pursued within the scope of this study) is that successful EU participation provides a signalling function for obtaining national subsidies.

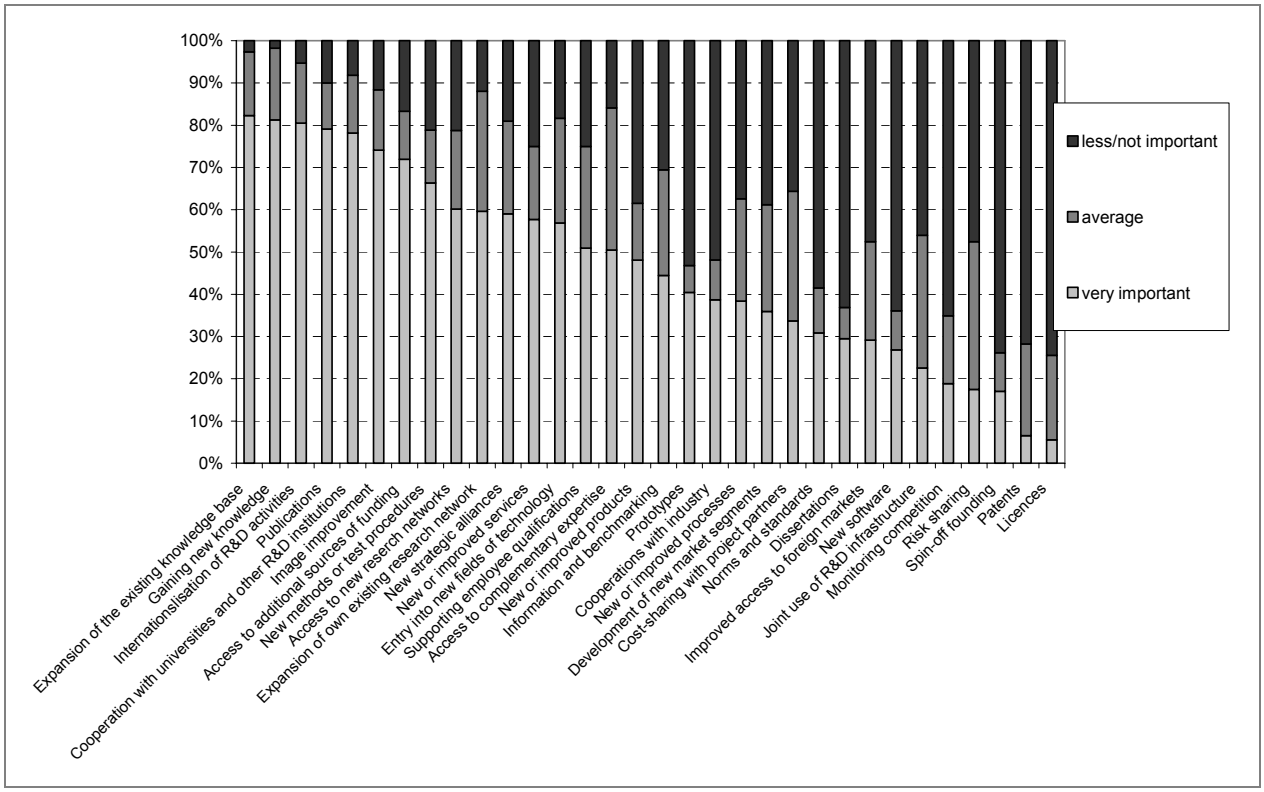
[38] Luukkonen, T. (2000): Technology and Market Orientation in Company Participation in the EU Framework Programme; unpublished.

Figure 22: Universities - assessment of different goals (shares of the responding departments)



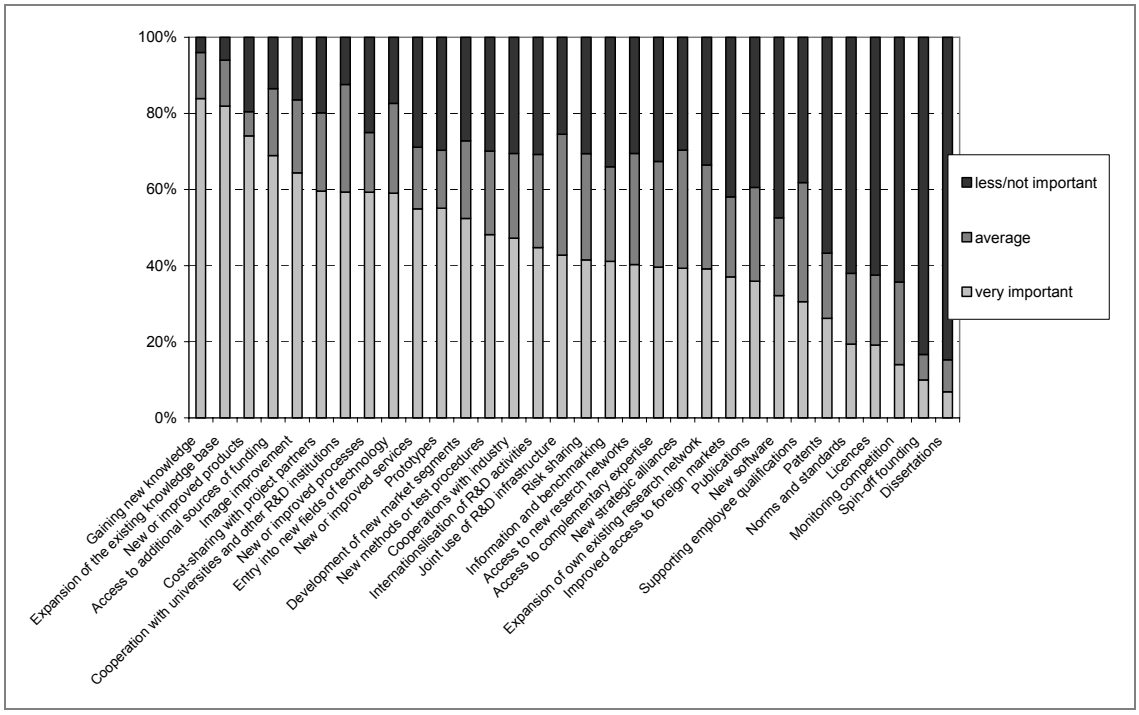
Source: self-conducted survey

Figure 23: Research institutes – assessment of different goals (shares)



Source: self-conducted survey

Figure 24: Industry – assessment of different goals (shares)



Source: self-conducted survey

4.8.2 Factor analysis

To test the original classification of targets (Table 35), a factor analysis was performed across all 32 goal categories. The factor analysis is a process that reduces a large number of variables to a lesser number of influences – factors – by means of the given cases. In the process, those variables (goal categories), which are closely related, are reduced to a factor. The goal of the factor analysis is to ascertain factors, which clarify, as completely as possible, the observed relationships between the given goal categories. Following the calculation of the correlation matrix between the separate categories, the so-called eigenvalues and the accompanying eigenvectors can be determined and sorted in descending order. The eigenvector, which corresponds to the eigenvalue, forms the factor; the elements of the eigenvectors are called factor loading. They are understood to be correlation coefficients between the relevant variables and the factors.

Sorting the initial eigenvalues yields nine factors with eigenvalues over 1, explaining 63% of the variance. After the computation of different factor models, the number of factors was limited to 5 with the help of a screen plot. These five account for 49% of the variance. The result, based on a rotated component matrix, is displayed in Table 37. The factor loading of the individual variables are sorted in descending order within the five factor sections. The variables have clearly been assigned to the factors. As Table 37 shows, all goal categories have a factor loading greater than 0.4. The authors have provided the descriptions of the separate factors.

Table 37: Rotated factor matrix

			factor loading
Factor 1	Market	New or improved services	.687
		Access to new market segments	.677
		New strategic alliances	.597
		New or improved Products	.590

		Improved access to foreign markets	.572
		New software	.561
		Prototypes	.547
		Competitive monitoring	.459
		Cooperation with industry	.426
		Norms and standards	.418
		Entry into new fields of technology, research and development	.408
Factor 2	Network	Access to new research networks	.749
		Expansion of own existing research network	.714
		Internationalisation of R&D activities	.658
		Access to complementary expertise	.639
		Cooperation with universities or other R&D institutions	.508
		Information and benchmarking	.467
Factor 3	Resources	Cost-sharing with project partners	.776
		Risk sharing with project partners	.679
		Joint use of R&D infrastructure	.666
		Access to additional sources of financing	.545
		New or improved products	.427
Factor 4	Output	Licenses	.759
		Patents	.753
		Spin-off foundings	.713
Factor 5	Knowledge	Support (increasing) of employee qualifications	.740
		Publications	.575
		Expansion of the existing knowledge base	.575
		Gaining new knowledge	.524
		Dissertations	.510
		Image improvement	.508

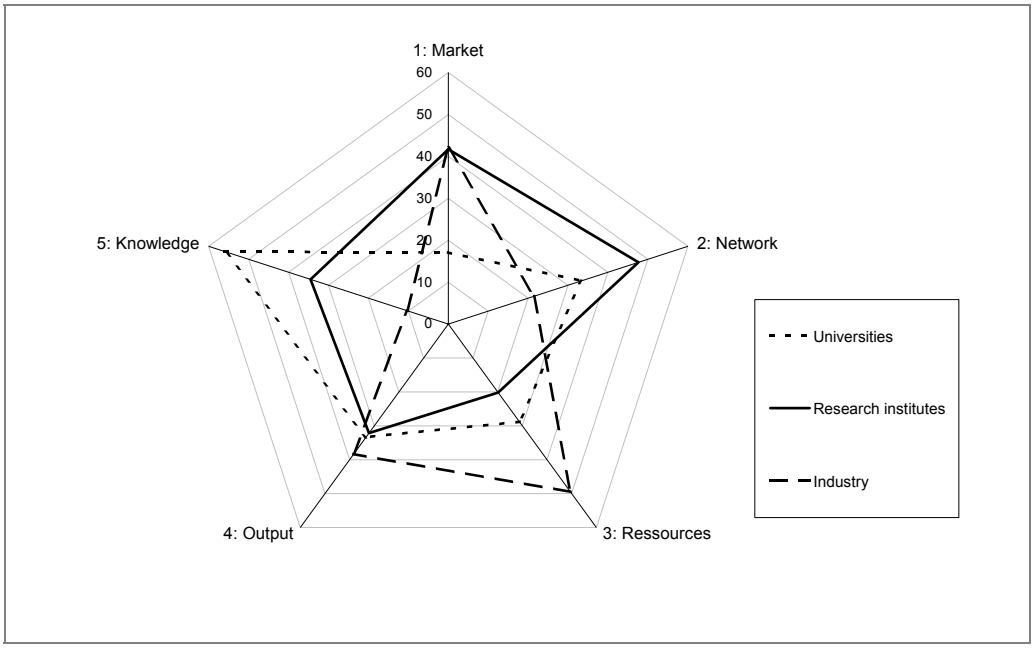
Stated variance: 49%,

Method of extraction: Analysis of main components; rotation method: Varimax with Kaiser-normalisation

The factor analysis provides results, which are relatively easy to interpret. Factor 1 is market-related and contains both the variables new or improved services and development of new market segments with the highest factor loading. Factor 2 mainly reduces goal categories, which are network-related and therefore information-related. Included here are the expansion of existing research networks or the internalisation of R&D activities. Factor 3 is resource-oriented and also contains the variable with the highest factor loading (cost sharing with project partners). Factor 4 brings together the goal categories, which are clearly output-oriented, and factor 5 can be interpreted as knowledge-oriented, since this factor includes not only supporting employee qualifications with the highest factor loading but also the categories expansion of the existing knowledge base and gaining new knowledge. One observation of this factor is interesting: despite the high ratings for the categories *expansion of the existing knowledge base* and *gaining new knowledge* they have a relatively low factor loading. That is mainly due to the fact that the selection of these goals does not allow significant differences between the participants to be identified.

Continuing the process, a specific factor value was calculated per factor, for each participation. Therefore, a highly positive factor value represents a highly positive assessment of the respective goal category. The factor values were then divided into three groups: strong agreement, medium and no agreement. These new variables can then be used to establish relationships to other categories, e.g. the individual types of organisations. Figure 25 below shows the percentage of the types of organisations corresponding strongly to the respective factors and it therefore provides a goal profile for the types of organisations.

Figure 25: Goal profile by type of organisation



Source: self-conducted survey

All three types of organisations signal strong agreement with one factor: 56% of universities agree strongly with the knowledge factor, 50% of companies with the resource-related factor 48% of non-university institutions, the network factor. A corresponding Chi-square-test shows, that the differences between the separate types of organisations are significant with respect to the goal profile.

4.9 Reaching goals

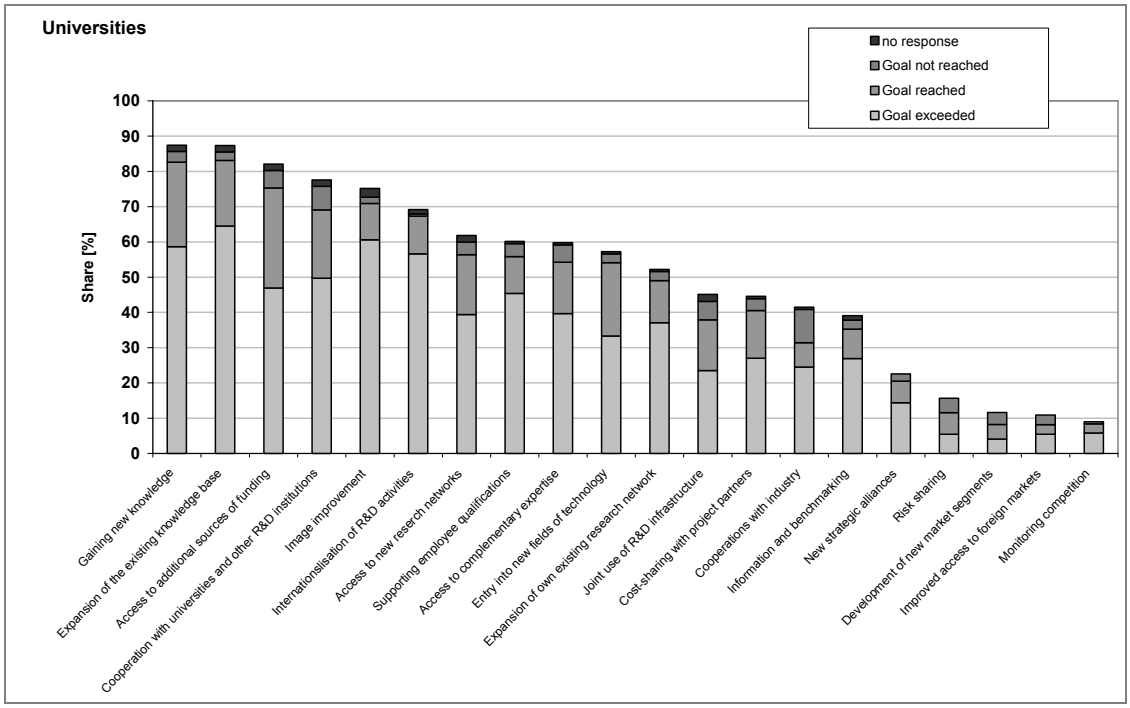
Another criterion for the effectiveness of a programme consists of the extent to which the targets being pursued by a FP participant are attainable or already attained. Since intangible goals involve subjective estimates and evaluations, reaching goals consists mainly of determining whether or not certain expectations have been met or if the level of achievement was above or below expectation. The problem is more easily solved with material (tangible) goals: in the questionnaire, the organisations were asked, if a particular result had already been attained as well as when it would be attained (if at all).

Contrasting the goal categories with an assessment of the extent of goals reached provides information as to whether or not certain goals, which were classified as important, were also attained within the scope of project participation or even exceeded expectations. This is an essential criterion for the effectiveness of the FPs. In this way, however, it is difficult to determine how categories classified as unimportant are to be evaluated in terms of goals reached. Fundamentally a non-goal can neither exceed expectations nor be reached. Nevertheless some effects may appear, which at first were not defined as goals for participation. Those effects can be classified as *side effects*.

The following three figures show the share of respondents from universities, non-university research institutions and industry, having specified certain targets as (very) important. In the course of this, only goal categories classified as intangible or resource-oriented were analysed. The targets are ordered by their importance. The degree to which goals were reached is also noted for every category of goals.[39]

For purposes of interpretation: **Universities**: *new knowledge* is the goal rated (very) important by the most respondents (about 87%). About 59% of all responding university departments reached this level AND even exceeded this goal; about 24% reached the level AND thus goal; about 3% said the goal was (very) important but could not reach it. The remaining 1% gave no indication as to the degree the goal was reached even though they listed it as a (very) important goal.

Figure 26: Universities: assessment of goals reached (intangible and resource related)



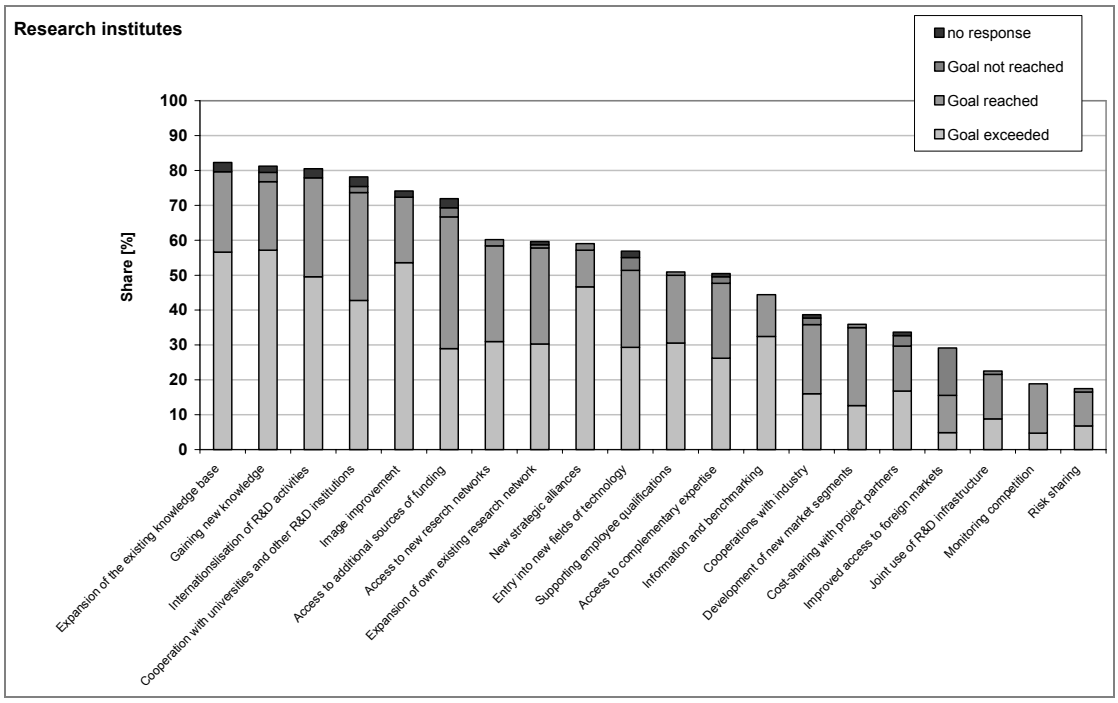
Source: self-conducted survey

Among all groups of organisations it can be generally observed, that participants having classified a particular goal as important, were able to give predominantly positive responses to the question of the degree to which the goal was reached. Only a small share of participants classified the respective goal categories as very important, yet the achievement of the goals was below expectations. This is likely due in great part to the psychology of a particular response behaviour – persons responding, and thinking of their subjective goal-setting tend to categorise these as achieved and providing results exceeding expectations. Nevertheless, despite all limitations, statements can be made about those groups of participants, which made an assessment of intangible objectives and are in retrospect revising it.

[39] At goal attainment, a school grade system was used, just as in the evaluation of goals (1=exceeded expectations...5=was below expectations0. The groups were aggregated for analysis: Goal exceeded (1 or 2), goal reached (3), goal not reached (4 or 5).

In addition to the knowledge-oriented goals in the university category (Figure 26), the image aspect as well as internationalisation are above all very important targets. At the same time, their results are said to exceed expectations. This concept of the scholarly reputation of participation is again addressed in the chapter covering impacts and likewise shows high short-term effects. Sixty percent of all universities assessing these goal categories judge image effects to exceed expectations. Internationalisation is just slightly below that with 57%.

Figure 27: Research institutes: assessment of goals reached (intangible and resource related)

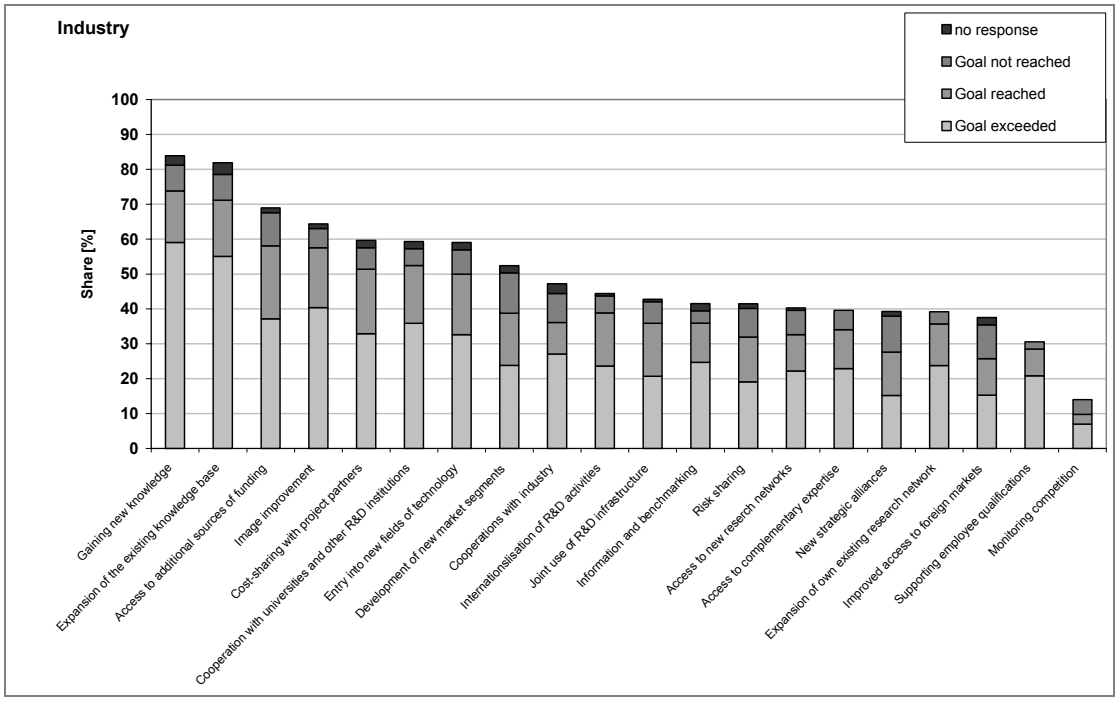


Source: self-conducted survey

The results for non-university research institutions are similar (Figure 27). The responding organisations in this group also evaluate the goals as attained as well as exceeding expectations. Above all, the image effects of participation are judged to exceed expectations. Another interesting aspect is also the fact that a mere third listed access to foreign markets as a very important goal yet half were not able to reach it.

The predominant share of participating companies in the industry sector (Figure 28) could also achieve their targets. Nonetheless it is noteworthy, that the share of participants, listing certain goals as important, but achieving only below their expectations is higher than in the non-industrial sector. This coincides with the results of the cost-benefit evaluation, where the industry group had the highest share of "disappointments" (see Figure 17).

Figure 28: Industry: assessment of goals reached (intangible and resource-related)



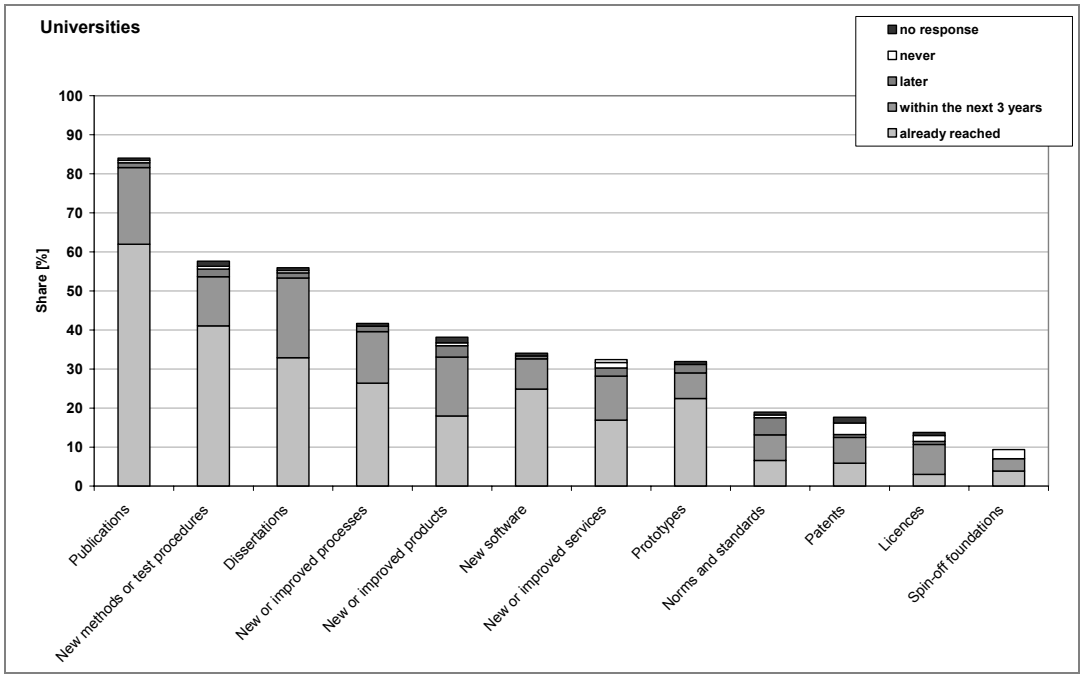
Source: self-conducted survey

The following three figures show the goals-reached ratings in regard to tangible and output-related goal categories. The figures are further differentiated by type of organisation. As the numbers indicate, the FPs not only contribute to enhancement of the knowledge base or cause network effects but lead directly to measurable results. As in the other goal categories the figures provide goal assessments (for instance 84% of university departments judge the goal “publications” to be (very) important). The share of departments falling under the category “goal already reached“ refers to the group of departments, which actually rated the goal (from 1 to 5).

As explained above, “academic results“ are an important motivation for university departments to participate in the FPs (Figure 29). Still, many departments do not perceive that their participation is limited to that. Eighty-four percent saw publications as an important goal and 56%, dissertations. Another 62% of responding departments were already able reach their publications goal, while 20% expect to do so in the next three years. Forty percent reported that new methods and test procedures were developed.

