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Knowledge Creation and Knowledge Diffusion Networks

Impacts in Finland of the EU's Fourth Framework
Programme for Research and Development



Finnish Secretariat for EU R&D



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Foreword

This report presents results from a large survey with Finnish participants in the EU's Fourth Framework Programme for RTD. It is one of several studies carried out by the VTT Group for Technology Studies on the theme of European research collaboration. The Fourth Framework Programme is especially interesting from the Finnish point of view, since it is the first framework programme in which Finnish organisations have been able to participate equally with organisations from older Member countries. Finns showed great enthusiasm in their participation.

This report shows that EU framework programmes have become a much used collaboration framework and a funding source; in a way, framework programme participation has become commonplace. However, it is of great importance in providing concrete means for cross-country and cross-institutional collaboration, collaboration forms that have become essential in present-day research and technological development. This survey can cover the impact of participation only to a limited degree because some of the impact is long-term and all impacts cannot be examined through a survey. As a continuation to this survey, VTT Group for Technology Studies is carrying out in-depth studies on the impact of EU research collaboration in different research sectors. These studies will further illuminate its broader significance.

This study was co-funded by the VTT (Technical Research Centre of Finland), Tekes (National Technology Agency) and the Ministry of Education. The study greatly benefited from advice by a steering group consisting of the following members: Eija Ahola (Tekes), Mirja Arajärvi (Ministry of Education), Eeva-Liisa Kortekallio (Ministry of Trade and Industry), Tarmo Lemola (VTT), Ari Mikkilä (Tekes), Esko-Olavi Seppälä (Science and Technology Policy Council of Finland), Marja-Leena Tolonen (Tekes), and Tytti Varmavuo (Nokia Group). The authors are grateful to Pirjo Niskanen and Soile Kuitunen for their insightful comments, to Ari Leppälähti for R&D statistics information, and to Phoebe A. Isard for her comments on the presentation and English language of this report.

Participants in EU framework programmes have been a target group of many studies. We wish, therefore, to express our hearty thanks to the survey respondents and the interviewed co-ordinators for their willingness to contribute to this study.

Terttu Luukkonen and Sasu Hälikkä

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Summary

This study is based on an extensive survey among Finnish participants in the EU's Fourth Framework Programme for RTD. The number of participants surveyed was 955 and the response rate was 70. Additionally, a few complementing interviews were carried out. The study draws attention to a potential change in the impacts as compared to the Second and Third Framework Programmes for RTD.

The study indicated that, among other things,

1. Finnish participants had a more realistic and demanding attitude towards participation in the Fourth Framework Programme as compared with the early days of EU RTD participation. In practice this was evident in, for example, greater expectations by firms concerning market-oriented benefits of participation. They also obtained such benefits to a greater extent than before. However, commercial benefits take time to materialise and the most direct outputs were related to learning, knowledge, resources, and networking effects.
2. Newcomers to framework programme collaboration were as likely to succeed as more experienced participants. Project success and influence on the project were, however, related to being well acquainted with the partners beforehand, that is, to well forged networks. Other factors contributed to project success, for instance, that the project was of strategic importance for the institution.
3. Undertaking co-ordination is worth the effort. The status of a co-ordinator was strongly related to project success and influence on the project. Co-ordination of a cross-country and cross-institutional project demands both personal capabilities and support from the institution of the co-ordinator, and provided these conditions are fulfilled, the likelihood of successful collaboration is very high.
4. An important finding of the study was that Finnish firms collaborated a great deal with universities and research centres in the framework programme projects, more than in their R&D activities in general, as judged by the data of the Community Innovation Survey. It is obvious that the framework programmes attracted university and research centre participants who had earlier collaborated with firms and visa versa, and who were therefore more inclined to do so within the EU framework. The promotion of cross-sector collaboration is, however, an important added value of the framework programme.
5. The study analysed different types of networking relationships engaged in by the companies: horizontal, vertical, mixed and other. Horizontal networking involves competitors; vertical, other companies along the value chain and mixed networks both competitors and subcontractors or client firms. 'Other' was a leftover category that had either only one company participant or companies the relationship of which was none of those above. The analysis showed that the original model for EU collaboration, horizontal networks, was not common among company networks. Vertical and mixed networks were the dominant patterns, particularly in the information and communications technology areas. Mixed networks were more additional than the other collaboration patterns, meaning that, without EU support, more often than the other network types, they would not have been realised at all. Mixed networks are the most complex in their network structure and entail more problems in collaboration than other company networks. They were the most common pattern among large companies. Another important finding was that projects in industries with the lowest R&D intensities had the largest additionality. Thus the EU framework programme effectively promoted R&D activities in companies that perform little R&D themselves.
6. The study confirmed an earlier finding that framework programme collaboration plays a different role for different research sectors. Thus the EU project was of strategic importance for research performing institutions, research centres and universities, and SMEs. For large companies and non-profit organisations, it was most often of potential future importance. Large companies have most resources to carry out their strategically important projects with their own money. However, EU funding enabled them to carry out research that was more long-term and done in more complex networks, or done faster or on larger scale.

7. The study showed an unexpected finding concerning non-profit organisations, that is, various public sector institutions such as municipalities, hospitals, hospital federations, and educational establishments or private organisations, such as industrial associations and foundations. The majority of these represented end-users of research findings and a large majority of their projects were somehow related to telecommunications applications. The participation experiences of this group were the most negative and their ability to utilise EU projects turned out to be the weakest.
8. For all research sectors, EU funding is important in enabling them to carry out cross-country collaborative projects. EU framework programmes have effectively contributed to increased international research collaboration and the international visibility of Finnish research, changes that have taken place particularly in the 90s.

1 Introduction

This is the second impact study of Finnish participation in EU framework programmes. The first study concerned Finnish participation in the Second and Third Framework Programmes (Luukkonen & Niskanen, 1998).¹ At the time, Finland was not a full member state of the EU, and participation took place on a project or programme basis. The Fourth Framework Programme is the first in which Finnish researchers and organisations have been able to participate on an equal footing with organisations from other member states.

Finnish research organisations and companies responded enthusiastically when given the opportunity to participate as equal partners in the Fourth Framework Programme. This enthusiasm was enhanced by active information campaigns launched in the beginning of the fourth framework programme by public officials responsible for information dissemination, by industrial associations and by EU R&D contact persons in large research organisations. Participation has increased al-

most fourfold since the Third Framework Programme (Figure 1). Even taking into account the fact that the total sum allocated by the EU to the Fourth Framework Programme was almost twice that of the Third², the increase in Finnish participation far exceeds the overall growth. The breakdown of Finnish participant organisations in the Fourth Framework Programme resembles that of the EU on average, while earlier, large companies and SMEs in particular had not participated actively (Figure 2). The proportion of research centres is larger in Finland than in the EU on average, reflecting the importance of this research sector in R&D in Finland.

The change in Finland's position in the Fourth Framework Programme is important enough to motivate a new study on participant experiences and potential changes in them. This study has, however, several goals. The study will pursue particularly the following questions:

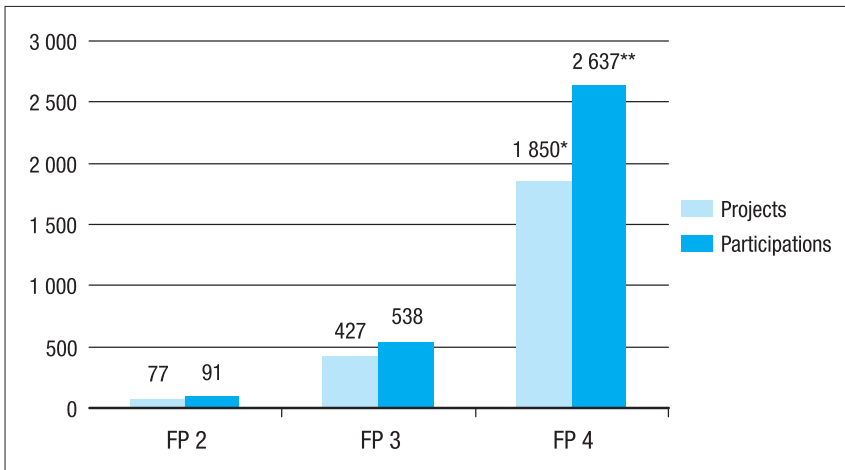


Figure 1. Finnish participation in EU framework programmes.

* Estimate.

** Final figure; source: National Technology Agency (Tekes)

1 EU framework programmes for RTD are the following: the First in 1984-87, the Second in 1987-91, the Third in 1990-94, the Fourth in 1994-98, and the Fifth in 1998-2002.
2 This reflects both growth and an inclusion of specific research programmes, which had not been included before, under the framework umbrella.

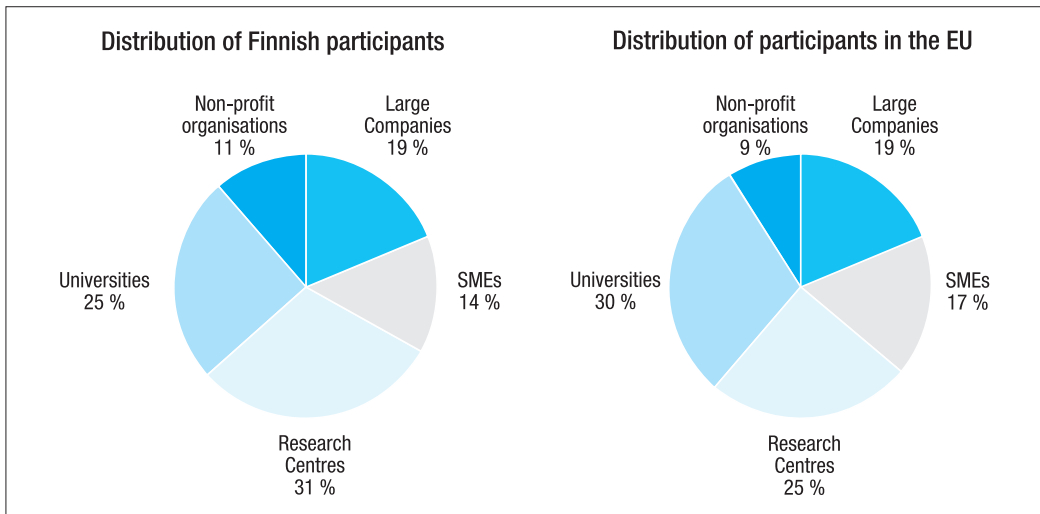


Figure 2. The Fourth Framework Programme: Distribution of participants in shared-cost projects by sector in Finland and the EU average.

1. Since many Finnish organisations have participant experiences from the Third, and even from the Second Framework Programme, it is reasonable to ask whether earlier participation experiences have helped collaboration in and increased satisfaction with EU types of collaboration networks or whether newcomers are equally likely to succeed.
2. Before the Fourth Framework Programme, Finns were subject to restrictions in their participation and co-ordination of projects and were generally only allowed to act as so-called scientific co-ordinators. Finnish policy has been to encourage Finns to undertake the position of a co-ordinator. It is, therefore, interesting to examine whether the position of a co-ordinator really enhances influence on and satisfaction with the project or whether the responsibilities of the co-ordinator are too heavy and hamper effective achievement of her own goals.
3. Our earlier report on EU participation (Luukkonen & Niskanen, 1998) did not examine the type of networks (horizontal vs. vertical) that Finnish companies had in the EU programmes. This question is, however, important for understanding the type of R&D activities funded from public R&D programmes. It is also especially pertinent in the context of the EU framework programmes, since the original

- model was based on networks between competing firms and public sector research institutions. However, the development has diverged further from this model. The prevalence of the different types of network, and problems and successes in them will be examined in this study. Attention will also be paid to collaboration with companies by other research organisations and their participant experiences.
4. The societal relevance of project goals and achievements is a question of special interest. Societal relevance is even further emphasised in the fifth framework programme. Measuring socio-economic goals and achievements is not easy. This study is our first methodological experiment in such measurement.
5. Finally, as in the first study (Luukkonen & Niskanen, 1998), this study will pay attention to factors related to project success.

This report will compare the findings of the present study with those of the Second and Third Framework Programmes. The comparison is aimed at revealing potential learning experiences and changes in expectations and achievements. This report is based on a large volume of survey material and interviews with 14 co-ordinators.

2 Materials and Methods

The study is based on a postal survey sent to all the participants in shared-cost activities in the Fourth Framework Programme, with the exception of SMT, Innovation, CRAFT and Inco programmes (see the Fourth Framework Programme in Appendix 2). There were two major reasons for the limitation of the study material. First, the study would have become too resource demanding, if all the participations by Finnish organisations had been the basis for the survey. Second, the survey aimed at studying projects that were typical research projects between EU country organisations, not for instance, projects that are designed to provide networks for meetings (concerted action type of projects), or other various funding forms.

Each Finnish participant was sent one postal questionnaire per project. The names and addresses of the participants were obtained from the database on the Fourth Framework Programme participation, collected by the VTT Group for Technology Studies in co-operation with the Finnish Secretariat for EU R&D (Luukkonen et al., 1999).³ This information was based on several

sources in addition to the Cordis database, including information obtained from the Commission, Finnish Delegates to the Programme Committees, EU liaison officers and research co-ordinators at universities and research centres. This database is, therefore, quite extensive. It is, however, based on the situation in the summer of 1998, and additional projects started in the autumn of 1998.

In total, the number of questionnaires mailed was 1169. The overall response rate was 70 % when the minimum of one answer per person is taken into account. This response rate was achieved through reminders via letter and telephone. The response rates by organisation type are given in Table 1.

The breakdown of participants by organisation type is the same as that used by the EU (see Appendix 1). The name of the last category, 'non-profit organisations', is, however, different from the EU category 'other'. 'Non-profit organisations' was chosen since the non-profit⁴ nature of these organisations was something they all

Table 1. Response rate by organisation type.

	Number of participants	Respondents	
	N	N	%
Large companies	204	146	72
SMEs	145	98	68
Research centres	255	183	72
Universities	248	167	67
Non-profit organisations	103	70	68
In total	955	664	70

Note. Participants in the above table denote the persons to whom the survey questionnaire was sent.

³ The Finnish Secretariat for EU R&D is situated at Tekes (National Technology Agency), and the database will hereafter be called the VTT-Tekes database on the Fourth Framework Programme.

⁴ The authors are aware that universities and research centres are also non-profit organisations, is, however, used in the same way in, for example, the US Science & Engineering Indicators report (1993).

had in common and 'other' was regarded as too vague for a more detailed discussion. The majority of the organisations belonging to this group are public organisations such as hospitals, hospital federations, municipalities, and educational establishments. There is, however, a sizeable subgroup of private organisations, such as industrial associations and foundations (see Figure 47).

3 Consortia

3.1 Participant organisations

The respondent organisations had the following positions in the EU projects:

Table 2. Position of organisation in EU project by sector (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Co-ordinator	14	15	14	17	12	4
Partner	63	64	57	65	69	48
Associated partner	19	17	22	16	16	35
Subcontractor	2	1	3	1	1	4
Missing	3	3	4	1	3	9
Total	100	100	100	100	100	100
	N=775	N=164	N=111	N=223	N=200	N=77

The abbreviations used throughout the report are the following (see Appendix 1):

BIG = large companies
 SME = small and medium-sized companies
 REC = research centres
 EDU = universities
 NPO = non-profit organisations

Appendix Table 1 gives the breakdown of participants by sector in the whole VTT-Tekes database on the Fourth Framework Programme. It is to be remembered that the data in Table 2 above are based on the survey responses. Since the response rates did not differ much by sector, both breakdowns are quite similar.

Research centres were co-ordinators somewhat more often than other organisations. They were the most frequent participants, too. The Technical Research Centre of Finland (VTT) was the single most active participant organisation within this group (cf. Niskanen et al., 1998).⁵

Non-profit organisations had a participant structure that differed most from the other groups. They had the

smallest percentage of co-ordinators and the largest percentage of associated partners. Thus they were least often in a position of presumable influence in the project. Since this group also differed from the other research sectors in several respects, it will be specially analysed later in this report.

EU framework programmes are especially geared to further inter-European collaboration. Thus the majority of the participants in the consortia came from other EU countries (Table 2.1 in the Appendix). Still, 63 % of Finnish respondents had other Finns in their projects (see Tables 2.2a-b in the Appendix).

⁵ The VTT is a contract research centre with a mission to carry out industrially relevant R&D. It is an established collaborative R&D partner for many Finnish companies, and therefore a frequent partner also in the EU context. In many cases, it helps companies find partners from other EU countries and frequently takes the initiative in EU projects in which Finnish companies participate.

3.2 Cross-sector collaboration patterns

A general feature in participation patterns was that participants from each organisation type collaborated most with partners from similar types of organisations. Thus, 83 % of companies, 88 % of research centres, 90 % of universities, and 49 % of non-profit organisations had similar organisations in their consortia.

An important aspect of EU collaboration is, however, that they often involve networks in which organisations, not only from different countries, but from different research sectors, collaborate with each other. Thus collaboration among firms and universities (EDU) or research centres (REC) was a common pattern. Eighty-two percent of the participations by firms involved collaboration with a research centre or a university (70% with a research centre and 65% with a university), be they Finnish or from other EU countries. Fifty-eight percent of the participations by universities and 68% of those by the research centres involved collaboration with firms (Figure 3). Non-profit organisations collaborated with firms in as many as 84 % of their projects. Non-profit organisations (NPO) do not normally carry out research themselves, but usually represent the end users of research results. A large percentage of companies among their partners mirrors the fact that they were more oriented towards exploitation-oriented research collaboration.

When considered at the project level, 64 % of the projects in which there were Finnish participants involved firm-university or firm-research centre collaboration. John Peterson and Margaret Sharp have suggested that few university-firm linkages have been fostered by EU framework programmes (Peterson & Sharp, 1998, 190). This observation is, however, based on indirect and insufficient evidence and our findings contradict their conclusion. A comparison of the findings of the 2nd Community Innovation survey for Finland (Communication..., 2000) and our data suggests that Finnish companies had more collaboration with universities and research centres in EU projects than in other R&D projects. According to the Innovation Survey, over 50 % of innovative Finnish companies had co-operation agreements with universities, while the corresponding figure for research centres was a little over 40 %. Our figures at the company level indicated that 70% of companies had collaboration with a university and 75 % with a research centre, both much higher percentages than those obtained in the 2nd Innovation Survey (Communication..., 2000). The Community Innovation Survey findings suggest that Finnish firms are more inclined to make collaboration agreements with universities or research centres than are firms in the other EU countries. It is, however, uncertain whether companies in different countries have defined innovative activities in a similar way when responding to the survey. For instance, in Finland the proportion of innovative firms turned out to be much smaller than in most other EU countries and this seems to suggest that in Finland firms

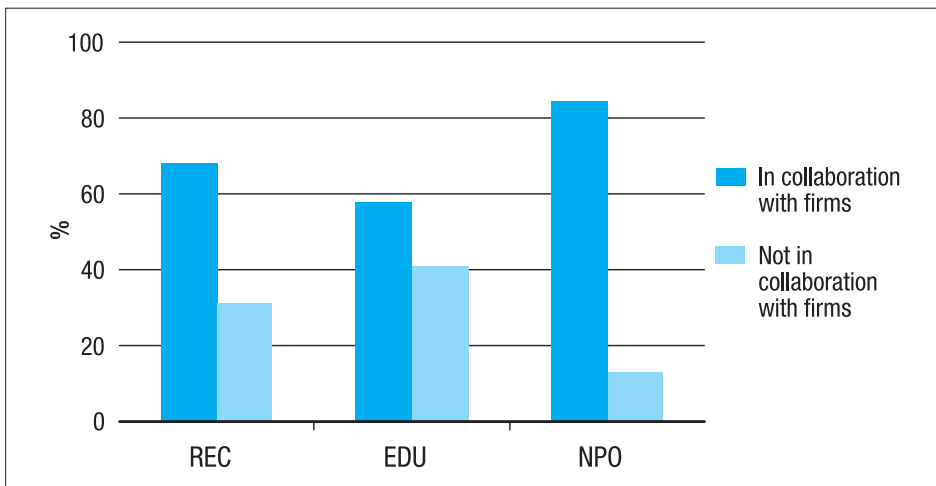


Figure 3. The extent to which organisations other than firms collaborated with firms.

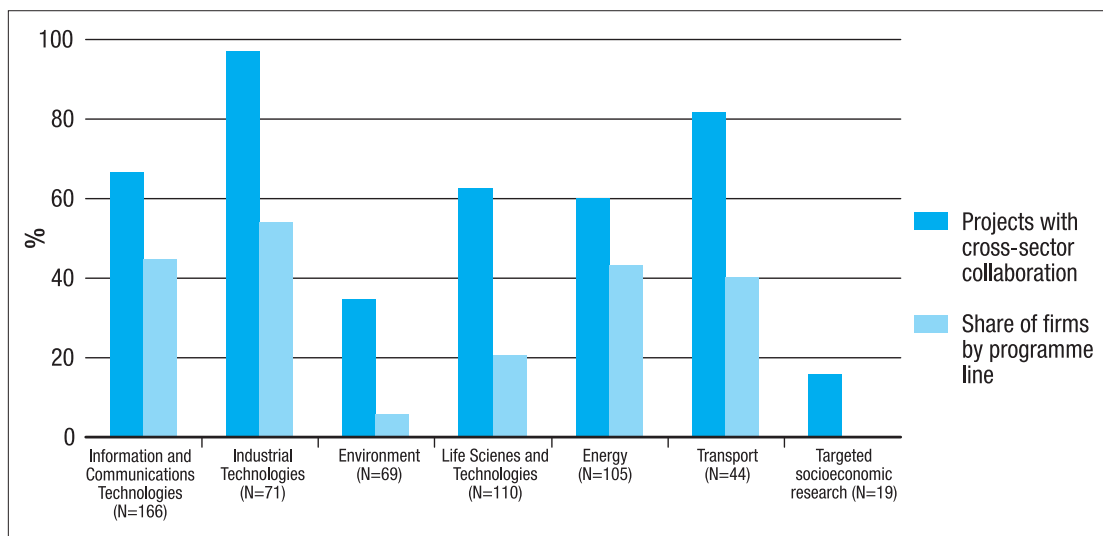


Figure 4. Collaboration between companies and research centres or universities by programme line.

have overlapping definitions for innovations and R&D activities.⁶ There are other potential sources of error, as well. Therefore, we cannot conclude that firms in Finland would be more inclined to make co-operation agreements than firms in other countries. It seems, however, particularly appropriate to compare the Innovation Survey data with our study material, since they both capture R&D activities.

Cross-sector collaboration varied by programme line. In industrial technologies, nearly one hundred percent of the projects had cross-sector collaboration, while in environment programmes the proportion was only 35% (see Figure 4). The prevalence of cross-sector collaboration was, however to some extent, a function of the participation of companies in each programme line, if

we take the share of firms in the survey data as a rough indicator of firm participation in each programme line (Figure 4).

The framework programmes have particularly attracted university or research centre participants who have earlier collaborated with firms and who were also more prone to do so in this context. A large majority of research centres, universities, and non-profit organisations had collaborated with firms before the EU project, with research centres having the largest percentages (Table 3). As is evident in Table 4, there were several reasons why these organisations collaborated with firms in EU projects. For universities the most often mentioned reason for collaboration was that the companies came along with the project, which shows that

Table 3. Collaboration with companies before the EU project (percentage).

	REC	EDU	NPO
In Finland	81	71	65
In other European countries	50	39	27
Outside Europe	18	22	10
	N=223	N=200	N=77

⁶ According to Eurostat (New Cronos database), in companies with over 20 employees, in Finland, 36 % of the manufacturing industry firms reported that they had made innovations while the corresponding figure for the EU on average was 53%; in services the respective figures were 24% and 42%.

Table 4. Reasons for collaboration with firms (percentage).

	Total	REC	EDU	NPO
The companies came along the project - no particular reason	33	14	47	25
Possibility to learn from companies about the progress in the field	32	29	37	29
Possibility to take part in the commercialisation of products	27	30	23	26
Possibility to use sophisticated equipment	9	5	14	8
	N=333	N=152	N=162	N=65

Note. The above percentages have been calculated from the responses of those reporting collaboration with firms in EU projects. There was, however, a sizeable subgroup of respondents who answered this question even though they had not reported collaboration with companies in EU projects. In such cases, the respondents had either filled in questions in a careless way or they reported on their earlier non-EU experiences of company collaboration.

there was no particular motivation within the universities to collaborate with the firms. All three groups of respondents wanted to learn from companies about the progress in the field and to participate in the commercialisation of products, although in most cases the respondent non-firm organisation did not, in fact, benefit from the commercialisation of the results (Appendix Table 2.3). Among the three respondent groups, universities were most satisfied with collaboration with firms in the EU project (Appendix Table 2.4). The proportion of non-responses was fairly high for this question, perhaps reflecting the fact that one third of the respondents said that the firms had come along with the projects, and it is quite likely that collaboration with firms was not particularly intensive in such cases.

Collaboration patterns of firms will be analysed in more detail in a later section.

3.3 Creation of Consortia

The suggestion that cross-country collaboration is based on earlier acquaintance and networks was reinforced by this study (cf. e.g. Larédo, 1995; Reger & Kuhlmann, 1995, 43; Ohler et al., 1997). Two-thirds of the Finnish participants knew some or most of their partners before the project began. University researchers knew their partners most often while respondents from

non-profit organisations knew their partners least often (Figure 5). This result is not surprising, since the latter organisations did not perform research and therefore, were not likely to be well connected with potential research partners in Europe.

That European research collaboration is cumulative was further supported by the finding that nearly 60 percent of those who had previously participated in EU framework programmes reported that most or some of their partners had been in their previous consortium.

It is obvious that earlier collaboration experiences facilitate the formation of consortia. Still, about half of the participants were newcomers. It is to be remembered that Finnish participation grew rapidly in the Fourth Framework Programme and therefore, it is inevitable that the growth brought a lot of new participants. Research centres had the largest percentage (around 70%) of those with previous participation in framework programmes (see Appendix Figure 1).

On average 23 % of all the participants took the initiative to start the project. However, the proportion was as high as 78 % for the co-ordinators, while it was 15 % for the rest of the participants (Figure 6). The proportion of those who took the initiative decreases as the involvement of the participants decreases (partner - associated partner - subcontractor; Table 2.6 in the Appendix). Still, a little fewer than half of those who took the ini-

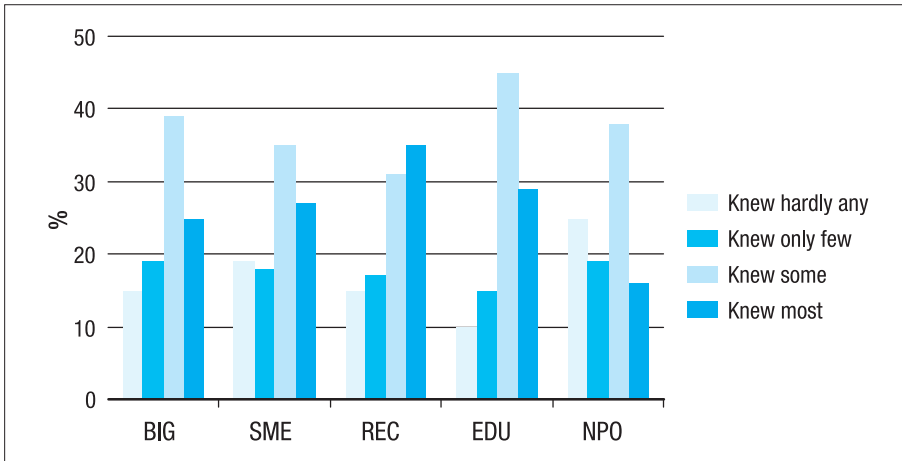


Figure 5. Share of partners the respondent knew before the project.

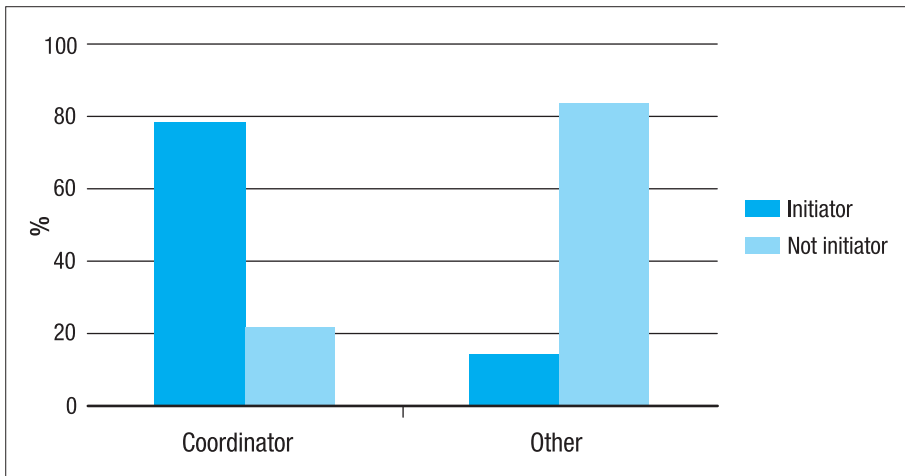


Figure 6. Share of initiators and their role in project.

tiative were co-ordinators, while the other half were partners. This indicates that being a co-ordinator is the most selective step, but also the fact that matters other than taking the initiative, influence the choice of the co-ordinator. As will be seen later on, being a co-ordinator helps a great deal in the achievement of pro-

ject goals and project success, an observation also made in the Swedish study of the Fourth Framework Programme (Svenska deltagare..., 1998). This finding is not self-evident; the co-ordinator is not always the most influential person in the consortium. The influence of the co-ordinator status is further analysed later on.

4 The Goals and Strategic Importance of the Project for the Participant Organisation

4.1 Business-oriented versus other goals

Figure 7 gives the goal setting of participants by organisation type. It comes as no surprise that, for companies, both large companies and SMEs, business-oriented goals were the most important, while researchers in research centres and universities regarded knowledge-related goals as the most important.

It is to be noted that business-oriented goals were somewhat different for the companies on the one hand and for non-company organisations on the other hand. The latter organisations could participate in the commercialisation process or aim at obtaining economic benefits from their contribution (for a detailed list of different business-oriented goals for different types of organisation, see Table 5). However, they do not represent organisations that are in charge of commercialisation or business operations, and therefore, their role in business-related activities is limited.

When compared with the situation as reported by the previous impact study, the overall importance of business-oriented goals has grown (Luukkonen and Niskanen 1998, 23). Nevertheless, we cannot draw far-reaching conclusions on the results of the two studies, because the classifications differed somewhat. Still, it is to be noted that although in the first study even companies rated knowledge-related goals as the most important among the different goal categories, this was no longer the case in the present study.

When business-oriented goals were analysed separately for companies that were newcomers to the framework programmes and those that had previous experience, there were differences between these two groups, though not systematic ones. For example, those with previous experience wanted more often to develop new business activities or to expand their markets, while the newcomers more often wanted to develop their production processes (see Figure 2 b in the Appendix).

The overall shift toward business-oriented goals may reflect the fact that Finnish companies, irrespective of

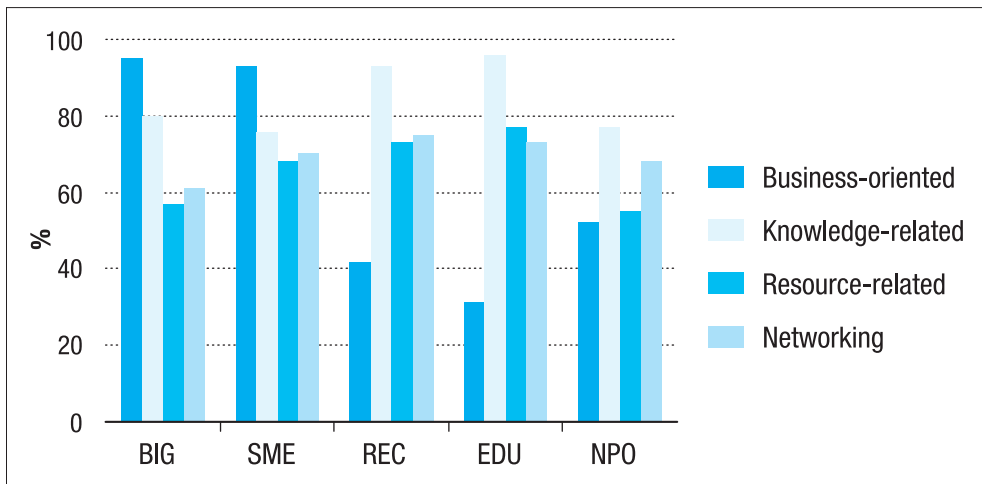


Figure 7. Goals by sector: share of respondents who regarded one or several goals in the categories mentioned as important.

Note. Goals are reported in more detail in Appendix Tables 3.1a-3.1d.

Table 5. The following classification of goals has been used.

COMPANY RESPONDENTS	NON-COMPANY RESPONDENTS
<p>Business-oriented goals</p> <ul style="list-style-type: none"> “Qualitative improvements in products” “Product diversification” “Increase of productivity” “New or substantially improved production processes” “Expansion of markets” “New business activities” “Prototypes” “Software” “Norms and standards” “Patents” “Licenses” 	<p>Business-oriented goals</p> <ul style="list-style-type: none"> “Taking part in the commercialisation of products” “Prototypes” “Software” “Norms and standards” “Patents” “Licenses”
ALL RESPONDENTS	
<p>Knowledge-related goals</p> <ul style="list-style-type: none"> “New scientific knowledge” “Monitoring scientific and technology development in the field” “New or substantially improved research methods or equipment” “Publications” “Training of personnel” “Post-graduate degrees” <p>Resource-related goals</p> <ul style="list-style-type: none"> “Sharing risks and costs” “Research funding” “Joint use of equipment” <p>Networking goals</p> <ul style="list-style-type: none"> “New contacts” “European co-operation” <p>Societal relevance</p> <ul style="list-style-type: none"> “Environmental questions ” “Health care and nutrition” “Transportation” “Telecommunications” “Energy saving and management” “Urbanisation and related problems” “Employment” “Problems related to ageing population” “Security-related questions” “Education” “New promising growth areas” 	

their earlier participation experiences, have learned to expect more from this form of research collaboration. It may also reflect a change in the emphasis of the framework programme.

Among the non-company participants, those that had earlier experiences of framework programme collaboration overall had stronger expectations concerning business-oriented goals than the newcomers had (84% vs. 66%). The explanation may be the fact that the experienced ones were more accustomed to collaborate with companies and were therefore more oriented towards it

and towards the achievement of business-related benefits (Figure 2 c in the Appendix).

Factor analysis of the goals

In order to test the classification of goals, used above, a factor analysis on the different goal items was carried out. Factor analysis is a multivariate method to determine interrelations among a set of variables. In our case, we wanted to test whether the individual goal items which were used to compose the above goal groups⁷, business-oriented, knowledge-related, re-

7 These goal items are listed under relevant goal groups in Table 5 and in the questionnaires in Appendix 5.

Table 6. Results of the factor analyses.

Results based on rotated component matrices			
Firms		Non-firms	
1: Business: Expanding business activities		1: Networking: Collaboration orientation	
Business	New business activities	Other	Added visibility of prestige of own research group or organisation
	.779		.705
Business	Product diversification		
	.760	Other	New contacts
Business	Expansion of markets		.699
	.730	Other	European co-operation
			.651
2: Business: Productivity		Other	Preparing a research proposal
Business	Increase of productivity		.633
	.829	Other	Dissemination of research results
Business	New or substantially improved production processes		.611
	.799		
Business	Qualitative improvements in products		
	.405	2: Knowledge: Scientific outputs	
3: Business: Technology monitoring and transfer		Knowledge	Publications
Business	Monitoring competitors		.806
	.780	Knowledge	Post-graduate degrees
Business	Technology transfer		.776
	.609	Knowledge	New scientific knowledge
4: Business: Property rights protection			.604
Business	Patents	Knowledge	Training of personnel
	.827		.484
Business	Licenses	3: Business: Output orientation	
	.716	Commercial	Software
5: Business: Output orientation			.801
Business	Software	Commercial	Prototypes
	.708		.724
Business	Prototypes	4: Business: Commercialisation	
	.597	Commercial	Patents
Business	Norms and standards		.834
	.541	Commercial	Taking part in the commercialisation of products
6: Knowledge: Scientific knowledge orientation			.611
Knowledge	Monitoring scientific and technology development in the field	5: Resource orientation	
	.704	Other	Joint use of equipment
Other	Added visibility of own research group or organisation		.773
	.556	Other	Sharing risks and costs
Knowledge	New or substantially improved research methods or equipment		.656
	.476	Knowledge	New or substantially improved research methods or equipment
Knowledge	New scientific knowledge		.508
	.458	Commercial	Norms and standards
7: Knowledge: Scientific output			.355
Knowledge	Publications	6: Other	
	.709	Knowledge	Monitoring scientific and technology development in the field
Knowledge	Post-graduate degrees		.452
	.669	Other	Research funding
Knowledge	Training of personnel		.401
	.553		
Other	Dissemination of research results		
	.439		
8: Networking: Collaboration orientation			
Other	European co-operation		
	.747		
Other	New contacts		
	.744		
Other	Preparing a research proposal		
	.545		
9: Resource orientation			
Other	Sharing risks and costs		
	.782		
Other	Research funding		
	.581		
Other	Joint use of equipment		
	.580		
<i>Total variance explained 61 %</i>		<i>Total variance explained 51 %</i>	
		<p><i>Note:</i> The items under the broken line indicate variables that were left out from further analysis because the factor loading was fairly low.</p>	

source-related, and networking, were indeed interrelated and thus reflected a common dimension, or alternatively whether we could generate new goal groups and goal subgroups. The dimensions generated by factor analysis are called ‘factors’ and the correlation of each item with the dimension is called ‘factor loading’.

The analysis was done separately for the companies and the non-company organisations, since, as is evident in Table 5 above, the goal items used in the questionnaires differed somewhat for the two groups. The results of the factor analyses are given in Table 6.

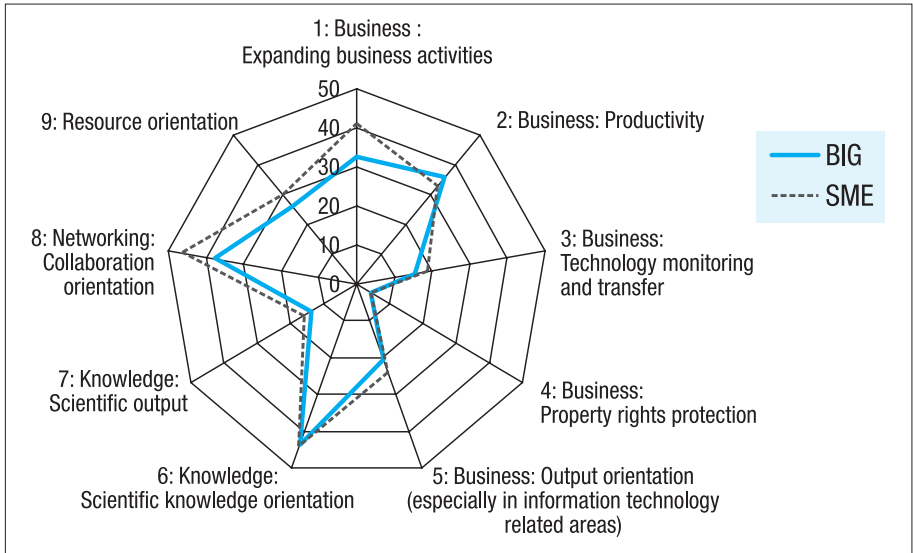


Figure 8. Goal profiles for firms.

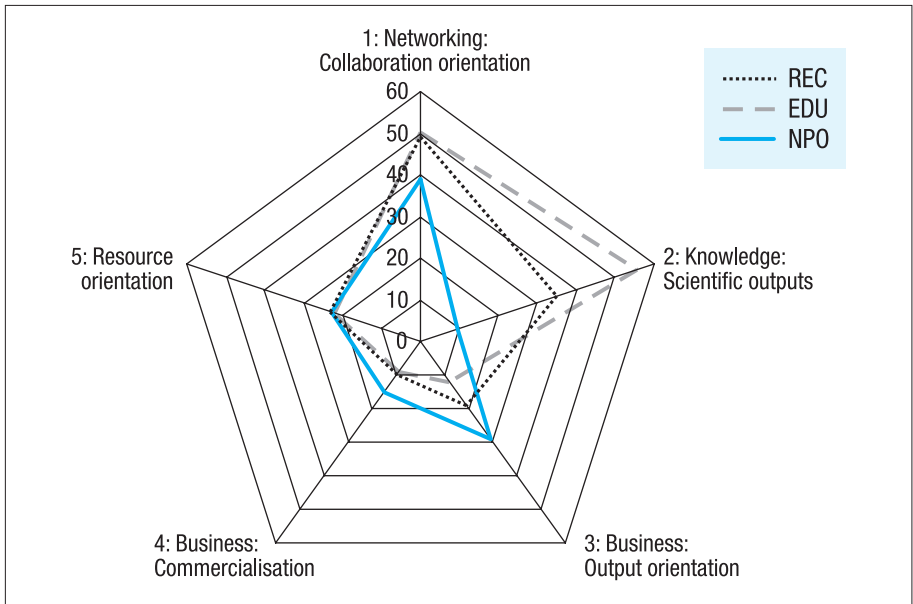


Figure 9. Goal profiles for non-firms.

The first finding is that overall the goal groups we used represented different dimensions of goals quite well. Most factors were composed of the different goal groups used in this study. In some cases, for instance, in business-oriented goals for companies, the factor analysis brought about further subdivisions, in fact five

subgroups: 1) expanding business activities, 2) productivity, 3) technology monitoring and transfer, 4) property rights protection, and 5) output orientation in business-related activities. Organisations other than companies also had two business-related factors, but only one related to scientific goals.

The results of the factor analysis have been used to obtain a more detailed picture of the goal profiles of the organisations. Thus variables that got a strong factor loading in the matrix in Table 6, were used to create new combined indices to better describe the goal profiles of different research sectors (Figures 8 and 9). The ‘spider’s web’ figures 8 and 9 illustrate the percentage frequencies of the new goal categories formed on the basis of the factor analysis.

Figures 8 and 9 are based on the average percentages of the answers that indicated that the goal items included in each factor (Table 6) were important or very important (or only ticked). The results indicated that large companies (BIG) and SMEs had very similar goal profiles. They differed only on three items: when compared with the large companies, the SMEs emphasised expansion of business activities, they were more network and collaboration oriented and had a stronger wish to obtain new resources for R&D. Both groups were collaboration-oriented and wanted to advance new scientific knowledge. As to non-firm organisations, their profiles differed much more from each other. Universities in particular, but also research centres, emphasised the importance of scientific outputs, while for non-profit organisations this was of very little importance, understandably since they are not research-performing institutions. Universities and research centres were also more collaboration-oriented than non-profit organisations while the latter were more output-oriented in terms of business goals. The differences between the non-firms were understandable and to be expected considering their different organisational goals.

4.2 Societal relevance

When studying the societal relevance of research, it was not assumed that participants would have embarked upon their research projects with societal goals as major objectives. It was, however, assumed that the societal or socio-economic relevance of the research projects was an important consideration. The items on the list of societal relevance were chosen on the basis of various EU RTD documents, and thus they are issues that have been recognised as significant problems in the EU RTD context.

For non-profit organisations, societal relevance figured as quite important, not surprisingly, since this group represented in the majority of cases organisations that provide various societal and public services (Figure 10). Their EU projects were related to the improvement or developments of public services. For all organisation types, societal relevance factors were mentioned quite often, in fact more often than expected.

With regard to individual relevance items, in total EU projects were most often related to environmental questions (Table 7). The only exception was the group of non-profit organisations, for which telecommunications questions were more often relevant, that is, in 45 % of the cases. By contrast, telecommunications was relevant in 27 % of the projects of large companies. Aside from energy for companies (both large companies and SMEs), health care, nutrition, plus education for universities, and education and transportation for

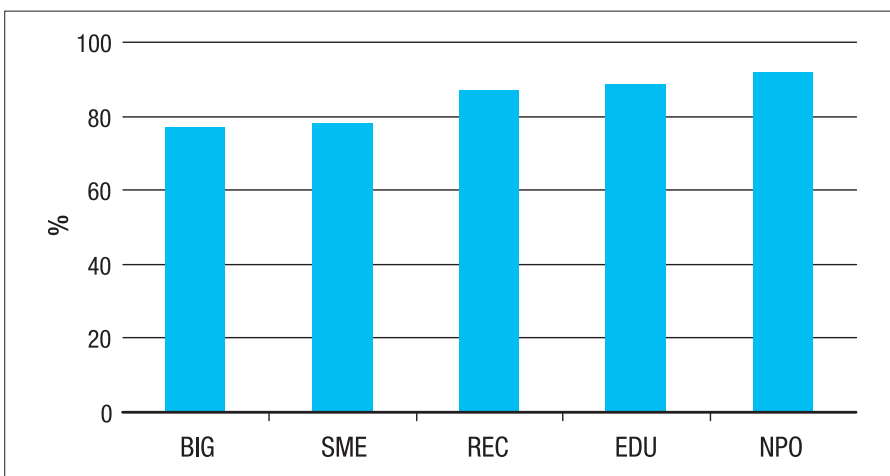


Figure 10. Societal relevance of the project goals by sector: share of respondents who regarded at least one of the societal goal items as important (see Table 7 below).