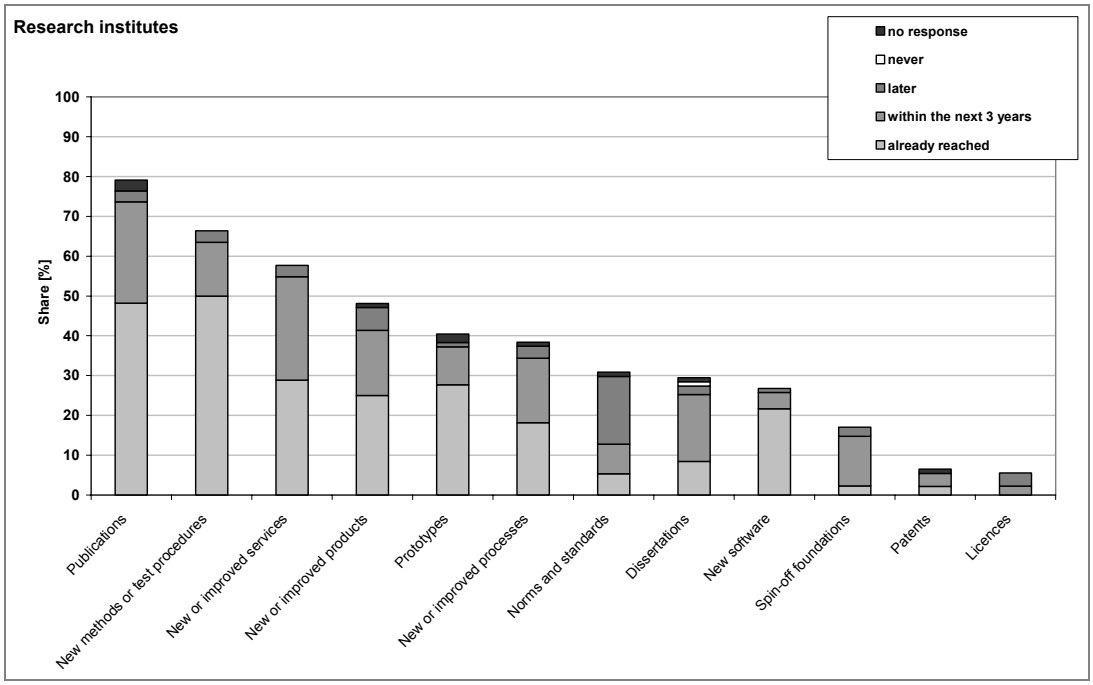
Non-university institutes (Figure 30) also rate publications as very important output, which has already been achieved for the most part. Naturally, dissertations are further down the list and are a medium-range goal. It is also interesting that in comparison, non-university institutes list spin-off foundings as an important goal to a greater extent than do universities (even though the share is still small). For the most part, achievement of this goal is expected within the next three years. Another mid-term effect is the development of new or improved services. Again, the majority of institutes anticipate only meeting this goal within 3 years. The development of norms and standards is a very long-term goal.

Figure 29: Universities: goals reached (tangible goals)



Source: self-conducted survey

Figure 30: Research institutes: goals reached (tangible goals)

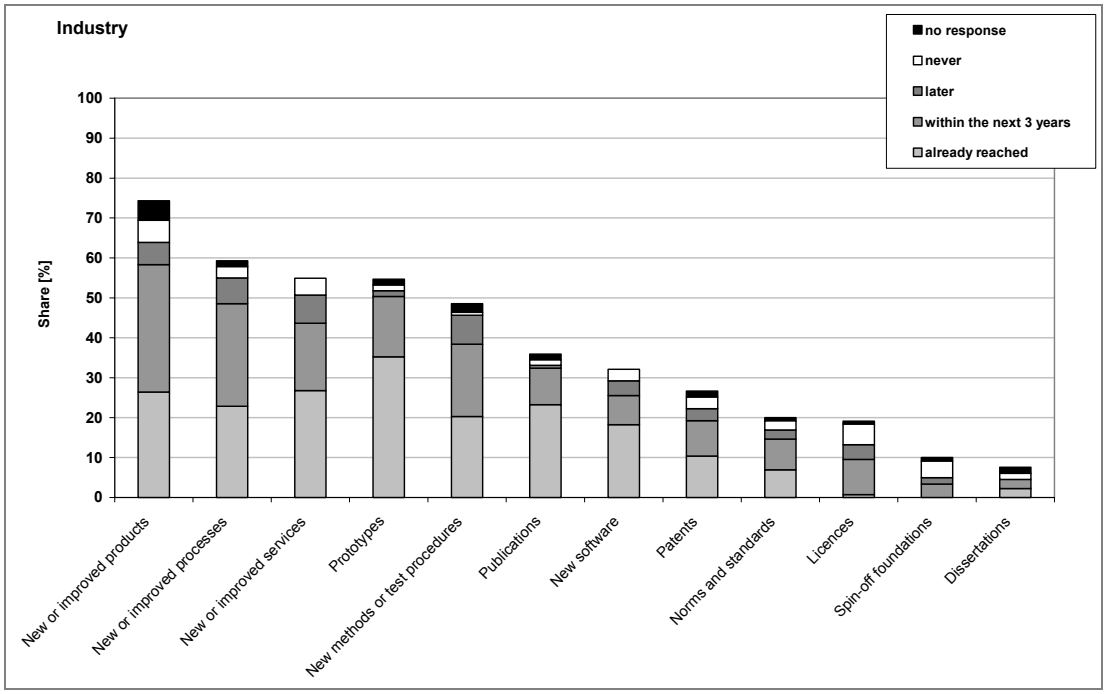


Source: self-conducted survey

Another very interesting analysis is the examination of the time period in which companies can achieve output-oriented results (Figure 31). The majority (75%) of businesses said that development of new or improved products was a very important goal. Still, this is a mid-range undertaking, which occurs in the phase after project conclusion (i.e. within the next three years). This is a further indication of the precompetitive orientation of the FPs. However, the development of prototypes demands much less time. This goal has

already been attained by a third of all companies responding. Further, 10% of the respondents have been able to develop a patent. Output-oriented results therefore involve a time period of 3 years. Beyond that, only a low share of companies expect tangible results.

Figure 31: Industry: goals reached (tangible goals)



Source: self-conducted survey

4.10 Impact of EU FP participation on participating organisations

With respect to the effects of EU FP participation, the survey attempted to differentiate by timing since it can be assumed that effects at different levels require different time periods. Figure 32 presents the results of the survey according to three time categories: (i) an impact has already been determined; (ii) one is expected within the next three years; and (iii) impact possible mid- and long-term (after three years). It should be noted, that the figure merely shows the shares of answers having delivered (or expected to deliver) "very positive" impact. This way, questionable results (tendency to answer "non-specific") can be widely eliminated. Moreover, the results are differentiated by type of organisation since for this question in particular the possible answers available to the observed types of organisations are systematically of widely varying relevance.

Of the effects already achieved (or so perceived by those answering) scientific and/or technological reputation ranks first for all types of organisations. This is particularly the case for the universities (73% indicate that they observe strong positive effects on reputation) and non-university research institutions (64%). Obviously, participation in EU FPs is already an important instrument for these institutions to externally express scientific/technological capabilities (see also Figure 29). But even 46% of companies note that they also observe strong positive effects on their technological reputations. In the meantime, it can be surmised that participation in EU FPs is seen externally as a distinct signal of quality, and this by all types of organisations.

In regard to the short-term effect on employment, university research institutes have the highest share (56%) indicating strong positive effects. This is not too surprising since within the scope of university projects doctoral students as well as post-docs generally work in addition to the project-related, permanent staff. The motivation to increasingly involve up and coming academics in EU projects is at least partially due to the fact the EU subsidies for universities refer to the marginal costs, so permanent staff is not financed. The results

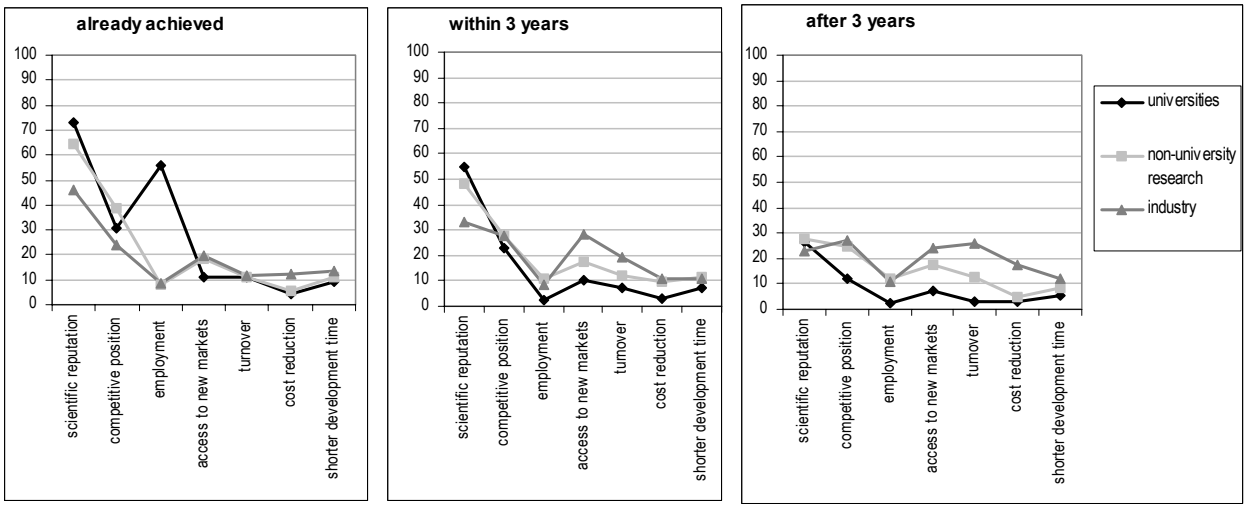
show that at the university level participation in EU FPs plays an important role for the academic up and coming. In non-university R&D institutions as well as in industry, the projects are however carried out by permanent staff, so that here the direct effects during as well as shortly after project execution are mentioned correspondingly less (8% of non-university R&D institutions as well as 9% of companies indicate strong positive effects).

The short-term effects on competitive position can hardly be compared by type of organisation due to their natures[40]. Thirty-nine percent of non-university research institutions and 24% of companies confirm strong positive effects on their competitive positions. Yet, based on the data in hand, it cannot be estimated, to what extent this is based on advantages actually achieved over competitors (e.g. in reference to quality, costs etc.) or if this is again an expression of (perceived) image improvement through participation in EU FPs.

Twenty percent of both of non-university research institutions and companies say they have been able to open up new markets in the short-term through participation in EU FPs. This is an indication, that research and technological development within the scope of EU FPs is an offensive instrument in establishing new markets.

Others effects, like increased sales, cost reduction and shortened development cycles only play a limited role in the short-term according to the responding institutions. About 10% say they have already experienced strong positive effects on sales and shortened development cycles. The numbers for cost reduction lie between 4 and 12%.

Figure 32: Short- and mid-term impact of participation in EU FPs (% of the answers in the category strong positive effect)



Source: self-conducted survey

The second diagram in Figure 32 displays effects expected within the next three years. At first glance it is evident, that the shares of those who answered “very positive“ to the question of effect on reputation generally clearly declined. Still, the share of respondents, who perceive the effect on scientific/technological reputation as “very positive” in regard to the time period of the next three years still have the highest numbers of all of the categories of answers. Again, the universities and the non-university research institutions lead.

The pattern of the order does not vary significantly. There is one exception: the university departments now answer the question of effect on employment with a mere 2.4% “very positive” and therefore lie clearly below

the values of the non-university research institutions (11%) and also industry (8%). This clearly shows, that university research institution participation in EU FPs leads to new employment opportunities (on a project-specific basis) for the academic up and coming. Then, at the end of the project no new employment impulses occur.

If the companies are observed, there is an interesting aspect regarding the assessment of the effect on the development of new markets. The share of companies responding and having rated this effect as very positive increases from 20% (already occurred) to 28% (within the next three years). This shows, that participation in EU FPs is also used as a mid-range offensive instrument for new market development. Although the FPs are generally organised to be precompetitive, direct (in part even in the short-term) economic effects are visible. This is further confirmed by the fact that the share for gains in competitive position goes from 24% (already attained) to 28% (expected within the next three years). Further, in reference to sales effects, the expectations of industry clearly go up from 12% (already achieved) to 20% (within the next three years). Long-term expectations (effects only after three years) foresee an even higher increase to 26%.

This already points to a general difference between the types of organisations. While universities assess the effects to be particularly strong, even in the short-term (i.e. during or shortly after the project) followed by decreased future expectations, the exact opposite is true for industry. While the "hard" effects (like development of new markets, increased sales or cost reduction) have a limited response (around 10%) at the outset (effect already occurred) they rise sharply in regard to future expectations.

4.11 Additionality

As previously detailed in chapter 2, the concept of additionality presents the analysis of the motivational effects of public subsidies of research activities. The reason why public subsidy sources are interested in this is a fear that public subsidy monies represent a substitution effect for private investment, which would have been carried out by the subsidised companies anyway. This would counteract the government's intentions, namely correcting potential market failure (too little investment in R&D from private industry based on the partially public character of R&D). Still, the additionality of R&D subsidy programmes (as with subsidies in general) remains notoriously difficult to measure.

A generally accepted methodical approach within the scope of surveys is the question, whether or not the planned project would have been carried out in case of rejection. The weakness of this approach is that eventually the survey recipient realises the intention of the question and in some circumstances answers dishonestly.

Another difficulty is that very specific criteria must be met in order to receive a subsidy for a project proposal from the European Commission. The most essential criterion is the cooperation aspect, a defining characteristic of the FPs, since cooperation (international as well as between different types of organisations) in R&D gains increasing significance. It is therefore evident, that without EU subsidy this exact composition of consortium would not have occurred. Additionality, which respects these cooperation effects, is therefore very high as such.[41]

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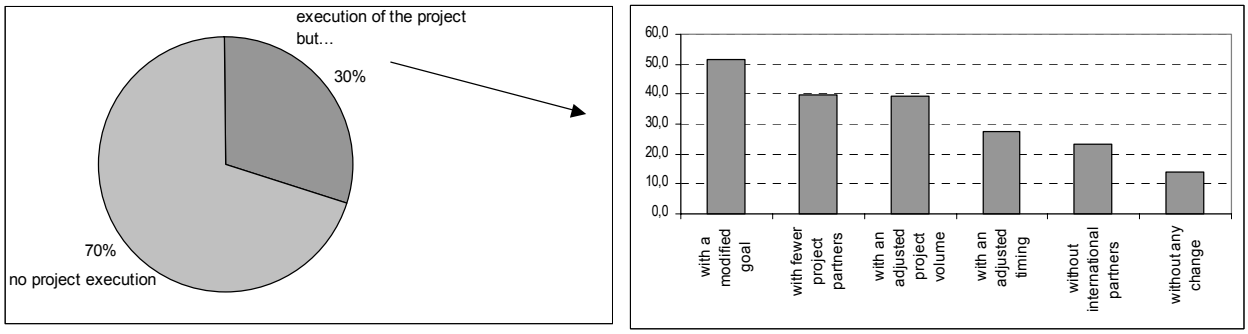
[40] "Competition" at the university department level naturally has other rules and runs via other mechanisms than at the industry level. Non-university research institutions are also more likely to submit to the "market rules" than are universities. For this reason, there is no further examination of university departments in this regard.

[41] Also see the relevant analyses from Luukkonen (2000)

Despite these methodological difficulties, within the scope of this survey an appropriate block of questions has been included for reasons of comparability. The results are, compared with Finland and Ireland, absolutely impressive: 70.1 percent of those questioned said, that they did not continue with the relevant research project after project rejection (see Figure 33). In Finland this share amounts to 54% (Luukkonen, 2000) and in Ireland 82% (Guy et al., 1999). This speaks in favour of the very high additionality of the EU FPs. One cause of this high additionality is certainly based on the fact that because of the complex project organisation (participants from at least two EU states, high number of participants from different organisations), the amount of work associated with the execution of the project without EU subsidy is considered to be too high and that without the subsidy the consortium would forego the whole project.

In additional to this general question, each participant who would have pursued the project was asked more detailed questions to establish the extent to which the structure and volume of the project would have changed due to a rejection.

Figure 33: Additionality of participation in the EU FP

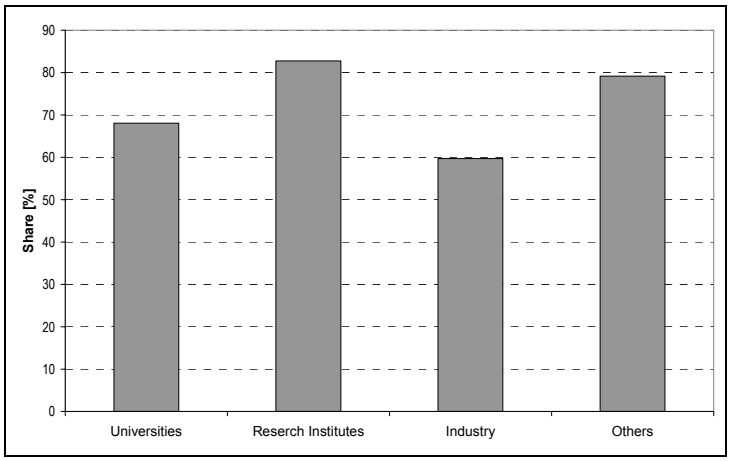


Source: self-conducted survey

Of the 30% of respondents that would have continued the project without EU subsidy only 14% say that they would have done so without any adjustments. This further underlines the great extent of additionality that can be achieved through the EU FPs. All those that would have continued the project with modifications list above all modified goal orientation (52%), a reduced number of project partners and different project volume (each 40%). The average change in project volume, is – 47%. So, without EU subsidy the project would have only been continued in a very reduced form.

There are marked differences between the types of organisations in reference to the question of additionality (Figure 34). Over 80% of non-university research institutions would not have pursued the project further. At the same time, "only" 60% of companies said that they would *not* have carried out the project.

Figure 34: Reaction to project rejection by type of organisation (share of respondents who did not pursue the project after rejection)

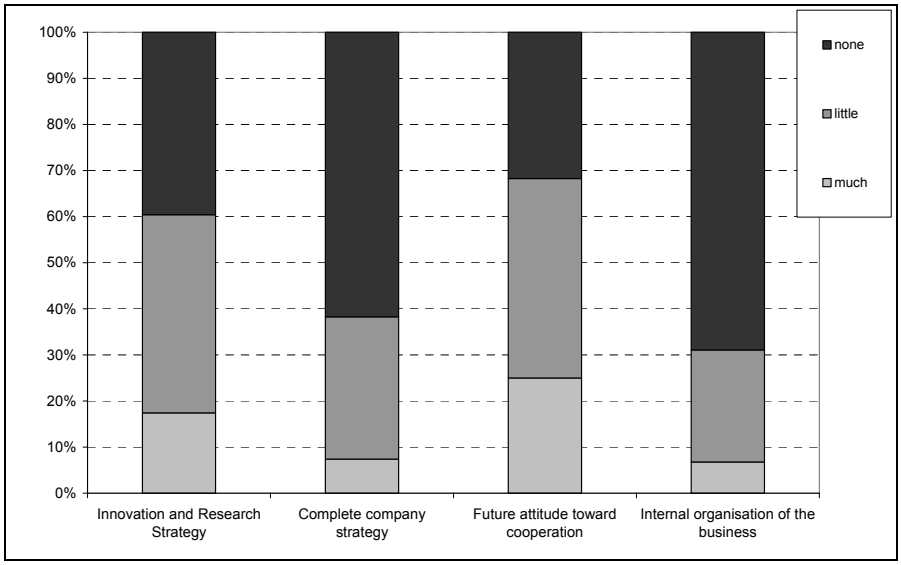


Source: self-conducted survey

Alongside this narrow definition of additionality, the survey also attempted to explore how "behavioural additionality" was affected by participation in the FPs.

Figure 35 presents these results although is should be noted that in this regard only companies are examined. The greatest effects are seen in future cooperative behaviour. Twenty-five and forty-three percent respectively say that participation in EU FPs led to major as well as minor adjustments in reference to future cooperative behaviour. The effects on innovation- and research strategy come in second. Participation in EU FPs rarely leads to changes that affect the entire company (business strategy, business organisation).

Figure 35: Effects of participation in the EU FPs on strategic behaviour (industry only)



Source: self-conducted survey

4.12 Factors (positive and negative) influencing project execution

Table 38 provides an overview of the (subjective) assessments of those surveyed in regard to which factors had a positive or negative influence on project execution. Both the median (50% of the answers are above, 50% below) and the mode are given (the most-cited value). A value of 3 means, that the factor had neither a positive nor a negative influence. The values 4 and 5 point to a positive influence and vice versa.

Table 38: Subjective assessment of influencing factors on the execution of the EU project

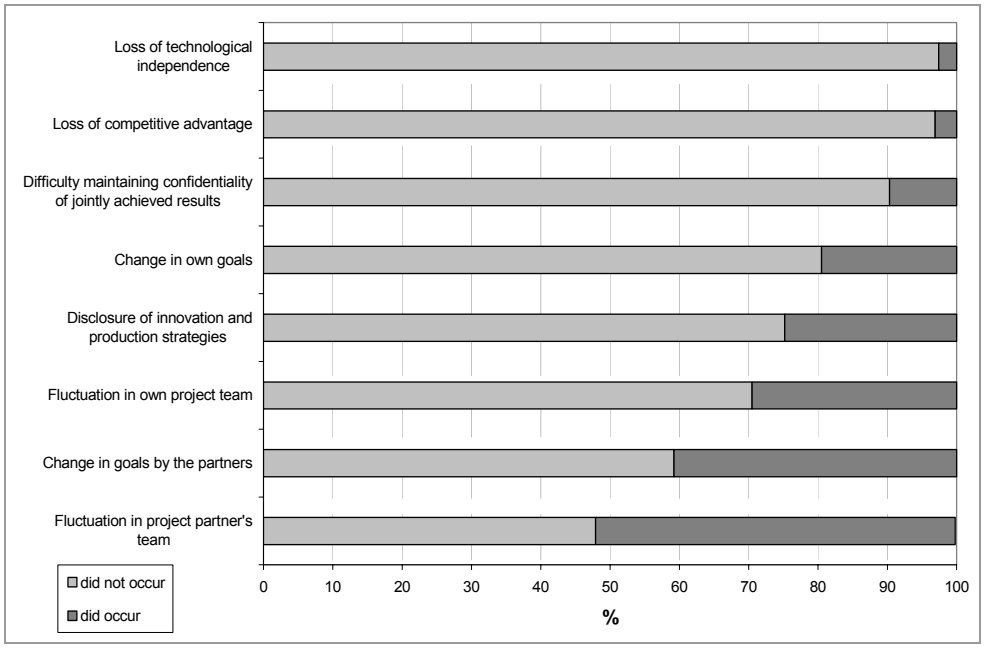
	N	Median	Mode
Reliability of partners	472	4	4
Differences in working styles	473	3	3
Geographic distance between project teams	472	3	3
Partner competence	469	4	4
Project management via the coordinator	474	4	5
Handling of intellectual property within the consortium	458	3	3
Interest in making use of project results	464	4	4
Amount of the EU subsidy	474	4	4
Coordination- and communication efforts	466	3	3

Source: self-conducted survey (1=very negative influence ... 5= very positive influence)

The quality of project management via the coordinator (median: 4; mode: 5) is of critical importance to successfully executing an EU project. Also, reliability of partners, partner competence, interest in the use of the project results and the amount of the EU subsidy show positive influences. By and large it can be said that hardly any negative assessments were submitted by the respondents in reference to influencing factors.

Figure 36 presents the perceived problems in the course of project execution. It is interesting to note that problems resulting from changes made by one or several project partners are most often mentioned. Fifty-two percent said that problems occurred due to changes partners' project team and 41% say adjustments to a partner's project goals were the source of difficulties. All other types of problems were only mentioned by a minority.

Figure 36: Perceived problems in the course of the project



Source: self-conducted survey

All in all it appears that problems occur less often due to the classical barriers to cooperation – like confidentiality or loss of *unique selling propositions* – than with the commitments made over the entire span of the project.

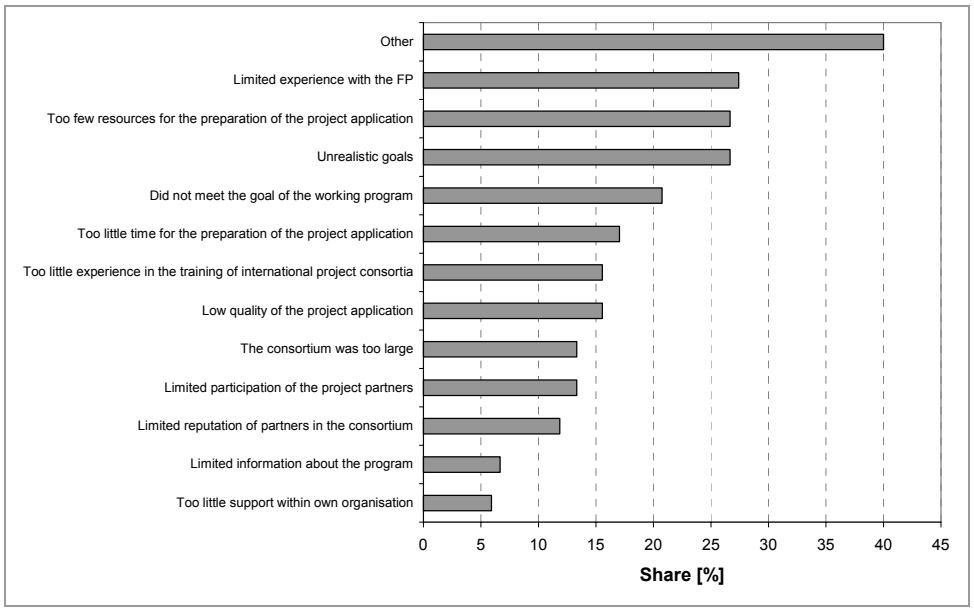
4.13 Rejected coordinators

Chapter 3 showed, that the quota of research projects rejected by the EU FPs is generally very high. An important question then becomes: "what happens to these rejected projects?" By also surveying the rejected Austrian coordinators, relevant statements can now be made on this issue. It should be noted that the following does not concern participants but only the Austrian coordinators.

The analysis of the subjective, perceived reasons for the rejection of the project proposal shows that – in contrast to other questions – the leftover answer category "other" is absolutely and relatively cited most. The reasons specified are exceedingly heterogeneous and range from the assessment of the evaluator as incompetent (this assessment was given by several respondents using various wordings), to political problems to companies either too large or too small as consortium partners. Based on the heterogeneous nature of the projects (both in terms of content and organisation) it is difficult to identify typical patterns in the perceived reasons for rejection.

Of the reasons for rejection provided on the survey, most respondents, with a share of about 27% each, blame too little experience with the FPs, goals set too high and too few resources for the application process. Too little support within the home organisation as well as too little information about the programme receive only 6 and 7% respectively. Apparently, lacking codified knowledge hardly plays role. On the contrary, as evidenced by the high value associated with lacking experience with the FP, a lack of *tacit knowledge*, is perceived to be a problem. This is confirmed, when one examines the differences in assessments of this problem by experienced organisations (having already participated in earlier EU FPs) and inexperienced organisations (no previous participation). Only 15% of experienced coordinators say this reason (*limited experience with the FP*) is responsible for project rejection. The value is 38% for the inexperienced.[42] Continuous participation in tenders and the gains in experience which result (statistically, 1 of about 3-4 proposals is approved) can be viewed as important instruments in increasing the likelihood of future success.

Figure 37: Subjective, perceived reasons for the rejection of the project proposal (share of yes answers in %)

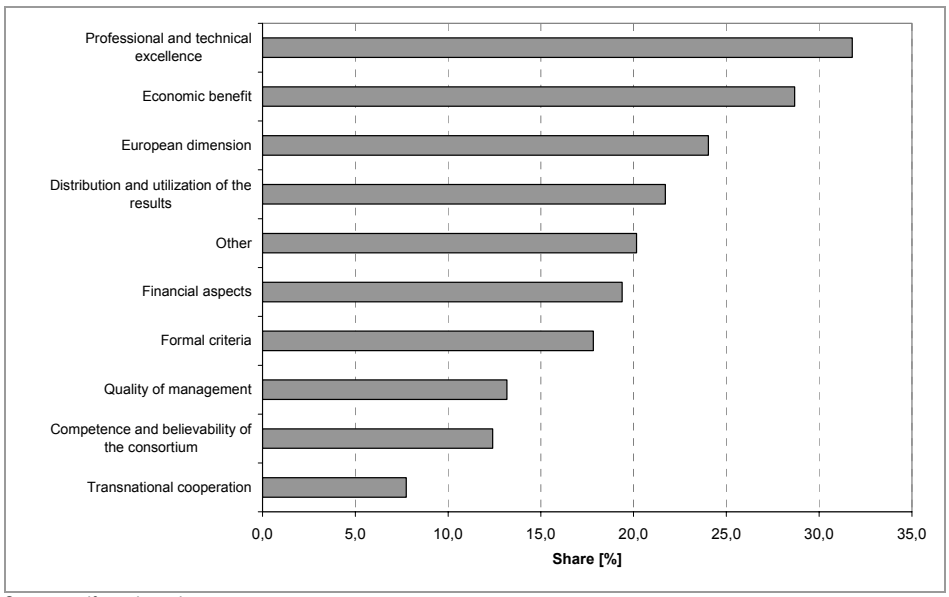


Source: self-conducted survey

[42] This difference between experienced and inexperienced however does not appear in the answer category "too little information about the programme."