Table 7. Societal relevance by sector (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Environmental questions	38	38	40	46	36	19
Telecommunications	20	27	24	13	11	45
Energy saving and management	18	26	22	17	13	12
Health care and nutrition	17	5	14	17	27	19
New, promising growth areas	14	17	14	11	15	18
Security-related questions	13	15	12	18	8	13
Education	13	9	10	7	23	22
Transportation	12	12	20	12	6	23
Problems related to ageing population	6	4	5	5	7	17
Urbanisation and related problems	6	4	7	6	3	12
Employment	5	4	7	5	4	8
	N=775	N=164	N=111	N=223	N=200	N=77

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Table 8. Societal relevance by programme line (percentage).

Societal relevance	Programme line						
	Information and communication technologies	Industrial technologies	Environment	Life sciences and technologies	Energy	Transport	Targeted socio-economic research
Environmental questions	11	44	85	28	68	42	
Telecommunications	52	4	7	2	1	21	5
Energy saving and management	4	29	8	6	59	15	
Health care and nutrition	13	5	13	52	8	3	
New, promising growth areas	15	14	9	16	17	8	21
Security-related questions	10	23	8	8	18	24	
Education	19	13	9	11	10	2	42
Transportation	12	4	12	1	5	74	
Problems related to ageing population	11			9		11	16
Urbanisation and related problems	5	3	8	1	6	18	
Employment	5	4		6	8	5	16
	N=242	N=94	N=86	N=140	N=132	N=62	N=19

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

non-profit organisations, all other societal question or service classes were mentioned infrequently.

When the societal relevance was cross-tabulated by programme line, there was a fairly high correspondence between project goals and programme line for some programme lines (Table 8). This is a sort of validity test of the relevance classification. Table 7 indicated fairly low percentages for many of the societal relevance categories in the whole data. However, when these were cross-tabulated with programme line, the percentages became quite high in many cases. Still, the match was far from perfect and shows that the classification into societal relevance produces further information when compared with that by programme line. It is interesting to note that, for example, respondents in energy programmes rated their projects as more relevant for environmental questions than for energy questions (68 % versus 59%). The match between societal relevance and programme line was highest in environment programme line, 85 %. Another group with a high correspondence was transport programme projects.

Not all of those who had telecommunications-related projects mentioned it in their answer to the question of societal relevance. If for example, the project was a telecommunications application in the health area, the respondent might only tick public health issue, not telecommunications, probably reflecting the end application area. This highlights the fact that the information on societal relevance is difficult to capture in a uniform way. To explore the relevance of the projects for the development of telecommunications applications in more detail, the programme or societal relevance class “telecommunications” was used as a criterion to sort out participation by each sector in telecommunications-related projects. The prevalence by sector is given in Table 9.

These percentages are larger than those in Table 7 and particularly so for non-profit organisations, SMEs and large companies which indicates the importance of the telecommunications field in Finland.

4.3 European added value

Why did participants carry out research in the European, rather than in the national context? This question was explored by presenting the respondents with a number of alternative reasons. These ranged from reasons that had nothing to do with the European context as such, for instance, the availability of research funds, to the other extreme, the European dimension of the research problems. The ratings of these reasons are reported in Table 10.

That partners had complementary skills and knowledge was the most important reason for all organisation types, and particularly important for university and research centre participants. They emerged as important in the Austrian impact study, too (Ohler et al., 1997, 62-63). The survey question presumed that complementary partners were to be found in other European countries, though it was not quite specific enough in this respect. For research centres and universities, the European dimension of the research problem also played a role. Yet, a more general and mundane reason, obtaining research funding, was also important for universities and research centres. Companies (particularly SMEs) were interested in new markets to be opened up by European collaboration. However, fairly few considered the promotion of standardisation at the European level as important. As might be expected, this reason was most often mentioned by companies in information technology, and almost as often by forest, service, and electricity and electronic companies (Appendix Table 3.2). The percentages were fairly low though, around 20 %.

The conclusion from the above is that a combination of reasons makes European collaboration attractive. Some of them are fairly mundane, such as obtaining research funds or improving one’s reputation. Other factors are related to complementary skills and knowledge, the nature of the research topic and other benefits to be obtained through the European dimension. The three or-

Table 9. Share of telecommunications-related participations.

	ALL	BIG	SME	REC	EDU	NPO
% of participations	34	41	48	20	22	69
	N=775	N=164	N=111	N=223	N=200	N=77

Table 10. What prompted respondents to take part in European research collaboration (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Partners have complementary skills and knowledge	62	57	58	65	67	52
In order to obtain research funding	56	41	50	63	67	49
New contacts	53	51	50	50	60	51
European collaboration improves the reputation of the research group / organisation	50	38	54	52	61	36
The research problem concerns several EU countries or the whole of EU	42	30	31	52	44	52
European collaboration opens up new research topics	41	27	27	50	55	31
In order to obtain research equipment and material	23	22	22	20	29	22
European collaboration opens up new markets	15	31	57			
In order to promote standardisation at European level	14	12	20	12	13	17
	N=775	N=164	N=111	N=223	N=200	N=77

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

organisational groups described above had in some respects clearly different motivational profiles.

4.4 Additionality

Additionality is an important question for policy-makers when they consider public support for R&D activities in companies. Additionality, or the incentive effect of public support, is one of the basic criteria for national public R&D aid to companies as decreed by the EU (Community framework ..., 1996). It is also used in the evaluation of framework programme support, though it is not formally used as a criterion in the granting of funds. An important underlying issue is a fear that public support would substitute for the R&D investments made by the companies, in which case it would be superfluous.

Even though simple in principle, additionality is not easy to determine. The standard questions to gauge this

matter, also used in this survey, are to some extent self-evident. EU collaboration always entails cross-country collaboration, and in most cases collaboration with the same constellation of partners would not have been possible without the award of EU funding. Each partner brings a different knowledge background to the network, and we can claim that different networks equal different knowledge outputs. Thus a new constellation of partners will always entail a somewhat different project and (nearly) every EU project has some additionality when it is compared to the situation without EU funding.

In our survey data, over fifty percent of the participants from all organisation types except large companies said that they would not have been able to carry out the research at all without EU funding. This sort of reply was classified as high additionality (Figure 11; Appendix Table 3.5). For a large group of participants, EU funding enabled the project to be carried out faster, on a larger scale or with different objectives. Very few (4%) would have been able to carry out the project fully without EU

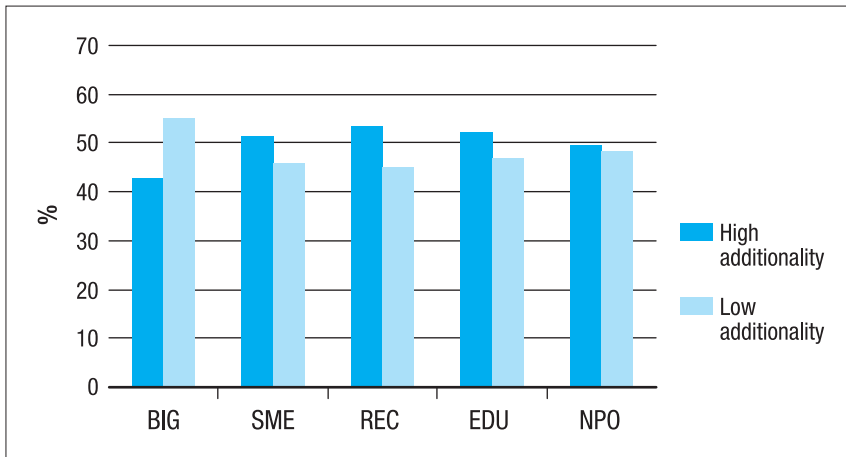


Figure 11. Additionality.

Note. See Appendix Table 3.5 for information about the classification into high vs. low additionality.

funding. The responses indicating that the project was carried out differently or that it would have been carried out even without EU funding were classified as low additionality in Figure 11.

Additionality was about the same as in the Second and Third Framework Programmes, according to which the proportion of those who would not have carried out the project without EU funding was 52 % with the corresponding figure now being 54% (Luukkonen & Niskanen, 1998). These findings are similar to those obtained in the German impact study of the Second Framework Programme (Reger & Kuhlmann, 1995).

Overall, the proportion of high additionality was quite high in both the Finnish and the German cases. We might ask whether the research that would not have been carried out at all was trivial for the participants and was only done to gain funds. This question is further explored in the next section.

4.5 Strategic value

The importance of the project for the technology strategy or research portfolio of the participant organisation or research group was explored with a slightly different question for companies and for other organisations.⁸ The answers have, however, been combined in Figure 12. The proportion of projects of marginal importance was quite small and the majority were of potential future importance or supported other research activities of the participants. The wording used for the companies, of potential future importance, refers especially to longer-term projects, the outcome and the commercial importance of which are not yet known. By contrast, the assessment of the project as being of strategic importance refers to an assessment of the project from the present-day perspective. The EU project was of strategic importance particularly for universities, while for large companies and especially for non-profit organisations, it was least often of strategic importance (Figure 12).

⁸ The wording for companies was as follows:

Please describe the importance of the EU project for the technology strategy of the company

It is of strategic importance

It is of potential future importance

It is of marginal importance

The wording for other organisations and institutions was as follows:

Please describe the importance of the EU project for other research projects of your group.

Does the EU project deal with questions in your core area of research?

It is of central importance

It supports other research activities

It is of marginal importance

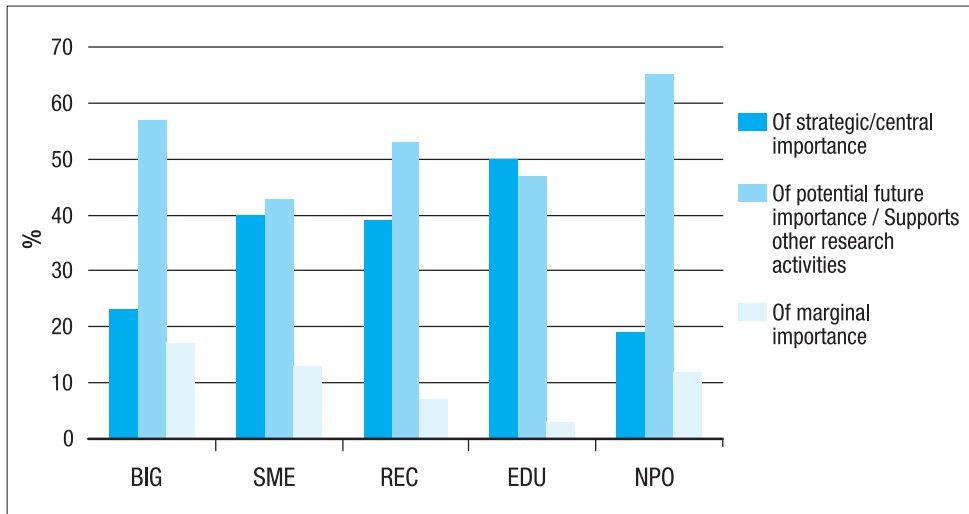


Figure 12. Strategic importance of EU project by sector.

The above results reflect the fact that university researchers pursued their central interests through EU projects. By contrast, large companies have their own resources to embark upon research that is of strategic importance for them and carry out fewer strategic projects through the EU framework. For the large companies, EU programmes provided extra resources to carry out projects that might produce knowledge of potential future importance. Such research is likely to be carried out in larger consortia than normal, and therefore outside funding is welcome as an additional resource. In some cases, public co-funding is important because it strengthens the case for funding in the eyes of the company management⁹.

Non-profit organisations are an interesting group, since for them, the EU project was least often of strategic importance. As said before, these organisations represented various public authorities, municipalities and associations of towns and hospitals or private, non-profit organisations, such as associations and foundations. For them the EU project most often supported other activities and the promotion of societal goals.

An interesting question concerns the relationship between strategic importance and additionality. We might, for example, assume that marginal projects were highly additional and that they would not have been carried out without EU funding. The matter is not, however, that simple (Tables 11 and 12). For firms, the projects that were of potential future or marginal importance were about equally often highly additional, more often than the projects of strategic importance. The relationship was somewhat different for non-firm participants. For this group, there was a clear linear relationship: the more marginal the project, the higher the proportion of highly additional projects, as was expected. Since the marginal group was small for both companies and other organisations, we cannot draw strong conclusions on this matter. Overall, compared with non-firm participants, firms had more projects that they would have done somewhat differently without EU funding. This is indicative that the decision to participate in an EU project and thus to obtain European public funding is taken on different grounds in firms compared to other organisations. Research centres and universities are specialised in doing research, and research projects have self-value for these institutions. They have a broad

⁹ This was found out in interviews with company R&D or technology directors, carried out by the authors in their parallel study of the role of EU collaboration for Finnish companies (unpublished data).

spectrum of potential projects that they are willing to do provided they can secure the funding. By contrast, companies must assess their R&D projects against market prospects. Projects that have market prospects, independent of their current importance, will be done to some extent anyway.

The above tables provide some illumination about the substitution of private funding by public programmes

(see for example Metcalfe, 1995; see section 4.4). The categories in the upper right hand corner in Tables 11-12 would represent true 'substitution' cases, since the research was of strategic importance to the organisations concerned and these would have carried out the research in any case irrespective of EU funding. The proportion of such cases was very small when compared to the total number of participations, 6 % for companies, and 2 % for other organisations.

Table 11. Additionality by strategic value: firms (percentage).

		Additionality			
		High	Low	None	
Strategic value	Of central importance	42	53	5	100 N=83
	Of potential future importance	49	49	2	100 N=141
	Of marginal importance	49	49	2	100 N=43

Table 12. Additionality by strategic value: non-firms (percentage).

		Additionality			
		High	Low	None	
Strategic value	Of central importance	45	49	6	100 N=202
	Supports other activities	58	39	3	100 N=262
	Of marginal importance	67	30	3	100 N=30

5 Outcomes

5.1 Achievements and impacts

As in the previous study on the impacts of EU framework programmes, knowledge-related achievements and impacts were those most often reached in all organisation types (Figure 13). The questionnaire used the terms ‘achievement’ and ‘impact’ interchangeably, since these two are closely related.

The respondents were asked to estimate the achievements and impacts they had already obtained and still expected to achieve (Figures 13 and 14). Compared with the previous study (Luukkonen & Niskanen, 1998), the results, however, differed in that large companies obtained business-oriented results more often (64 % in the present study versus 46% in the previous study). For SMEs, the results were about the same (67%

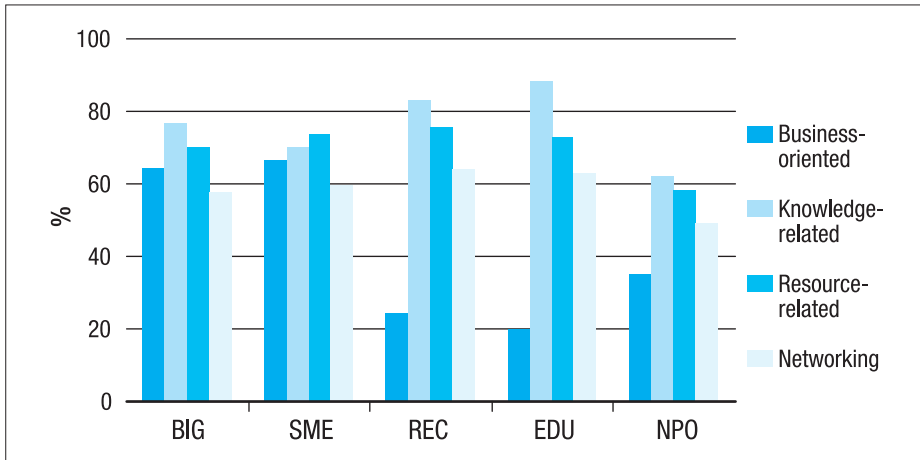


Figure 13. Results achieved by sector.

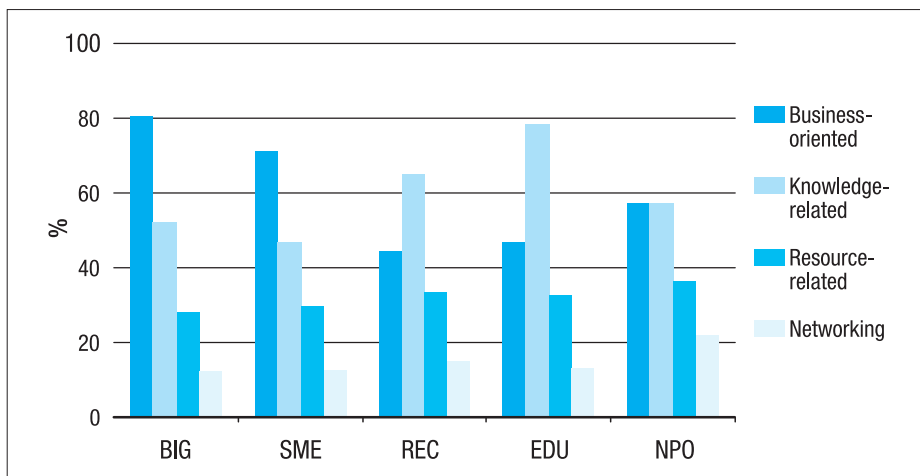


Figure 14. Expected results by sector.

Note. Types of achievements summarised in the above figures are reported in more detail in Appendix Tables 4.1a-4.1d.

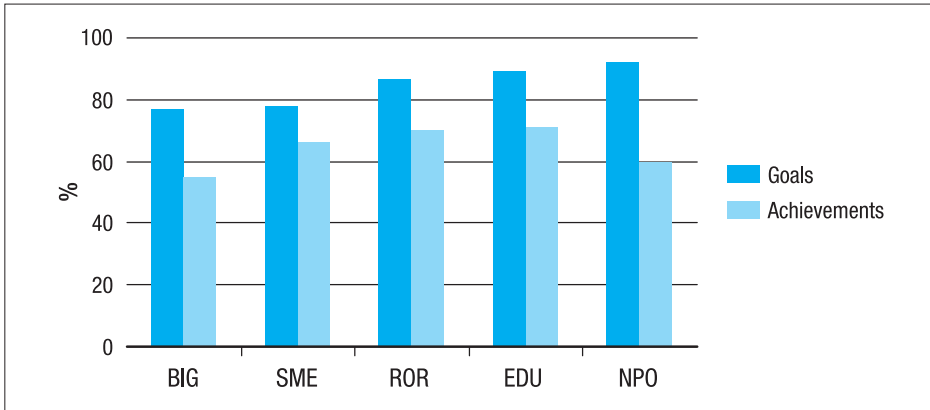


Figure 15. Societal relevance by sector.

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

obtained business-oriented results in the present study versus 71 % in the previous study). The findings also indicate that commercial impacts usually take some time to materialise after the end of the project. Still, as many as 64 % of large companies and 67 % of SMEs reported business-oriented results, already achieved. A majority of all companies expected additional business-oriented results in the future. Respondents in other organisation types also expected to achieve business-oriented outcomes in the future, though less often. Resource-related and networking achievements are fairly immediate since they were often already achieved at the time of the survey, while they were not much expected in the future.

Figures 3 a-d and 4 a-d in the Appendix examine achievements in relation to the goals set for the project. According to these figures, overall there are no great differences in the achievements between those who regarded different goal types as important, and the answers reflected the sector affiliation of the respondent.

The societal relevance of achievements was reported less often than the societal relevance of goals (Figure 15). This is somewhat difficult to interpret. It may be an indication of the fact that the project had not produced all the results expected, or that the results and their impacts were still pending. It may also be an indication of fatigue among the respondents in filling in the questionnaire, and thus of unreliable answers. Unfortunately, this question could not be pursued further by, for example, exploratory interviews.

5.2 Project success

Project success can be estimated in many ways. One way is to look at the rate of achievement of the various objectives set for the project. We chose a more straightforward method and asked the respondents to estimate the success of the project. Our previous impact study of the framework programmes used the same procedure (Luukkonen & Niskanen, 1998). As will be seen later on, project success was related to many other factors, and we have to keep in mind that to some extent, the assessment of success and these other factors are not independent of each other.

A somewhat smaller proportion than in the previous study considered the EU project successful (Figure 16). Still, the majority of respondents regarded the project as successful. However, non-profit organisations reported project success in only 43 % of the cases (Figure 17) while the figure was 57 % for this group in to the previous study (Luukkonen & Niskanen, 1998). Overall, as compared with the previous study, a much larger percentage considered the project partly successful, partly not successful, while earlier the proportion of this category was small. The shift to a more critical stance can be interpreted as an indication of a more realistic and demanding evaluation of project success. It can be understood as taking into account that participation in EU framework programmes was no longer a novelty and a status factor, which it probably was in the beginning.

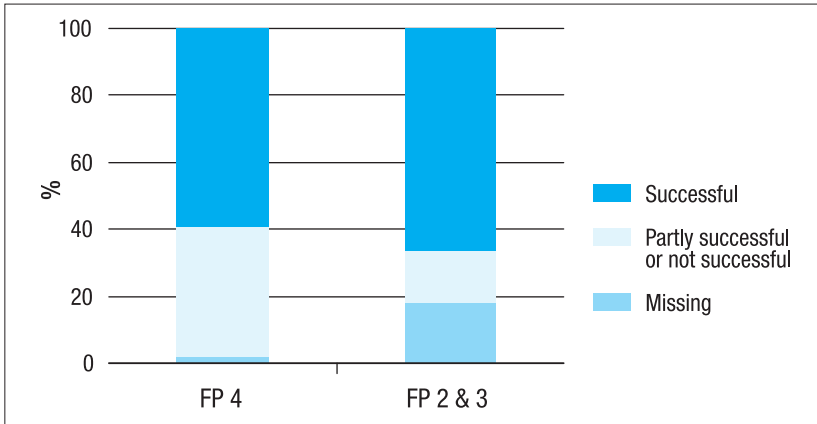


Figure 16. Project success in Framework Programmes.

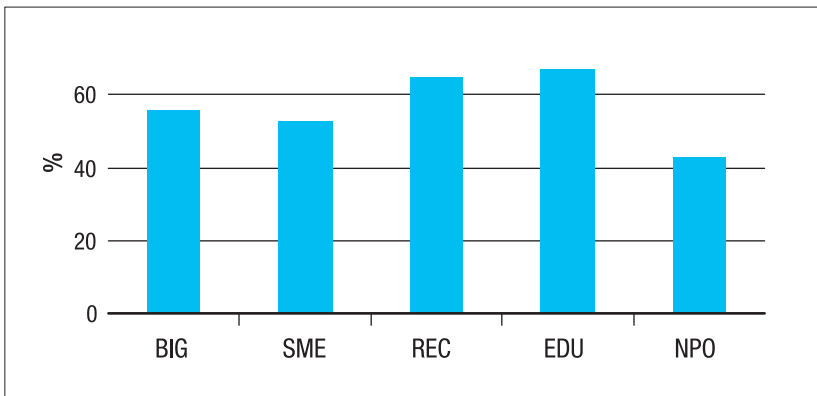


Figure 17. Project success in the Fourth Framework Programme by sector.