Along with the subjective, perceived reasons for project rejection, the survey also asked for the official EU Commission reasons (see Figure 38). Lacking expert and technical excellence was most often mentioned with a share of 32%. The absence of sufficient economic benefit (29%) and project proposals with too little European dimension (24%) placed second and third.

Figure 38: Reasons for rejection from the European Commission point of view (share of yes answers in %)

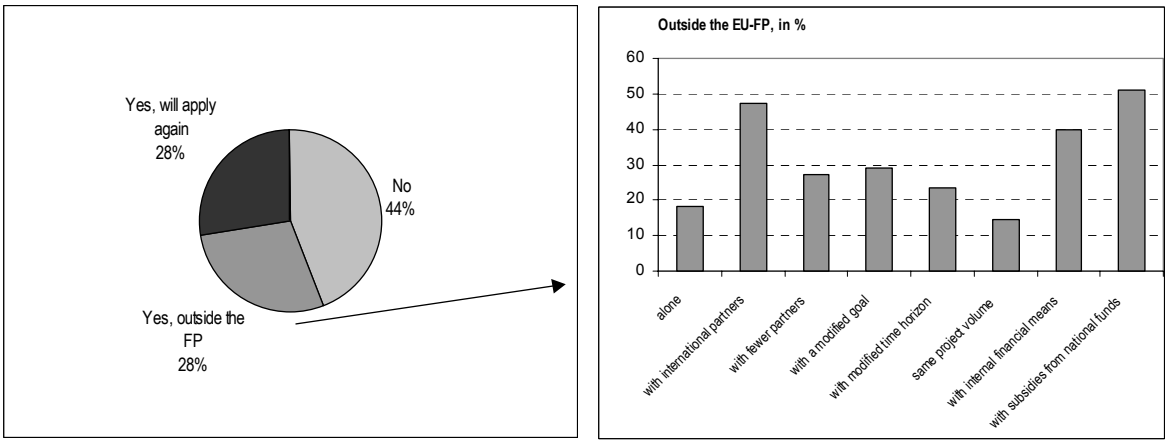


Source: self-conducted survey

Forty-four percent of coordinators responding said that following rejection of their research proposal by the European Commission, they did not pursue their project (see Figure 39). Another 28% sought to continue the research project outside the EU FPs, 16% applied again (or plan to) and 12% have tried both (applied again and simultaneous continuation independent of the FPs).

Of those continuing the research project outside the EU FPs despite rejection, about 50%, said that they were able to receive national subsidies as sources of financing. On the other hand 40% continued the research project using their own resources. It is interesting to note that approximately 50% stated that during the continuation of the project, they still cooperated with international partners (18%, said they continued the project alone). Obviously the (unsuccessful) attempt to participate in EU FPs has already had clear effects on the formation of cooperative research networks. Admittedly, the projects are pursued with adjusted goal orientation and resources. Only about 15% said they planned to continue the project with the same resources as originally planned.

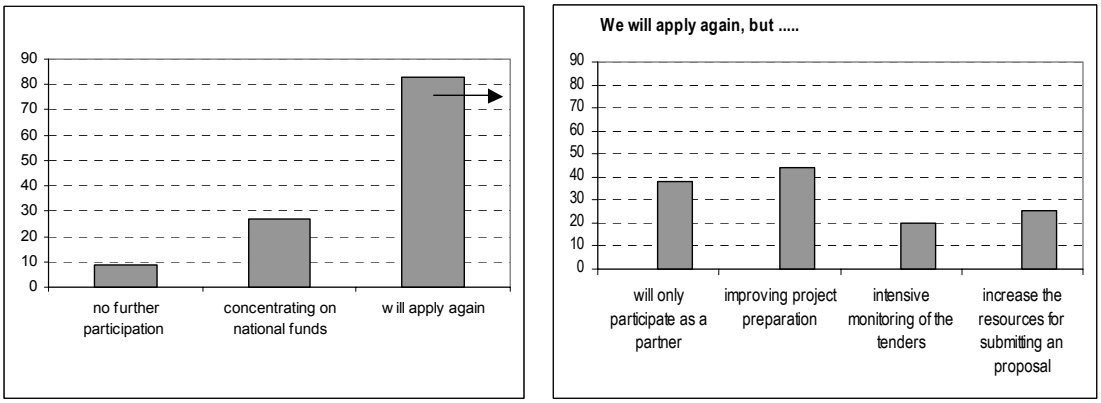
Figure 39: Continuation of intended research despite rejection



Source: self-conducted survey

In most cases, the rejection of an EU application does not lead to total abandonment of participation in EU FPs. As Figure 40 shows, over 80% of respondents say that they plan to submit future applications within the scope of the EU FPs. Only 8.5% plan no further attempts at FP participation. Of those planning to continue submitting research project applications to the FPs, a not so insignificant group plans to alter its behaviour. Forty one percent want to improve their project preparation and 36% will only apply as a partner and not as the coordinator of a project. This is a further indicator of the high level of involvement required by the conception and coordination of EU project proposals. The categories intensive monitoring and increased resources for the application process play a lesser role with 20% and 25% respectively. The low share of mentions for intensive monitoring of EU programme tenders insinuates that the possibility of information deficits is of little consequence to success or failure in submitting applications thus confirming previously mentioned results about the perceived reasons for project rejection.

Figure 40: Consequences of project proposal rejection



Source: self-conducted survey

5. Determinants of participation for Austrian university departments

The following section attempts to define characteristics, which differentiate departments participating in EU projects from those, which do not. Since the introduction of the FPs, universities play an important role in network building and the internationalisation of research. Therefore, the following pursues the question of whether or not this results in a different composition of subsidy seekers at national and European levels. This question shall be answered based on the example of the university departments, in that those taking advantage of national subsidies will be compared with departments receiving subsidies in the 4th FP. The following questions will be discussed:

- Which structural characteristics typify university departments participating in the 4th FP? How large is this share?
- Can a *trade-off* between research and teaching be recognised? Between participant and non-participant in the FP?
- Which scientific areas are represented with particular intensity in the FP?

Data base

The basis for the analysis was data from over 904 departments, provided by BMBWK. The data contained information on the fields of research, support, publications (incl. patents), as well as teaching personnel. The data cover the period from 1996-1998; the number of publications, the master's theses and dissertations, as well as the number of projects is aggregated to a sum over these three years. The data on teaching are presented as a yearly average. For the different kinds of scientific outputs subsumed in the publication variable, activity figures have been calculated following the Austrian University Board of Trustees (OEUK). An activity number has also been calculated for support performance according to OEUK convention. An overview of the separate variables can be seen in Table 39.

Table 39: Activity data by the OEUK

First edition monographs * 3
Original contributions to industry periodicals or collective works * 1
Research reports *1.5
Patents * 2.5
Lectures and presentations within the scope of scholarly congresses * 0.5
Other scientific publications * 0.5
Masters theses * 1
Dissertations * 2

Source: OEUK

Table 40 below provides an overview of the following analysis of basic variables.

Table 40: Variable overview

–	Data on teaching activities	Number of teachers in persons and VZÄ
		Scope of course offered (in hours/week)
–	Number of publications	First edition monographs
		Original contributions to industry periodicals or collective works
		Research reports
		Patents
		Lectures and presentations within the scope of scholarly congresses
		Other scientific publications
–	Supervision of theses and dissertations	
–	Number of projects	EU FPs
		Fund for the promotion of scientific research (FWF)
		Research subsidy fund for the industrial economy (FFF)
		Other, mainly public, funding
		Federal, provincial, local
		Other contractors, sponsors/investors

Source: BMBWK

The 904 departments were assigned to 6 fields of science (by Statistik Austria). The assignments were based on the orientations of the departments, not by affiliation to a university. For instance, the department for mathematics from the school of Bodenkultur is assigned to field 1 and not field 4.

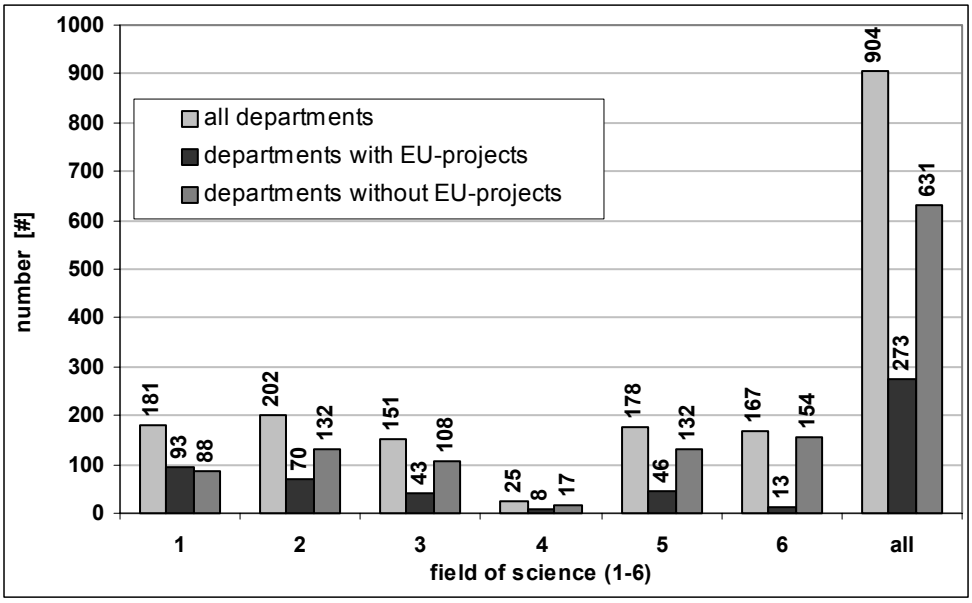
Table 41: Fields of science

(1)	Natural sciences
(2)	Technical sciences
(3)	Human medicine
(4)	Agriculture and forestry
(5)	Social sciences
(6)	Humanities

Source: Statistik Austria

Figure 41 shows the number of departments per field of science as well as the number of departments participating in EU projects.

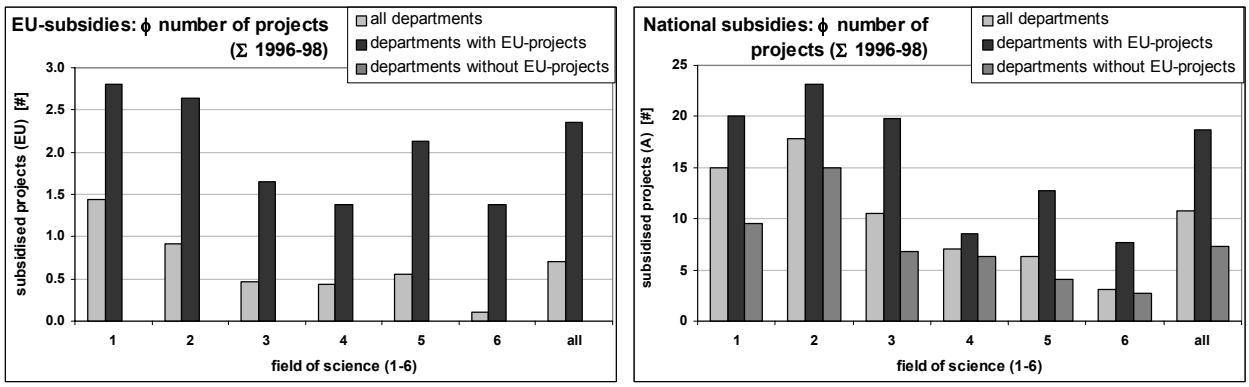
Figure 41: Departments by scientific area



Source: BMBWK, internal calculations

Both of the largest fields of science (natural sciences and technical sciences) also have the highest share of EU participants (more than half of those from the natural sciences as well as a third of the technical departments take part in at least one EU project). The lowest share of EU participants is found in the humanities departments with 8%. The total rate of participation is 30%. Figure 42 shows the average participations in European and nationally subsidised projects.

Figure 42: Average participation in EU and national subsidies



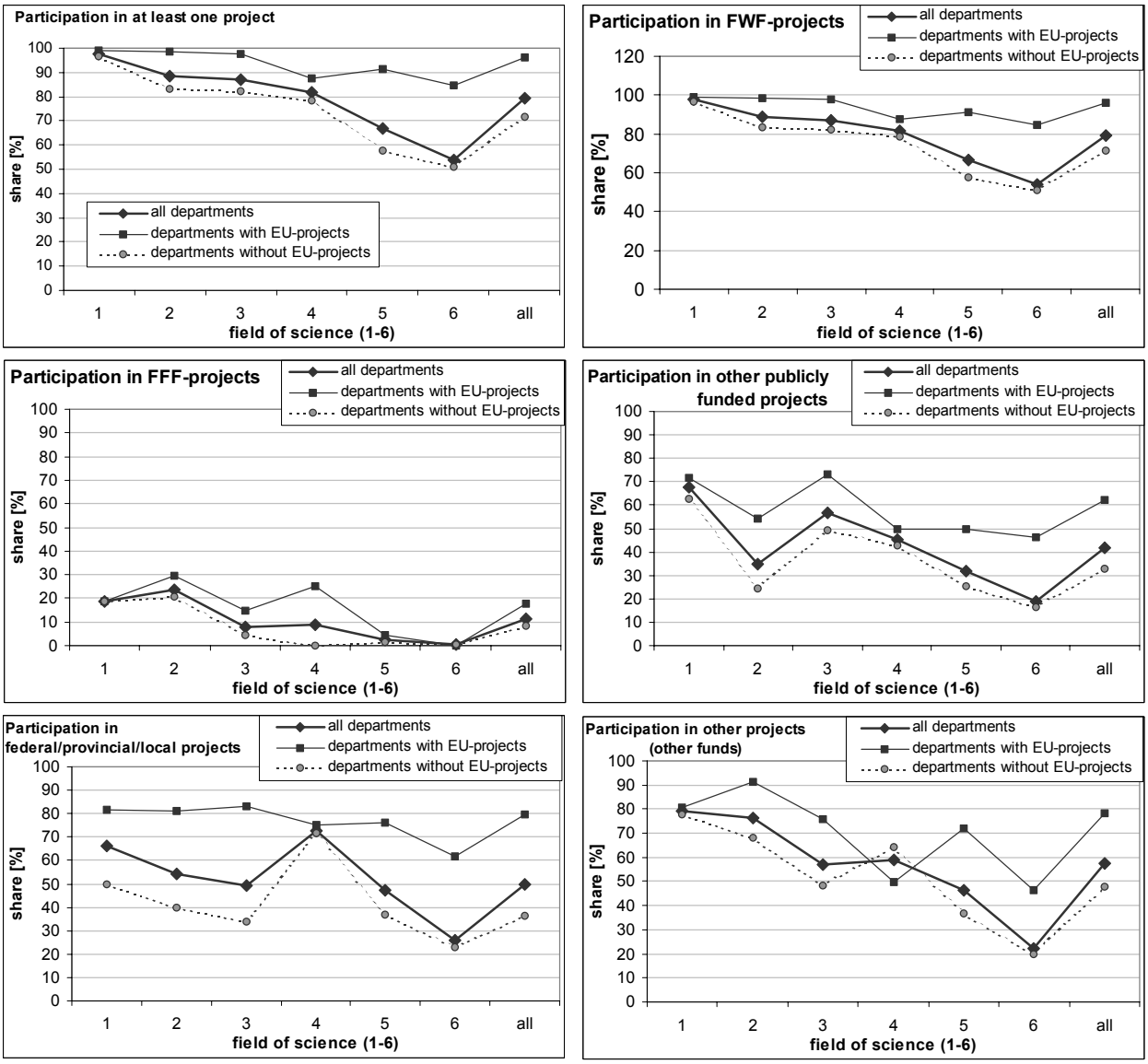
Source: BMBWK, internal calculations

Scientific and technical departments also have the most EU projects (in the period from 1996-98, about 1.5 or 1 in regard to all departments, and 2.5 in regard to departments with at least one EU project); besides that, EU participants in all fields of science show higher participation levels in nationally subsidised projects.

Participation in Austrian subsidy programmes

Figure 43 shows the shares of the departments participating in at least one project.

Figure 43: Participation in national subsidies



Source: BMBWK, internal calculations

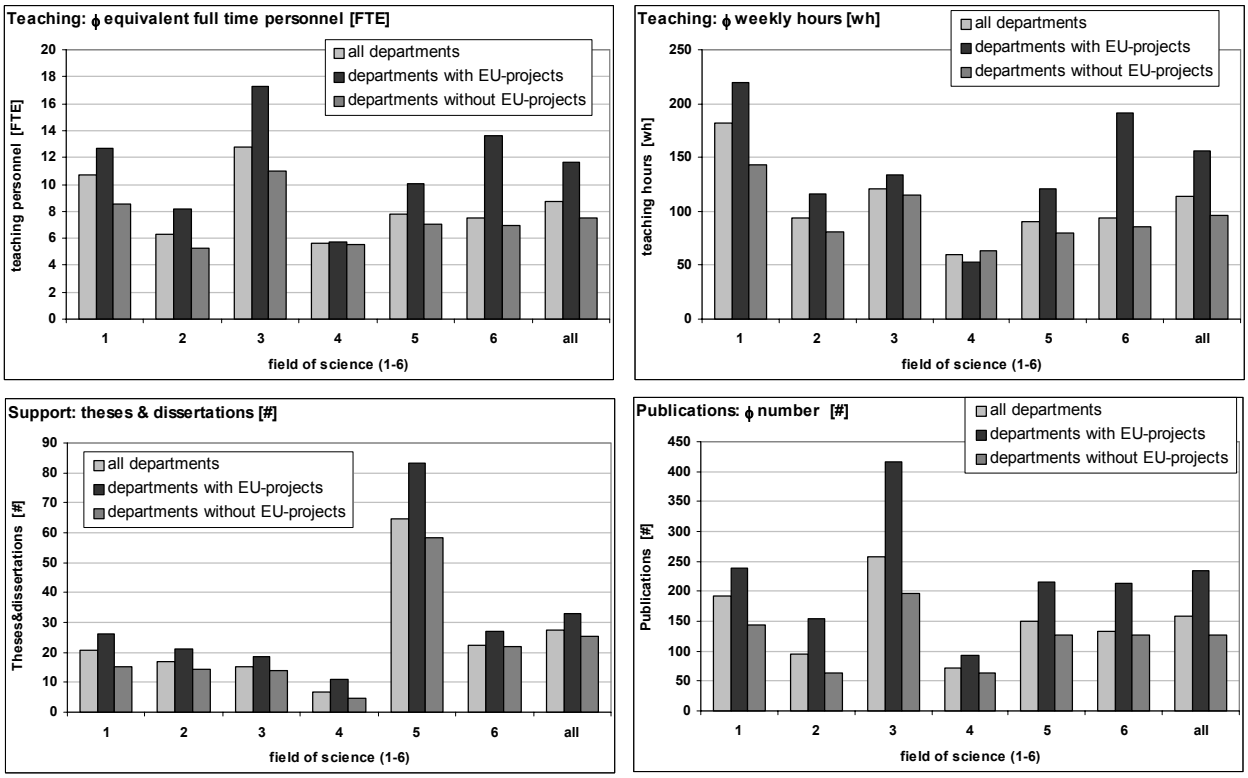
It is evident that departments with at least one EU project are more likely to participate in Austrian programmes than are departments without EU projects (with one single exception: departments without EU projects, and belonging to field of science 4 (agriculture and forestry as well as veterinary sciences), prefer to take part in *other programmes* unlike their counterparts without EU projects).

The following attempts to identify characteristics, which could explain these different rates of participation.

Differences between participants and non-participants in EU projects

Figure 44 shows the characteristics of departments (teaching, publications, support, ...) expressed as averages.

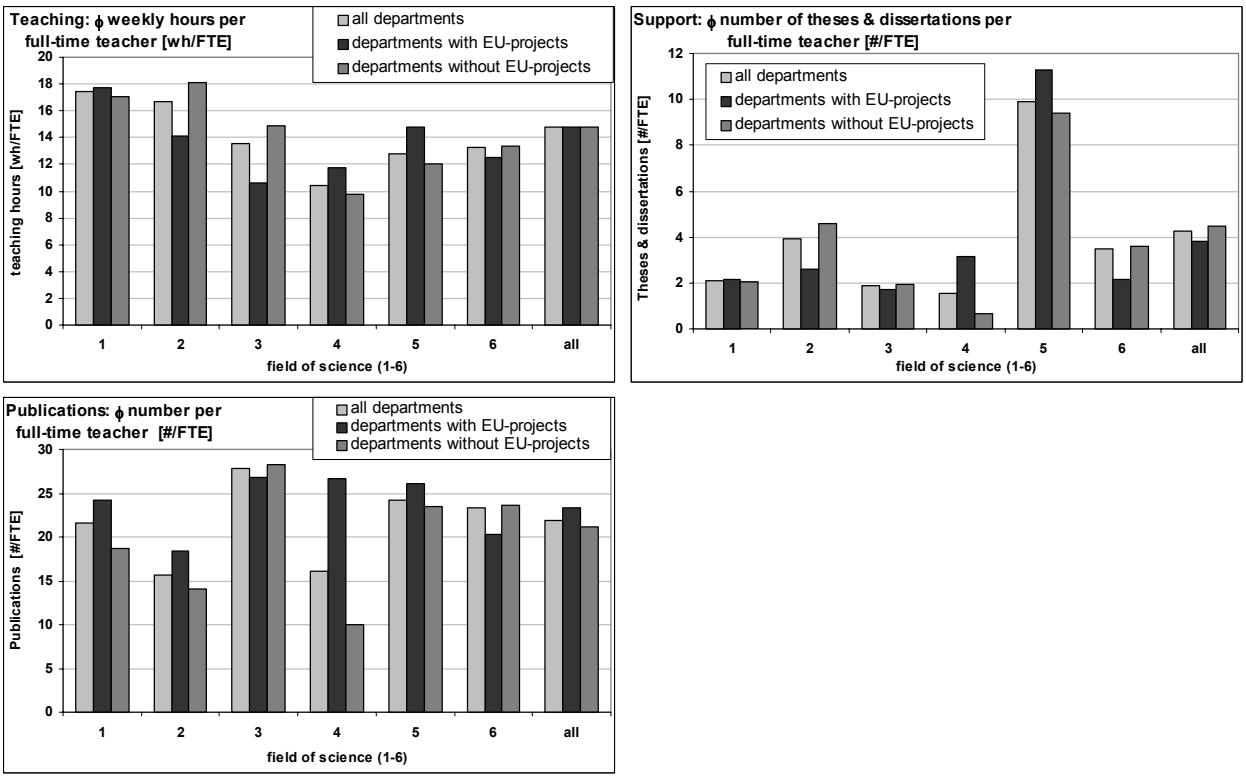
Figure 44: Characteristics of departments



Source: BMBWK, internal calculations

Conspicuously, EU project participants show higher values than non-participants in all categories. To resolve the question of whether or not participating departments are merely "larger " or also “more active” in regard to other characteristics, the characteristics will be related the teaching personnel as a proxy for the "departments size" attribute; the result is shown in Figure 45.

Figure 45: Attributes weighted by department size



Source: BMBWK, internal calculations

In terms of the number of hours per equivalent full-time teaching staff, the participants and non-participants are truly balanced (across all departments there is practically no difference). Departments without EU projects need slightly more intense support, but show somewhat less publication intensity (each depending on teaching personnel). This leads to the conclusion, that an essential criterion for EU projects is department size (this seems plausible: tender, coordination and execution of EU projects pose a not so insubstantial administrative effort; larger departments are better able to deal with the time commitments). Given equal size of the departments, the rate of participation is essentially dependent on the field of science.

A Probit model attempts, to model the probability that a department participates in at least one EU project. Dummies served as independent variables for the fields of science[43]; publications, weekly hours and support services (each in regard to the teaching personnel), to model the other activities; as well as Dummies for the participation in national subsidy activities.[44]

The result is summarised in Table 42.

[43] Five dummies for fields 1-5, which indicate value 1 when a department is categorized in a particular field. Otherwise, the value is 0. No Dummy was provided for field 6 since that would lead to a linear dependence on the regressor. Therefore, field 6 is included as the reference constant.

[44] Five dummies for participation in national subsidy programmes: FWF; FFF; other mostly publicly subsidised funds; federal, provincial, local; other contractors. The value 1 appears when a department receives funds for at least one project. Otherwise the value is 0.

Table 42: Probit-model

Independent variables	*Coeff.*	*Prob.*	*Sign*
Constants + field of science 6	-2.08	0.00	**
Field of science 1	0.95	0.00	**
Field of science 2	0.82	0.00	**
Field of science 3	0.63	0.00	**
Field of science 4	0.77	0.02	**
Field of science 5	0.66	0.00	**
# Publications / VZÄ	0.00	0.28	
# Hours/week teaching / VZÄ	-0.01	0.23	
# Theses + dissertations / VZÄ	0.01	0.39	
Participation in FFF-Project	0.10	0.52	
Participation in FWF-Project	0.42	0.00	**
Participation in other public funding	0.19	0.09	*
Participation in BLG project	0.86	0.00	**
Participation in other projects	0.20	0.10	*
N = 851; McFadden R^2 = 0.21			

The *Coeff* column shows coefficients in the Probit model; *Prob*. and *Sign* give an indication as to the significance of parameter values (**(*) means significance at the 95(90) percent level).

It can be seen that the fields of science 1-5 all command a higher likelihood of participation than reference field 6 (positive coefficients); participation in national projects also raises this probability. The "activity variables" publications, teaching and support have no significant influence on the likelihood of participation.

The likelihood of participation is highest in field of science 1 (natural sciences), followed by 2 (technical sciences), 4 (agriculture and forestry, veterinary science) and 5 (social sciences). Field of science 6 (arts) brings up the rear.

In summary, the following inferences can be drawn from the analyses:

- Thirty percent of all Austrian university departments are participating in the 4th FP. This is greatly determined by the field of science. Natural sciences and technical sciences have the highest share of departments taking part in the FP (51% as well as 35%).
- Participating departments are generally larger than the group of non-participants. Given the same department size, the participation depends essentially on the field of science.
- Weighted by size, no significant difference can be recognised in the research- or support services between the group of participants and non-participants.
- The most interesting results are however, that no *trade-off* between national subsidies and EU subsidies can be ascertained. University departments actively pursuing national sources of funding also show a strong presence in the EU FPs.

6. Evaluation of the support infrastructure and of available data

Austria, just like the other EU members, has built a support infrastructure to promote participation in the FPs. On the one hand it supports interested programme applicants and on the other hand the political-administrative level. This chapter describes this infrastructure in terms of its most important players as well as of available data. For this the relevant question formulations from the survey were evaluated and interviews were conducted with representatives from support infrastructure as well as with programme delegates. Additionally, the analysis of existing international studies, complemented by live interviews allows comparison with other EU member states. The analysis of the initial- and supplemental financing is basically based on two sources: The available records detailing subsidies provided within the scope of the 4th EU FP from subsidy providers (BMBWK and FFF) as well as interviews with the responsible persons from the providers.

It should be emphasised that this chapter is not an evaluation of the support infrastructure but provides information about requirements that make it easier to understand the success or failure of Austrian participation. Further, the tasks allow the formulation of conclusions about the potential for improvement based on information gathered.

Support for interested programme applicants is dealt with at the outset. Section 2 then deals with support at the political-administrative level through data preparation and leveraging information. Part three is concerned with the financial support of applicants and section four contains an international comparison of the support infrastructure in Finland, Ireland and France. Finally, section 5 concludes the chapter with a discussion of proposals for improving the Austrian support infrastructure.

6.1 Support for potential FP participants via BIT, regional support posts and national programme delegates

6.1.1 Structure and sponsors of BIT

Since 1993, the "office of international research and technology cooperation" (BIT) has acted as the office of the association for international research-, technology- and education cooperations (VIKOP) to support the international, in particular the European, research and technology programmes, actions and initiatives. The members of VIKOP are at the same time the sponsors of BIT. On the one hand they are comprised of representatives from the relevant ministries,[45] of the office of the Federal Chancellor (only in the 4th FP) as well as the Austrian chamber of commerce as sponsoring organisations. On the other hand they include representatives from some provinces and lobbyists[46] as simple members. The entire group of sponsors in international comparison should be seen as a positive exception that is only possible in a small country.

At the time of the 4th FP, the BIT was organised in 4 thematic projects: information- and communication technologies, industrial and material technologies, life sciences and -technologies, as well as environment and energy. Additionally there are departments for horizontal programmes and initiatives: cooperation with third countries (INCO, COST and INTAS), Central and Eastern Europe offices, INNOVATION, TMR, as well as EUREKA. Within the scope of special projects, the Austrian National Host was established and TEN

[45] Federal Ministries of external affairs, of economic affairs, of health and consumer protection, of agriculture and forestry, of environment, youth and family and of science, transportation and arts.

[46] The provinces of Styria, Upper Austria and Salzburg, the VÖI, FFF and FWF, ÖÄW, VTÖ, ÖRK and the federal chamber of labour

TELECOM and INFO2000 were counselled. The BIT (project INNOVATION) coordinates the Innovation Relay Centre Austria (IRCA) with the following partners: ATTAC Innsbruck, CATT Linz, DANUBE Vienna, KIZ Klagenfurt, APS Graz. APS, ATTAC, CATT and DANUBE also act as regional support centres.

At the time of founding in 1993, 12 persons worked at the BIT. By the end of 2000, the number had increased to 50 employees. With that, it is apparently the largest support infrastructure in international comparison.

6.1.2 Goal setting and range of services

The task and the goal of BIT are the promotion of Austrian participation in international research programmes, their intensification, as well as the support of the coordination of international and national R&D activities. Financial returns are not an exclusive goal. Networking researchers and the development of know-how are just as important. In the course of informing, stimulating, encouraging and supporting the participants in international research programmes, various services[47] are offered. In particular:

- General information: mailings and information events
- Specific information: since the beginning of 1995, interest profiles are more often created and information is spread with greater accuracy and increasingly via electronic means.

Information events are held in conjunction with the delegates. Even before a call for tender, work begins with the drafts of the call in order to react as quickly as possible. BIT consultants have personal contact with Scientific Officers in Brussels. Sometimes they also have research experience in the respective fields thus easing communication with the applicants.

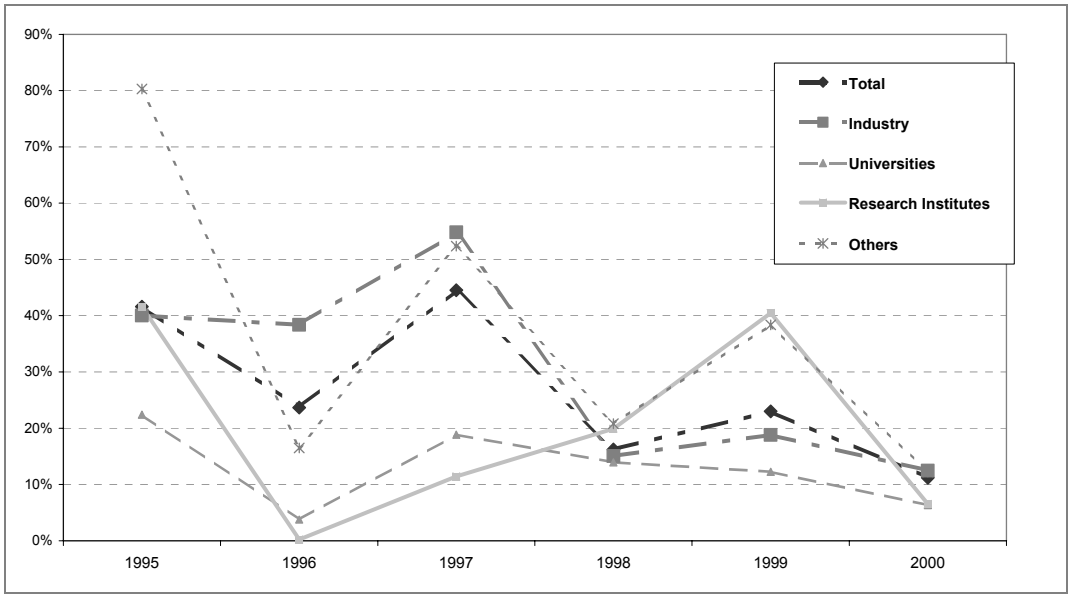
Since its creation, a permanent effort of BIT has been reaching new target groups, new organisations and new persons. Table 43 shows the number of persons and organisations receiving a mailing from BIT ("loose contact") between 1994 and 2000. Figure 46 shows the growth rates by type of organisation. It shows that during of the 4th FP the targeted group (organisations) could be tripled. After the growth at the beginning of the observed period, there is stronger growth in industry in 1997. This category has been holding at over 60% ever since. Starting only in 1999, after the end of the 4th FP, non-university research institutions will be addressed.

[47] The range available services listed is in the VIKOP regulations:

(a) Planning, furnishing and maintaining appropriate offices for the practical, effective execution and support of the activities of the association in particular:
- In accordance with national emphases, the intensifying and support of international research-, technology- and educational cooperation through concrete suggestions and initiatives for the areas university, the non-university teaching and research institutions as well as trade and industry;
- information and consultation about international research- technology- and educational cooperation, subsidy- and process questions and support in creating project proposals;
- support in the search for project partners, domestic and foreign;
- consultation and support in executing projects and the evaluation of results;
- compiling and diffusing information about activities, program's, advertisements and individual projects;
- expert support in the perception of Austrian interest in international committees for research, technology- and educational cooperations;
- information events, in particular lectures, discussions, symposia, etc.;
- publishing, creating and marketing of publications, images and A/V materials;
- studies and research as well as evaluation of the results;
- building and maintaining a library and documentation, access to international databases and data networks as well as participation in such institutions;
- close collaboration with the expert commissions of the programme delegates; ÖNORM A 2050 is responsible the for the allocation of services.

(b) collaboration with regional or local support institutions with the same or similar objectives.

Figure 46: Organisations informed via the BIT (by means of mailings), growth rates, 1995 - 2000, by type of organisation



Source: BIT

Table 43: Persons and organisations informed via the BIT (by means of mailings), 1994-2000

Year	Persons	Organisations				
		Total	Industry	University	Research institute	Other
1994	4 783	2 710	1 444	589	327	350
		100%	53.3%	21.7%	12.1%	12.9%
1995	7 339	3 837	2 022	721	463	631
		100%	52.7%	18.8%	12.1%	16.4%
1996	8 579	4 745	2 798	748	464	735
		100%	59.0%	15.8%	9.8%	15.5%
1997	12 344	6 858	4 332	889	517	1 120
		100%	63.2%	13.0%	7.5%	16.3%
1998	13 866	7 970	4 984	1 013	620	1 353
		100%	62.5%	12.7%	7.8%	17.0%
1999	21 374	9 802	5 922	1 137	871	1 872
		100%	60.4%	11.6%	8.9%	19.1%
2000	26 184	10 897	6 659	1 209	928	2 101
		100%	61.1%	11.1%	8.5%	19.3%

Source: BIT

Consultation during project proposal formulation

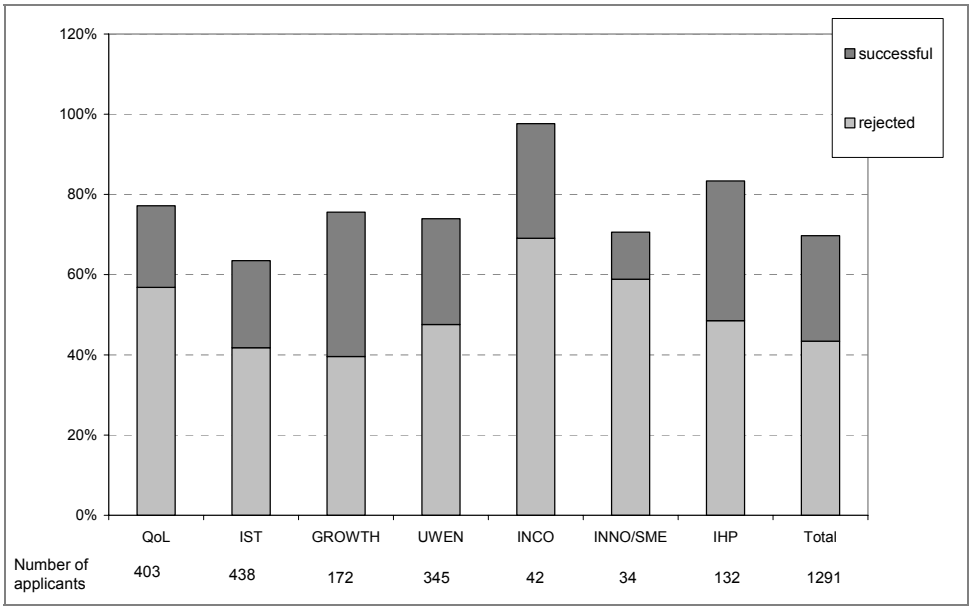
During project proposal creation, the BIT consults with respect to support in meeting the formal criteria, layout of the application, the explanation of the relevance-criteria, or management criterion. There is no typical model of consultation. In principle, assistance is available in every step of the project proposals. The writing of the application itself is however completely left to the applicant.

Figure 47 is based on data provided by BIT. They document share of applicants in active contact with BIT *in the 5th FP*[48] since comparable data do not exist for the 4th FP. The application time period in question stretches from July 1998 to December 2000. The data are based on information available in January 2001.

[48] Of 1291 applicants, 70% had contact to BIT. 25% were successful

The quota of organisations consulted varies about 75%. In the IST programme, which has the highest absolute number of applicants, the quota is lowest at 64%.

Figure 47: Number and share of submitting organisations in active contact with BIT



Source: BIT

In the 5th FP, organisations in active contact[49] with BIT have an above average success rate (Table 44).

Table 44: Success rates, submissions July 1998-December 1999, by programme and support from BIT

	QoL	IST	GROWTH	UWEN	INCO	INNO/SME	IHP	TOTAL
Active contact	26%	34%	48%	36%	29%	17%	42%	38%
Loose contact	17%	24%	42%	16%	0%	40%	28%	23%
No contact	13%	26%	17%	10%	-	20%	25%	20%
Total	24%	31%	45%	30%	29%	21%	39%	33%

Source: BIT

In most programmes, the success rate of applicants in active contact with BIT is about 10 percentage points higher than those who only received mailings from BIT (loose contact). In the IHP programme, the difference in success rates is 15 percentage points and in the UWEN programme, 20 points. In the GROWTH programme, where the wide majority of applicants were in close contact with BIT, the difference in the success rates to the group with "loose contact" is not so great.

Support in finding foreign partners

Support in finding foreign partners is above all based on the national contact agency's network. The CORDIS database is problematic, since it is not updated, but the CORDIS project database is useful.

Alongside the search for partners, brokerage events help to build up the selection of available partners. The Innovation Relay Centre's network is also a source of information. The IRC however concentrates on trans-national technology transfer projects.

[49] "Active contact" is understood to be when the representative of an organization was in direct contact with BIT(info center record) or took part in an event. "Loose contact" means that the organization received mailings from BIT.

Cooperation with third countries

To boost R&D contacts between Austria and the countries of Central and Eastern Europe, two departments were arranged in BIT in the course of the 4th FP. The focus was on countries bordering the EU as well as on other Central and Eastern European countries.

The Central and Eastern European Office (CEES) was established in 1996 by the federal ministry for economic affairs with the purpose of intensifying participation of Austrian companies and organisations in technology cooperation with the countries of Eastern and Central Europe. CEES serves as an information and support unit for prospective Austrian partners interested in such cooperation whereby the coordinating and stimulating measures do also extend beyond the FP (e.g. EUREKA or bilateral agreements, etc.). The office services and supports essentially applicants with project consortia comprised of partners from Central and Eastern European states. This includes all preliminary work, information and consulting activities leading to the creation of technology cooperation with the associated CEE and Central and Eastern European member states of EUREKA.

CEES collaborates closely with the department for third country cooperation. This department is responsible for the INCO, INTAS and COST programmes. Likewise established in 1996, it was essentially concerned with the acquisition and analysis of cooperation potential of Austrian researchers with third countries and international organisations. The goal was the stimulation of Austrian participation in specific EU programmes with third countries, international organisations and COST.

6.1.3 The INNOman database

The BIT has created a database which records all projects of the 4th FP relevant to Austria and which allows access to information about the institutions and persons which comprise the potential players in developmental and research activities in Austria. Based on a simple address list (in the Access database program) INNOman gradually became a client-server database system on Oracle[50] with the following components[51]:

- Project database ('97): documents all projects (submitted and successful) with Austrian participants. The projects are saved in a uniform structure and can be uniformly processed for all programmes. BIT delivers the complete, uniform overview of Austrian participation in the 4th FP .
- Infocenter ('98): this module records all consulting activities and other client contacts (mail, fax, mailing, conversations, events).
- Internet access for delegates ('98): as a service to the programme delegates, Internet access (INNOweb) to the INNOman data was made available.

Specifications were defined for all of these components based on the needs of the consultants. Based on this, the BIT IT-department programmed appropriate, user-friendly features. As usual, the results of the tenders are analysed and conclusions drawn for the BIT support strategy. Additionally, the BIT creates special evaluations for the coordination department in the ministry of science and for some delegates.

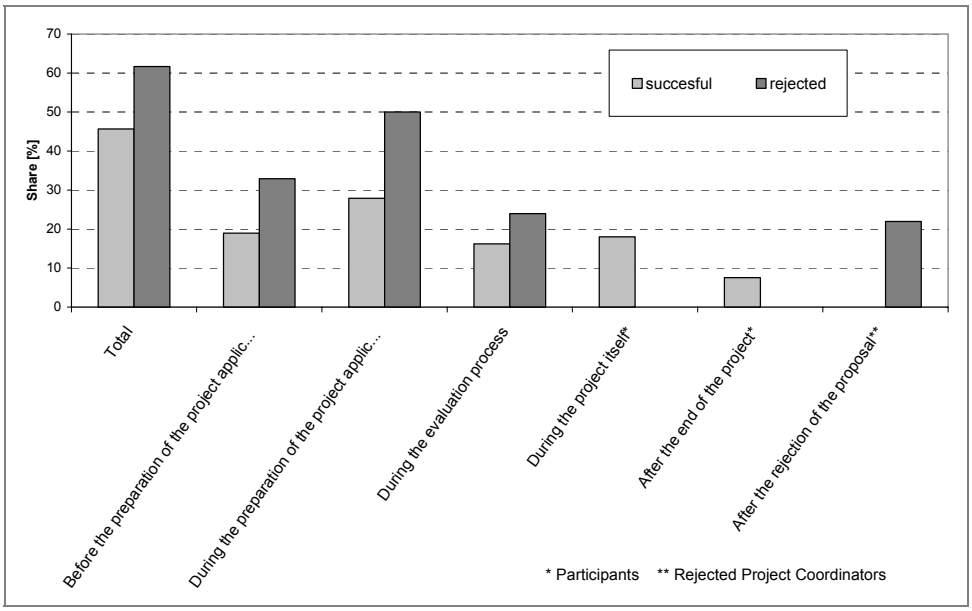
[50] Since February 1997

[51] The description of the database is based on interviews with BIT employees and documents supplied by BIT.

6.1.4 The perception of the target group: who uses BIT, and how?

Within the scope of the survey, successful and rejected FP participants were questioned. Both groups are distinguishable however, since only the project coordinators of rejected projects were addressed[52]. This bias should be noted when interpreting the following results. The decisive factor is particularly found in that project coordinators require more support than others but, it should not be concluded, this leads to an increased likelihood of success.

Figure 48: Contact with BIT, stage at which contact occurred

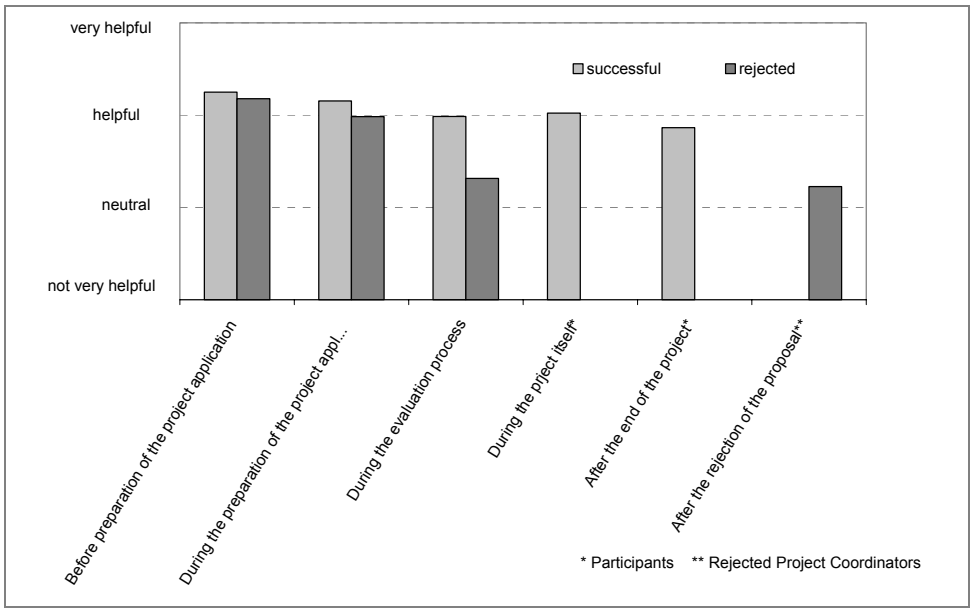


Source: self-conducted survey

Figure 48 shows, that among those rejected (project coordinators) there was more contact with the BIT than between BIT and the successful (project partners and -coordinators). The contact is generally strongest during the project proposal elaboration phase during which half of the rejected and more than a quarter of the successful are in contact with BIT. The candidates were further asked if they took advantage of BIT (and/or other institutions) support during the partner search. Although BIT perceives this as one of its important (if not sometimes difficult to fulfil) tasks, only about 10% of the rejected and only 5% of the successful used this service.

[52] The survey analysis was discussed in detail in chapter 4.

Figure 49: Assessment of the applicant's contact with BIT in different phases of project initiation, -execution or - rejection (average)

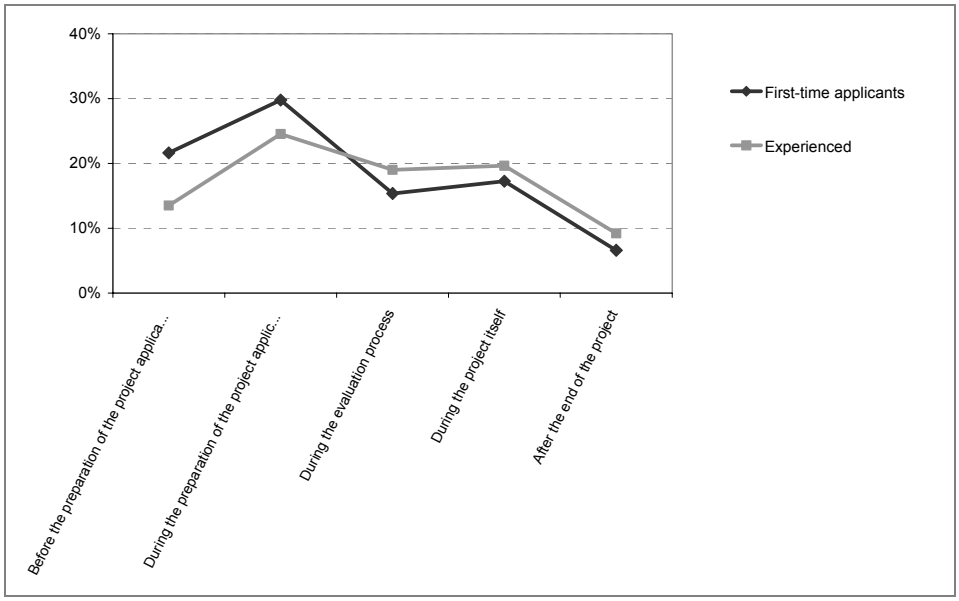


Source: self-conducted survey

The evaluation of contact with BIT is generally positive (see Figure 49) although the group of successful FP participants is, on average, somewhat more satisfied than the rejected applicants where satisfaction begins to decline above all in the evaluation process. This could either be because the candidates do not deal well with failure or because they feel that they are receiving "neutral" or average feedback about the reasons for failure. For BIT itself, this result is still very good, since support after the evaluation process is no longer one of its core services.

It has already been said that BIT's core task is reaching new target groups. Figure 50 differentiates between the successful applicants in the 4th FP with experience in FPs (having already participated in the 2nd or 3rd FP) and those for whom the 4th FP application was their first. Again, the contact with BIT is observed in the different phases.

Figure 50: Contact with BIT in the different project phases, successful participants, with and without experience from earlier FPs



Source: self-conducted survey

First-time applicants, in comparison to experienced candidates, have no difficulties taking advantage of BIT's support services. At one third, the share of those accepting advice from BIT during the elaboration of the project proposal is higher among the inexperienced than the experienced. The latter however have more access to BIT in the later phases.

6.1.5 Regional support offices

The structure of the Austrian regional offices for the support of Austrian project applicants in the 4th EU FP extends from a network which was founded in 1990 during Austria's participation in the EU educational programme COMETT II (practical training of students and postgraduates – economics) (in Europe more than 200, in Austria 4 networks): DANUBE for Vienna, Lower Austria and Burgenland, APS in Graz for Styria and Corinthia, CATT in Salzburg and Linz for the provinces Salzburg and Upper Austria, and ATTAC in Innsbruck for Tirol and Vorarlberg.

The regional offices are independent, public associations with a structure similar to BIT. They are responsible for the coordination of all "relevant EU" institutions in the region in regard to research and educational programmes. Since 1995 the ministry of economics subsidises the activities in the R&D area. The regional offices work in close cooperation with BIT and are also partners in the EU's IRCA project, led by BIT.

Geographical proximity favours access to new clients. Common events are carried out with the regional offices. Over time, BIT has evolved from hosting more general Jour-Fixes to program-specific events in cooperation with the respective delegates. In real cases of project consulting for applicants, the regional offices consult with BIT in Vienna.

The results of the survey show, that regional information offices (APS, CATT, ATTAC, DANUBE) were only consulted by about 10% of applicants, and then above all by first-timers. In this respect they do justice to the role ascribed to them, namely to reach new target audiences. The low number of recorded cases does not

allow examination of the individual support offices. Nevertheless, there appear to be discrepancies in the quality of support from region to region[53].

6.1.6 The role of and support via the programme delegates

Austria had 2- 5 delegates in each programme committee of the current FP. Usually, 2-3 persons from the appropriate federal ministries are delegates together. External experts can also be nominated. The delegates' duty is to support the success of the programme as a whole and especially Austria's participation therein, within the scope of the programme committees. That includes the following tasks: influencing the tenders and secondly representing Austrian interests during the selection of projects[54]. In particular, when project applications are not immediately approved for subsidy however also not rejected, the delegates have an important function in supporting Austrian project applications. Third, the delegates play a role as disseminators of information about future and current tenders. Further and fourth, within their departments they define the Austrian strategy for participation in the FP. Finally, they take part in the preparation of the coming FPs.

The programme delegates have different mediating functions, which can be applied more efficiently, given the efficiency of the basic requirements. The following points belong to these general requirements:

- The quality of information from the Commission
- Identifiability of the information centres for applicants in Austria
- Cross-section contacts to other programme delegates
- Completeness of the information on Austria's participation.

The information drawn from the following sections concludes that BIT is a convenient and clearly identifiable information centre for applicants. Accordingly, close cooperation between delegates and BIT exists: the BIT is informed about tenders by the delegates; common events are organised by BIT. BIT also made evaluations of Austrian participation available to the programme delegates in the 4th FP. The cooperation between BIT and delegates is aimed at providing information to the (potential) applicants. The feedback from participants, as well as information from BIT about the execution of the individual programmes, is again an important input for the formation of Austrian positions within the scope of the programme committees in the Commission.[55]

Support via the delegates

The national delegates receive the first information about upcoming tenders. They are further familiar with the evaluation process and the EU's applied evaluation criteria. They support the Austrian applicants in two ways. On the one hand they present the FP at information events organised by BIT. On the other hand they represent Austrian interests in Brussels and gather information about the strengths and weaknesses of partner countries and the interaction with them. Such background information can be helpful for successful participation, and, where possible, is passed on directly or via BIT employees to prospective parties.

[53] The available data indicates that the quality of services greatly correlates to how often they are accessed – CATT received not only the most mentions among the regional offices, but also received the best evaluation.

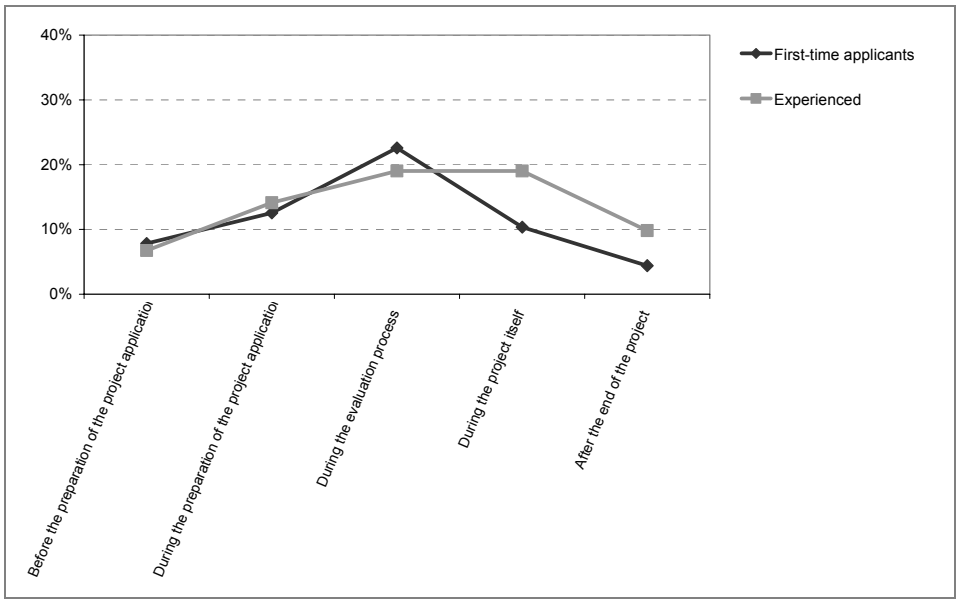
[54] This does not include evaluating the projects but borderline cases discussed in the committees given the results of the evaluation.

[55] In the majority of programmes, the delegates are accompanied in the programme committees by the responsible BIT consultant.

Based on the survey, some points concerning the presence of the delegates during candidate support can be highlighted (see Figure 51)

In comparison with BIT, a shift in focus of contact in the evaluation phase becomes apparent. If participants with and without previous experience in EU FPs are compared, one can recognise, that also here the new candidates have the same access at the beginning of the decisive phases of the application process. However, during the project, the contact between delegates and experienced participants remains constant, while contact to first-time participants declines.

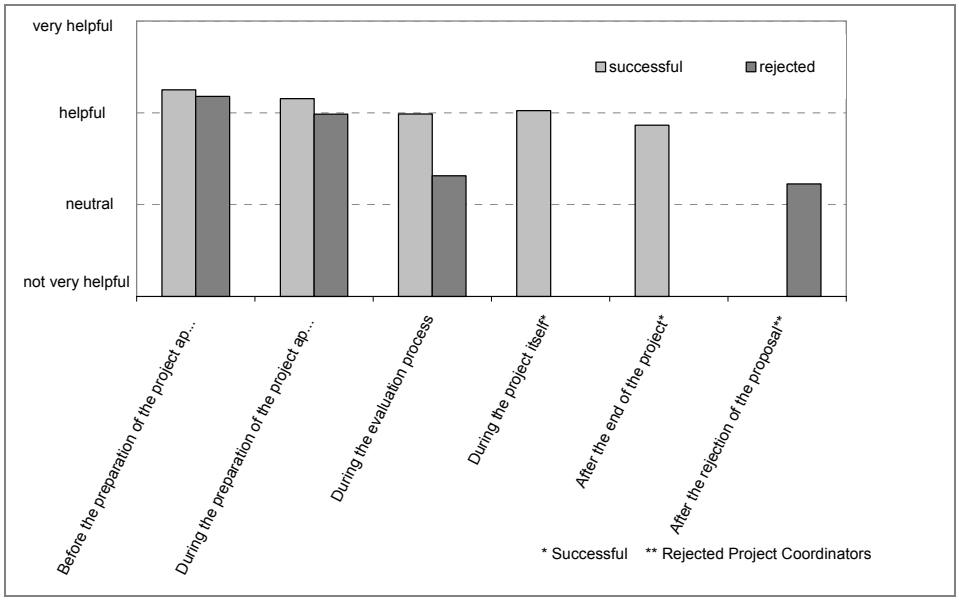
Figure 51: Contact with the national delegates in the different project phases, successful participants, with and without experience from earlier FPs



Source: self-conducted survey

On the whole, contact with programme delegates is less than with BIT: 34% of successful participants had contact, as did 44% of rejected project coordinators. While the group of rejected applicants had the highest rate of contact in the project preparation phase, the successful candidates had it in the evaluation process phase.