Table 13. The respects in which the project was successful (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Learning new technical and scientific knowledge and skills	61	60	58	61	68	52
Learning to work in an international project	60	57	58	58	64	69
Achieving technical and scientific objectives	49	49	42	62	48	26
Succeeding in developing commercial products	12	16	20	10	6	13
	N=775	N=164	N=111	N=223	N=200	N=77

Participants from research centres and universities considered the project successful more often than participants from companies or non-profit organisations. The

latter had more exploitation-oriented goals, and presumably, evaluated the project more critically.

Table 14. The respects in which the project was less successful (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Participants' commitment was weak	18	17	18	22	14	23
There was no concrete co-operation	15	9	12	19	17	21
Objectives were unrealistic	14	14	19	15	10	18
Objectives or end products were not achieved	13	11	12	13	12	18
The quality of research was mediocre	9	9	8	8	10	13
Some of the research problems were trivial	3	3	6	1	3	4
	N=775	N=164	N=111	N=223	N=200	N=77

When asked to elaborate project success, the reasons mentioned differed somewhat by organisation type (Table 13). These responses cannot be directly compared with those obtained in the previous study since the latter were prompted by an open question. In the present study, the respondents were given alternatives based on the answers to the open question in the previous study. According to the previous study, respondents most often named 'achieving the technical and scientific goals', while when prompted by a ready-made list, more often referred to learning effects.

The reasons why the project was less successful were not often mentioned (Table 14). These reasons, however, included reasons such as 'participants' weak commitment', 'lack of concrete co-operation', 'unrealistic objectives', and 'non-attainment of objectives'. The fact that objectives were not achieved or that they were unrealistic, factors related to formal goal-achievement, were mentioned most often when this question was posed in the previous study with an open question. The different order indicates that when prompted by a ready-made alternative, the respondents are more ready to mention other, less formal and perhaps more awkward problems.

5.3 Research quality

The survey questionnaire had a question, which aimed at measuring the scientific quality of the project. There is little project-level information about the scientific

quality of EU framework programmes. The results, however, indicate that it is not easy to obtain reliable information about the matter.

The distribution of the responses clearly indicated that the perception of the scientific quality of the project was related to the organisational goals of the participants (Figure 18). Thus university participants most often considered that the project was on the forefront of research internationally while non-profit organisation participants thought that the project was oriented towards applications and therefore not very ambitious scientifically (Appendix Table 4.2). In joint projects, this difference was highlighted by the difference of the judgements concerning the same project: the university participant might judge the project as one which was on the international forefront, while the non-profit participant might say that the project was application-oriented and not ambitious. Even though they were talking of one and the same project, they perceived it quite differently according to their expectations. Overall, 41 % of the projects were evaluated similarly by the participants. In 17 % of the projects, the participant assessments differed greatly; for the rest, 42% were evaluated fairly closely. It is obvious that there are differences in judgement due to different individual assessment criteria. However, some of the divergences in judgement may have been due to different organisational goals and perspectives.

There was a relationship between perceived quality and success of the project (Table 15). Over 80 % of those who assessed the project as being on the forefront of

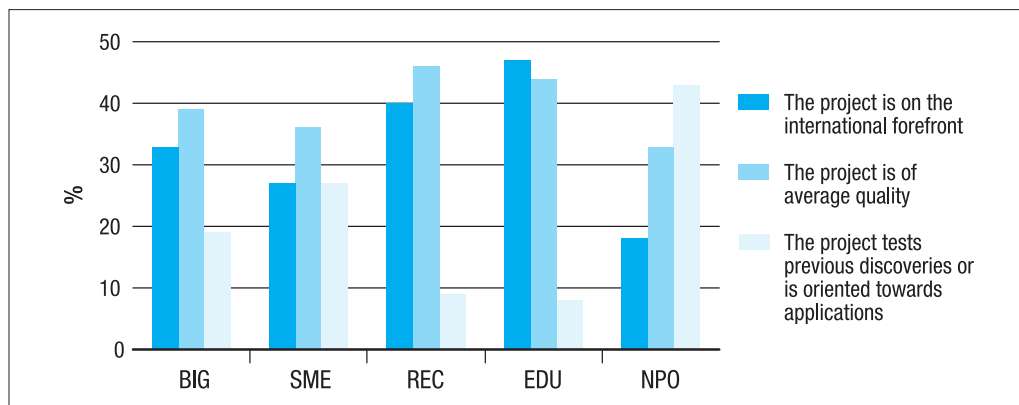


Figure 18. Research quality.

Note. A more detailed account of the response patterns is given in Appendix Table 4.2.

Table 15. Project success and research quality (percentage).

Project success	The project is on the international forefront	The project is of average quality	The project tests previous discoveries or is oriented towards applications
Successful	83	50	41
Partly successful	16	48	53
Not successful	0	2	5
	100	100	100
	N=280	N=313	N=129

science also considered the project successful. By contrast, around 40 % of those who considered the project application oriented and therefore not ambitious scientifically, regarded it as successful. The question concerning scientific quality combined two aspects, the level of scientific ambitions and application orientation. Therefore, the correlation between success and perceived quality of the project was far from perfect.

On the basis of the above analysis, we cannot take the statements of scientific quality at face value. In order to obtain a better assessment of the research quality of EU projects, we would need outside judges to evaluate the projects one by one. For more basic science, we could use bibliometric indicators such as the citation impact of the project papers relative to the field. Citation level is understood to measure the international visibility, and thus indirectly, the scientific quality of a piece of research. However, we lack bibliometric studies that would compare the citation level of a set of publications

produced within EU projects with those in corresponding fields in general. It has been shown in several studies that internationally co-authored papers are more highly-cited than scientific papers in general (e.g. Glänzel et al., 1999), and it is therefore to be expected that papers produced within an EU collaboration are more highly-cited than papers on average. We cannot, however, be sure as long as we do not have concrete proof.

5.4 Factors related to project success

Previous participation experiences, surprisingly, were not related to project success (Figure 19) and they were only very weakly related to influence on the project (Figure 20). An Austrian study of the Fourth Framework Programme had a similar finding indicating that previous framework programme participation did not

Table 16. Matters enhanced by previous framework programme participation (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Planning of the project	52	55	48	53	52	41
Formulation of the application	59	66	50	62	56	45
Choice of partners	39	47	43	37	39	24
Adjustment of own research interests with those of others	42	47	50	38	48	21
Collaboration with partners	48	58	55	43	48	45
Achievement of results	31	33	35	29	33	21
	N=394	N=64	N=40	N=158	N=103	N=29

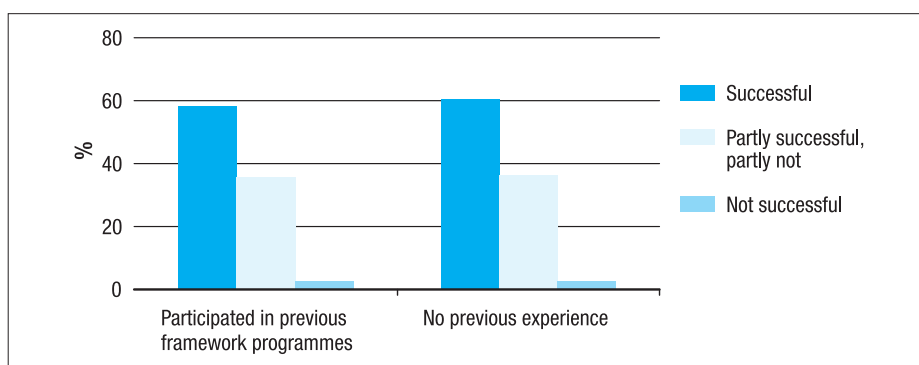


Figure 19. Project success by previous framework programme experience¹⁰.

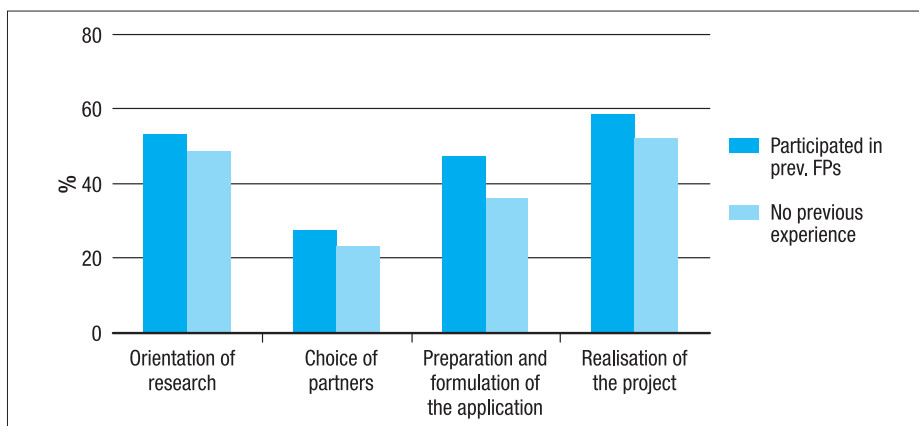


Figure 20. Influence on project of previous framework programme experience¹⁰.

¹⁰ Respondent or someone else in the same unit

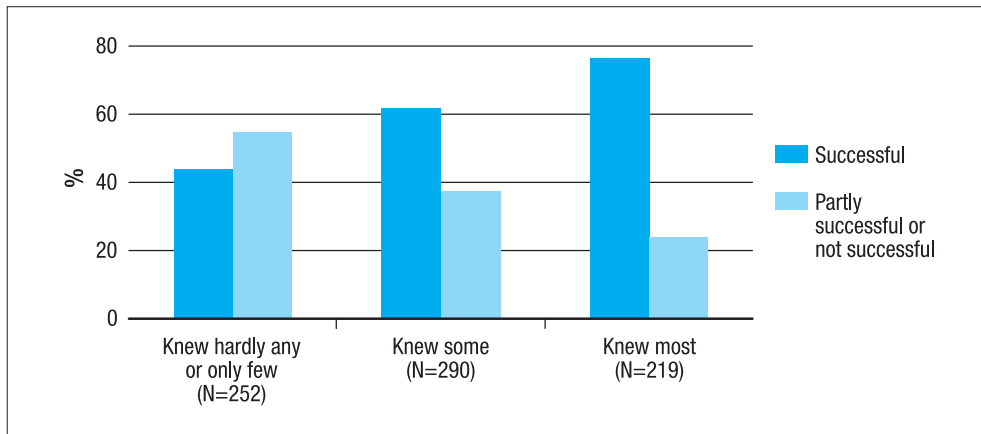


Figure 21. Project success by acquaintance with partners.

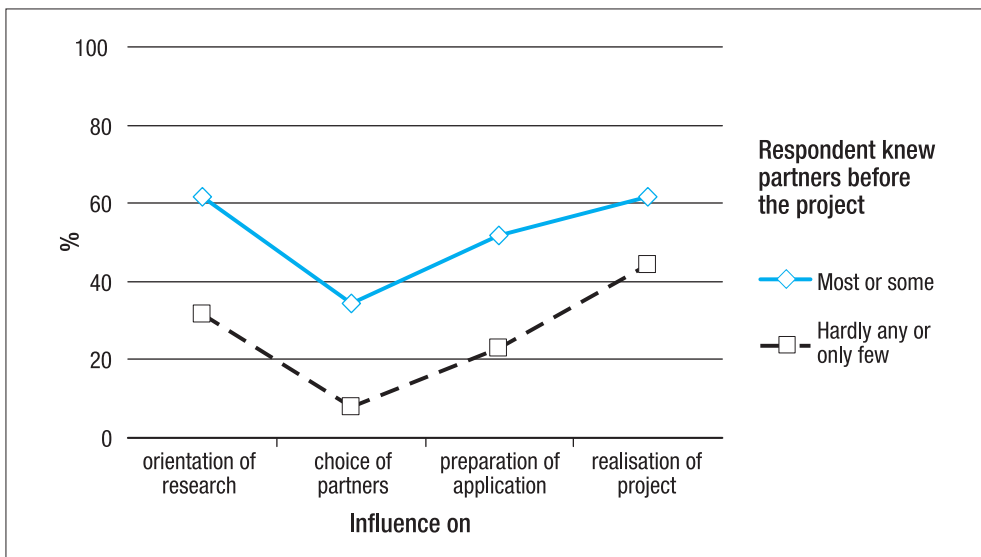


Figure 22. Influence on project by acquaintance with partner.

enhance project success (Ohler et al., 1997, 85). However, our study showed that previous framework programme participation helped especially in the planning of the project, in the formulation of the application, and in collaboration with partners (Table 16).

With regard to project success, knowing most or some of the partners before the project was strongly related both to project success (Figure 21) and to influence on the project (Figure 22), matters not examined by the Austrian study mentioned. Knowing the partners means that one has more realistic expectations as to their project performance and interests. This presumably helps

the achievement of project goals. Finnish participants could exert most influence on the orientation of research and realisation of the project. By contrast, Finnish participants had least influence on the choice of partners.

Research centres and universities were somewhat more successful when their consortia did not have firm participants, probably indicating the difficulties of collaboration in heterogeneous networks (Figure 23). However, for non-profit organisations, the difference in success between company and non-company consortia was almost non-existent and in the reverse direction.

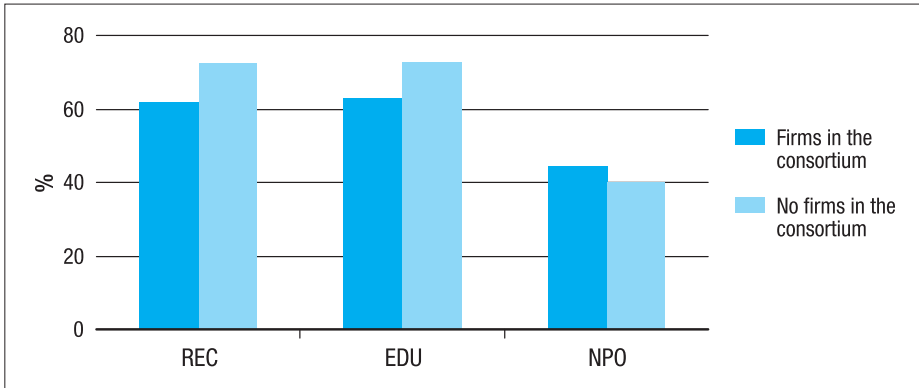


Figure 23. Non-firm respondents: success by collaboration with firms.

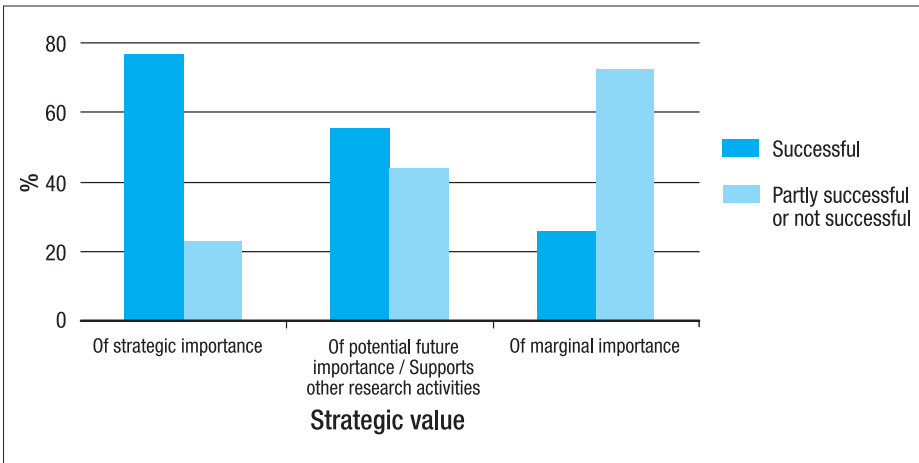


Figure 24. Project success and strategic importance.

They were more exploitation-oriented in their EU collaboration and presumably collaboration with companies was more in line with their goals and goal achievement.

The strategic value of the project was strongly related to project success for all participant groups (Figure 24). Projects that were of strategic importance were most of-

ten successful while the reverse was the case for projects that were of marginal importance. The projects of potential future importance were in the middle. This finding can be deemed to reflect the fact that those who considered that the project was of strategic importance, were more committed and presumably did their best to achieve project goals. In contrast to strategic importance, additionality was not related to project success.

6 Problems in Collaboration

The study also investigated the problems encountered in collaboration, as did the previous study. The most frequently mentioned problems are listed in Figure 25. The table lists items that were regarded as problems at least to some extent. Table 5.1b in the Appendix gives the listing of matters that created a lot of problems. The relative rankings of the problems in the figure and table differed somewhat, but not decisively. The ranking of the problems encountered varied somewhat from that in the previous study (cf. Luukkonen & Niskanen, 1998).

There were no great differences in the occurrence of problems by organisation type (Appendix Tables 5.1a and 5.1b). There was one exception though, that is non-profit organisations, which had systematically more problems than did other organisation groups. This is one among many factors that point to greater difficulties among non-profit organisations in the utilisation of EU collaboration for their organisational purposes.

Overall, previous EU collaboration experience did not shield the participants from problems (see Appendix Table 5.2), as might have been expected.

Project success and consortia types were, however, related to problem profiles. The following figures report frequencies of problems in different sorts of networks and organisation types as well as the connection between problems and project success. The 'spider's web' figures illustrate the percentage frequencies of problems for each problem category.

Those who reported project success had systematically fewer problems (Figure 26). There was about a twenty-percent difference between the two classes in almost all the problem categories. The greatest difference between the less and more successful participants were related to the management skills of the co-ordinator and too ambitious objectives.



Figure 25. Problems in collaboration.

Note. The above figure lists matters that were regarded as problems at least to some degree. See Appendix Table 5.1a.

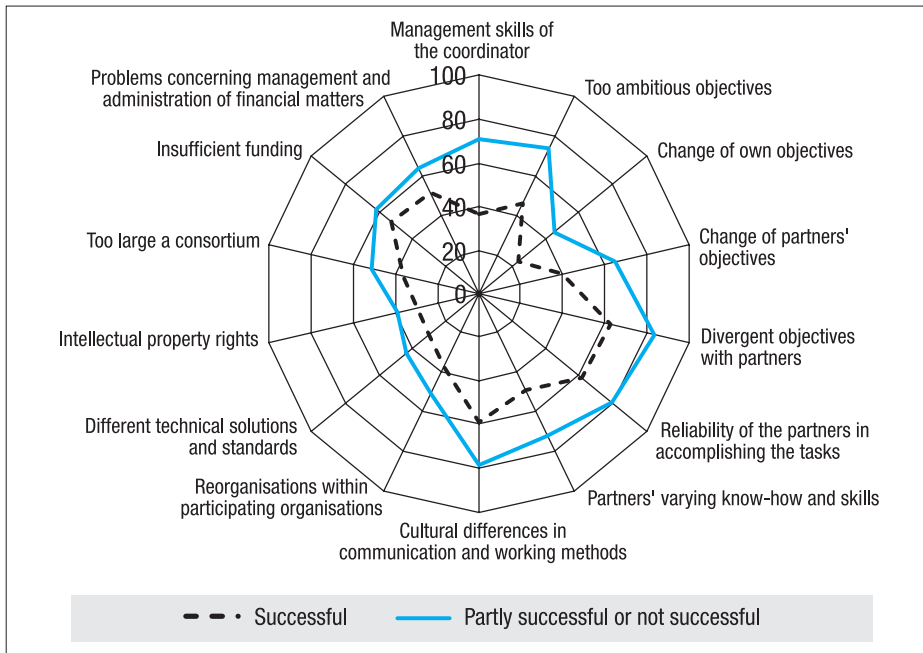


Figure 26. Problems by success.

Participants from universities and research centres encountered more problems when they collaborated with firms compared with a situation in which they did not (Figures 27-29). This was particularly the case for research centres. By contrast, non-profit organisations

had a somewhat different ranking of problems when they collaborated with firms, but overall, the frequency of problems was the same. The shapes of the problem 'webs' in Figures 27-29 were by and large similar, particularly for universities and research centres. They en-

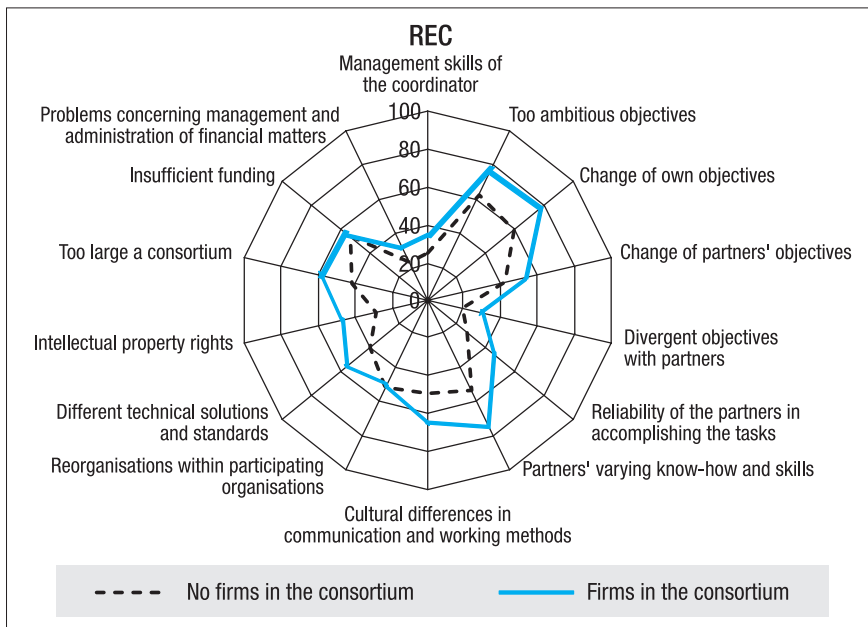


Figure 27. Problems in consortia of research centre respondents.

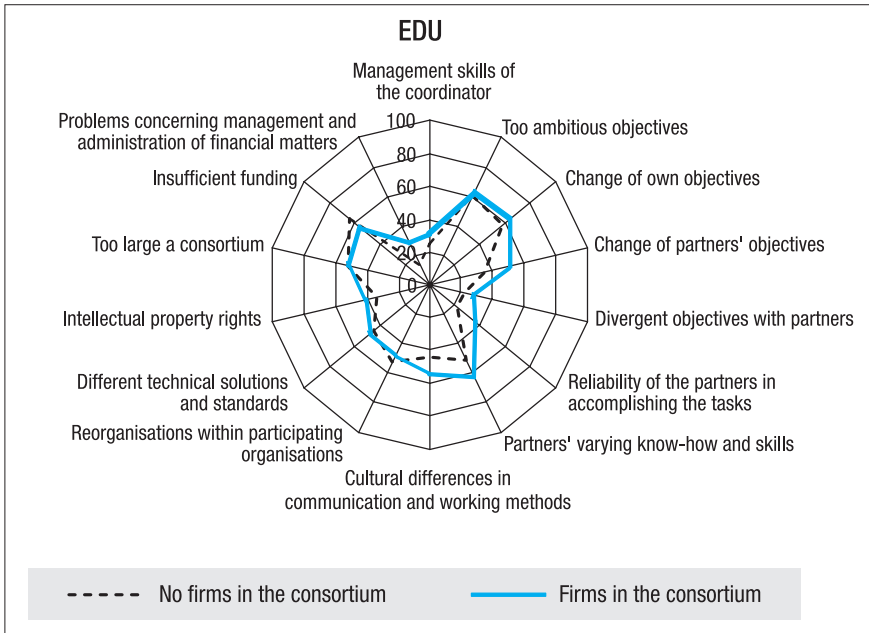


Figure 28. Problems in consortia of university respondents.