Figure 52: Assessment of contact with the programme delegates in different phases of project initiation, -execution or -rejection through the applicant (average)



Source: self-conducted survey

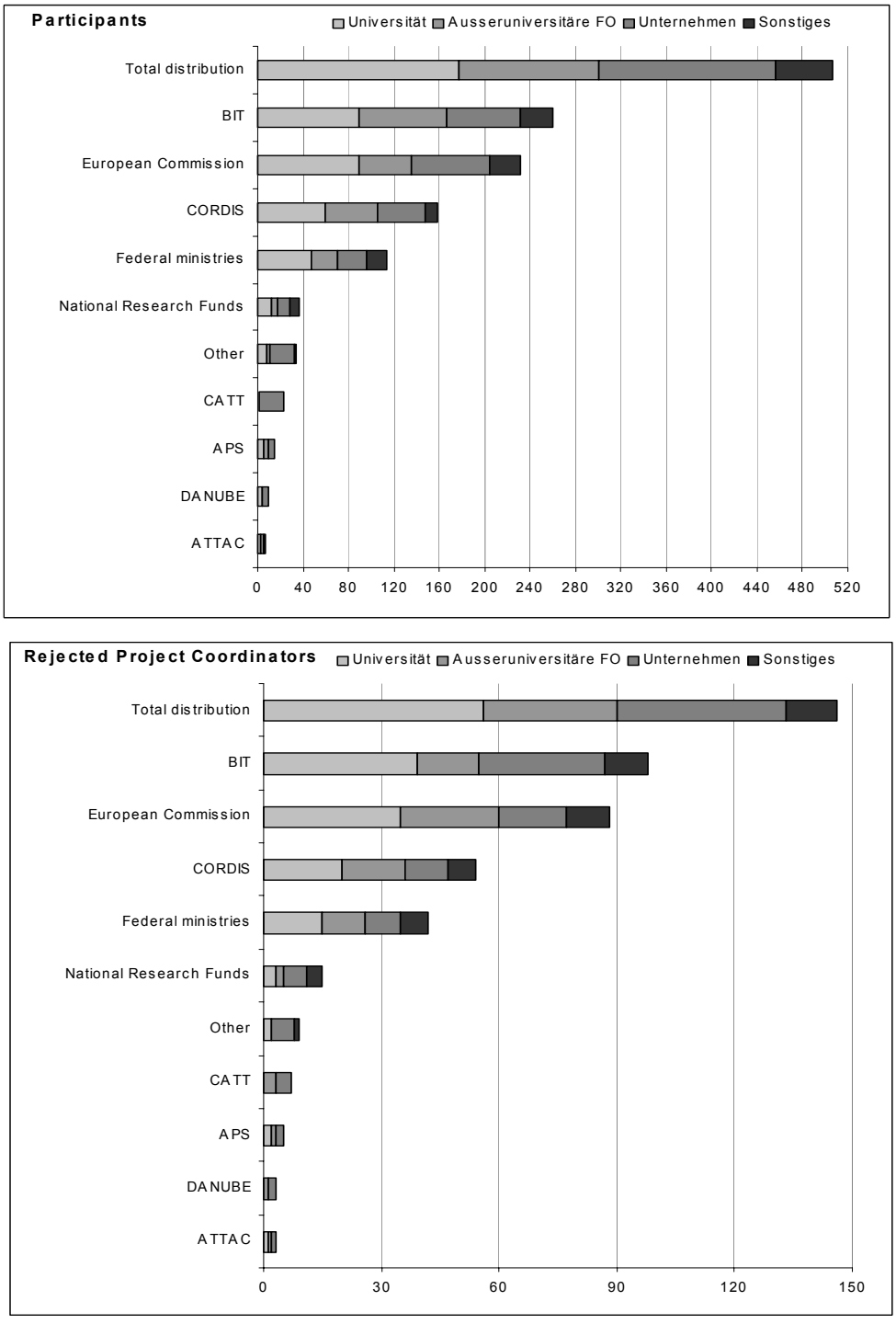
The evaluation of contact with programme delegates – similar to the BIT – is positive, at least with regard to the successful candidates. Hardly anybody in contact with the programme delegates found this to be of little help (see Figure 52).

6.1.7 General evaluation of administrative procedures and the support of (potential) participants

External sources of information

Along with BIT, regional offices and national delegates, as sources of personal support for applicants, the Commission also supplies information, which can be helpful in the preparation of project proposals. Figure 53 attacks the question of the use external sources of information and differentiates the user groups by type of organisation. The ranking of information sources is the same from both groups (successful and rejected). BIT takes first place, followed by the European commission, and CORDIS. Half of the number of participants using BIT uses the Austrian federal ministries as sources of information. BIT and the Commission are used more often by the group of rejected coordinators than by the group the successful programme participants.

Figure 53: Use of external sources of information by type of organisation



Source: self-conducted survey

Within the scope of the survey, the above-mentioned external sources of information were appraised for their utility using a school grading system (1 being the highest, 5 the lowest grade). Table 45 shows the mode and the median of this valuation. The variance for the group of the successful by CORDIS and official Commission offices is under 1, otherwise just over 1. Because of the low number of users, the regional offices could not be statistically evaluated. In general, the results are positive. Both with successful participants and rejected coordinators, the median and the mode are 2 for all sources of information.

Table 45: Assessment of external information sources by their utility (median and mode)

	Successful		Rejected coordinators	
	Median	Mode	Median	Mode
Official positions of the Europ. Commission	2	2	2	2
CORDIS	2	2	2	2
BIT	2	2	2	2
Federal ministry	2	2	2	2

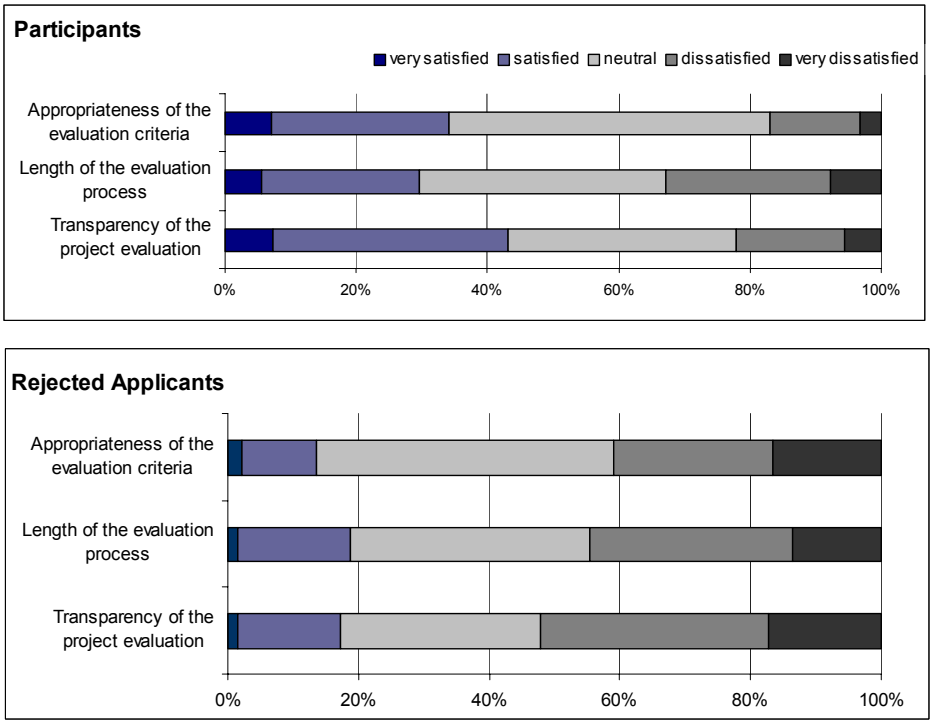
Source: self-conducted survey

The Evaluation process

Alongside the national and European support structure, the quality of the EU's evaluation process plays a role in the applicant's perception of the administrative processes. The hypothesis that failings in the evaluation process create an annoyance, that the duration, the intransparency and inadequate evaluation criteria are perceived to be *very* negative, was not confirmed in the Irish study. Nevertheless, dissatisfaction is widespread enough so as to pose a general problem. Figure 54 attacks the question of satisfaction with the evaluation process in Austria. Clear differences are visible between both groups (successful and rejected). The successful project participants most often criticise the duration of the evaluation process (one third are dissatisfied or very dissatisfied). As to transparency and adequacy of evaluation criteria, the criticism is limited (about one fifth is unsatisfied or very unsatisfied). Among rejected applicants, dissatisfaction is generally more pervasive and found above all with regard to the transparency of procedures (more than half of the answers). Duration is mentioned second.

The results are therefore rather balanced. Those successful do not criticise the process, which led to their success. Even when it is possible to reject the common hypothesis of unanimous dissatisfaction with the administration in Brussels, it must still be noted that rejected applicants know too little of why they were rejected.

Figure 54: Assessment of external information sources by their utility (average)



Source: self-conducted survey

6.2 PROVISO as a new instrument

The PROVISO project is an information and support infrastructure for policy, strategic and tactical development as well as for public relations in the area of European RTD FPs[56]. PROVISO came about during the 4th FP and assumed its final structure[57] in 2000, based on financing from BMBWK and BMVIT over multiple years. The project is based on following "pillars":

- PROVISO staff only work half time on the project. The other half, they work as assistants to the programme delegates[58] and are assigned to the respective departments in the ministries. The project manager is the only exception.
- The project team receives all current information for the programmes handled by PROVISO. This includes data from the responsible delegate (who is personally responsible for the confidentiality of the data). With this information, a database is created which is a priori exclusively available to the participating PROVISO delegates as well as the PROVISO team (see below).
- Based on the database and related IT solutions, the information can be processed particularly fast[59] and reduced all the way down to presentation materials via partial automation.

[56] See http://www.bmbwk.gv.at/3PROVISO.htm

[57] The Austrian Computer Association is contracted to perform PROVISO. All employees of the project work there. BMBWK and BMVIT are the clients in the venture with equal shares.

[58] In this function, they also provide support to the programme delegates in Brussels.

[59] Within a few days of raw data delivery

The project therefore makes use of two synergy effects: the synergy between content-based work and European work through the double half-time construction, and the synergy between different programmes through the cooperation and cross-section analysis in the team.

PROVISO however does not cover all thematic programmes[60]. The decision to take part in PROVISO does not lie with the delegates alone, but also with the direct target group of the project since the delegates are personally responsible for the data in the tenders. The delegates participating in the project are very content with this, but they perceive the incompleteness of the data to be a weakness since statements, which depict a particular programme against the backdrop of the entire FP, are only possible on a limited basis.

Although the information, processed in PROVISO (in anonymous form) is of interest to a broad section of the public, PROVISO data has hardly been published to date. The products along with the personal support from delegates include above all internal reports like project reports, programme reports, graphic brochures, thematic dossiers, call reports, inquiry information and presentation materials. Inquiries can only be considered when either the employer or the delegate supports the inquiry (management assignments). At the end of 2000, the clients and BIT reached a cooperation agreement. In addition to a defined data exchange, the agreement provides for delivery of regular standard evaluations as well as, where feasible, more specific evaluations upon request.

6.2.1 The data from PROVISO

At present, the programmes recorded in the PROVISO database represent 70-75% of the financing volume of the 5th FP as well as 55-60% of the 4th FP. The specific, recorded programmes of the 4th FP are: industrial and materials technologies (Brite/Euram), information technology (ESPRIT, ACTS), environment and climate (in part also oceanic sciences and technologies - MAST), non-nuclear energies (Joule), transportation as well as Targeted Socio-Economic Research (TSER).

Whenever possible, the PROVISO database records information (project costs, financing, run-time, programme area and thematic emphasis etc.) for all project proposals and current projects as well as the participation from all countries. Upon receipt, the PROVISO data are cleared of inconsistency and sorted by the type of organisation. Unlike in CORDIS, all projects, also the rejected ones are recorded as are the evaluation results including comments. Further, along with the Austrian partners, all international coordinators and partners as well as all pertinent related information (country, type of organisation, partner costs and -financing) is documented. In other countries, databases of this quality are - when they exist at all – limited to single programmes. At the European level, there appears to be no general thematic database of this breadth and current accuracy[61].

6.2.2 The question of development potential

PROVISO sees itself as a service to the client and is very successful given this inner-orientation. Indeed, it is so successful, that an unused potential exists. In economic terminology it would be called unused externalities. It is a typical problem in the area of information services where the confidentiality of the information is at play. The potential refers to, for example, the provision of (anonymous) data about future

[60] The 5th framework will cover the following: IST, Growth, Energy & Environment as well as the horizontal programme IHP and its leading project "Improving the socio-economic knowledge base." The thematic programmes Quality of Life and Management of Living Resources and the horizontal programmes INCO-med, INCO-dev, Innovation and Craft are not included.

[61] The cooperation database from CORDIS is not sufficiently updated (deletion of old entries), the CORDIS project database contains much less information and only makes the data available after final approval of the project, not during the tender.

applicants who want to adapt their strategy of accumulated experience to other applicants. It should also be considered whether or not to raise the Austrian example at the European level – making data from statistical institutes available for diverse analyses, etc. A more precise look shows, that there are various reasons why this potential is unused:

- The personal responsibility of delegates for the absolutely confidential use of the data imposes a powerful restriction on the use of the data. Thereby only parts of the FP can be covered.
- It is generally difficult to put a price on information services. If they are publicly created, it is harder still. If they contain strategic information for companies it becomes critical.
- PROVISO is young and is only in the consolidation phase during the 5th FP.

Summarising, it can be said that development potential unquestionably exists. The cooperation agreement with BIT is already headed in the right direction as once more, positive synergies are being used. The basis of PROVISO ought however to be spread to encompass all parts of the FP to make the largest possible benefit available to all delegates. A condition for this would be participation of all delegates, which includes the provision of data as well as financing.

6.3 The Austrian support infrastructure in international comparison: Ireland, Finland and France

Since the Austrian support infrastructure has now been described the following must be addressed: to what degree does it comply with the usual international standards, does it comply at all, or does it display special traits. The next section is based on the experience that the international partners in this study have gathered in other countries whether it be within the scope of the national impact studies in Ireland and Finland or through additional research in France.

This section – with appropriate brevity – gets into the support infrastructure for EU R&D programmes in selected countries. Austria's general position in the 4th FP was discussed in chapter 3, and shows first that new member states Austria and Finland were not only able to greatly increase their shares between the 3rd and 4th FPs, but second, also that Ireland's share in the 4th FP lies closest to Austria's. These 2 countries are therefore more or less quite comparable. As one of the largest member states, France is only selectively used in comparison, in particular when trying to highlight special challenges facing a small country like Austria. Table 46 provides and introductory overview of the most important institutions involved in the countries being compared.

Table 46: Comparison of the support infrastructure (Ireland, Finland, France, Austria)

Task/Organisation	Ireland	Finland	France	Austria
Controlling ministry:[62]	DETE: Department of Enterprise, Trade and Employment	Ministry of Trade and Industry	Ministry for research and technology in cooperation with the other responsible "technical" departments	BMBWK

[62] Here, the department in charge of European frameworks in each country is listed. There is no indication here of the distribution of responsibilities among the other expert departments responsible for the specific programs.

Task/Organisation	Ireland	Finland	France	Austria
Support during strategy development, analysis	Forfas	Finnish Secretariat for EU R&D, a part of Tekes (national technology agency)	(Working groups, connected to large research organisations, administration, branch representation)	PROVISO, BIT
Execution of the programme, consulting applicants	National Delegates, Enterprise Ireland, Innovation Relay Centre	Finnish Secretariat for EU R&D	Diverse national contacts (in specific institutes by program), national delegates, ANVAR for SMEs, 8 Innovation Relay Centres, chamber of commerce	BIT, Regional support centres
Data preparation	Forfas, only approved programs, in need of expansion	Tekes since the 5th FP	Research ministry, technology department, programme specific.	PROVISO, BIT
Administration of initial financing	Enterprise Ireland	Tekes, Academy of Finland, agriculture ministry, ministry of transportation and communication	ANVAR, functional departments	FFF, BMBWK
Amount of initial financing	6,000 Euro	70% of preliminary costs, max. 6,700 Euro for partners, 13,330 Euro for coordinators and 3,300 Euro "exploratory award" for SMEs.	N/A	max. 18,170 Euro
Number of persons concerned with EU agendas	Rough estimate: between 5 and 10 full-time equivalent (Forfas and EI, OST)	8 people in secretarial, more NCPs in the Finnish Academy	ANVAR: 2 persons + 8 in the IRCs + 1 responsible correspondent in each region, NCPs	BIT: ca. 50 PROVISO: 6 Persons half-time, 1 Person full-time

Source: Technopolis, VTT, internal research

Success or failure of an application allow no direct conclusions to be drawn about the quality of the support infrastructure since it is the nature of EU projects, that the quality of the project application is dependent upon all partners, and especially the project coordinator. The quality of the national support depends much more on the adequacy of the actual situation and the need in the country. Upon closer examination of the 4 countries, the following points can be highlighted:

- Specific European-offices are found in Finland and Austria, the newest EU member states. At the same time, at the institutional level in Ireland or France the support of EU agendas is barely distinguishable from other research and innovation subsidy as well as in respect to policy and administration.
- The smaller countries all profit from the clarity of the institutional landscape. It provides in each case a clearly identifiable contact point for potential applicants. On the other hand, the national contact points in France are institutionally decentralised and are serviced by the delegates from the ministry of economics and the expert departments, as well by as the international offices of the large research organisations (CNRS, IEA, INRA,…). ANVAR is the starting point for innovation subsidies for SMEs, and also for SME-specific EU programmes.
- Data preparation has improved between 4th and 5th FPs in the smaller countries observed. The starting points were however quite various: in Ireland, the evaluation of participation in 4th FP brought out the very low quality of the data (when existing at all). In the meantime, a database has been installed which is being serviced by Forfas. In Finland VTT ascertained data on participation in the 2nd, 3rd and 4th FPs within the scope of the impact studies. Only since the 5th FP are confidential data from the Commission serviced by the European office of Tekes in the form of an extranet. The national contact points (NCPs), which provide the data, have password-protected access. In France there is no database covering participation in the entire FP. The data are serviced for each individual programme.
- The Austrian support infrastructure is conspicuously different in terms of its size as well as in regard to the BIT and the database servicing via the PROVISO team. The consulting need appears to justify this size. At the same time it is important to pay attention to the complementary nature of the institutions involved, that is, to make us of synergy and to avoid doubling.

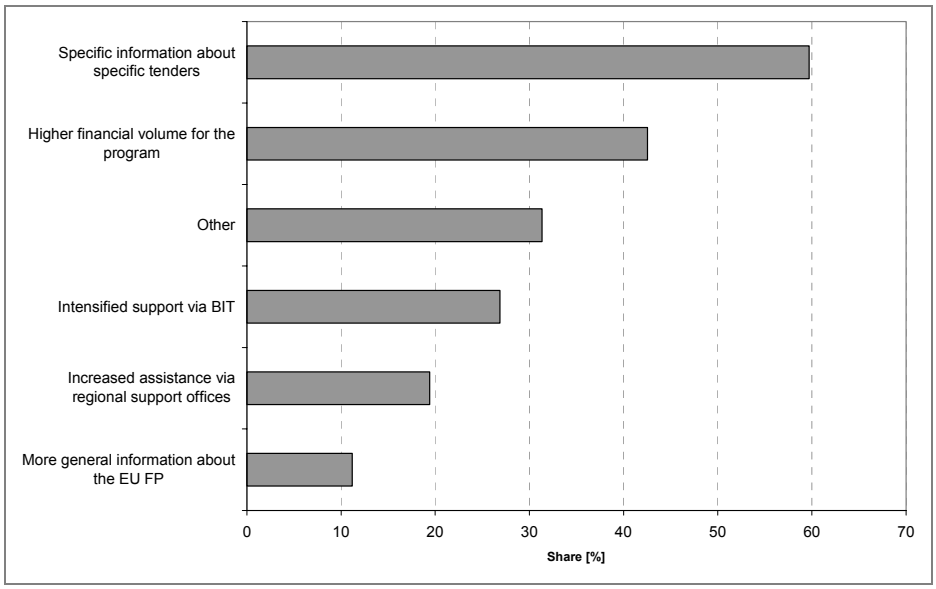
6.4 Summary and proposals for the improvement of the Austrian support infrastructure

Summarising, it can be said that the Austrian support infrastructure is positively evaluated, and unquestionably represents an indispensable element of the participation of Austrian candidates in the EU FPs. The candidates are, to a great extent, informed about the FPs and whoever seeks support, gets it. It has been possible to continuously expand the field of potential applicants and there is no doubt of the continued pursuit of this goal.

The survey analysis shows a positive picture and a trend toward the need for specific information

If one considers the proposals of the rejected applicants to raise the likelihood of success of Austrian project proposals in the EU FP (Figure 55), it becomes immediately apparent that the need for more general information is largely satisfied. At the same time, over half of those questioned have need of more specific information on the respective tenders. About a quarter see a possibility, to raise the likelihood of success through intensified support via BIT, only one in five through intensified support from the regional support centres.

Figure 55: Suggestions from rejected applicants aimed at raising the likelihood of success of Austrian project proposals in the EU FP



Source: self-conducted survey

In regard to the regional offices, the survey does not supply sufficient material from which to draw definite conclusions. There is, however, the indication that the quality of support varies greatly among the regions. Given the size and competence of BIT, the duties of the regional offices in the FP should be clearly defined. Their role as a provider of primary information should be particularly emphasised.

Who makes what best? Final remarks on the organisation and distribution of competence in the support infrastructure

The Austrian support infrastructure is shaped by the BIT, even though this not the only responsible entity. Since just recently, the PROVISO project exists alongside the BIT for the exclusive support of the delegates. In the area of start-up financing applicants turn to either the FFF or the BMBWK depending on the type of organisation.

Development potential of the databases

Since the beginning of the 5th FP, both Austrian databases - INNOman and PROVISO – have experienced substantial improvements in quality. Based on the information available to date, there is no comparable custom information system to combine, prepare and analyse data in the other FP participant countries. With the cooperation agreement between BIT and PROVISO has provided the first instance of mutual fertilisation in the administration of the database, and content exchange between the respective experts is the rule. In consideration of the fact that Austria takes on the role of a forerunner here, it seems appropriate to strategically rethink the development and use of both databases. This certainly applies to dealing with the question of confidentiality. It would be desirable to transfer the protection of confidentiality from the personal responsibility of the delegate to political authorities. Further, following the example a of continuous evaluation approach like in EUREKA, the expansion and inclusion of industry-specific key figures is conceivable. This would create a basis of data for future impact analyses. Successful participants could be surveyed in intervals of 2 and 3 years with respect to the commercial turnover from research results.

6.5 Financial support of the participants via national subsidy institutions

Increasing participation intensity among Austrian researchers and with it the financial returns from the EU FPs has been high on the technology policy agenda ever since Austria's joining. In particular, in preparation for full membership, activities to the raise participation intensity were increased. Alongside the construction of a comprehensive information and consulting infrastructure, the financial support of the participants was also made possible.

In the BMBWK, a subsidy apparatus was created under the heading **project preparation support** and **supplementary financing.** It affords researchers willing to participate financial support at the initiation of EU projects (project preparation support) and during the execution of successfully submitted projects (supplementary financing). According to the ministry's areas of responsibility, the target group is limited to university departments and non-university research institutions. The execution of the subsidy takes place in-house through the responsible department (VIII/2) in close cooperation with the responsible expert consultant and the national delegate.

For companies willing to participate, the FFF for companies offers financial support for the initial costs. In accordance with the increasing participation of Austrian researchers in EU FPs, the national resources supporting participation have also increased. It now appears to be the time to examine the effect and accuracy of these national support schemes. The following chapter attempts to do this.

At the outset it must be noted, that based on the given state of the data, the assessment of the effects of supplemental- and initiation support must be restricted to qualitative statements. A quantitative assessment of the effects would have required a specific survey of the applicants. Such a survey would have broken the frame of this evaluation.

The following analysis is essentially based on two sources: the records provided by the funding providers (BMBWK and FFF) with regard to the funding executed within the scope of the 4th EU FP as well as interviews with the responsible persons at the executing entities.

6.5.1 Supplementary financing of BMBWK

Within the scope of supplementary financing, BMBWK finances the project costs, "which are indispensable to the realisation of the EU project and which are verifiably not covered by the EU subsidy[63]." Expressly not financed is "the difference between excessive costs in the EU proposal and the resulting truncated EU subsidy ". Beyond that it is not possible to finance the acquisition of basic equipment for institutions applying. Given these limitations, the supplemental subsidies are essentially concentrated on three kinds of project costs:

- Supplemental costs for the **acquisition of special equipment** necessary to carry out the project. Here, the EU, as a rule, merely financed the amortisation costs during the course of the project, not the overall investment.
- **Value added tax** for the purchase of special equipment. This applies exclusively to university departments, which are not able to deduct value added tax.
- **Personnel costs**: Costs for staff, expressly needed for project execution yet not covered by the EU subsidy. This does not mean that the marginal cost approach applied by the EU is eased for university

[63] From the appropriate page at the BMBWK homepage (http://www.bmwf.gv.at/4fte/eufin)

departments. Overhead costs and employment costs for university support staff are also not financed within the scope of the supplementary financing. The applicant must present a believable case that personnel costs not covered by the EU, without supplementary financing, endanger the execution of the project.

The responsible BMBWK department (dept. VIII/2) makes the funding decisions in consultation with the programme delegates responsible for the respective programme.

On funding practice: of the 902 participations in 4th EU FP by university departments and non-university research institutions, 186 (20.5%) enjoyed national supplementary financing. Table 47 provides an overview of the subsidies granted between 1995 and 2000. With 66 approved participations, the pinnacle of approved applications in the 4th EU FP was reached in 1998. It stands out that the average subsidy amount in the observed time period continuously declined. This may well be due to the relatively large range of the granted subsidy volumes (minimum: 10,300 ATS; maximum 4,454,052 ATS) and a simultaneously unequal distribution of project sizes during the observed time period. Beyond this, it should be noted that the execution of the individual EU programmes is also unequally distributed (in regard to time). With that, the program-specific project sizes also come through with corresponding irregularity on the supplementary financing.

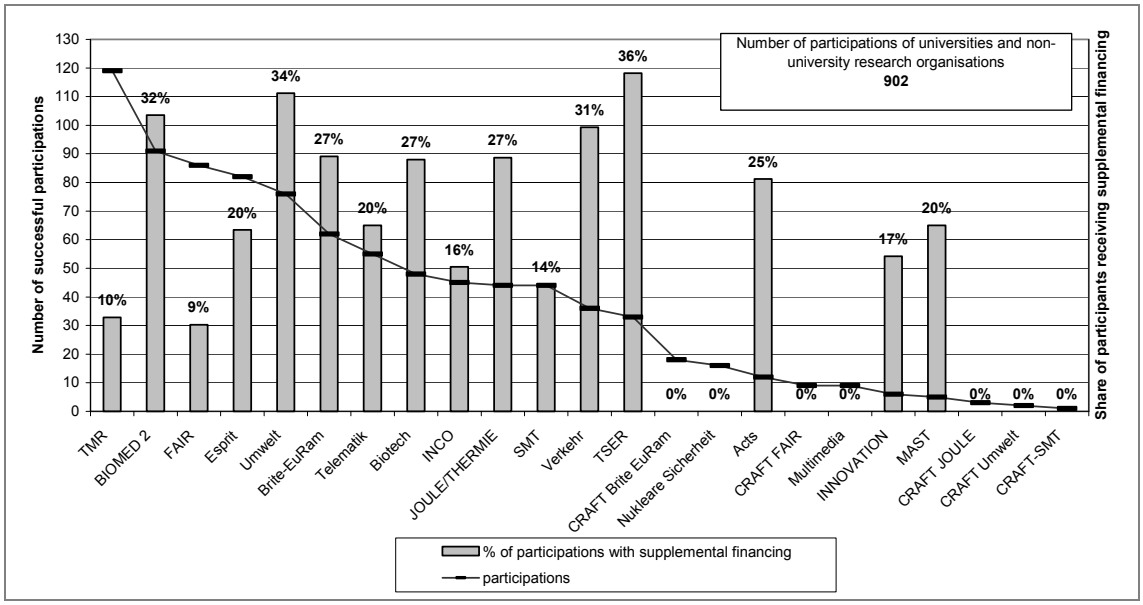
Table 47: Approved supplementary financing for the 4th EU FP

Year	Participations	Intentions	Volume in ATS	Average
1995	13	13	14,083,356	1,083,335
1996	22	17	24,732,611	1,124,210
1997	44	38	30,370,943	690,249
1998	66	63	45,876,361	695,096
1999	34	33	18,028,544	530,251
2000	7	7	3,835,258	547,894
Total	186	171	136,927,073	736,167

Source: BMBWK, internal calculations

If one observes the distribution of the supplementary financing across the programme groups, it can be seen that the share of participations with supplemental financing varies greatly. Since according information to from the responsible department, within the scope of the 4th EU FP no applications for supplementary financing were declined, the observed distribution across the programme groups is not the result of selection or selective subsidy policy. It only reflects the different needs for supplementary financing in the respective programmes. It can only be supposed, that the supplementary financing quota is above all high in those programmes, where the project volumes were cut relatively significantly by the EU commission as well as where the need for special equipment is particularly high.

Figure 56: Share of participations receiving supplemental financing in universities and non-university research institutions in 4th EU FP



Source: BMBWK, internal calculations

With 29 cases of subsidy, BIOMED 2 has the most supplementary financing. Environment (26) and Brite-EuRam (17) are second and third. Interestingly enough, relatively speaking, the most Austrian participations were awarded supplemental financing in the TSER programme. No fewer than 36% of the Austrian participations in TSER enjoyed national supplementary financing.

The assumption that among participants the coordinators in particular have a high need for national supplementary financing was not confirmed. The share of coordinators among participations receiving supplemental financing is, at 19%, not significantly higher than the total average of both target audiences (17%).

The division of subsidy volumes granted across both target audiences (university departments and non-university research institutions) shows a somewhat heavier focus of supplementary financing on university institutions. In total, 97 subsidies totalling 76 million ATS or 55% of the total subsidy monies were granted to university institutions. At about 59 million ATS, the non-university institutions (83 subsidies) still received 43% of all subsidy monies. If this distribution is compared to that of the successful participations (599 university institutions versus 303 from non-university institutions), then the share of supplementary financing received by non-university institutions *is* surprisingly high.

Along with the two target audiences mentioned, subsidies were occasionally given to engineering offices (5 subsidy cases with a total volume of 1.6 million ATS) or individual researchers (1 case worth 0.3 million ATS).

Given this purely descriptive representation of subsidy practice, in summary, the following can be emphasised: The supplementary financing from BMBWK is definitely an important instrument, both in its broad-ranging effects as well as in its scope as a financial resource, offering substantial support to universities as well as non-university research institutions in the execution of EU projects.

The impact of supplementary financing

The assessment of the impact of subsidies begins, as a rule, with the subsidy goals - the expected goal or the goal striven for. In our case this is not immediately possible, as there are no explicit goals for the

supplementary financing granted by the BMBWK, which would produce information about the expected output. The implied goal of the supplementary financing is the general increase in the Austrian participation quota in the EU framework programmes.

According to its character, the supplementary financing from BMBWK is not a subsidy programme as much as it is an emergency programme, which reduces the participation risk for the participant in the EU FP and also represents, as it were, a safety net.

Against this backdrop, it makes little sense, in the evaluation of the impacts, to set a measuring stick at the level of an original subsidy programme. The supplementary financing should be taken for what it is: it was established in Austria's preparation for full entry into the EU in the knowledge that, in order to motivate the Austrian research community to participate in the EU FP, appeals alone would not suffice. The supplementary financing financed through the BMBWK also has, against this backdrop and next to the pure economic effects, symbolic character. Through the supplementary financing, Austrian research and technology policy underlines how important the integration of the Austrian research community was and is to said policy.

Despite this more general significance, naturally the question remains: what was triggered by the supplementary financing and to what extent will the subsidy instrument in its present form do justice to the demands for effectiveness and efficiency?

A quantitative analysis of the effect of the supplementary financing is not possible within the scope of this study. Still, given the information available at present, some basic considerations about the effects to be expected come to mind. These are presented below.

Before we come to effects to be expected in detail, a more important aspect in the application process must be added: the application for supplementary financing can generally only be submitted based on an approved EU project. That is an important aspect in judging the impacts of the subsidy. It is logical to distinguish between two scenarios here.

In the **first scenario** we assume that the participants in the EU FP fundamentally cannot be sure, that possible gaps in financing will be filled through the national supplementary financing. In this case, it is expected that the decision to take part in a project consortium is, in principle, independent of the availability of national sources of financing. It is not assumed that the Austrian participant will assure his/her participation to his/her partners based on pure good luck or with the reservation of still uncertain national supplementary financing. That would clearly contradict the rules of cooperation. In other words, the national supplementary financing will only insignificantly affect potential participants' willingness to participate. In this scenario it is to be expected that participants, who would have executed the EU project even without national supplementary financing, will mainly receive the supplemental subsidy.

In the second scenario we assume that the EU FP participants can be sure that any gaps in financing will be covered by the national supplementary financing. In this case, the effect of the national subsidy is completely different. From the perspective of potential participants, the national supplementary financing represents a security net, which could potentially increase the willingness to participate. Above all for participants with low resource buffers, national supplementary financing reduces the risk of participation. In this scenario it is to be expected that supplementary financing actually increases the participation quota.

Based on the fact, that within the scope of the 4th EU FP no application for supplementary financing was rejected, the supplementary financing from BMBWK applies to the second scenario. It is therefore to be expected, that through the opportunity of national supplementary financing, Austrian participations, which otherwise would not have been possible, actually came to be.

Particularly in cases of clearly foreseeable gaps in financing, like equipment costs which are not covered or the sales tax to be paid, the possibility of national supplementary financing can become a real criterion for participation. A limit should be noted however. The participants cannot assume with any sense of security, that possible gaps in financing can be covered by BMBWK. No explicit guarantee of this sort was issued.

Another aspect, which can only be hinted at here, regards the effects of the supplementary financing, which extend beyond the project. Through the possibility within the scope of EU project to finance equipment, which can be used beyond the run-time of the project, the strategic significance of EU projects increases. Through this possibility the Austrian participant can finance entry into a new technology via EU projects. Given the equipment situation in the Austrian universities, this can be an effect to be taken absolutely seriously. Still, the question arises as to what extent the supplementary financing attracts problems caused elsewhere and which should be solved there as well. For reasons of transparency and controllability, it seems counterproductive to compensate deficits in volume and strategic orientation of investment budgets in Austrian university departments through the possibility of external project-oriented supplementary financing.

A final aspect to be mentioned here does not refer to the question of whether or not a participation of Austrian researchers was made possible, but to what extent the supplementary financing influenced the scope and kind of participation. Here it is assumed, that the possibility of national supplementary financing makes Austrian participants particularly attractive to the consortium, when costs important to the success of the entire project can be covered (for instance acquisition costs for special equipment); in the end, all participants in the consortium profit from this. This increase in the attractiveness of Austrian participants does however assume that the participants from other member states in the consortium find no such national financing possibility. According to our present knowledge, Austria is indeed, an exception in this respect. Although a systematic examination of this is still outstanding.

Summarising, the authors assume, that the supplementary financing in its present form has had an absolutely positive effect on the participation behaviour of the Austrian research community. It is to be assumed that both the participation quota as well as the quality of the participation will be potentially raised through the supplementary financing.

Summary

Looking back, the following summary can be compiled from the information presented in the previous section as to subsidy practices and the expected effect of supplementary financing:

- The supplementary financing of BMBWK offered, through its financial endowment, the unbureaucratic and flexible administration of a true support for participants in the 4th EU FP.
- Supplementary financing in its current form absolutely had its justification in the catching-up and establishment phase, in which Austria still found itself during the period of the 4th EU FP.
- The continually increasing rush increasingly butts up against the borders of personnel capacity in the subsidy execution - with respect to the financial resources as well as the capacity to execute.
- The documentation and the monitoring of the subsidy are mainly oriented toward the internal departmental requirements for formal, correct, budget-technical execution. The resulting information generated is not a sufficient basis for a well-founded impact study.
- Subsidy execution, until now unbureaucratic and flexible, will also remain an important criterion in the future, especially against the backdrop of the costly initiation of EU projects.

These findings yield a list of issues and possibilities for improvement for the future of supplementary financing:

- ⇨ If one assumes that the Austrian participation in 5th EU FP settles in at a level corresponding to the size and productive capability of the Austrian research community, it should be considered to what extent a general escalation of the participation quota should remain a goal of national supplementary financing.
- ⇨ Against this backdrop, the question of the effectiveness of the supplementary financing will push its way into the foreground in future. With limited means and a continually increasing participation intensity of Austrian universities and non-university research institutions, it can certainly come to a bottleneck in supplementary financing. In preparation for this, there is need for a clear picture of the effects of supplementary financing and possible scenarios for a differentiated allocation of the resources. The basis for this is:
  - ⇨ a sound analysis of the different states of need and their urgency as well as the effects achieved to this point,
  - ⇨ an intelligent subsidy design based on this, and which increases the effectiveness and transparency as well as secures the advantages of the current process (unbureaucratic, flexible).
- ⇨ At the organisational level it must be asked to what extent the subsidy execution within the department is still manageable. Alongside the pure considerations of capacity, the experience with management to date and the execution of subsidy programmes should be demonstrated. With that, it has absolutely proven to be good practice to separate organisation at the policy level from that of the processing and execution.
- ⇨ Independent of the organisational question of the subsidy process, the BMBWK's supplementary financing is in need of an advanced documentation- and monitoring system. This would substantially ease future evaluations and the ongoing fine control.

6.5.2 Project preparation support of BMBWK and of FFF

The threshold for successful participation in EU projects is set high. This comes not only from the high rejection quota in comparison to the national subsidy practice but also in the necessarily high cost of project preparation. This can represent a serious entry barrier particularly for small companies as well as for poorly endowed research institutions. This problem is addressed through financial support of project preparation via project initiation support. As far as university departments and non-university research institutions are concerned, project preparation support is offered directly by BMBWK. The Austrian Industrial Research Promotion Fund (FFF) subsidises the project preparation costs for small and medium size enterprises in EU projects. The following represents the project preparation support for both target audiences in the actual subsidy volumes and cases carried out. Subsequently, ways to raise the effectiveness of this instrument are detailed in light of the results presented.

Table 48 provides an overview of the approved BMBWK project preparation financing for the 4th EU FP. In total, 45 project submissions were subsidised. Twenty-two of the resulting projects were successful. That complies with the 50% success rate and therefore lies clearly higher than the success rate of all submitted projects with Austrian participation at 27%.

Table 48: Approved project initiation support by BMBWK for the 4th EU FP

Total	Volume (ATS)	Average	Contracts/Completed	Rejections/Abruption
45	4,708,443	104,632	22	23

Source: BMBWK

Of the 40[64] funding cases, 22 apply to the university sector and 18 to non-university research institutions. In regard to the programmes affected, the emphases are on Brite-Euram (9), Environment and Climate (6) as well as ESPRIT (6).

Preparation subsidies for SMEs are processed via the FFF. Table 49 provides an overview of the approved subsidy cases. In total, 89 subsidy proposals with a total subsidy volume of 15.7 million ATS were granted. One fifth (19 absolute) of the cases allotted funds to the direction of EU consortia (coordinators). Twenty-two subsidy applications or about a fifth were rejected.

The average subsidy amounts show, that on the one hand the start-up financing granted to SMEs at 176,000 ATS is markedly higher than that granted to universities and non-university research institutions (104,600 ATS). On the other hand, the amount of the subsidy does not appear to depend on whether or not the applicant is actually a project partner or coordinator. If one assumes that the start-up costs for the coordinator as a rule are clearly higher than for the partner, then it can be concluded, that the determination of the eligible costs for the start-up financing in this point are not differentiated by role in the project.

Table 49: Approved start-up financing of FFF for the 4th EU FP

	Partner	Coordinator	Total
Number	70	19	89
Funding in ATS	12,492,000	3,176,000	15,668,000
Average funding in ATS	178,457	167,158	176,045
Average number of employees	102	83	98

Source: FFF

Table 49 also shows that companies coordinating projects are, on average, not larger (measured by the number of staff) than partners. Although based on the small number of subsidy cases more far-reaching conclusions are premature.

The funding documentation of FFF shows a further interesting aspect: no fewer than 55 subsidised companies within the scope of the start-up financing appear as first time FFF clients. Therefore, from the point of view of FFF more than half of the subsidised companies are new recruits. That is an indication that target audiences, which do not necessarily belong to FFF clientele, are addressed through the EU FPs. Besides that, it is an indication that the FFF *was* able to draw attention to the possibilities of start-up financing even outside of its industry target group.

Summary

Project preparation support scheme addresses an entry barrier to the EU FP (and this not only for Austrian participants), which must be taken seriously. This is evident in that in other member states similar subsidy initiatives have been started. If the support granted in the project preparation phase of the 4th EU FP in Austria is observed, one thing becomes very clear: with roughly 2,200 submitted projects with Austrian participation, the support of 134 submissions is undoubtedly subcritical.

If the problem is taken seriously, substantial build-up of resources as well as active integration of this subsidy track in the existing information and consulting infrastructure are necessary. Beyond that, a differentiation of the subsidy by the respective states of need seems necessary. In this way for example, a specific subsidy for coordinators is worth considering.

[64] As several supported applications led to various contracts, the number of projects affected (45) is not identical with the number of subsidy cases (40)

In the "other" category of proposals submitted by rejected applicants (to increase the likelihood of success of Austrian project proposals in the EU FP) one most often comes across the demand for project preparation support. Now this instrument exists in Austria and it is not very often used.

International examples show, that in other countries the one-stop-shop for EU research subsidies do not run under the title "Europe" or "international research cooperation," rather under the title "Innovation- and Research Subsidy". In Austria, three different institutions, BIT, FFF and BMBWK, are entrusted with these two questions. A line must be drawn here in the allocation of responsibilities. At present this line is the allocation of Austrian subsidy monies, which is incumbent upon FFF and BMBWK but not BIT. In view of the fact, that efficient project preparation support would profit from exact knowledge of the problems of the applicants, and on the other hand the bouquet of support instruments would be completed (information from Brussels, databases, events, direct consultation…) in certain points of the financial support of the start-up, the authors are of the opinion that a shift of these duties into the support infrastructure should be considered. This shortens the bureaucratic effort for the subsidy applicant and can increase the accuracy in as much as the support institutions are sensitive to the problems of the applicants and are thereby better able to examine the need for financial support.

7. Embedding the FP in the Austrian subsidy portfolio

The discussion surrounding the European Research Area (ERA) has raised new questions as to the relationship of national subsidy instruments to the European subsidy instruments. For instance under the slogan "opening the national subsidy funds" the question arises, to what extent should national R&D subsidies be more strongly represented in a European context.[65] At closer observation is becomes apparent that the empirical scientific basis for this discussion is amazingly thin. This is the general motivation behind the pursuit of the question of the relationship of the EU FP to national R&D subsidies within the scope of this impact study. The specific motivation consists therein, that now, after the conclusion of the 4th EU FP for the first time, robust patterns of participation can be traced. Based on them, the question of how the national R&D subsidies can most sensibly act in relation to EU FPs can be discussed anew. At the end of the day, this question is also concerned with the effect of the FP. If it is assumed that through participation in the framework programmes primarily new options and new innovation potential are built up, then the ability to exhaust this potential is also dependent on the existing innovation infrastructure in Austria. The national subsidy programmes belong to this.

In this chapter, essentially four questions will be discussed:

- What status did the 4th EU FP have in the Austrian research community as an external source of financing in comparison to national subsidy sources?
- To what degree does the clientele of the national subsidy institutions overlap with the participants in the 4th FP? Wherein does the clientele differ?
- What distinguished the projects executed?

In answering these questions, we attempt to identify intersections and things complementary between the 4th EU FP and the national subsidy programmes. Based on these insights, basic considerations for the improvement of the intersections between the national subsidy landscape and the FPs are presented at the end.

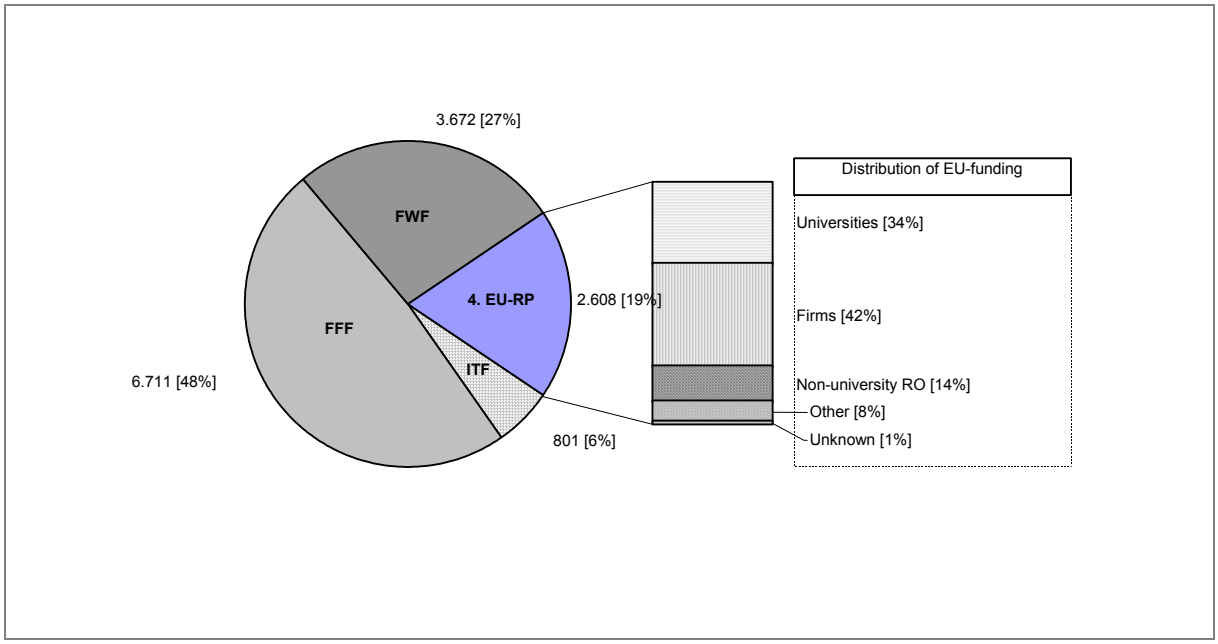
7.1 The EU FP have become an important source of financing for Austrian R&D activities

If one compares the returns from the 4th EU FP to the accumulated subsidy volume of the most important Austrian R&D research institutions over the FP's run-time (1995-98) (see Figure 57) the relative significance of the FP as an external source of financing is evident. At 2.6 billion ATS, about one fifth (19%) of the project subsidies available to Austrian researchers at national and European levels came from the 4th EU FP. A restriction must be noted here. The Austrian funding organisations accounted for here do not cover all available project subsidies. Missing for instance are subsidy resources handed out directly from the ministries, the ERP fund as well as the subsidies offered by the individual provinces.[66] Still, the three funds dealt with here do cover the predominant majority of the Austrian subsidy offering, which, in the narrowest sense, addresses the bottom-up research and innovation projects.

[65] See: Technopolis Ltd. Et al. (1999)

[66] A complete list and comparison of the resources available for project and programme subsidies in Austria is made especially difficult since the published reference figures vary between the subsidy providers. Thus lack of clarity could not be completely removed from the representation given here as cash values were given for the FFF subsidies while ITF, FWF and the EU-FP published figures for non-repayable grants. However, for a rough approximation of the actual magnitudes of the proportions, a mixing of the figures is tenable.

Figure 57: Cumulative funding volumes by source in millions ATS; period: 1995 - 1998

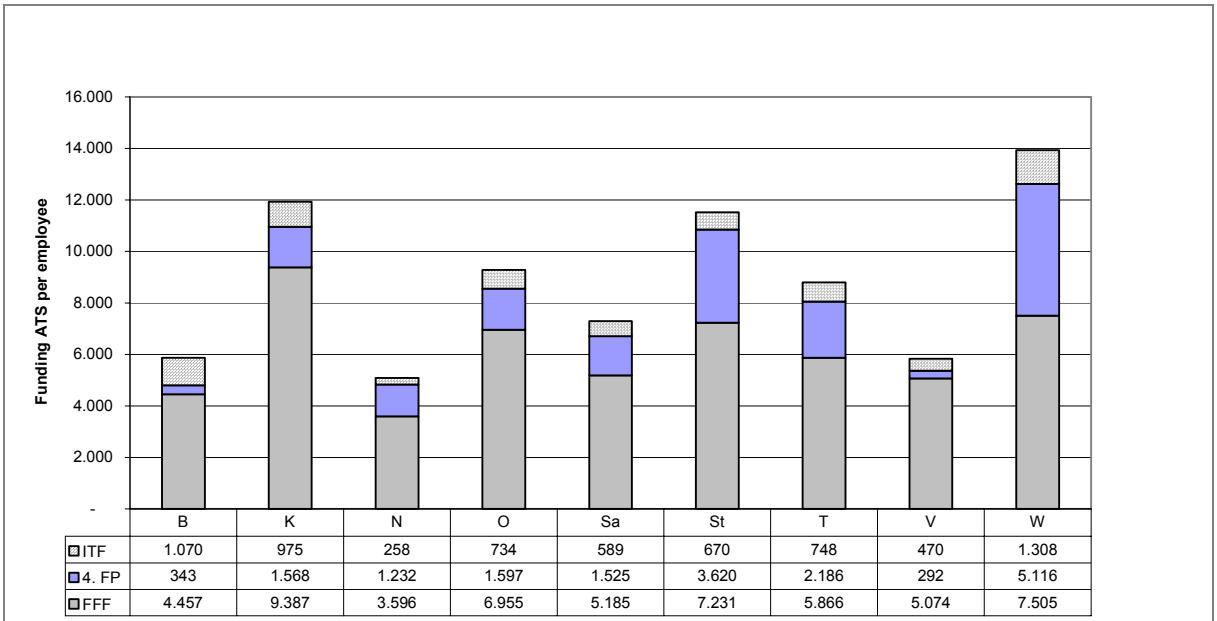


Source: BIT, FFF, FWF, internal calculations

Taking the volumes of subsidies paid out by FFF and ITF together, over half (54%) of the research and innovation subsidies at the federal level flow into the industry sector. The FWF – the leading fund for scientific research at Austrian universities – was responsible for 3.67 billion ATS or 27% of the available resources. If one considers the division of EU subsidies received by the individual types of organisations, it becomes apparent, that especially in the case of scientific research at Austrian universities, the 4th EU FP played a relatively more important role than it did for the industry sector.

To gain some insight into the regional significance of the 4th EU FP, the regional distribution of both national research and innovation subsidy funds, FFF and ITF, are displayed in Figure 58, which compares the returns from the 4th EU FP. To standardise the magnitude relationships, the accumulated subsidy sums are oriented to the number of employees in the secondary sector. The results show that the regional significance of the 4th EU FP varies greatly. It is not too surprising that the provinces with universities clearly profit more from the FPs than the others. With 5,116 ATS in subsidies received from the 4th EU FP per employee, Vienna takes the top position.

Figure 58: Cumulative funding volume by source and province in ATS per employee in the secondary sector; period: 1995-1998



	B	K	N	O	Sa	St	T	V	W
ITF	1.070	975	258	734	589	670	748	470	1.308
4. FP	343	1.568	1.232	1.597	1.525	3.620	2.186	292	5.116
FFF	4.457	9.387	3.596	6.955	5.185	7.231	5.866	5.074	7.505

Source: BIT; FFF, internal calculations

There is broad consensus that a European research programme which wishes to produce high-quality research results and innovations, neither can nor should live up to regional policy demands. Although, from the perspective of the individual member countries, the question arises as to what extent heavy, long-term concentration on a few research- and technology intensive regions is desirable. The issue here is not so much the disparities in the subsidy monies received as they can be more than absorbed by other instruments. The issue is integration into the European research scene. That which is true for the predominant majority of individual FP participants, namely, that participation results in reputation- and image improvement alongside the scientific and economic benefits, can also be transferred to the individual regions. Given this, it makes sense to intensify efforts to increase the engagement of provinces less active till now.

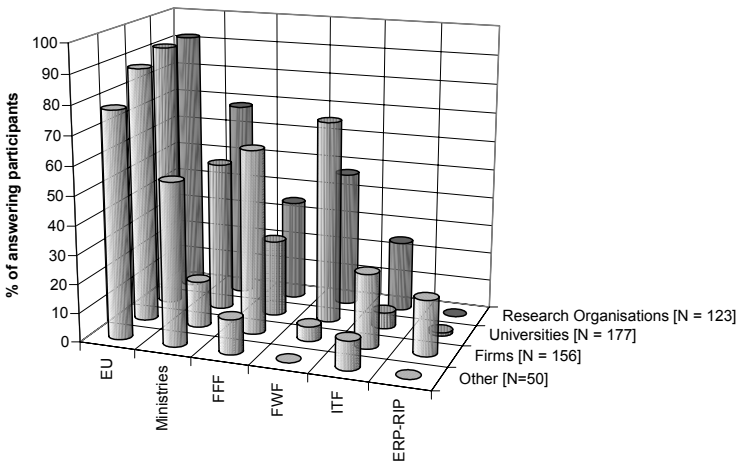
In summary it should be emphasised that through Austria's full membership and the subsequent active participation in 4th EU FP, an important source of financing for Austrian R&D activities could be developed even though this new source of financing was only concentrated on a few provinces.

7.2 The EU FPs are used by Austrian researchers parallel to national subsidies

The following sub-chapter is concerned with the extent to which participants in the EU FP also take advantage of national subsidy offerings. This question is significant as the so-called *spill-overs* between EU projects and national R&D activities (in both directions!) also depend on whether or not division of labour in the "research market" increases because of the additional source of financing. Expressed more sceptically: does participation in EU FPs lead to a segmentation of the Austrian research scene? Based on the results of the participant survey the question can be answered with an unequivocal "no". Participants in EU FPs also use the national subsidy offering in every respect (also see chapter 5). There are hardly any specialised research units in the EU FPs (university institutes, departments). Although, segmentation can be expected in another respect: the results suggest that the EU FPs continue to expand the quality slope within the Austrian research community.

The individual results: Figure 59 provides an overview of which other external subsidy sources participants in 4th EU FP used to finance their R&D activities during the FP's run-time. The dominant pattern is, that EU participants (surveyed at the department/institute level) also take advantage of national subsidy sources along with the EU subsidies. The differences between the types of organisations lie above all in the varied scattering across the spectrum of subsidies accessed. At the national level, industry concentrates mainly on the FFF. Universities and non-university research institutions on the other hand rely on a broader spectrum. Surprising is the significance of the direct subsidy monies from the relevant ministries both for university departments as well as for the non-university research institutions. From the technology policy point of view, therein lies a considerable and frequently underrated steering potential for the *policy makers* themselves.