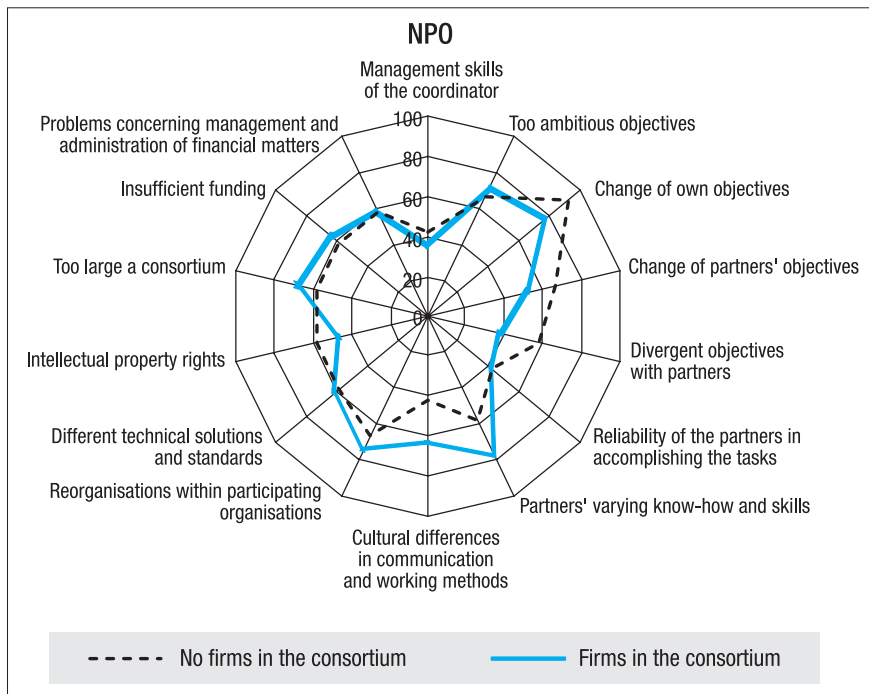


Figure 29. Problems in consortia of NPO respondents.

countered most problems in partners' objectives, cultural differences in communication and working methods, management and administration, and funding.

Difficulties in different types of firm consortia are analysed in the next chapter.

7 Interfirm Collaboration

7.1 Frequency of consortia types by size of firm and industry

This chapter examines patterns of interfirm collaboration in the Fourth Framework Programme and the relationship between types of interfirm consortia and other factors. The chapter will also take into account the industrial sector of the company.

A general pattern, which emerged, was that companies very rarely collaborated with their direct or indirect domestic competitors (Figure 30) even though most companies engaged in inter-company collaboration (83%) in the EU project. They did, however, collaborate with their competitors abroad to some extent. Overall, Finnish companies collaborated with foreign firms more than with domestic firms (64% vs. 40%).¹¹ It is likely that even in the case of foreign competitors, the companies had different market segments or catered to different market niches. The virtual absence of collaboration

with domestic competitors highlights the fact that in truly competitive situations, even pre-competitive collaborative R&D projects are difficult for reasons of confidentiality. By contrast, R&D collaboration with clients, Finnish or foreign, was more frequent. Among the subcontractors, Finnish partners were more common than foreign partners.

The presence or absence of competitors was decisive for the breakdown of company collaboration relationships by vertical vs. horizontal dimensions as used in this chapter. Horizontal collaboration was defined as one with direct or indirect competitors but with neither clients nor subcontractors; vertical collaboration as one in which there are clients and/or subcontractors but no competitors; and mixed collaboration as one that has at least one competitor and a subcontractor or a client. The last category, 'other', includes collaboration with only non-company participants, or if there are other company participants, these are not in any of the above rela-

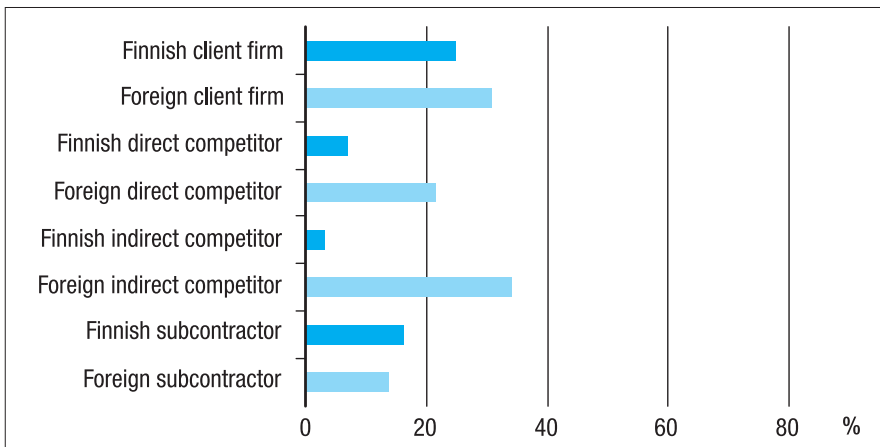


Figure 30. Companies in collaboration with other companies.

11 Foreign partners were more usual in practically all partner categories for the respondents from all organisation types, since overall, the consortia had more foreign than Finnish participants.

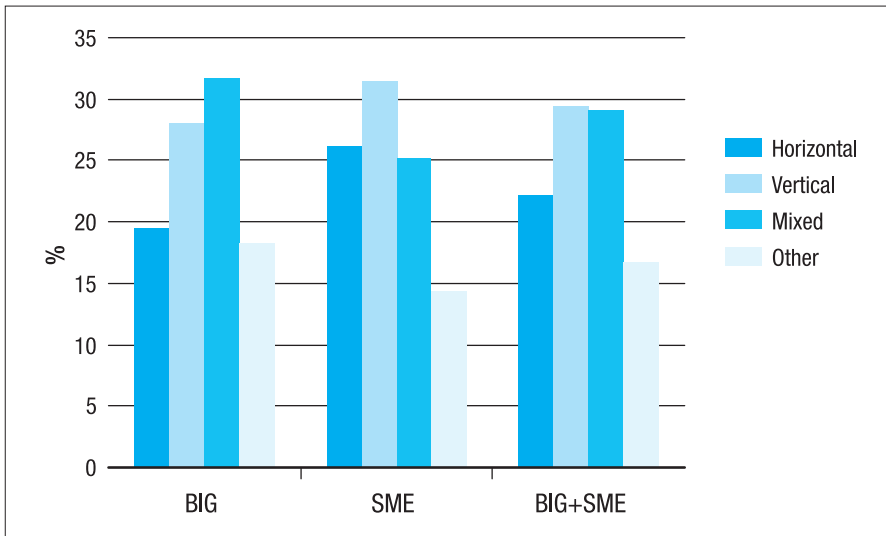


Figure 31. Vertical versus horizontal collaboration relationships.

tionships with the respondent firm. Research centres or universities participated alike in the different types of company consortia (Appendix Table 2.5).¹²

The model for research consortia in the framework programmes, first introduced in ESPRIT, was based on collaboration between firms, research centres and universities and in the beginning, the participating firms were major competitors (see e.g. Peterson, 1991). The research to be undertaken was pre-competitive, generic research that had wide applications across many economic sectors (Peterson and Sharp, 1998, 6). The model was originally taken from Japan (*ibid.*). Over time, there have been changes in emphasis and actual programme practice. However, there is little empirical evidence of the prevalence of different consortia types.

This chapter will show that interfirm collaboration patterns have changed since the beginning of the frame-

work programme. The networks that are most prevalent are formed along the value chain or contain partners that are in different positions in the value chain and the RTD process. The framework programme has great potential in promoting the latter types of complex networks which are particularly frequent in most rapidly developing fields.

Figure 31 gives the frequency of the different types of company networks calculated on the basis of participations. Overall, vertical or mixed networks were more frequent than horizontal ones. There were some differences between the SMEs and large companies. The SMEs had a somewhat larger proportion of both purely vertical and horizontal networks than did large companies, while the latter had more networks of the mixed kind. Mixed networks were most complex in their participant structure, and therefore, it is interesting to note that for the large companies, they represented the most

12 The following analysis into horizontal versus vertical and other networking types will use the classification of participations as defined by the Finnish participating companies. It is to be noted, though, that if given sufficient information, we might classify the projects into different type of networks. We tried such a classification of projects using the information we obtained from the Finnish participating companies. There were several projects in which the participating companies had classified the project differently clearly because of their different points of view. Projects that were classified, for example, as mixed by one company and as vertical by another were subsequently classified as mixed. The end result was that there was a larger percentage of mixed consortia than when the classification was based on participations alone. A 'true' classification of the consortia would have also needed information from the foreign participating companies. This we did not have. The trial classification based on information from the Finnish companies was, nevertheless, indicative of the fact that the proportion of mixed consortia is probably larger than indicated by our analysis. It was also larger particularly in information and communications technologies programme projects thus strengthening our argument that it is the dominant collaboration pattern in the most rapidly developing fields.

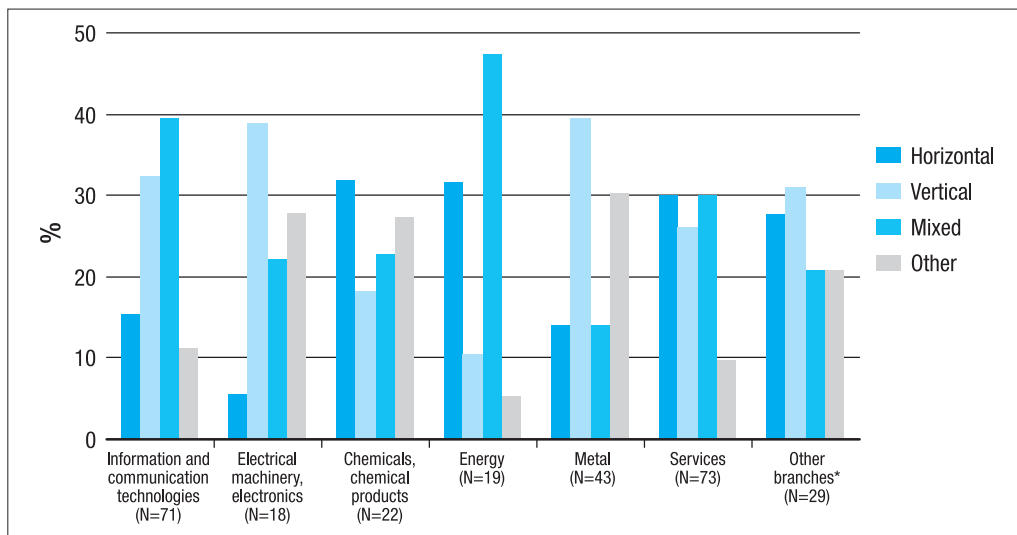


Figure 32. Company network types by industry.

* Forest, food, construction, and textiles, clothing and footwear industries.

common consortia type in the Fourth Framework Programme. The differences were not, however, large.

There were some interesting differences in the frequencies of network types by industry (Figure 32)¹³. The data by industry are given in the approximate order of the R&D intensities of the industries. In the most high-tech industry group, information and communications technologies, and in an industry that is less R&D intensive, energy, mixed networks were the most common network type. For information and communications technology firms, vertical networks were also quite common while the other network types were little used. Vertical networks were quite frequent in almost all industries with energy and chemistry and plastics being the major exceptions. Horizontal networks were most frequent only in chemistry and plastics. In this industry group, networks defined as ‘other’ were also quite frequent. This industry group included pharmaceutical companies which, according to our earlier studies, were very cautious in their EU collaboration because of reasons of confidentiality and fear of knowledge leakages (Luukkonen, 2000). In such cases, EU collaboration takes place in projects that are far removed from the market phase, and this can be done even with competi-

tors. The number of pharmaceutical firm projects, however, was not sufficiently large to influence the whole group. Still, they highlight type of reasons which might have been behind the observed pattern.

Contrary to our assumptions, horizontal networks were not related to standardisation projects (Appendix Table 3.4). A minority of industrial partners wishing to promote standardisation at the European level collaborated in horizontal networks while nearly half (43%) of them were in mixed networks. Mixed and vertical networking was the dominant pattern in particularly the information and communications technology programmes (Figure 33). In other programme lines, the proportion of each network type differed. When only telecommunications related participations were considered, 36 % of them took place in mixed networks and 31% in vertical networks, while only 17% took place in horizontal networks. Of mixed networks, 54 % were devoted to telecommunications related areas. The corresponding figure for vertical networks was 46% and for horizontal ones 35% (Tables 17 and 18). These results indicate that in an area of special interest to Finland’s economy, telecommunications, collaboration in mixed or vertical networks was especially pertinent.

13 In this chapter in the tables which give data by industry, service sector firms doing business in information and communications technology areas have been merged together with this sector making this industry close to a cluster classification. The reason for this was the fact that they had more in common with information and communications technology firms than with other service sector firms in terms of their consortia types. Firms with multiple product areas were merged within the sector to which the division in question was related.

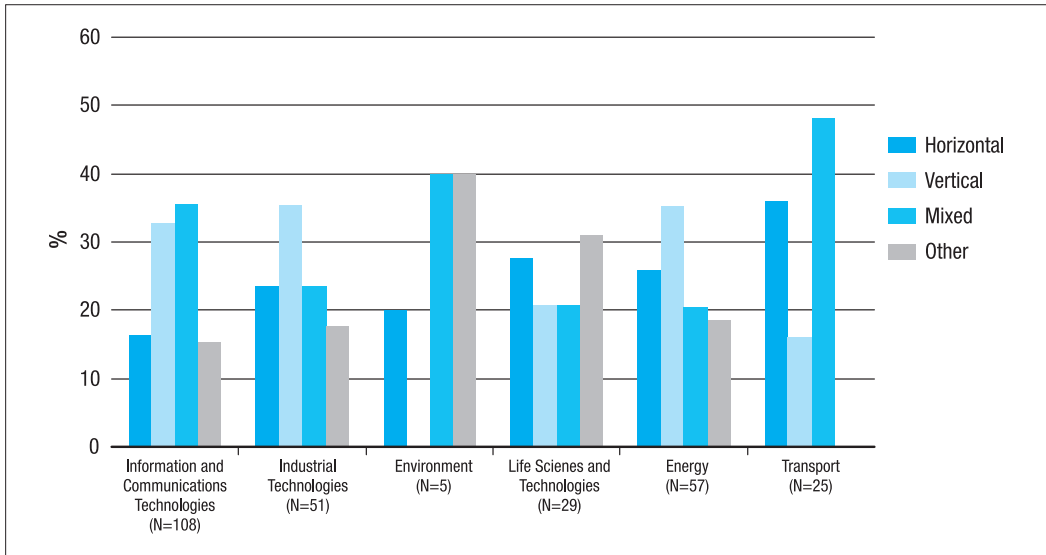


Figure 33. Company network types by programme line.

Table 17. Telecommunications related participations by type of networking (percentage).

	Telecommunications related participations
Horizontal	17
Vertical	31
Mixed	36
Other	13
Missing	3
	100

Table 18. Company participations by project focus (percentage).

	Telecommunications related participations	Other participations
Horizontal	34	66
Vertical	46	54
Mixed	54	46
Other	35	65
Missing	57	43
	100	100

It seems that the horizontal model is only rarely the most relevant model of collaboration for industry in the EU projects. Potential problems related to working with competitors, such as fear of knowledge leakages and the division of intellectual property rights, are important, but not the only reasons for the lower frequency of the horizontal consortia. As referred to above, it is possible to collaborate with competitors in projects that are far removed from the market phase. The low frequency of the horizontal networks highlights that an increasing proportion of RTD activities is becoming more complex and requires knowledge and skills, obtainable only in collaboration with partners that are in different posi-

tions in the value chain and the RTD process. This applies especially to rapidly developing fields, such as the R&D intensive field of telecommunications.

7.2 Additionality

Figure 34 shows that additionality was highest in mixed networks and lowest in vertical consortia and the networks that either had no other firms or only firms that were neither competitors nor in any specific relation to each other. These firms would, in a majority of the

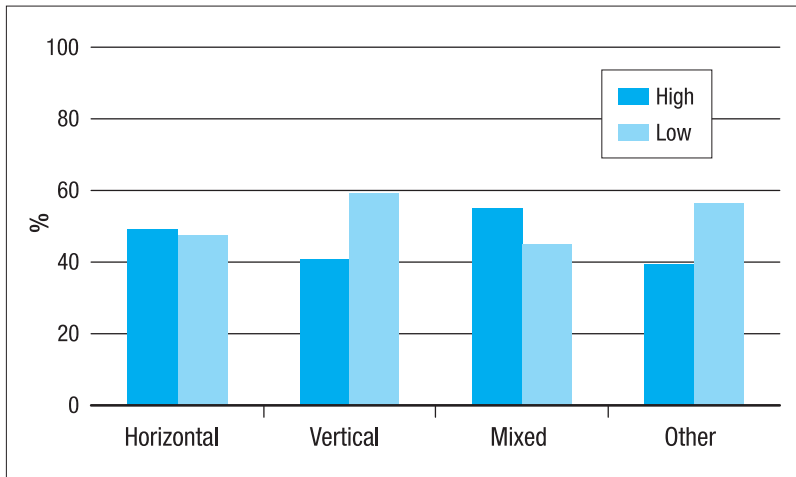


Figure 34. Additionality by company network type.

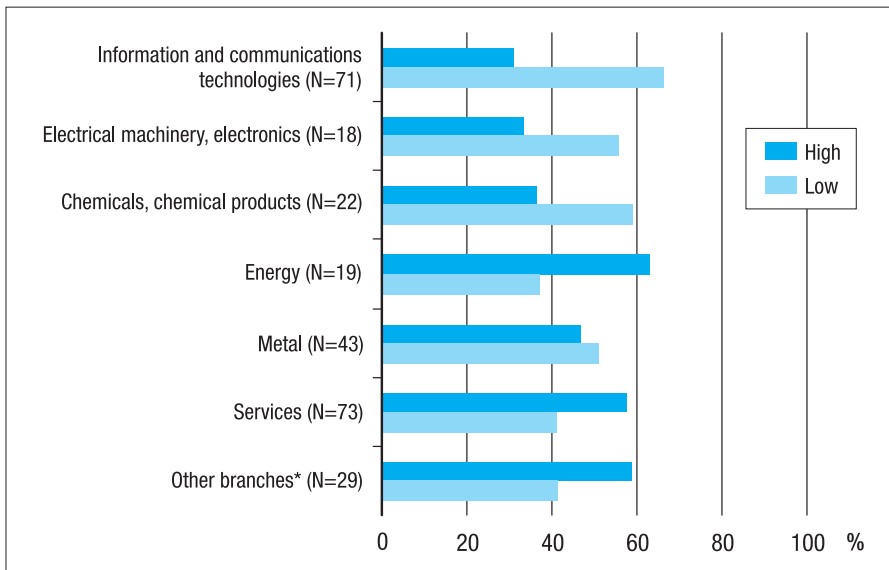


Figure 35. Additionality by industry.

* Forest, food, construction, and textiles, clothing and footwear industries.

cases, have done the research anyway in some form irrespective of the EU funding. By contrast, projects that demanded complex network structures, i.e. mixed consortia, were probably too complicated to organise without the EU collaboration framework and funding. It is to be noted that in EU framework programmes it is not only, or often not so much, a question of funding as such, but of a ready-made legal collaboration frame, the existence of which facilitates the creation of cross-country and cross-institutional projects (see Luukkonen & Niskanen, 1998). The benefit of a legal collaboration

framework may be the greater, the more complicated the network structure.

When considering additionality by industry, by and large, the lower the R&D intensity of the industry the higher was the additionality (Figure 35). For information and communications technologies, the majority of projects had low additionality while for industries with lower R&D intensities, the majority of projects had high additionality. This finding shows that the incentive effect of EU framework programmes was highest with

companies that did not carry out much R&D by themselves. In high-tech industries, the majority of the projects would have been carried out somehow, though differently without EU support, either on a smaller scale, with slower time-schedules or with lower budgets. Very few projects were rated as having no additionality at all, and therefore, we should be cautious not to over-interpret the above findings.

7.3 Strategic importance of project and interfirm collaboration

Mixed and vertical consortia had the largest percentages of projects that were of strategic importance (Figure 36). By contrast, consortia entitled ‘other’ were least often of strategic importance. Projects with such a consortia structure were presumably longer-term projects with less immediate commercial value, and consequently, had the largest percentage of projects of potential future importance. Horizontal consortia, which had direct or indirect competitors as partners, had the largest number of projects of marginal importance and the smallest number of cases of potential future importance. This may be an indication that collaboration with competitors took place in less strategic projects and that these entailed alliances formed for shorter-term reasons.

When the strategic value was examined by industry (Figure 37), the strategically important projects were the largest category only in the service sector. SMEs represent a large proportion (71%) of the companies in this sector, and as was evident in Figure 12, framework programme projects were more often of strategic importance for the SMEs than for the large companies. This is understandable taking into account that SMEs have many fewer resources for R&D in general and the R&D that they carry out is more directly related to their short-term commercial and strategic interests.

As to industries other than the service sector, possible future importance was the largest category for all. In contrast to additionality, there were no clear tendencies as to the relationship between the R&D intensity and strategic value of EU projects of the industry. Overall, the fact that EU projects were of potential future importance indicated that, for a large number of them, the research funded was still somewhat removed from the market phase and that the commercial value of the projects was in the future applications rather than in immediate economic gain. This was also evident in the nature of the impacts, already dealt with.

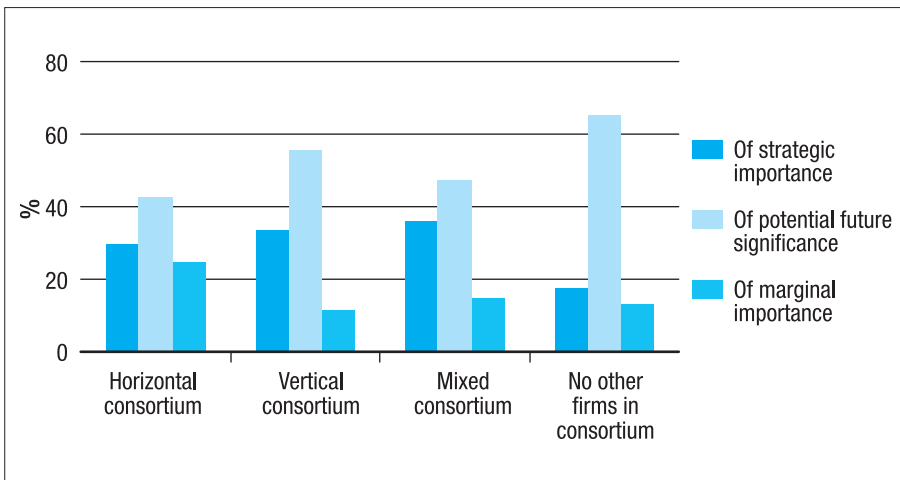


Figure 36. Strategic importance of project by type of company networks.