Figure 59: Sources of financing accessed by type of organisation and source [in %; period 1994 – 1998]



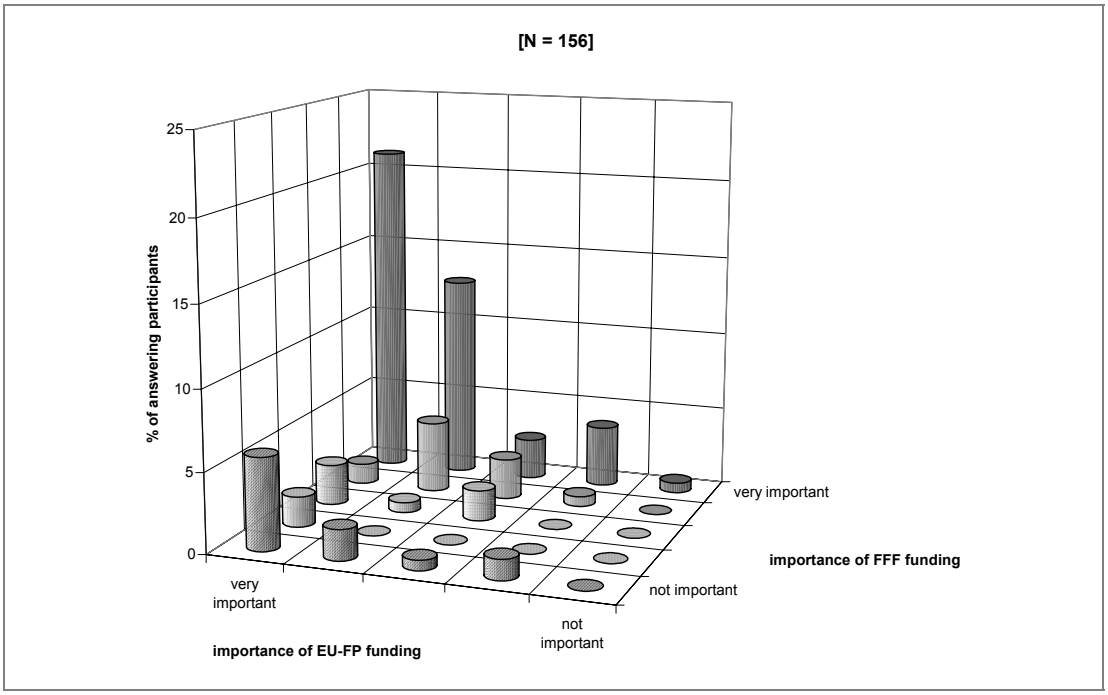
	EU	Ministries	FFF	FWF	ITF	ERP-RIP
Other [N=50]	78	56	12	0	10	0
Firms [N = 156]	88	16	63	5	26	19
Universities [N = 177]	92	52	27	70	6	1
Research Organisations [N = 123]	92	68	35	47	24	0

Source: survey, internal calculations

Figure 59 alone does not provide sufficient confirmation of the result already anticipated at the outset since it merely represents the results of the binary question "taken advantage of – yes/no". To provide well-founded support for the result, the importance of the individual external sources of financing should be included. The following three figures provide this information. For the three most important types of organisations, industry, universities and non-university research institutions, they record the importance of the dominating external sources of financing (in Figure 59) along the varying significance of the EU FP.

Figure 60 combines the importance of the EU FP with the importance FFF as an external source of financing for the "industry" group. It becomes clear that the dominant share of organisational units participating in the FP perceive the EU FP as well as the FFF as very important external sources of financing. Still, a small group of companies (5.8% from 156 mentions) can be identified for which the EU research programmes are a very important external source of financing but for which the FFF is not important.

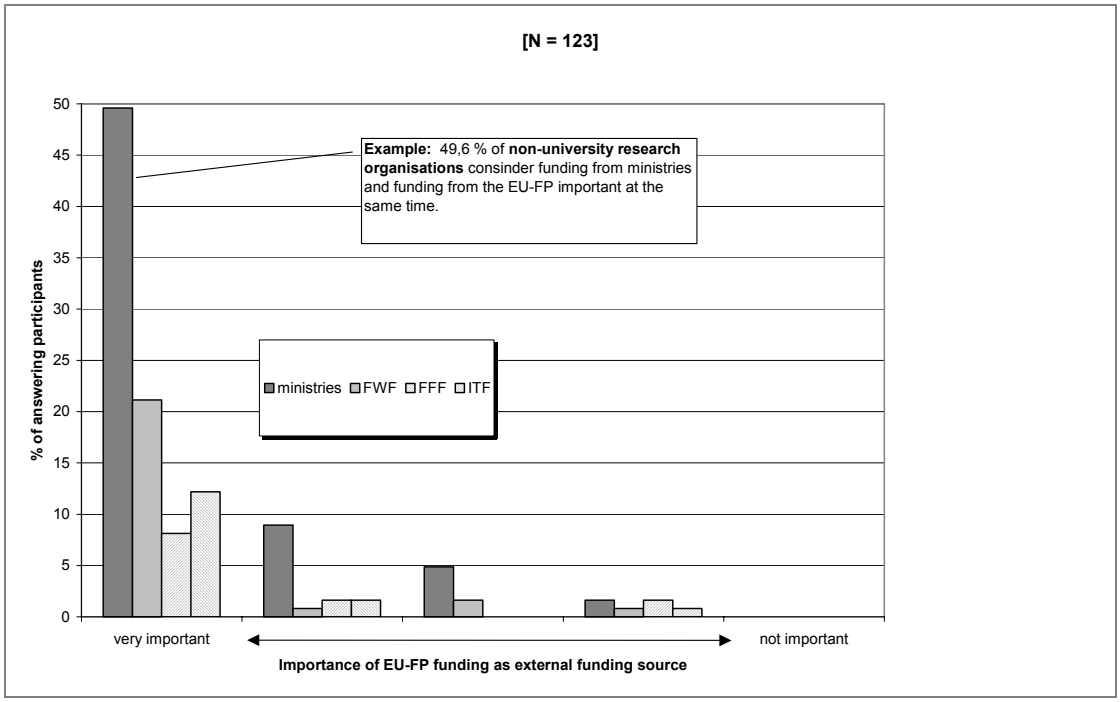
Figure 60: Importance of national subsidy providers against the EU FP for industry; EU FP against FFF



Source: survey, internal calculations

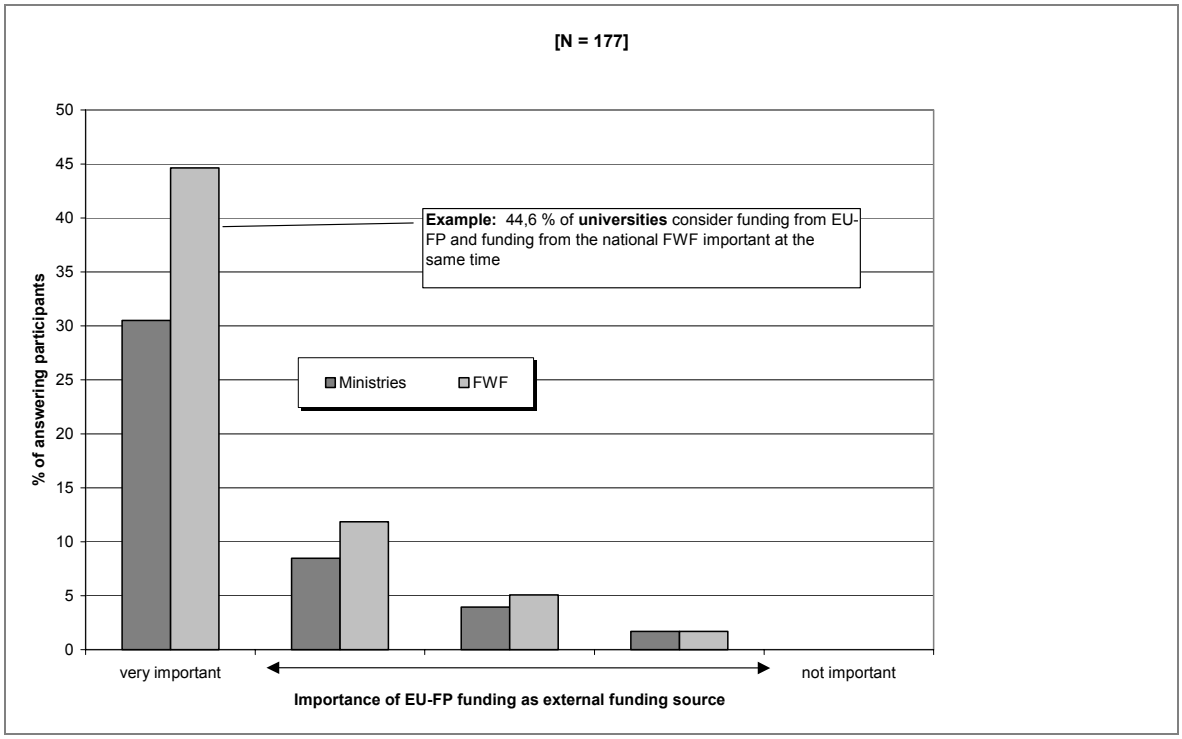
Figure 61 and Figure 62 show the corresponding results for the non-university research institutions and universities.

Figure 61: Importance of national subsidy providers against the EU FP for non-university research institutions



Source: survey, internal calculations

Figure 62: Importance of national subsidy providers against the EU FP for universities



Source: survey, internal calculations

The results depicted show relatively clearly that independent of the type of organisation, external sources of financing are used simultaneously. At the individual participant level, the EU subsidy is not a substitution for national R&D subsidies but an addition. This result may seem trivial at first glance. The further implications are however absolutely clear and of basic technology policy significance.

- Through participation in the EU FP, sources of financing are not addressed for new groups not yet included in the national subsidy offering. Moreover, the subsidy offering expands for those already experienced in addressing national resources. So the question is not if Austrian researchers and companies take advantage of EU subsidies or national subsidies, but if they generally take advantage of subsidies at all.
- The content-based transitions or *spill-overs* between nationally subsidised and through EU FP subsidised R&D activities take place predominantly within one and the same organisational units.
- By and large, there is potential and danger behind the simultaneous use of national and European subsidy instruments. The potential is that know-how built up and subsidised nationally is in the position to develop additional sources of financing. Thereby, the effectiveness of national subsidy programmes increases. On the other hand it must be assumed that given scarce national resources, the institutes and companies which get what they want are those which can broaden their base of know-how within the scope of EU projects. Indeed, it is absolutely conceivable, that through participation in the FPs not only a dynamic phase has set in on the Austrian research scene but also a possible weakening of the latecomers. This classic Matthew-effect can only be combated by a differentiated national subsidy policy which confronts the EU FP as complementary instead of substitutive.

Table 50 offers a further insight in the compatibility of national subsidy instruments with the EU FP. What plans do FP participants have after the conclusion of the EU project? The answers to this question clearly show that EU projects establish networks beyond the projects' run-times and that the themes dealt with are further pursued.

Table 50: Plans after the conclusion of the EU project, data in % of respondents

Intentions after project conclusion ... (more than 1 answer possible)	University	Research institutions	Industry	Other
N	170	118	151	46
		%		
Begin new research projects with some of the original project partners	69.4	72.9	41.1	47.8
Push for commercialisation of the project results	24.7	28.0	62.9	26.1
Dissolve project team	19.4	10.2	37.1	17.4
End research activities in this area	4.1	4.2	11.3	8.7
Continue: in the EU FPs	64.7	78.0	37.7	54.3
Continue: with national funds	58.2	44.9	36.4	28.3
Continue: with own resources	40.6	34.7	42.4	26.1
Continue: with other partners	20.6	28.0	19.2	15.2
Continue: within the scope von EUREKA	3.5	0.8	3.3	2.2

Source: self-conducted survey

The network aspect is particularly important to universities and non-university research institutions. About 70% of respondents from both of these groups said that after the conclusion of the EU project, new research activities are planned with some of the original project partners. Even 41% of companies indicate this. In a minority of the cases the internal project team is dissolved. For the predominant majority of participants, the area of research explored in the EU project remains relevant even after the project. On the whole however, differentiation by types of organisations also shows that in comparison to universities and non-university research institutions, industry clearly concentrates on the commercial exploitation of results. Indeed, after the EU project is over the set-up of long-term networks and also the continuity of internal project teams are less important to business. This confirms expectations and confirms the known relationship between scholarly research and industrial innovation activity. For companies, scientific networks are of interest as idea suppliers

and as access to problem solving capacity[67]. EU projects afford both and after the conclusion it is often enough to continue the contacts at a lower level of activity and to be more engaged again at a later date if necessary. In this respect it is critical to find the right balance between maintaining the networks and maintaining one's own ability to absorb on the one hand and the immediate, important concentration on the business goal – development and sale of products and services – on the other.

It is also so regarding the use of external sources of financing for planned follow-up activities. The predominant share of universities and non-university research institutions stays within the context if the FPs . This is only the case for 37% of businesses.

All in all the intentions after the conclusion of the EU project also display an important aspect of the significance and the interaction of subsidy instruments. For individual participants, research projects are grouped into areas of competence, built up over the long-term and fed by different sources of financing. More to the point, one could say that the research community and in particular industry establish fields of competence over time. And where possible they use the entire spectrum of available internal and external sources of financing. This tempers the steering potential of subsidy instruments defined as top-down. The supply of project subsidies alone is not sufficient to establish research and development activities for topics, which do not apply to existing areas of competence.

7.3 Large companies with above average R&D capacities have above average representation in the EU FPs

The previous chapter demonstrated that as a rule, the EU FP is used parallel to national subsidy instruments. So, from the point of view of the participants, the significance of the EU FP was that of an additional source of financing. In this regard, two questions remain unanswered: what distinguishes successful participants in EU FPs from those that do not participate? To what extent was the reserve of potential participants already exhausted by the 4th FP? Both of these questions are at the centre of this subchapter however the analysis is limited exclusively to the industry sector. This is because data, which make such an analysis possible, are only available for industry. With the support of FFF, the largest Austrian research subsidy fund for the business sector it has been possible to identify structural differences between participants and non-participants. Beyond that, the available information also makes possible a direct comparison of the innovation competence of both groups along one objective measuring stick – the project assessment via the FFF.

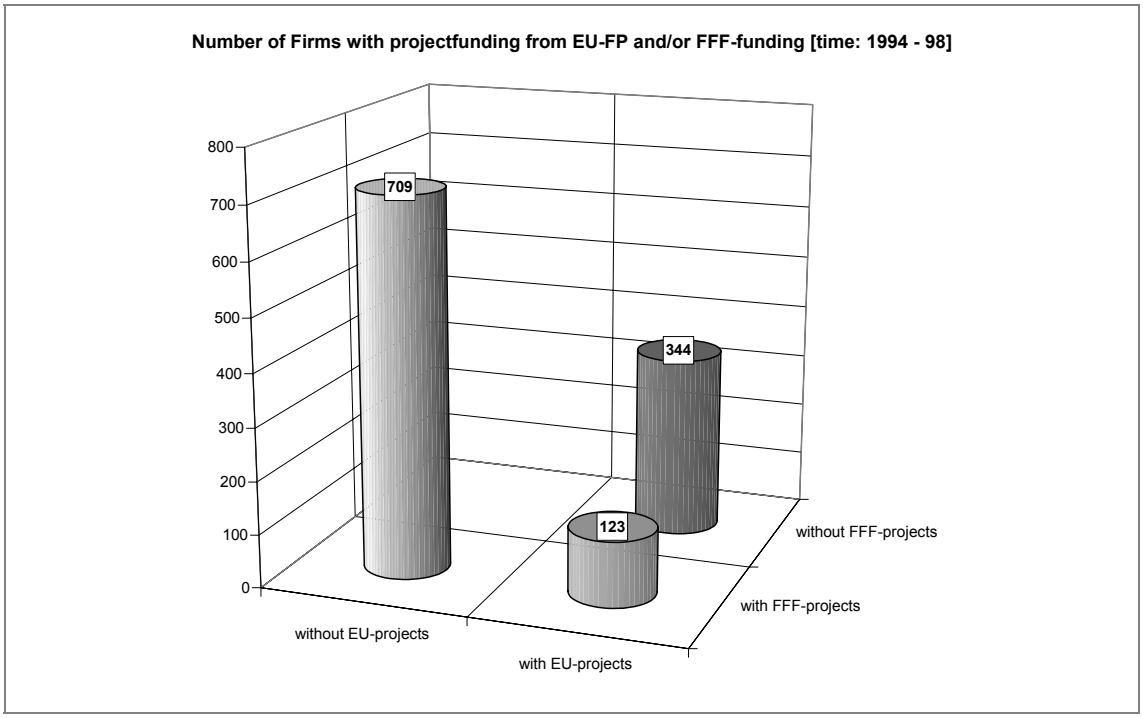
The starting point for the analysis was the identification of three different groups by means of the participant list from the 4th EU FP and FFF customer list:

- Companies which during the programme run-time (1994 – 1998) executed both FFF and EU projects,
- Companies which only carried out EU projects
- Companies which carried out FFF-projects within the observed time period but no EU project.

Figure 63 shows the distribution of the three groups. The largest groups are, as expected, the companies which carried out FFF projects but no EU project in the 4th FP.

[67] See: Schibany, Joerg, Polt (1999)

Figure 63: Companies with EU and FFF projects



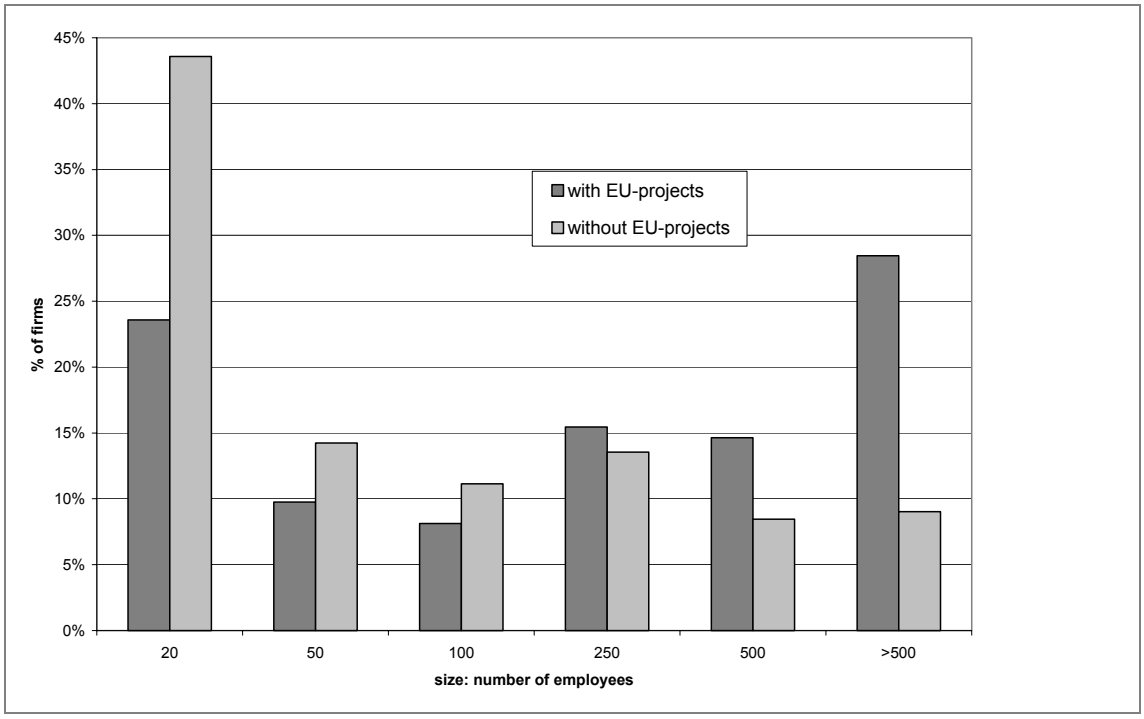
Source: FFF, BIT, internal calculations

The high number of 4th EU FP participants with no parallel FFF projects is somewhat surprising. This appears to contradict our results obtained in the survey. They showed that the predominant majority of the EU participants also take advantage of national subsidy offerings. This inconsistency is explainable in that surveys are always bound by a certain bias. In our case it appears that "subsidy professionals" have answered the questionnaire. On the other hand the technical comparison of FFF client data and the list of successful EU participants is difficult since name spellings or name changes make an accurate classification difficult. Finally it should be added that a variety of smaller consulting and research companies took part in the 4th EU FP. While not the typical FFF clientele, they had a heavy focus on established companies in the production sector. Based on the relatively high number of companies recorded in this analysis, the following results appear to be quite robust all the same.

Given the information at hand (industry- and project evaluation by FFF) the comparison is necessarily limited to two groups: FFF clients with EU projects (123) and FFF clients without EU projects.

Figure 63 clearly shows that FFF clients with EU projects are on average plainly larger that those without EU projects. Based on these results, large companies are therefore relatively more heavily represented in EU programmes than are smaller companies.

Figure 64: Size breakdown of companies with and without EU projects



Source: FFF, internal calculations

The difference in the existing R&D capacities turns out to be especially clear (Table 51). While about 88% of companies with EU projects have R&D staff, there is the indication that in a mere 70% of cases a separate R&D department exists in companies without EU projects. In addition, the median number of R&D staff (only those with any R&D staff are included) is many times higher with participants than in the control group (130 vs. 29).

These size differences continue on in the average number of projects submitted per company (2.4 as opposed to 6.4) even though the rejection quota was at the same level for both groups. Companies without EU projects were slightly more successful than those with, as they had a rejection quota of 13.4% of submitted projects as opposed to 14.8%.

Table 51: Characteristics of companies with and without EU projects

Number of companies ...	**without** EU Projects	**with** EU Projects
without FFF-Projects		344
with FFF-Projects	709	123
Average: Number of employees	195	605
Share of companies with R&D staff in %	68.9	87.8
Average number of R&D staff	29	130
Approved FFF-Projects – 1994-98	1,701	783
Projects per company – 1994-98	2.4	6.4
Approved total costs, average in Mio. ATS	6.6	9.4
Rejection quota in % of submitted proposals	13.4	14.8

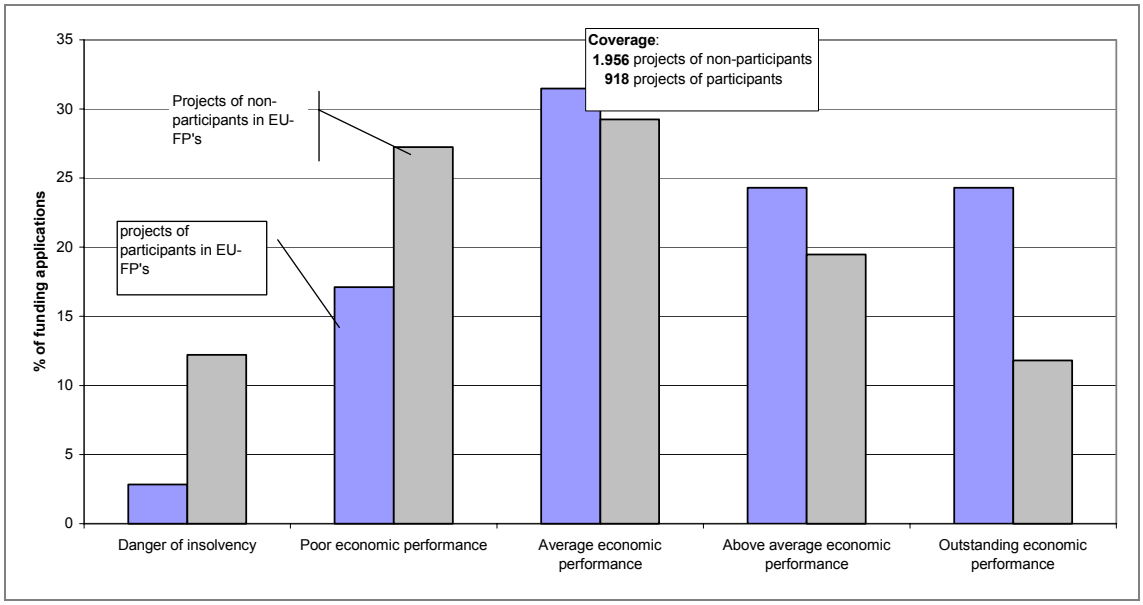
Source: FFF, internal calculations

In summary, companies participating in the EU FP are on average larger and more R&D intensive than companies, which concentrate on the national subsidy offerings. Although it should also be noted that a

considerable number of small and medium sized enterprises are represented among the EU participants. Company size therefore appears to further participation in EU Programmes yet is not a requirement.

The following Figures (Figure 65 to Figure 68) provide another differentiation of these results. In the course of its project evaluation, the FFF also assesses the economic efficiency as well as the development dynamics of the companies applying. Here it also becomes clear that in the FFF's assessment, companies with EU projects clearly do better in terms of economic efficiency than those without EU projects. The distribution of companies along the scale used by the FFF to assess economic efficiency (Figure 65) shows a higher presence of companies with EU projects at the upper end of the scale ("above average key figures" as well as "outstanding key figures").

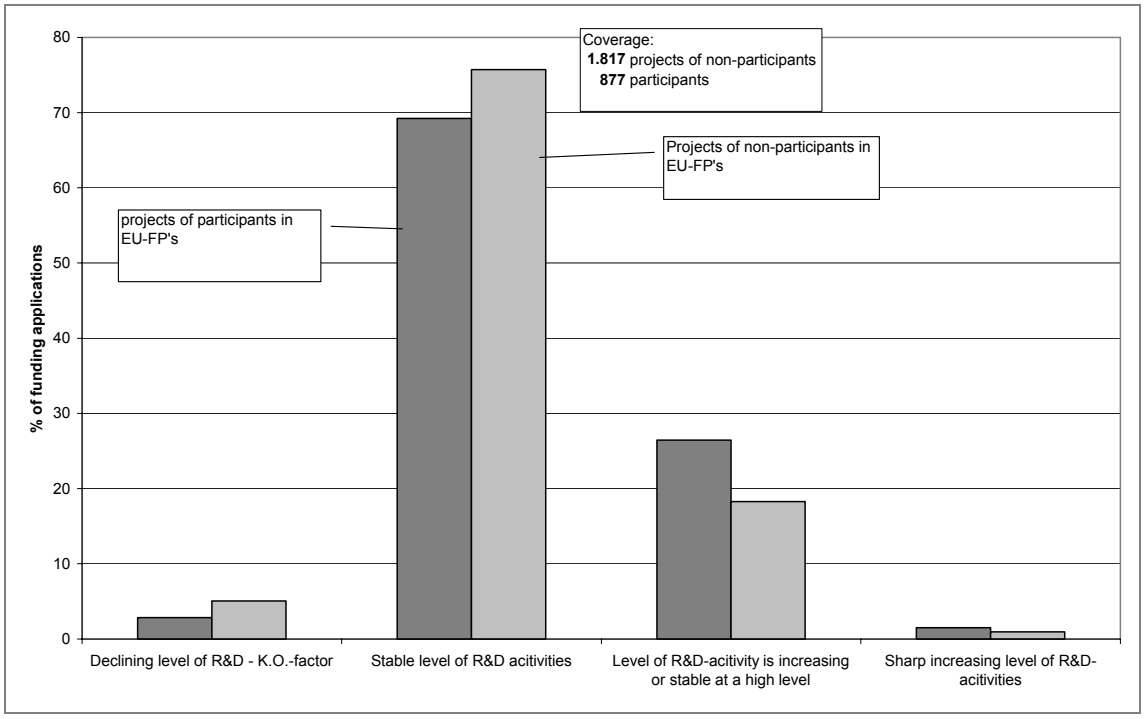
Figure 65: FFF benchmarks of participants and non-participants – economic efficiency of the submitting company



Source: FFF, internal calculations

The same is true of the FFF's assessment of the development dynamics even if in a somewhat diminished form (Figure 68). Companies with EU projects do better than non-participants here as well, though here, the predominant share of both groups is concentrated at the second level of the scale ("stable level of R&D-activities"). To be more precise it should be added that the basis of this assessment is the question, whether or not a future change in R&D activities can be expected. The question is not an assessment of the starting position but an estimation of expected dynamics. So at this level where no increase in R&D activities is to be expected, there are both mature companies with an established R&D culture and high level of innovation as well as companies weaker in innovation where no increase in R&D activities is to be expected.

Figure 66: FFF benchmarks of participants and non-participants: dynamics of the submitting company

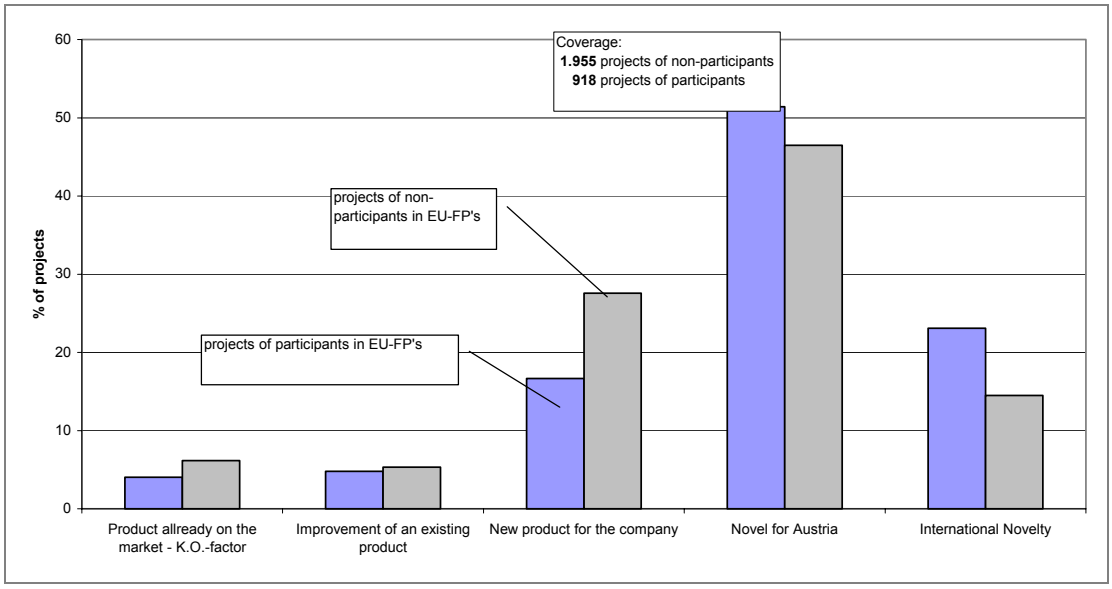


Source: FFF, internal calculations

What conclusions can be drawn from previously presented results? Basically, only two: (i) size, good economic key figures and high R&D capacities positively correlate to participation in the EU FP. (ii) size, good economic key figures and high R&D capacities are however not necessary requirements for this. The latter comes from the fact that small companies and companies with "bad economic key figures" are represented among the EU participants.

This picture is completed by the results of the project evaluation from the FFF (Figure 67 and Figure 68). It shows that on average, companies with EU projects reach a higher level of technological innovation than those without EU projects. Yet, the differences are not extreme. Nevertheless 46.5% of non-participants submitted projects that were classified as “novel for Austria" with respect to the technological novelty. This number was 51.4% for EU participants. The best mark in this context ("international novelty") was received by 23.1% of EU participants as opposed to 14.5% for the non-participants.

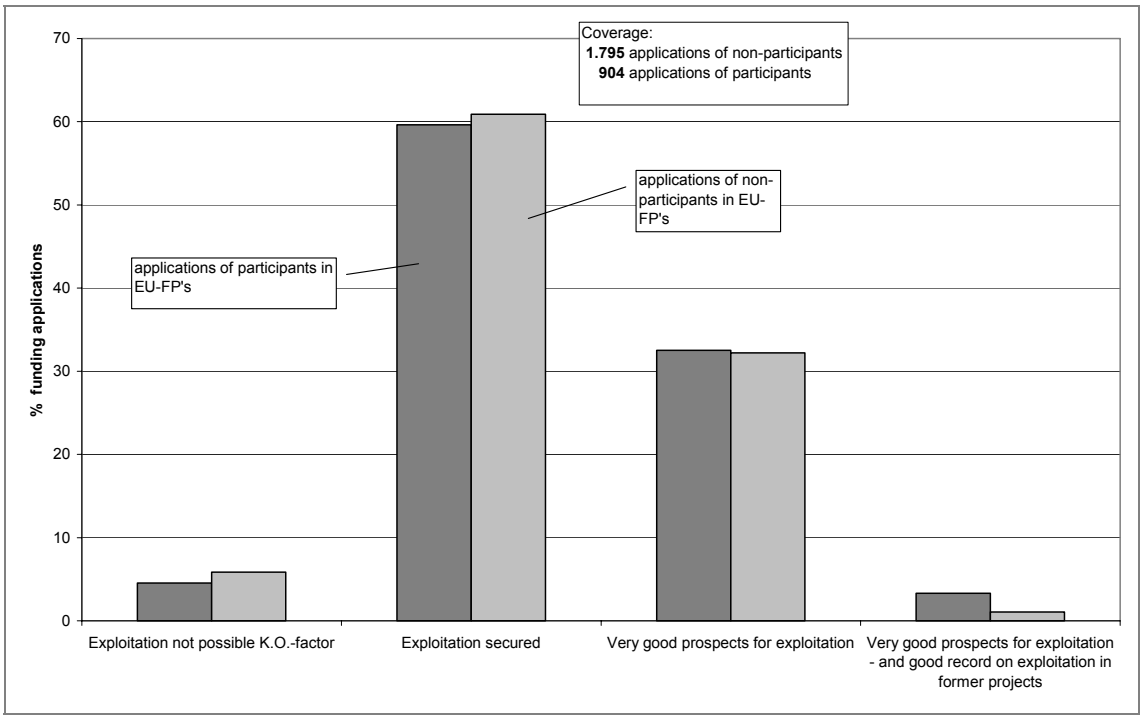
Figure 67: FFF benchmarks of participants and non-participants – technological novelty of the submitted projects



Source: FFF, internal calculations

Almost no differences could be found between the two groups with respect to the prospects of the usability of projects submitted to the FFF (Figure 68).

Figure 68: FFF benchmarks from participants and non-participants – prospect of usability for the submitted project



Source: FFF, internal calculations

In summary, the comparison of EU and non-EU participants produced the following results:

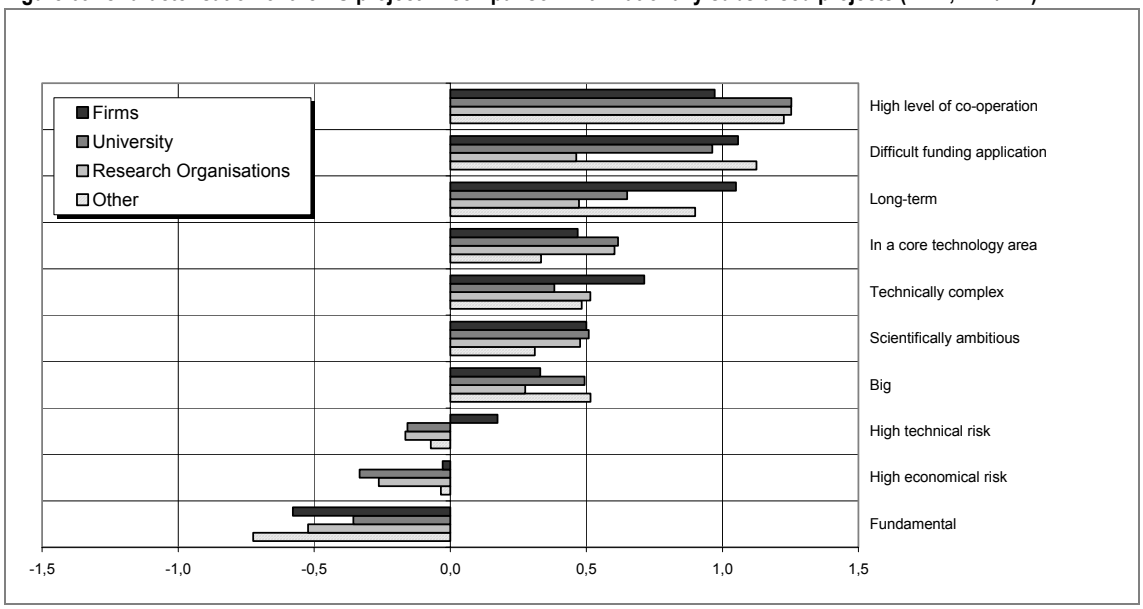
- Participants in EU FPs are on average larger, more economically productive and have relatively greater R&D capacities than non-participants.
- In addition the projects submitted to FFF by EU participants are on average more innovative.

- All in all, the EU FPs absolutely address the elite of the Austrian industry sectors.
- Finally, it should be mentioned that the results presented also suggest that a considerable reserve of economically productive and innovative companies exists. Until now, this group has not been motivated to participate in the EU FPs and could therefore be the target of future *awareness*-activities. Based on the information processed here, this inference does not appear to be sufficiently supported. Even in the case of companies absolutely predestined for participation in the EU FP because of their structure (size, R&D capacity), it can make economic sense not to do this. In addition, the EU FPs do not cover the entire thematic spectrum of innovation activities. Against this backdrop, a reliable definition of a target group still to be activated can only come after further investigation.

7.4 EU projects are more demanding and more application-oriented than nationally funded projects

A comparison of the fundamental characteristics of EU projects with nationally subsidised projects shows a further insight into the interplay between the national subsidy offering and the EU FP. The companies surveyed within the scope of this investigation were asked to compare nationally subsidised projects (FWF, FFF/ITF) with the executed EU projects. The grid supplied was made up of 10 central dimensions describing R&D projects. Figure 69 summarises the results.

Figure 69: Characterisation of the EU project in comparison with nationally subsidised projects (FWF, FFF/ITF)



Source: self-conducted survey, internal calculations

The bars extending to the right illustrate, that the difference between EU projects and nationally subsidised projects was positive. For instance, EU projects are on average more cooperation-intensive than nationally subsidised projects. The opposite case applies to application-oriented projects: EU projects are more application-oriented (bars extending left) than nationally subsidised projects.

At first glance, the picture is paradoxical. EU projects extend over a longer time period (longer-term), are more technologically complex and scientifically more demanding. At the same time they are more application-oriented and pose a slightly lower commercial risk. This paradoxical combination is cleared up, when one considers the understanding of innovation processes in light of new innovation theory. Innovation is not a linear process in which scientific demand decreases with increasing application-orientation. The new understanding of innovation says that multiple impulses for scientific research come straight from application.

The differences between nationally subsidised projects and EU projects shown here reflect what has already been implied in the setting of the EU FP as an external source of financing. The crucial point exists in building up fields of competence. The competitive pressure forces companies and research institutions to continuously extend their fields of competence and simultaneously to secure a certain know-how in neighbouring fields of competence and sometimes to increase exploratory activities. The second mainly serves to open new development options. In the most cases, EU projects lie within the technological core area. This is at least partially due to the fact that the competitive selection process tends to favour those already demonstrating know-how and a corresponding reputation. Against this backdrop, EU projects strive for the expansion and further development of existing fields of competence. The expansion of available competence can be absolutely scientifically demanding, technologically complex and little oriented toward the fundamentals. The results presented here point straight in this direction.

Against this background the EU FP takes on important significance: it helps participants to become better where they are already good. The flip side of this discovery is that EU FPs are not suited to exploring new fields of interest. Thus there is continued need for national R&D subsidies.

8. Summary of the most important results

Austria manages a quantum leap in participation with the 4th FP

With the start of the 4th EU FP for research, technological development and demonstration (1994-98) Austria managed a quantum leap in participation. Austria participated in 1,444 project with over one thousand organisations, a quadrupling of participation in comparison to the sum of all earlier FPs. Further, Austria's share in all participations rose substantially – as did the shares of the other new member countries.

The FP's display structural characteristics that have a governing effect on participations. Cooperation of participants from different countries in common project consortia lead to similar patterns of participation between the countries. Essentially, all member nations have the highest share of participations in those programmes with the highest funding.

The participation by member nation and the number of RTD employees shows an impressive and explanatory relation. The existing absorption potential in the form of human resources explains 80% of the variance of the successful participations of a given nation. In other words: the number of RTD personnel essentially determines the absolute number of participations. Still, smaller countries show (like countries tending to have lesser national R&D expenditures) higher participation intensity.

The participating organisations already have experience with cooperation

The collaboration within EU projects is based on experience with cooperation and existing networks. In that regard, Austrian university departments and non-university organisations are particularly geared toward the international. About three quarters of participants stated that they had already collaborated with their project partners and hence could take advantage of previous experience. Austrian participants also take the initiative in forming consortia: about a third of impulses came from them at the creation of project consortia.

The Austrian participants paint predominantly positive image

The general assessment of the benefits of participation in 4th FP is absolutely positive: 66% of the participants estimate the benefits of their participation to be higher than the costs. Seventeen percent see a balanced relationship between benefits and costs and only 17% judge the relationship negatively. The universities and non-university institutes provide a more positive image than do the participants from industry. Further, *newcomers* estimate the general benefits to be positive as well: over two thirds estimate the benefit/cost relationship to be positive. With that, their assessment was slightly more positive than that of the group that had already participated in earlier FPs.

The research activities in EU projects is precompetitive. This influences the status of an EU project within the context of research strategy. The FPs make it possible for industry to carry out cooperative research activities which could be of future strategic significance. Such knowledge is increasingly developed in larger consortia and contributes to the building of competence. For the majority of participating companies, participation in FPs supports other innovation activities. Universities and non-university institutions however attribute EU projects with a substantially higher strategic significance – showing a causal relationship with scholarly research.

The FPs as an instrument of the Europeanisation of R&D

The FPs contribute *qua* structural and institutional characteristics to the Europeanisation of research. This can be recognised in that the trans-national components of cooperation between countries and types of organisations play a great role. More international partners are represented in a project consortium than are national partners thus creating the basis for a network within the research sector. A preference for vertical cooperation can still be found within the business sector. Companies increasingly cooperate with clients or subcontractors as opposed to with direct or indirect competitors.

Goals

In terms of goals tied to participation, a change toward market-driven goals has occurred. Along with the FPs as additional sources of financing, universities and non-university institutes pursue scholastic targets like publications and network-related objectives without exception. Industry targets are however output as well as resource related. The development of new products and/or the goal of cost sharing with project partners represent a significant incentive for participation.

Reaching goals

An essential criterion for the effectiveness of a subsidy programme is the extent to which the goals set by participants in an FP are attainable or have already been achieved. In both the intangible as well as output-related categories of goals, participants who rated the targets important were able to give a positive appraisal of the achievement of objectives, and this to an overwhelming degree.

Short- and mid-term effects

In reference to the effects of participation in the EU FP, there are great differences between the types of organisations. While all types of organisations name increased scientific/technological reputation as the effect most often already achieved, in terms of employment, the universities were most able to achieve short-term employment impulses through participation. Companies (and to a limited extent non-university research institutions) have, over time, rising expectations in terms of “hard” economic effects (e.g. development of new markets or increased sales).

High additionality

As already shown in studies from other countries, the additionality of participation is very high. A dominant majority of projects would not have happened without the EU subsidy. Any minority, that would have continued the project despite rejection, would have done so only with (sometimes) major adjustments (lower project volume, different goal orientation, fewer international partners, etc.). Participation on the FPs also has a significant impact on the strategic behaviour of the organisations, and above all on the future cooperative behaviour and on the innovation- and research strategy.

Rejected coordinators plan to participate again

Rejected coordinators are not deterred by a negative assessment. The overwhelming majority says that they still want to participate in future FPs. Although, to some degree the organisations affected plan to change their participation behaviour, in as much they no longer want to serve as coordinator while simultaneously improving project preparation.

High participation by universities

Thirty percent of all Austrian university departments took part in the 4th FP. The extent of Austrian university department participation primarily depends on the scientific orientation and size of the department; the bigger the department (measured in teaching staff), the higher the level of participation. In terms of scientific orientation, departments of the natural sciences have the highest participation rate followed by departments of the technical sciences, agriculture, forestry and veterinary sciences, the social sciences and human medicine; departments with a humanities orientation are far behind in last place. There is also the indication of an accumulation of national subsidies and EU programmes: departments participating in the 4th FP also have higher participation rates in Austrian-subsidised programmes.

Further, there appears to be little if any "trade-off" between subsidised research and other department activities. Based on department size, (again measured in teaching staff) there are no substantial differences between participants and non-participants in the 4th FP based on publications, the course offering and the support services (master's theses and dissertations).

Support of programme participants

The participant survey has shown that the Austrian support infrastructure is rated absolutely positively and represents an irreplaceable element of participation for Austrian organisations in EU's framework programmes. The participating organisations are well informed about the FPs and whoever seeks support receives it. The field of potential applicants could be continuously expanded and there is no doubt that this goal will be pursued further.

The survey shows a positive image and a trend toward the need for specific information

If the suggestions (for raising the likelihood of success of Austrian project proposals in the EU FP) of rejected applicants are examined, it becomes immediately apparent that the need for general information is satisfied to a large extent. Still, more than half of those surveyed indicated a need for more specific information about various tenders. About one quarter sees the possibility of raising the likelihood of success in intensified support by BIT. Only one fifth see the opportunity in intensified support through regional support offices.

The survey does not supply sufficient material to draw clear conclusions about the regional offices. Still there is the implication that the quality of the support varies greatly in the different regions. Given the size and competence of BIT, the duties of the regional offices in the FP should be clearly defined. Its role as a primary information provider should be particularly emphasised.

Evaluation of the organisation and competence distribution in the support infrastructure

The Austrian support infrastructure is shaped by BIT even though it is not the only responsible organisation. In addition to BIT, PROVISO, just recently brought into being, exists exclusively to support delegates. Depending on the type of organisation, access to FFF or BMBWK is available in the area of start-up financing.

The outside perception of the Austrian support infrastructure provided in this study should not be understood to be an evaluation of the institutions concerned. That would exceed the scope and task of the impact study. Nevertheless, based on the results, some suggestions about the organisation and distribution of competence in the support infrastructure can be deduced:

Development potential of the databases. Since the beginning of the 5th FP, both Austrian databases - INNOman and PROVISO – have largely improved quality. The cooperation agreement between BIT and

PROVISO has provided the first instance of mutual fertilisation in the administration of the database - content exchange between the experts is already the rule. In consideration of the fact, that Austria plays the role of a forerunner here, it seems appropriate to strategically re-think the development and use of both databases. This includes addressing issues not the least of which are the question of confidentiality. In this case, it would be desirable to transfer responsibility from the delegates themselves to political authorities. Further, the expansion and inclusion of company specific key figures is conceivable based on the example of a continuous evaluation approach. This data would form a basis for future impact studies. Every 2 or 3 years, successful participants could be asked about their turnover due to research results.

The Austrian support infrastructure in international comparison

A comparison of the Austrian support infrastructure with the three selected countries (Ireland, Finland, France) produced the following results:

- Specific European offices are found in Finland and Austria, the youngest EU member states. In Ireland or France the support of EU agendas can hardly be distinguished, at an institutional level, from other research and innovation subsidies, either in terms of politics or administration.
- The smaller countries clearly benefit from the clarity of their institutional landscapes. In each case, there is a clearly identifiable contact for potential applicants. In contrast, the national contacts in France are institutionally decentralised and serviced in concert by the delegates of the ministry of science, the expert department, as well as the international offices of the large research organisations (CNRS, IEA, INRA,…). ANVAR is the first point of contact for SMEs seeking innovation subsidies and SME-specific EU programmes.
- Data preparation has improved between 4th and 5th FPs in the small countries mentioned. The starting situations were however very different. In Ireland, the evaluation of participation in the 4th FP highlighted the very low quality of the data (if it existed at all). In the meantime, a database has been set up and is administered by Forfas. In Finland, data concerning participation in the 2nd, 3rd and 4th FPs were ascertained from VTT within the scope of the impact studies. Only since the 5th FP is a database available from the European secretariat of Tekes with the confidential data of the commission. It exists as an Extranet with the national contacts (NCPs) providing the data and having password-protected access. In France there is no database with participation data from the entire FP. The data are individually serviced individually for every programme.
- The Austrian support infrastructure differs conspicuously in size both in terms of BIT and database administration by the PROVISO team. The need for support seems to justify the size. At the same time it is still important to respect the complementarity between institutions involved. That means using synergies and avoiding following two tracks.

Financial support of the participants in programme preparation (start-up financing) is subcritical

The support of the Austrian programme participants in the detailed project preparation process addresses a serious entry barrier to the EU FP and this not only for Austrian participants. This is seen, among other ways, in that other member states have started similar initiatives. If the Austrian support for the project preparation phase (in the 4th EU FP) is examined, one thing becomes clear. Of about 2,200 submitted projects with Austrian participation, the support of 95 applications (via BMBWK and the FFF) is undoubtedly subcritical.

Further, it appears that the organisational *setting* for subsidy distribution could be improved. The accuracy and controllability of the start-up financing could be increased by the concentration of the subsidy on one

institution for all target audiences and through the integration of this instrument into the established support infrastructure.

The supplementary financing of EU projects through BMBWK was worthwhile in the first phase of full Austrian membership.

The evaluation of the effectiveness of the supplementary financing of EU projects - for universities and non-university research institutions - offered by the BMBWK has confirmed the usefulness of this instrument for the observed period. Still, the evaluation shows that some room for improvement exists. The results can be summarised as follows:

- The supplementary financing of BMBWK offered, via its financial makeup, the unbureaucratic and flexible administration of a true support for participants of the 4th EU FP .
- The supplementary financing in its current form absolutely had its place in the catching-up and establishment phases in which Austria still found itself during the 4th EU FP.
- The ever-surging crowd increasingly runs into staff capacity limits in subsidy distribution.
- The documentation and the monitoring of the subsidies are mainly oriented toward the internal departmental requirements for formal, budgetary execution. The subsequently generated information is not sufficient for a well-founded impact study.
- The unbureaucratic and flexible subsidy distribution creates an external perception of a dubious process with respect to the transparency and objectivity of subsidy distribution.

Now however after the widely successful integration of the Austrian research community into the world of the EU FPs, a re-engineering of the supplementary financing seems appropriate. Based on the experience gathered, it appears that there is still unused potential in increasing the accuracy and effectiveness of the instrument. A condition for this is of course a well-founded impact study, which was not doable within the scope of this evaluation based on the condition of the data provided and the limited resources.

The EU FPs have become important sources of financing for Austrian R&D activities

The purely financial significance of the 4th FP for the Austrian research community is underestimated, when the returns achieved are measured against aggregated public R&D expenditures. If however the returns from the Austrian participation in 4th EU FP are compared with resources made available at the federal level for bottom-up project promotion, then it becomes apparent that the EU FPs have, in the meantime, become an important source of financing for Austrian R&D activities. At 2.6 billion ATS, almost one fifth (19%) of the available project subsidies for Austrian researchers between 1995 and 1998 came from the 4th EU FP.

The distribution of EU resources has however shown, that of all the monies which flowed into Austria, the provinces with universities continue to profit greatly. If it is assumed that of all things industry participation in the FPs is tied to the development of new know-how potential and establishes itself at least long-term as increased competitive capacity, such high regional disparity in participation behaviour is not desirable over time. Therefore it makes sense to intensify efforts to involve previously less-involved provinces.

Austrian researchers use the EU FPs parallel to national subsidy providers

The survey results clearly show that independent of the type of organisation external sources of financing are simultaneously accessed. At the individual participant level, the EU subsidy is not a substitute for national

R&D subsidies but an additive. At first glance this result may seem trivial. The additional implications are however clarifying and of fundamental significance to technology policy.

- Through participation in the EU FP, sources of financing are not addressed for new groups, not currently party to the national subsidy offering. Further, the subsidy offering is expanded for those already experienced with applying for national subsidies. The question is therefore not whether or not Austrian researchers and companies take advantage of EU or national subsidies but if they take advantage of subsidies at all.
- The transitions in content or *spill-overs* between nationally subsidised and EU FP-subsidised R&D activities usually occur within one and the same organisational unit.

The overlapping of the EU FP and the national subsidy landscape is also evident in participants' continued plans for the time after EU projects have been performed. Almost half of the participants intend to continue the studies from the EU project by applying for national subsidies. In total, the observed financing structure and the observed patterns of participation yield the following image: for the participants, research projects group themselves around competence, to be built up long-term and fed by the different sources of financing. The research community and in particular the companies establish fields of competence over time and use, where possible, the entire range of available internal and external financing. From a technology policy standpoint, this qualifies the manoeuvrability of top-down subsidy instruments. The supply of project subsidy by itself is not sufficient to establish R&D activities in areas, which do not already fall into existing areas of competence.

The EU FP is mainly attractive to large companies with above-average R&D capacity

With the help of FFF, for the first time and within the scope of this study it has been possible to compare companies participating and not participating in the EU FP in terms of their economic efficiency and technological competence. The results confirm the hypothesis that the EU FPs mainly attract large companies with above average R&D capacity. Individual details are as follows:

- Participants in EU FPs are, on average, larger, economically stronger and have relatively higher R&D capacities than non-participants.
- In addition, projects submitted to FFF by EU participants are on average more innovative and larger.

In summary, the EU FPs attract the elite of the Austrian business sector. It must be said however, that there is still quite a reserve of innovative and economically strong companies among the non-participants.

EU projects are more involved and more application-oriented than nationally subsidised projects

From the point of view of participants, in comparison, EU projects are closer to the scientific-technological core concentration of the company, more involved and more application oriented than nationally subsidised projects. Against this backdrop, EU projects gain a specific, strategic significance for companies. EU projects are aimed at the reinforcement and development of existing fields of competence. Just as the results of the survey show, reinforcing available competence can absolutely be scientifically challenging, technologically complex and be little oriented toward the basics. All in all, the EU FPs help companies to become better where they are already good. The other side of this is that EU FPs are not suitable for exploring new topics. For that, national R&D subsidies remain necessary.

9. Interview partners, abbreviations and links

Interview partner	DI Manfred Horvat, Managing Director, BIT
	Mag. Josef Säckl, Data monitoring, Statistics, BIT
	Michael Lang, IRCA in 4th FP
	Mag. Andreas Geisler, BMBWK, Delegate for Energy, Environment and continuing development
	Mag. Josef Mandl, BMWA, Delegate for Innovation and SMEs
	Dr. Andrea Schmölzer, BMBWK, Delegate for improving human potential and socioeconomics
	Dr. Birgit Blasch, BMBWK/BMVIT, Project leader for PROVISO and delegate for competition oriented and continuing growth
	Mag. Michael Wiesmüller, PROVISO
	Mag. Günter Dinhobl, PROVISO
	Michael Hübner, PROVISO
	Dipl.-Ing. Margit Ehardt-Schmiederer, PROVISO
	Mag. Martina Hartl, PROVISO
	Michel Ganoote, ANVAR, Director of International Relations, France
	Alain Brenac, Minister of national education for research and technology

Abbreviations and Links

BMBWK	Federal Ministry for Education, Science and Culture
BMWA	Federal Ministry for Economic Affairs and Labour
BMVIT	Federal Ministry for Transport, Innovation und Technology
BMLFUW	Federal Ministry for Agriculture and Forestry, environment and water management
BMSG	Federal Ministry for Social Security and Generations
COST	European cooperation for scientific and technological research
INCO	Confirming the International Role of Community Research
INTAS	International association for the promotion of co-operation with scientists from the New Independent States of the former Soviet Union
Forfas	The National Policy and Advisory Board for Enterprise, Trade, Science, Technology & Innovation, Ireland
BIT	Bureau of international research and technology cooperation http://www.bit.ac.at
VIKOP	Society of international research, technology and educational cooperation
IRCA	Innovation Relay Centre Austria http://www.bit.ac.at/irca/
APS	European programmes for technologies and trainings; http://www.cis.tugraz.at/aps/
CATT	Central Austrian Technology Transfer and Training; http://www.catt.at/
ATTAC	Society for European technology, research and educational programmes, info centre for Western Austria (Tirol, Vorarlberg) http://info.uibk.ac.at/c115/attac/index.html
DANUBE	Society for European educational, research and technological development in Eastern Austria (Vienna, Upper Austria, Burgenland) http://www.danube.or.at/

ANVAR	French national agency for the innovation; http://www.anvar.fr/
FFF	The Austrian Industrial Research Promotion Fund; www.fff.co.at
Tekes	National technology agency of Finland http://www.tekes.fi/eng/default.asp
Forfas	http://www.forfas.ie/
PROVISO	http://www.bmbwk.gv.at/eu/3proviso.htm
French ministry of research, European site:	http://www.recherche.gouv.fr/technologie/actioninter/default.htm

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