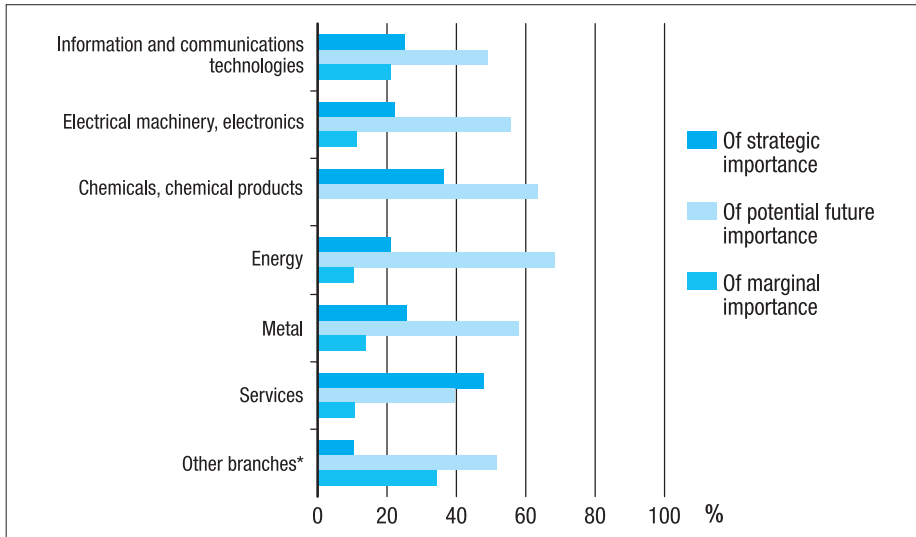


Figure 37. Strategic value by industry.

* Forest, food, construction, and textiles, clothing and footwear industries.

7.4 Interfirm collaboration, project success and problems in collaboration

Project success was only very weakly related to type of firm networks (Figure 38). Networks entitled 'other' were somewhat more successful than the rest of the networks. Since the last category entailed a lot of networks with only one participant company, the finding could be interpreted as indicating that inter-firm collaboration entails problems. This interpretation was confirmed by

the results concerning the occurrence of problems by type of interfirm consortia (Figure 39).

Figure 39 reports the prevalence of problems, at least to some extent, by type of networking. Networks entitled 'other' had, by and large, least problems, while mixed networks had the largest percentages of problems in most problem categories. In mixed networks, the problems were particularly related to divergent objectives with partners. This can be understood as a result of the heterogeneous nature of the network and consequently the different motivations and aims of the participants.

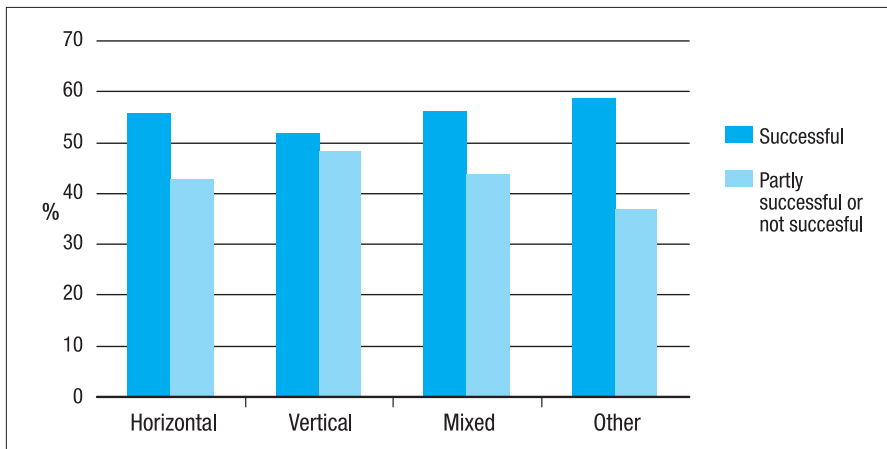


Figure 38. Type of networking and success.

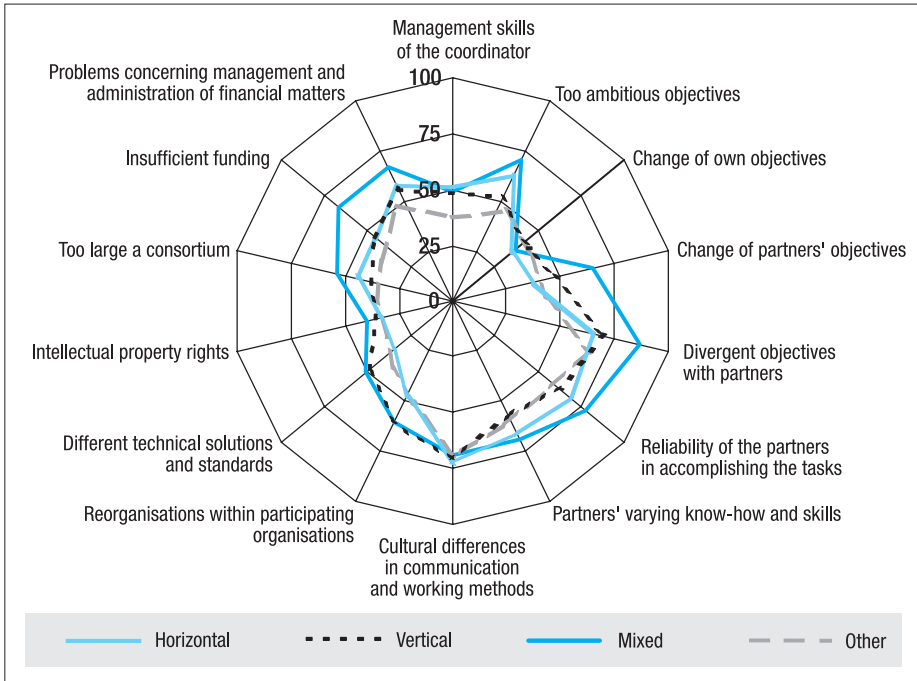


Figure 39. Problems by company networks.

Note. Percentage shares have been calculated taking into account the respondents that had given values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Together with horizontal networks, mixed networks had the largest number of participants (on average 9 for mixed and horizontal, 8 for vertical and 6 for other networks).

In all networks in which firms participated, intellectual property rights and change of own objectives were mentioned least often while problems related to the partners' behaviour prompted a lot of responses. That intellectual property rights were not often mentioned has to be understood against the background that companies have to solve these problems beforehand. According to the findings of interviews with technology directors of large Finnish companies carried out in 1996 at the outset of the Fourth Framework Programme, intellectual property rights emerged as an important question for judging the suitability of EU research projects (Luukkonen & Niskanen, 1998). Our ongoing interview study has shown that Finnish companies have learned to solve these problems both through contracts and a pre-selection of potential collaborative projects. Sensitive areas are left outside EU types of fairly open collaborative networks.

By and large, companies had somewhat different problem profiles when compared with non-company partici-

pants (Figures 27-29). Companies had more problems in questions related to the partners' behaviour, such as the reliability of the partners in doing their tasks or divergent objectives with partners, while non-firm organisations had more problems caused by the change of their own objectives, partners' varying know-how and skills, and insufficient funding.

This chapter has showed that EU framework programmes have evolved away from horizontal networks and towards vertical, and especially mixed networks. These were the dominant pattern especially in information and communications technology programmes and industry. Mixed networks were more additional than other network types indicating that they are less likely to emerge without the EU framework and support. However, mixed networks had more problems, particularly those connected with the partners' behaviour and objectives. There were not clear differences between industries in the strategic value of their projects. There was, however, an interesting finding that the projects of industries with low R&D intensities had higher additionality. Thus the EU programmes promoted R&D particularly in industries that had less practice in doing it on their own.

8 The Status of the Co-ordinator

Besides the survey findings, this section draws on qualitative material on co-ordination and project management, collected through 14 telephone interviews with co-ordinators. All the tables and figures below will be based on the survey data and the interviews only illustrate by giving examples of the questions studied.

As referred to above, the Fourth Framework Programme was the first in which Finnish participants did not have restrictions concerning their participation and could for the first time act as co-ordinators, not just as scientific co-ordinators. Finnish organisations seized the opportunity: almost every fifth shared-cost project with Finnish partners was co-ordinated by a Finn. In total, Finnish organisations acted as a co-ordinator in 13 % of their participations (see Appendix Table 1). This is a good achievement considering that Finns were newcomers as equal participants in EU framework programmes. By comparison, on average 14% of participations in the whole of the Fourth Framework Programme were as co-ordinators (Second European Report on S&T Indicators 1997, 516).

Research centres were the most and non-profit organisations least active in taking the leading role in an EU project (Figure 40). The successful accomplishment of the task of a co-ordinator requires that the organisation

have good project administration skills and facilities. It is therefore not surprising that research centres were the most active in this respect.

It is often assumed and it was proposed in the interviews that the task of a co-ordinator is too resource demanding for an SME. However, one of the interviews concerned a very small service-sector firm that had several ongoing EU projects and that co-ordinated one of the projects. The interview showed that this SME had facilities to carry out the task successfully and that the interviewee considered their EU collaboration successful.

Administrative skills and facilities are, however, not sufficient for the accomplishment of the task. In the interviews, it was repeatedly mentioned that personal capabilities, character and experience are crucial qualities of a co-ordinator, more important than the organisation she comes from. A capable co-ordinator needs a good acquaintance with the field. Still, it was suggested that a professional co-ordinator, such as a consultant company, might also do the job. This was, however, the opinion of a small minority.

Co-ordinators were often the initiators of the project: according to the survey, the percentage of initiators among the co-ordinators was 78%, while, by contrast, it

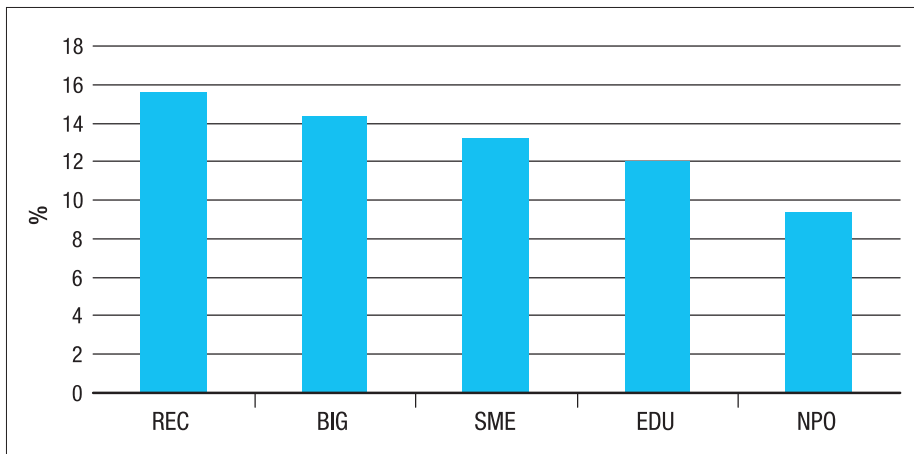


Figure 40. Proportion of co-ordinators by sector.

Source: VTT-Tekes database on Finnish participants in the Fourth Framework Programme

was only 15% among other participant groups. It is understandable that the initiator often takes the responsibility for the project and sometimes she even has no choice if she wants that project to be carried out. A consortium may find itself in a situation in which, to find a co-ordinator, it has to search outside the original network. It is, however, more common that one of the partners in an existing network takes the responsibility. Since the task of the co-ordinator is laborious and time-consuming, it is not the most desirable role in the consortium. Therefore, co-ordinators are likely to be people who consider that the research theme is of strategic importance for their own or their organisation's research and/or technological activities. According to the survey, the proportion of co-ordinators who thought

that the project was of strategic importance was 58%, while the corresponding figure for other participants was 34%. For 37% of the co-ordinators, the project was of future importance, while the corresponding proportion was 54% for other participants. It is also not surprising that half the co-ordinators knew most of the participants in their consortia before the project. The corresponding proportion among other participants was one fourth.

The co-ordinators found the research project successful more often than other participants (Figure 41). An explanation for this is probably the fact that the co-ordinator has a leading role in collaboration and that she has consequently greater possibilities to influence the pro-

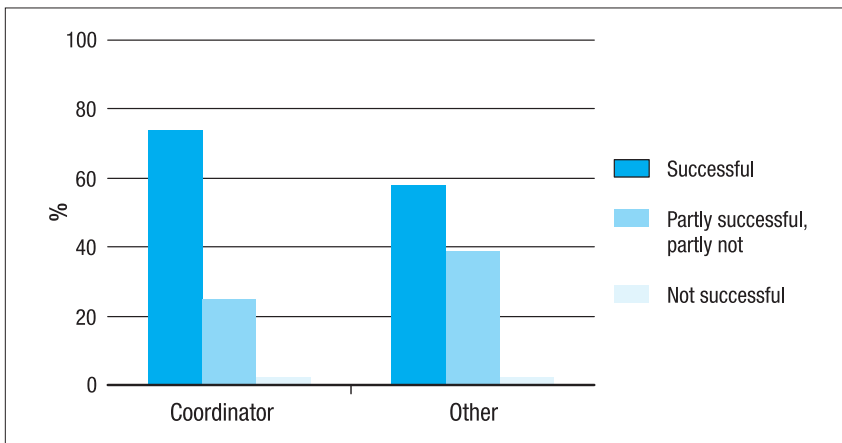


Figure 41. Co-ordination and project success.

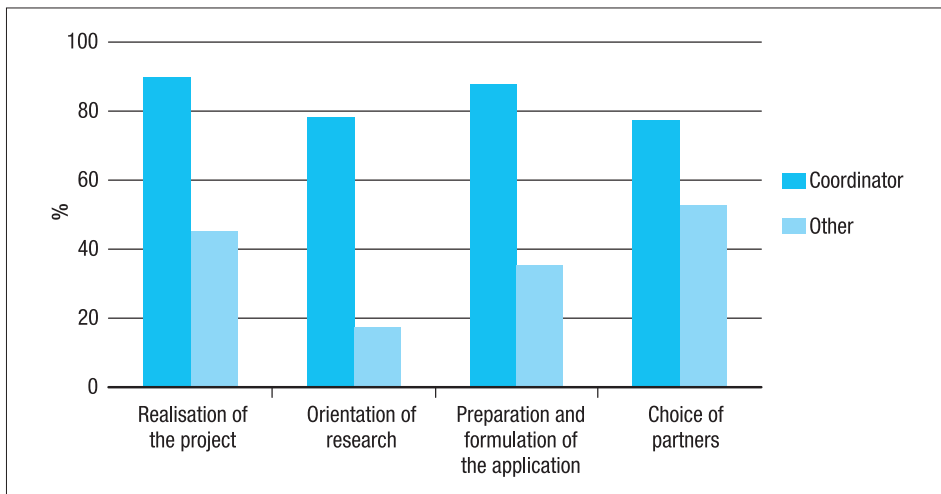


Figure 42. Influence on project.

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very much, 1 = not at all.

ject in many ways. The interviewed co-ordinators compared their experiences as a co-ordinator and as a partner and most concluded that they had a much better possibility to influence the project as a co-ordinator than as a participant. This observation was supported by the survey findings, according to which co-ordinators reported more influence than other participants on several aspects of the project, as can be seen in Figure 42. This finding is not self-evident since, as mentioned above, the co-ordinators may in some cases be purely formal or technical co-ordinators and not the scientific leader of the project.

Another benefit of the task of the co-ordinator is enhanced visibility and professional reputation of the person who takes on the task. An interviewee described the benefits as follows: “There are no particular benefits. I would say that the best advantage is the reputation and that the co-ordinator gets the credit for the project. One gets fame and honour.”

In the survey, the respondents were asked to explain the respects in which the project had been successful. The proportion of respondents according to whom the project was successful because of learning effects was about the same among the co-ordinators and other participants, that is, above 60%. However, co-ordinators more often than others thought that the project was successful because of the achievement of technical and scientific objectives (see Figure 43).

When asked about the respects in which the project was less successful the responses by the co-ordinators and

other participants differed (see Figure 44). The co-ordinators did not mention weaknesses in collaboration as often as other participants. The only matter that the co-ordinators pointed out more often was the participants’ weak commitment to the project, an understandable problem for a person who attempts to keep a multi-partner and multi-country project running on time. As one of the interviewees said, “the challenge is to conduct a group of people over whom you do not have authority.” Most of the co-ordinators who were interviewed mentioned the difficulty in keeping the group together and active.

Overall, other participants were clearly more critical towards the project. Judging by the interview and survey data, the project seemed in many cases to be the co-ordinator’s project. In such a case, after all the effort, one does not easily admit failure in the project.

Still, co-ordinators reported somewhat more problems in collaboration (Figures 45 and 46). The differences were pronounced especially when considering the matters in which the respondents had a lot of problems. The co-ordinators more often reported problems that were related to the behaviour of the partners, such as the reliability of the partners in accomplishing the tasks, divergent objectives with partners and reorganisations in participating organisations. Other participants reported problems related to the management skills of the co-ordinator much more often, understandably. When less important problems were also considered, the co-ordinators and other participants differed less, though in the same respects.

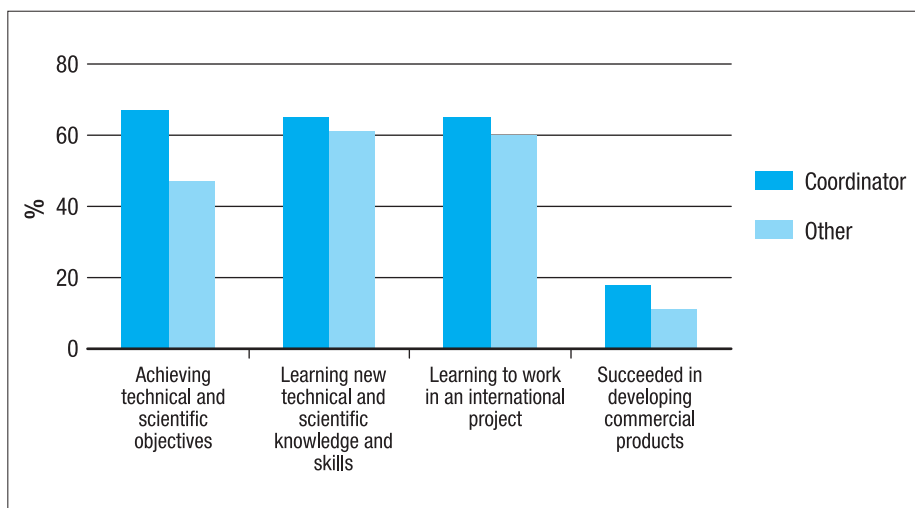


Figure 43. The respects in which project was successful.

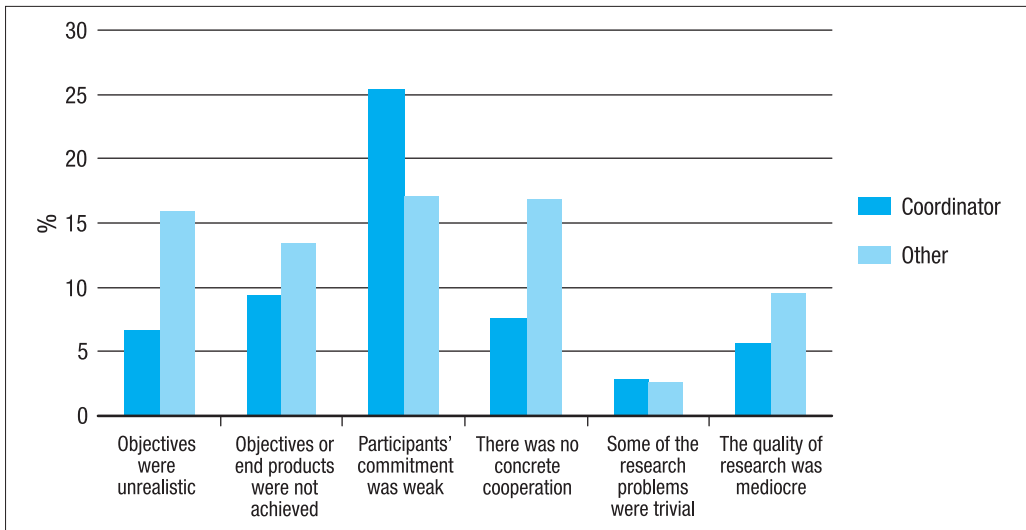


Figure 44. The respects in which the project was less successful.

A problem in EU R&D collaboration that emerged particularly in the interviews was the bureaucracy of the Commission. Still, this matter was also positively commented upon: “Instead of an awful bureaucracy it [the administrative responsibility] was so well structured, that it did not feel like burden, rather a well organised reporting.”

Overall, the findings support a view that the task of the co-ordinator is well worth the effort. Inevitably, there is a selection of organisations and persons for the task, and some of the positive experiences may be the result of the labours of well-committed and able persons and the organisational support they obtain in their own research environment.

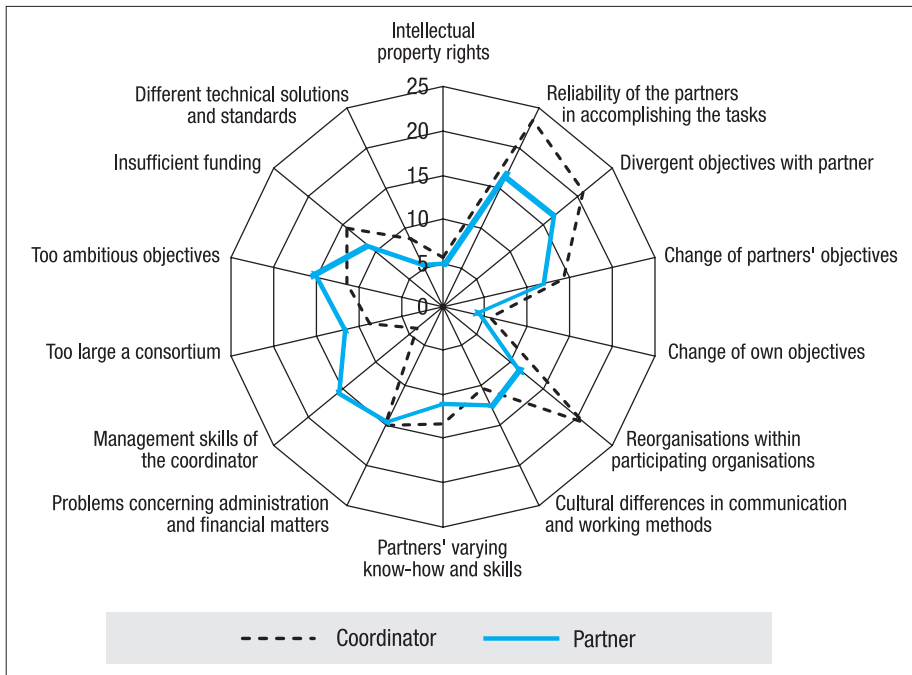


Figure 45. A lot of problems by position in project.

Note. Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

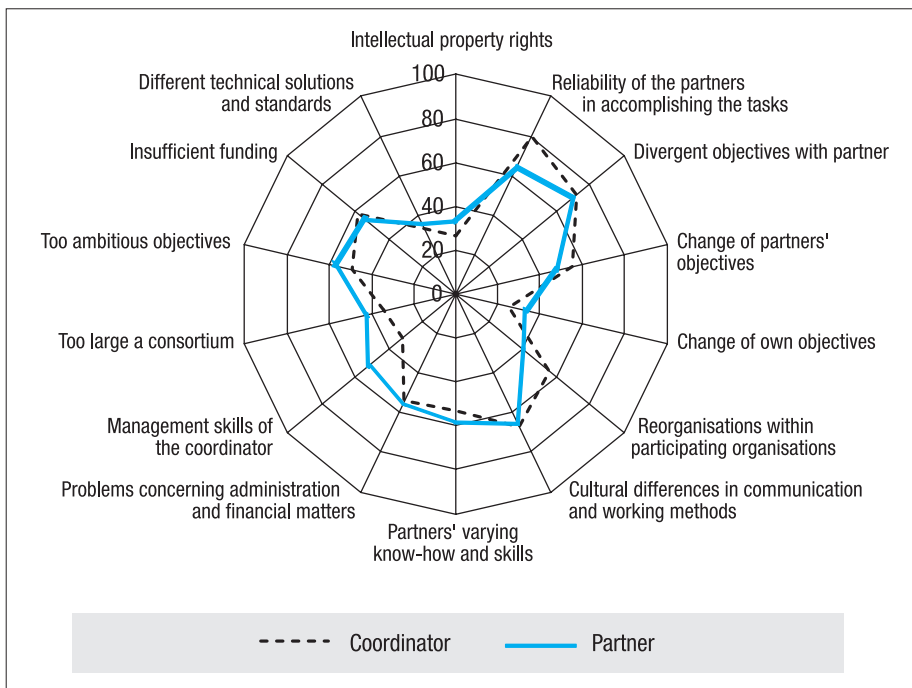


Figure 46. Problems at least to some extent by position in project.

Note. Percentage shares have been calculated taking into account the respondents that had given values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

9 Non-profit Organisations

As referred to above, non-profit organisations consist of various types of private and public organisations, such as hospital associations, local authorities, foundations, industrial associations, and non-academic schools such as vocational schools.

Although at first sight, the non-profit organisations seemed rather a heterogeneous group, in the project context these organisations have a lot in common. To a large extent, they represent the public interest and have therefore a special role in projects: the research results are often piloted or applied by them, and are aimed at being developed into various public services. In total, 56 % of their participations were in information technology programmes with telecommunications comprising 47 % (Niskanen et al., 1998). When in the survey data we consider either the programme or the relevance of the project, 69 % of the projects of non-profit organisations were telecommunications-related, a very high number indeed. Their telecommunications-related projects ranged, for instance, from the development of smart card systems, the management of public transport-

tation systems or electronic traffic information to electronic commerce, multimedia and health care related information systems. The high percentage of telecommunications-related projects is not surprising taking into account that Finland is one of the world's most advanced countries in the development of telecommunications related applications in various spheres of life.

Though to a lesser degree than other consortia, non-profit organisations included several participants from the same sector and even from same type of organisation, i.e. towns teamed up with other towns and associations with other associations. Compared with research centres and universities, non-profit organisations collaborated more with Finnish firms. In every second consortium of non-profit organisations, there was a Finnish firm, while in research centre consortia this was the case in fewer than one third and in university consortia, in one fourth of the projects. The proportion of NPO projects with foreign firms does not differ noticeably from the corresponding proportion among other organisations (Appendix Table 2.1).

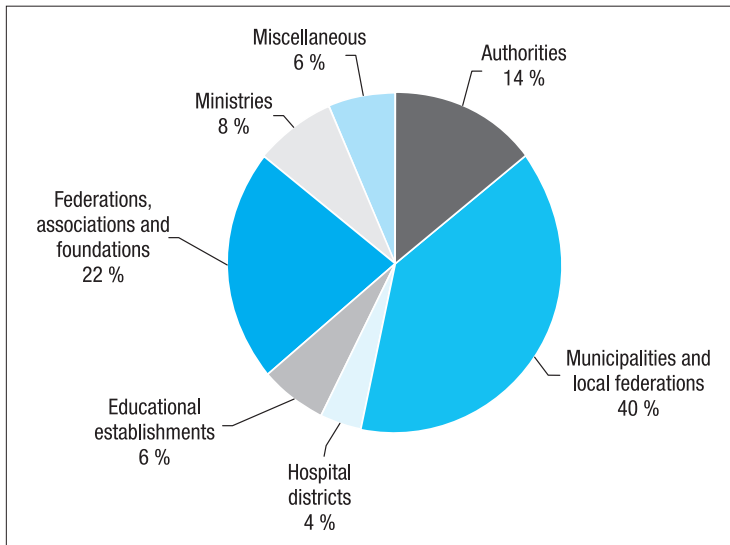


Figure 47. Participations by non-profit organisations in the survey data (N=77).

Non-profit organisations attracted attention by their different answer profiles. Not only did respondents from these organisations consider EU projects less successful than the rest, but they were also less active in the course of the project. Probably because R&D was not part of their core activities, their commitment to the projects was somewhat loose. They were more likely to have joined the consortium on someone else's initiative, had the largest proportion of those who knew hardly any other participants in advance, and were less able to exert influence on the orientation of research and project execution. They were least often in a position of influence in the project. The strategic value of the project among the respondents from non-profit organisations was also fairly low, even somewhat lower than among the big companies: all other types of organisations considered their projects more important for their

activities (cf. Figure 12). One could ask whether they were newcomers and just learning to collaborate internationally. However, they did not report any less experience of previous Framework Programmes or other forms of European research collaboration activities than firms did. Yet, they did not benefit from previous experience as much as other organisations (Table 16).

Overall, the non-profit organisations emerged as a group that seemed least committed to the projects and obtained fewest benefits from EU collaboration. Still, they represented organisations that are important end users of research results, and in most cases, develop public services. Therefore, the successful participation of this group in EU types of research collaboration is important and enhancement of their participation is in the public interest.

10 Concluding Remarks

The EU framework programmes are among the very few European research programmes giving money to concrete cross-country research collaboration, and it is the most substantial programme in this respect. Granting research money is an effective way of bringing research partners together for solving joint research problems. Because of the rapid growth of Finnish participation, EU research collaboration has become an important form of international research collaboration for Finnish research organisations. Still, as our study of Finnish participation structures showed (Luukkonen et al., 1999), Finns do not yet participate quite as much as they might when taking into account the research intensity of the country. There is still room for further increase.

Our study showed that framework programme collaboration has become almost commonplace for Finnish research performing and utilising organisations. It means that the expectations concerning EU research collaboration have become more realistic and also more demanding. EU research collaboration does not entail as much prestige or value in itself as it did in the very beginning, when it was a rarity. This means that it is evaluated by its utility in promoting the research and other interests of the participants.

This study had a set of questions as a starting point. In many respects, the study did not throw up great surprises, but made more specific the picture obtained by our previous impact study of the EU's Second and Third Framework Programmes (Luukkonen & Niskanen, 1998). There were, however, some findings that were unexpected, i.e. the negative picture of the participation experiences by the group comprising non-profit organisations. A few new questions were also raised, and these brought about new findings, most importantly among them the description of different types of company networks and their participation profiles. The societal relevance of project goals and achievements was also explored for the first time.

The study showed that newcomers to EU collaboration were likely to succeed as often as partners who had previous experience. However, it highlighted the importance for collaboration of being well connected in research networks. Well-forged networks and acquaint-

ance with the partners beforehand turned out to be important for project success and influence on the project. They are also important for being invited and succeeding in inviting others to cross-country collaborative projects. The study supported the view that being a co-ordinator is well worth the effort. The status of a co-ordinator was strongly related to project success and influence on the project.

The study further highlighted the fact that the role of EU collaboration differs in different research sectors. Large companies were able better to pursue their strategically important projects without public research funding such as EU framework programmes. However, even for them, the EU framework provided an opportunity to carry out research projects faster, on a larger scale or otherwise differently than would have been the case without this opportunity. Their EU projects were often longer-term and of potential future importance. They entailed complex networks that would have been difficult to achieve without EU support. For SMEs, research centres and universities, EU funding was more additional than for large enterprises and it was used much more often to finance projects of strategic importance. SMEs have fewer resources to carry out R&D with their own money, and research performing institutions are quite dependent on outside funding for achieving their research goals. Non-profit organisations are a group apart, not only because their participation experiences were most negative, but also because they represent institutions that are neither research performers nor producers of goods, but the end-users of research applications. A large majority of the projects in this group were telecommunications related, reflecting the rapid progress of the telecommunications field and applications in Finland. Their smaller success in utilising EU framework programmes should be a concern for Finnish authorities responsible for promoting EU research collaboration.

The framework programmes have an important function in promoting cross-sector collaboration, that is collaboration among companies and universities or research centres. Even though in Finland, there is a lot of company - university or research centre collaboration outside EU programmes and an apparent willingness to do so, EU programmes appeared to enhance such col-

laboration. Cross-sector collaboration was especially prevalent in programme lines in which companies participate frequently and therefore, to some extent, the frequency of cross-sector collaboration reflected company involvement in the programme line.

Another important finding of the study was that horizontal networks, that is collaboration with competitors, were a minority among company consortia. Vertical networks, that is collaboration with other companies within the value chain, or mixed networks, that is collaboration with both competitors and suppliers or customers, were the dominant patterns. The additionality of EU funding was greatest in mixed networks, which are the most complex and, as was shown by the study, also the most difficult to manage as judged by the occurrence of problems. They were the most prevalent network type in standards development and in information technology and telecommunications related projects. We can conclude that EU framework programmes indeed have an important role in promoting complex network structures. This study indicated another interesting point. When considered by industrial sector and its

R&D intensity, the framework programme had the highest additionality in industries that have the lowest R&D intensities. Promoting R&D activities in industries which otherwise only carry them out to a small extent, can be regarded as a beneficial outcome.

For all research sectors, EU framework programmes are an important vehicle for European research collaboration and figure as important in their goal setting. According to our as yet unpublished study on scientific publishing in Finland¹⁴, there has been a rapid increase in international collaboration overall, but most growth in collaboration in the 90s has taken place with EU countries. At the same time, the international visibility of Finnish science has grown decisively in the 90s. The framework programmes have, among other European collaboration forms, contributed to this development. One of the more general impacts of EU collaboration is thus enhancement of the internationalisation of Finnish research both in universities and research centres and companies. Few Finnish organisations and companies included have substantial international R&D collaboration activities outside the EU framework.

14 The study is being carried out in collaboration with Olle Persson.

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Appendix 1

Sectoral Division

BIG	Large companies
SME	Small and medium sized enterprises (enterprises employing fewer than 500 people, with less than one third of their capital in the hands of another company, unless this is another SME, a bank or a venture capital company, and with an annual turnover not in excess of ECU 38 million. This definition is in accord with the EU definition at the time of the Fourth Framework Programme.)
REC	Research Centres (public and private)
EDU	Universities (university hospitals included)
NPO	Non-profit organisations (corresponding term in EU publications: "other"; the sector includes non-university hospitals, non-academic educational establishments, local authorities, ministries, municipalities, associations and foundations)

Appendix 2

The Fourth RTD Framework Programme (1994-98)

	Funding (MECU)
Activity 1	11,436
I. Information and Communications Technologies	3,668
Advanced Communication Technologies and Services (ACTS)	671
Information Technologies (ESPRIT 4)	2,084
Telematics Applications (TELEMATICS 2)	913
II. Industrial Technologies	2,140
Industrial and Materials Technologies (BRITE/EURAM 3)	1,833
Standards, Measurements and Testing (SMT)	307
III. Environment	1,157
Environment and Climate (ENV 2)	914
Marine Sciences and Technologies (MAST 3)	243
IV. Life Sciences and Technologies	1,709
Biotechnology (BIOTECH 2)	595.5
Biomedicine and Health (BIOMED 2)	374
Agriculture and Fisheries (FAIR)	739.5
V. Energy	2,412
Non-nuclear Energy (JOULE/THERMIE)	1,076
Nuclear Fission Safety (NFS 2)	441
Controlled Thermonuclear Fusion (FUSION 12C)	895
Transport	263
Transport (TRANSPORT)	263
Targeted Socio-Economic Research	147
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Activity 2	575
Cooperation with Third Countries and International Organisations	
International Cooperation (INCO)	575
Activity 3	352
Dissemination and Exploitation of Results	
Dissemination and optimisation of results (INNOVATION)	352
Activity 4	792
Stimulation of the training and mobility of researchers	
Training and Mobility of Researchers (TMR)	792
Total	13,215

Appendix 3

Tables

Table 1. Finnish participants in the Fourth Framework Programme by sector.

Shared cost projects	ALL		BIG		SME		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%
Co-ordinator	199	13	40	14	28	13	70	16	45	12	16	9
Partner	1116	75	213	77	145	68	357	80	290	78	111	65
Associated partner	167	11	25	9	39	18	21	5	39	10	43	25
Total	1482	100	278	100	212	100	448	100	374	100	170	100

Source: VTT-Tekes database on Finnish participation in the Fourth Framework Programme. Because of imperfect data concerning subcontractors, these have been excluded.

2. Consortia

Table 2.1. Collaboration with different organisations (percentage)

	ALL	BIG	SME	REC	EDU	NPO
Domestic research centre	30	35	35	32	26	19
Foreign research centre	63	58	52	83	61	42
Domestic university	23	28	21	18	27	19
Foreign university	67	57	55	72	84	44
Domestic client firm (firm respondents)	9	25	25			
Foreign client firm (firm respondents)	11	30	32			
Domestic direct competitor (firm respondents)	2	6	8			
Foreign direct competitor (firm respondents)	8	27	13			
Domestic indirect competitor (firm respondents)	1	3	4			
Foreign indirect competitor (firm respondents)	12	31	39			
Domestic subcontractor (firm respondents)	6	20	12			
Foreign subcontractor (firm respondents)	5	17	10			
Domestic firm (non-firm respondents)	20			30	25	53
Foreign firm (non-firm respondents)	38			64	51	64
	N=775	N=164	N=111	N=223	N=200	N=77

The sum of percentages is more than 100%, since each respondent could have several types of partner.

Table 2.2a Participation of domestic partners in the respondents' consortia by sector (percentage*).

BIG	74	N=160
SME	65	N=108
REC	60	N=221
EDU	53	N=198
NPO	76	N= 75
Total	63	N=762

*Share of respondents who answered to the question concerning partners.

Table 2.2b Participation of domestic partners in the respondents' consortia by programme line (percentage*).

Energy	57	N=129
Environment	64	N= 84
Industrial Technologies	66	N= 93
Information and Communications Technologies	71	N=238
Life Sciences and Technologies	61	N=139
Targeted socio-economic research	5	N= 19
Transport	68	N= 60
Total	63	N=762

*Share of respondents who answered to the question concerning partners

Table 2.3. Benefit from commercialisation of results (percentage).

	REC	EDU	NPO
Respondent or organisation will benefit	22	7	18
No benefit	39	50	32
Respondent or organisation does not take part in commercialisation	23	29	31
Missing	16	14	18
Total	100	100	100
	N=152	N=116	N=65

Percentage shares have been calculated taking into account the respondents that reported having companies as partners in their consortia.

Table 2.4. Satisfaction with collaboration with companies in EU project (percentage).

	REC	EDU	NPO
Satisfied	48	56	45
Satisfied to some extent	33	28	32
Not satisfied	5	4	5
Missing	14	12	18
Total	100	100	100

N=152 N=116 N=65

Percentage shares have been calculated taking into account the respondents that reported having companies in their consortia.

Table 2.5. Research centres and universities in company networks (percentage).

	Type of company network			
	Horizontal	Vertical	Mixed	Other
REC and EDU	57	54	51	61
REC not EDU	7	21	20	17
EDU not REC	16	7	13	13
Neither REC nor EDU	20	17	16	9
Total	100	100	100	100

N=61 N=81 N=80 N=46

Missing 7

Horizontal: direct or indirect competitors but neither clients nor subcontractors.

Vertical: clients and/or subcontractors but no competitors.

Mixed: at least one competitor and a subcontractor or a client

Other: no other company participants (than the respondent) or if there were, the company participants were not in any of the above relationships with the respondent company.

REC and EDU: at least one partner in the consortium is a research centre and university.

REC not EDU: at least one partner is a research centre; there are no universities in the consortium.

EDU not REC: at least one partner is a university; there are no research centres in the consortium.

Neither REC nor EDU: neither research centres nor universities in the consortium.

Table 2.6. Share of initiators among respondents in different positions (percentage).

	All	Co-ordinator	Partner	Associated partner	Subcontractor
Initiator	23	78	16	11	8
Not initiator	74	22	82	87	92
Missing	3		2	2	
ALL	100	100	100	100	100

N=775 N=106 N=486 N=145 N=12

Missing 26

3. Goals

Table 3.1a Business-related goals (percentage).

	ALL	BIG	SME
Qualitative improvements in products	43	38	49
Expansion of markets	42	35	48
New or substantially improved production processes	41	43	35
Product diversification	40	34	46
Increase of productivity	29	28	28
Software	26	22	32
New business activities	25	23	28
Prototypes	25	24	26
Technology transfer	24	20	28
Norms and standards	14	15	12
Monitoring competitors	10	10	8
Patents	4	5	3
Licenses	4	3	5
	N=275	N=164	N=111

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Table 3.1b Goals related to commercialisation (percentage).

	ALL	REC	EDU	NPO
Prototypes	19	20	13	30
Software	17	17	11	29
Taking part in the commercialisation of products	15	16	11	27
Norms and standards	10	9	6	26
Patents	5	4	8	3
Licenses	2	1	3	4
	N=500	N=223	N=200	N=77

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Table 3.1c Knowledge-related goals (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Monitoring scientific and technology development in the field	59	62	58	60	54	61
New scientific knowledge	53	38	30	69	77	14
New or substantially improved research methods or equipment	43	38	36	48	46	39
Publications	26	12	11	25	54	12
Training of personnel	24	23	26	21	31	18
Post-graduate degrees	14	4	5	11	37	3
	N=775	N=164	N=111	N=223	N=200	N=77

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Table 3.1d Other goals (percentage).

	ALL	BIG	SME	REC	EDU	NPO
New contacts	57	53	61	60	58	52
Research funding	55	38	55	62	67	43
European co-operation	54	43	58	56	57	58
Added visibility or prestige of own research group or organisation	51	36	53	59	60	38
Dissemination of research results	34	17	21	42	46	32
Preparing a research proposal	24	15	22	29	29	14
Sharing risks and costs	18	32	24	13	9	21
Joint use of equipment	10	7	12	9	12	9
	N=775	N=164	N=111	N=223	N=200	N=77

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Table 3.2. Reasons for taking part in European research collaboration by industry (percentage).

	Information and communication technologies	Electrical machinery, electronics	Chemicals, chemical products	Energy	Metal	Services	Other branches*
Partners have complementary skills and knowledge	61	56	64	53	60	55	55
In order to obtain research equipment and material	17	28	23	16	35	19	24
In order to promote standardisation at European level	23	0	14	0	5	22	17
The research problem concerns several EU countries or the whole of EU	27	28	14	21	26	44	31
In order to obtain research funding	31	50	36	58	51	59	28
European collaboration improves the reputation of the research group / organisation	35	67	50	58	30	58	31
European collaboration opens up new markets	41	50	41	42	19	62	21
European collaboration opens up new research topics	21	22	36	11	19	38	28
New contacts	49	56	68	47	35	60	38
	N=71	N=18	N=22	N=19	N=43	N=73	N=29

*Forest, food, construction, and textiles, clothing, and footwear industries

Table 3.3. Reasons for taking part in European research collaboration by programme line (percentage).

	Information and communication technologies	Industrial technologies	Environment	Life sciences and technologies	Energy	Transport	Targeted socio-economic research
Partners have complementary skills and knowledge	60	64	58	76	57	47	68
In order to obtain research equipment and material	21	27	30	24	22	16	26
In order to promote standardisation at European level	24	4	9	12	7	15	5
The research problem concerns several EU countries or the whole of EU	40	28	48	41	44	55	68
In order to obtain research funding	47	51	72	69	55	52	53
European collaboration improves the reputation of the research group /organisation	44	56	50	49	47	61	79
European collaboration opens up new markets	20	15	3	6	20	24	0
European collaboration opens up new research topics	35	47	47	44	30	60	63
New contacts	51	61	48	52	43	63	89
	N=242	N=94	N=86	N=140	N=132	N=62	N=19

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked.

Table 3.4. Reasons for taking part in European research collaboration by company network (percentage).

	Horizontal	Vertical	Mixed	Other	
Partners have complementary skills and knowledge	19	35	25	21	N=159
In order to obtain research equipment and material	18	33	33	16	N= 61
In order to promote standardisation at European level	19	29	43	10	N= 42
The research problem concerns several EU countries or the whole of EU	20	25	31	20	N= 83
In order to obtain research funding	20	33	29	16	N=123
European collaboration improves the reputation of the research group /organisation	27	28	31	14	N=123
European collaboration opens up new markets	26	28	34	11	N=114
European collaboration opens up new research topics	36	19	32	14	N= 73
New contacts	28	25	35	12	N=139

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked.

Table 3.5. Importance of EU funding for the project (additionality) (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Project would have been carried out without EU funding	4	2	4	3	5	6
Project was carried out faster	19	17	14	19	21	23
Project was carried out on larger scale	22	22	8	25	29	17
Project was carried out with different objectives	17	19	19	17	14	18
The project would not have been carried out	54	44	54	58	57	55
	N=775	N=164	N=111	N=223	N=200	N=77

Missing cases 15; multiple responses allowed

The classification in Figure 9: **High additionality** = "The project would not have been carried out", **Low additionality** = "Project would have been carried out without EU funding" or "Project was carried out faster" or "Project was carried out on larger scale" or "Project was carried out with different objectives". Multiple responses with alternatives from both categories were classified as low additionality.

4. Outcomes

Table 4.1a Business-related achievements and impacts (percentage).

		ALL	BIG	SME
Qualitative improvements in products	Achieved	21	16	29
	Expected	37	39	34
Product diversification	Achieved	19	16	23
	Expected	39	36	43
Increase of productivity	Achieved	8	8	8
	Expected	28	28	28
New or substantially improved production processes	Achieved	11	11	11
	Expected	28	30	26
Expansion of markets	Achieved	12	8	18
	Expected	41	38	45
New business activities	Achieved	7	6	9
	Expected	28	26	30
Monitoring competitors	Achieved	23	22	25
	Expected	12	11	12
Technology transfer	Achieved	25	23	29
	Expected	19	18	22
Prototypes	Achieved	25	23	27
	Expected	11	8	15
Software	Achieved	18	16	21
	Expected	15	13	18
Norms and standards	Achieved	7	8	5
	Expected	15	14	15
Patents	Achieved	5	6	4
	Expected	9	9	10
Licenses	Achieved	1	1	
	Expected	10	8	12
		N=275, miss. 11	N=164, miss. 5	N=111, miss. 6

Table 4.1b Achievements and impacts related to commercialisation (percentage).

		ALL	REC	EDU	NPO
Taking part in the commercialisation of products	Achieved	5	5	4	7
	Expected	29	24	30	38
Prototypes	Achieved	16	16	12	26
	Expected	18	17	18	21
Software	Achieved	12	11	9	22
	Expected	19	19	15	27
Norms and standards	Achieved	5	5	3	8
	Expected	16	12	16	29
Patents	Achieved	3	3	3	0
	Expected	13	9	17	11
Licenses	Achieved	1	1	0	1
	Expected	10	6	12	14
		N=500, miss.20	N=223, miss. 8	N=200, miss.8	N=77, miss.4

Table 4.1c Knowledge-related and technological achievements and impacts (percentage).

		ALL	BIG	SME	REC	EDU	NPO
New scientific knowledge	Achieved	43	38	33	50	56	12
	Expected	25	19	16	29	28	30
Monitoring scientific and technology development in the area	Achieved	65	58	65	72	68	51
	Expected	18	19	18	17	15	32
New or substantially improved research methods or equipment	Achieved	27	18	21	36	36	8
	Expected	26	23	18	26	31	36
Getting acquainted with latest research methods and techniques	Achieved	40	33	46	42	47	21
	Expected	16	15	11	14	19	23
Publications	Achieved	34	26	26	39	46	21
	Expected	33	19	19	40	46	29
Training of personnel	Achieved	38	33	36	41	46	15
	Expected	19	16	19	19	21	19
Post-graduate degrees	Achieved	8	6	2	8	15	1
	Expected	29	13	14	30	52	21
		N=775, miss.31	N=164, miss. 5	N=111, miss. 6	N=223, miss. 8	N=200, miss. 8	N=77, miss. 4

Table 4.1d Other achievements and impacts (percentage).

		BIG	SME	REC	EDU	NPO
Sharing risks and costs	Achieved	47	47	24	26	34
	Expected	9	11	11	6	14
Research funding	Achieved	66	68	69	69	56
	Expected	6	9	11	11	10
Joint use of equipment	Achieved	14	15	17	17	12
	Expected	8	11	6	10	21
Added visibility of own research or own research group	Achieved	45	67	67	69	37
	Expected	18	10	16	17	33
Dissemination of research results	Achieved	28	29	36	46	23
	Expected	24	28	38	36	44
Future research proposals	Achieved	18	25	27	27	15
	Expected	16	15	20	20	21
New contacts	Achieved	58	65	67	66	52
	Expected	13	13	16	14	23
		N=164, miss. 5	N=111, miss. 6	N=223, miss. 8	N=200, miss. 8	N=77, miss. 4

Table 4.2. Quality of project (percentage).

	ALL	BIG	SME	REC	EDU	NPO
The project is on the forefront of the research area internationally	36	33	27	40	47	18
The project is of average quality in international comparison	34	31	29	39	37	25
The research is of good quality but not very innovative	7	8	7	7	7	8
The project tests and elaborates previous discoveries	7	7	10	4	4	14
The project is oriented toward applications and therefore not very ambitious in terms of research questions	10	12	17	5	4	29
Missing	6	9	10	6	3	6
ALL	100	100	100	100	100	100
	N=775	N=162	N=113	N=223	N=200	N=77

In Figure 18 the classes “The project is of average quality in international comparison” and “The research is of good quality but not very innovative” have been combined as well as “The project tests and elaborates previous discoveries” and “The project is oriented toward applications and therefore not very ambitious in terms of research questions”.

5. Problems

Table 5.1a. At least some problems in the following respects (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Divergent objectives with partner	70	74	68	72	62	79
Reliability of the partners in accomplishing the tasks	67	66	64	72	63	71
Cultural differences in communication and working methods	66	68	67	68	58	74
Partners' varying know-how and skills	58	62	59	60	50	60
Too ambitious objectives	56	62	54	53	52	68
Problems concerning administration and financial matters	55	59	58	50	50	73
Insufficient funding	55	46	54	55	59	62
Management skills of the co-ordinator	49	49	46	50	46	61
Change of partners' objectives	48	53	42	50	44	55
Reorganisations within participating organisations	42	54	51	39	30	42
Too large a consortium	41	45	39	40	38	48
Different technical solutions and standards	35	45	41	28	22	58
Intellectual property rights	32	36	32	32	29	36
Change of own objectives	32	39	36	26	26	40
	N=775	N=164	N=111	N=223	N=200	N=77

Percentage shares have been calculated taking into account the respondents that had given values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Table 5.1b. A lot of problems in the following respects (percentage).

	ALL	BIG	SME	REC	EDU	NPO
Reliability of the partners in accomplishing the tasks	18	13	17	20	18	22
Divergent objectives with partner	17	16	14	20	15	22
Too ambitious objectives	15	19	14	13	10	23
Problems concerning administration and financial matters	15	10	17	15	15	21
Management skills of the co-ordinator	14	13	12	17	11	19
Reorganisations within participating organisations	13	17	16	13	7	13
Change of partners' objectives	12	13	10	14	11	14
Cultural differences in communication and working methods	12	12	12	9	12	23
Insufficient funding	12	8	9	13	13	18
Partners' varying know-how and skills	11	13	6	13	10	14
Too large a consortium	11	10	11	11	12	13
Different technical solutions and standards	6	7	5	4	3	16
Intellectual property rights	5	8	5	4	4	4
Change of own objectives	4	5	7	3	3	6
	N=775	N=164	N=111	N=223	N=200	N=77

Percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Table 5.2. Problems by previous experience (percentage).

	Participation in previous framework programmes		
	Respondent	Other researchers in the unit	Neither
Reliability of the partners in accomplishing the tasks			
Problems, at least to some extent	32	37	31
None	63	59	62
Missing	5	4	7
Divergent objectives with partner			
Problems, at least to some extent	72	76	61
None	21	20	34
Missing	7	4	6
Too ambitious objectives			
Problems, at least to some extent	69	77	67
None	25	19	28
Missing	5	4	5

...Table 5.2. continues

	Participation in previous framework programmes		
	Respondent	Other researchers in the unit	Neither
Problems concerning administration and financial matters			
Problems, at least to some extent	53	56	43
None	40	39	50
Missing	7	5	7
Management skills of the co-ordinator			
Problems, at least to some extent	33	31	32
None	59	64	61
Missing	8	5	7
Reorganisations within participating organisations			
Problems, at least to some extent	42	45	40
None	52	51	53
Missing	6	4	7
Change of partners' objectives			
Problems, at least to some extent	64	72	63
None	30	24	31
Missing	6	4	6
Cultural differences in communication and working methods			
Problems, at least to some extent	55	65	54
None	38	30	40
Missing	7	5	6
Insufficient funding			
Problems, at least to some extent	52	53	58
None	40	43	35
Missing	8	4	7
Partners' varying know-how and skills			
Problems, at least to some extent	49	53	49
None	41	41	43
Missing	10	6	8
Too large a consortium			
Problems, at least to some extent	44	46	38
None	49	50	55
Missing	7	4	7
Different technical solutions and standards			
Problems, at least to some extent	54	62	55
None	40	34	39
Missing	7	5	6
Intellectual property rights			
Problems, at least to some extent	49	59	56
None	44	37	37
Missing	7	5	8
Change of own objectives			
Problems, at least to some extent	31	41	34
None	59	53	58
Missing	10	6	8

N=220

N=239

N=381

(values 2, 3, 4, 5 or ticked)

Appendix 4

Figures

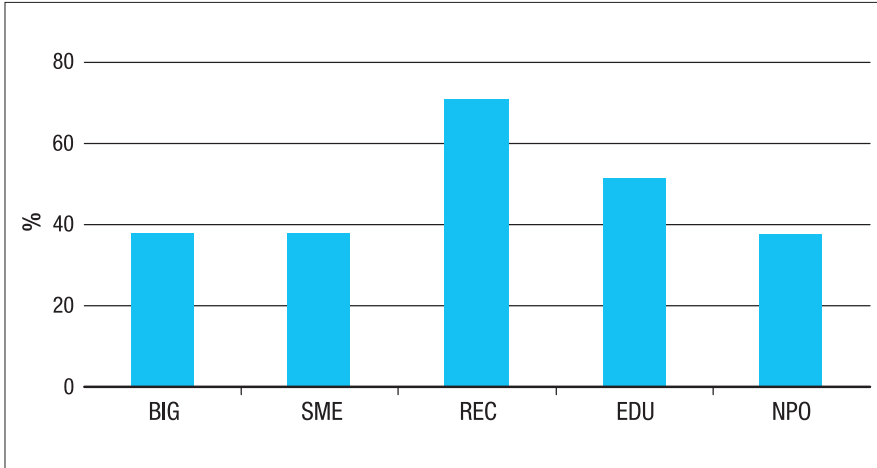


Figure 1. Previous participation in framework programmes (respondent or other researcher in the unit).

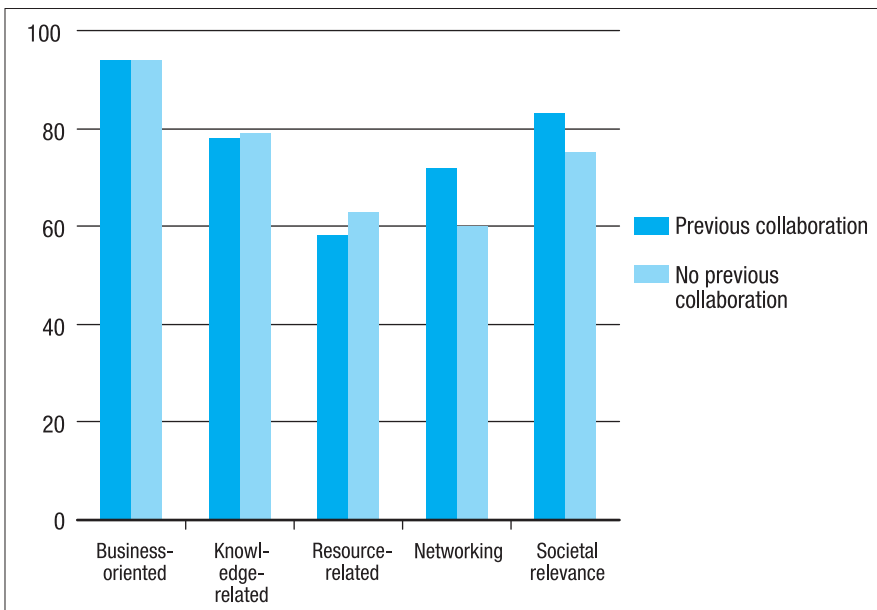


Figure 2 a. Companies: goals by previous collaboration.

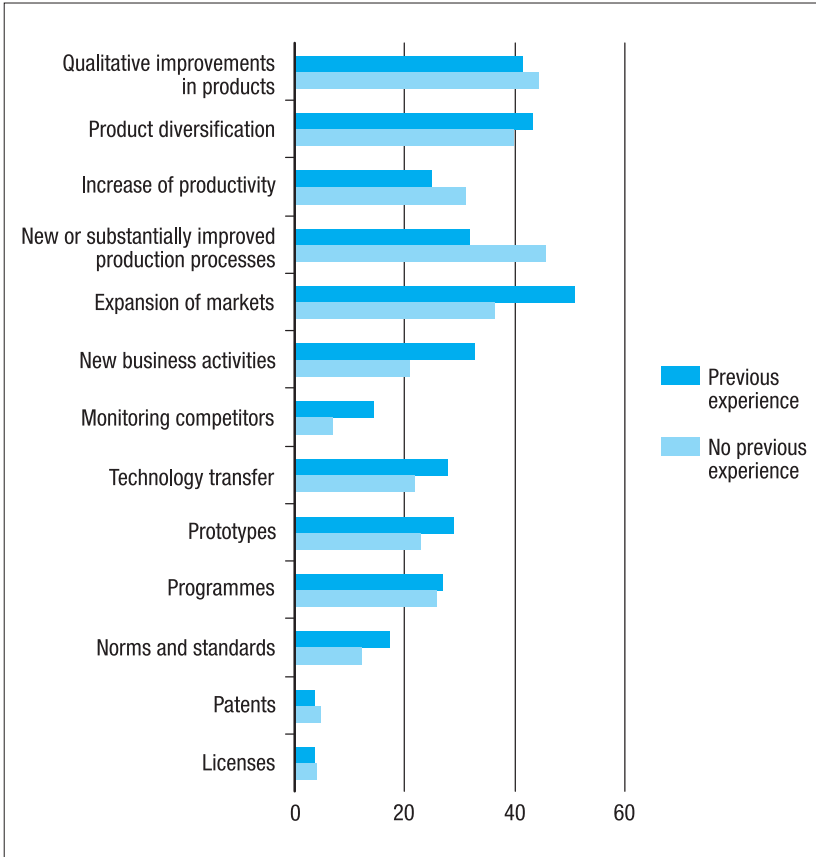


Figure 2 b. Companies: business-oriented goals by previous collaboration.

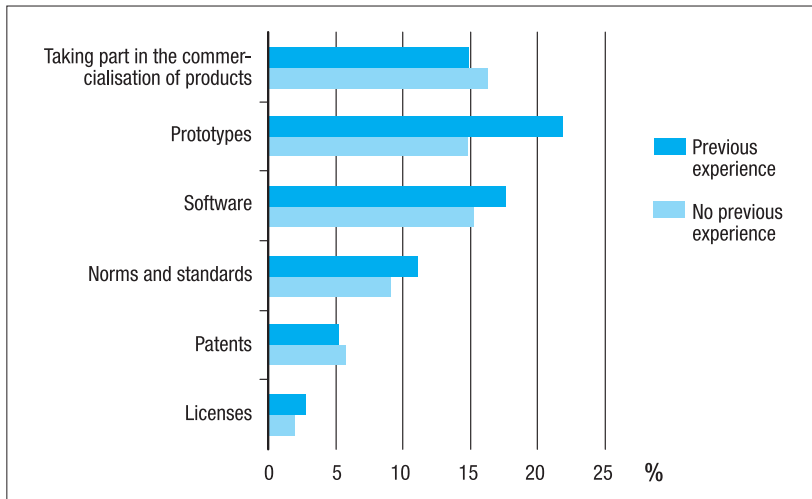


Figure 2 c. Non-firm participants: business-oriented goals by previous collaboration.

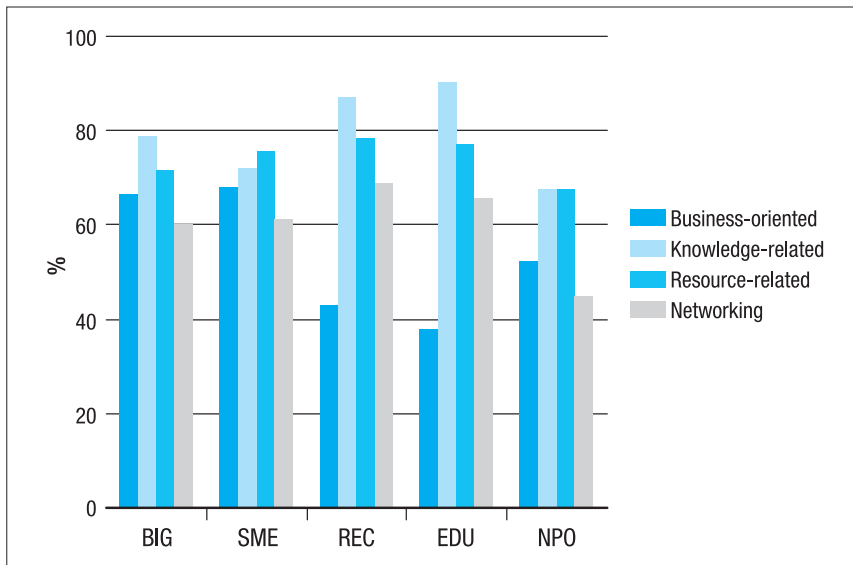


Figure 3 a. Achieved results: respondents who regarded *business-oriented* goals as important.

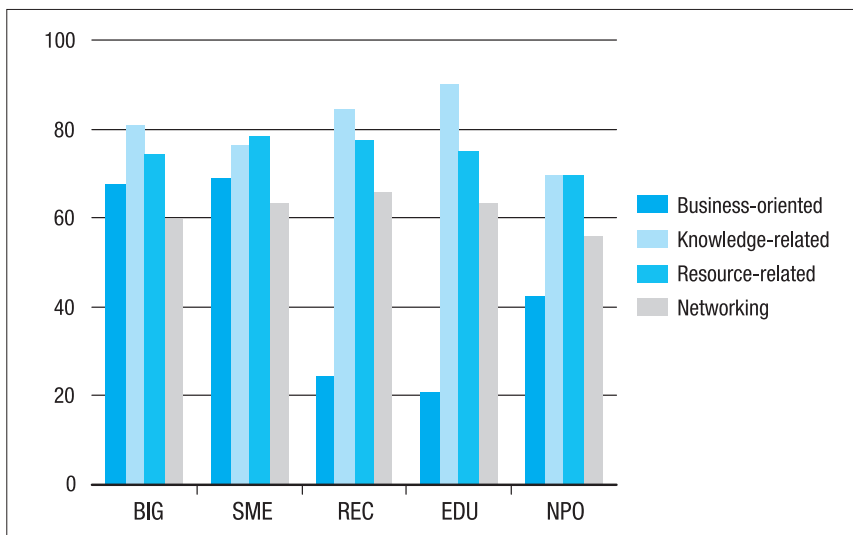


Figure 3 b. Achieved results: respondents who regarded *knowledge-related* goals as important.

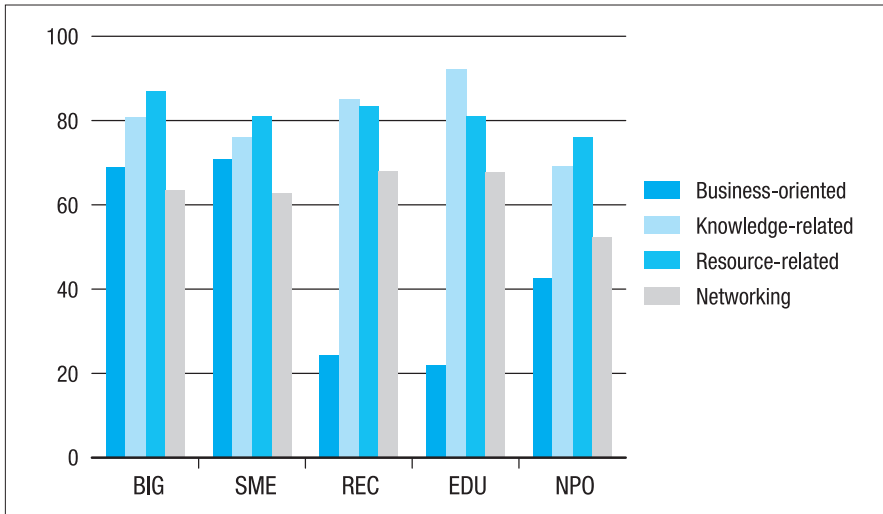


Figure 3 c. Achieved results: respondents who regarded *resource-related* goals as important.

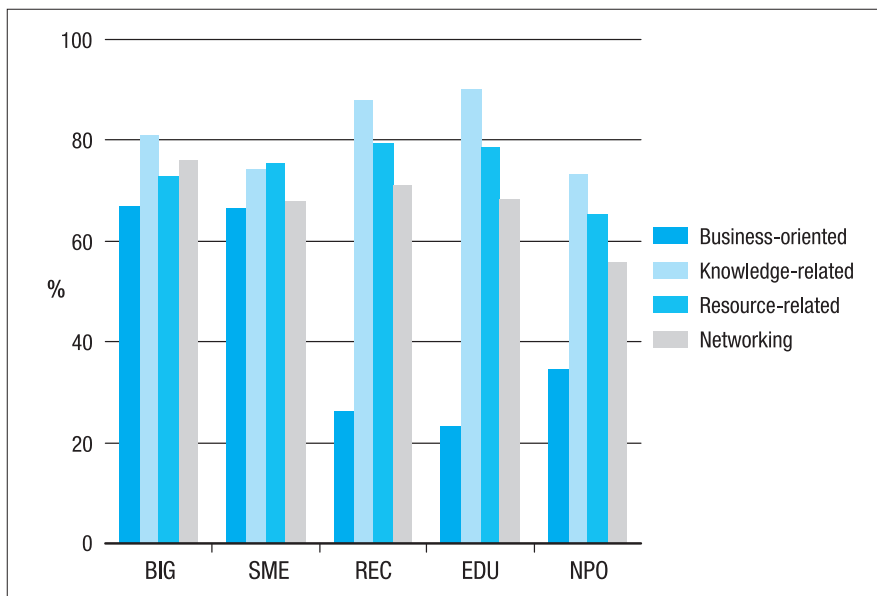


Figure 3 d. Achieved results: respondents who regarded goals related to *networking* as important.

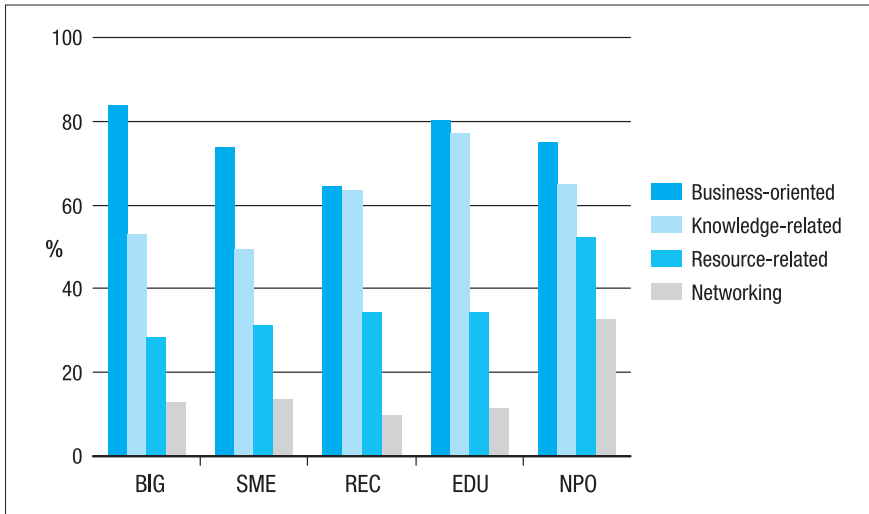


Figure 4 a. Expected results: respondents who regarded *business-oriented* goals as important.

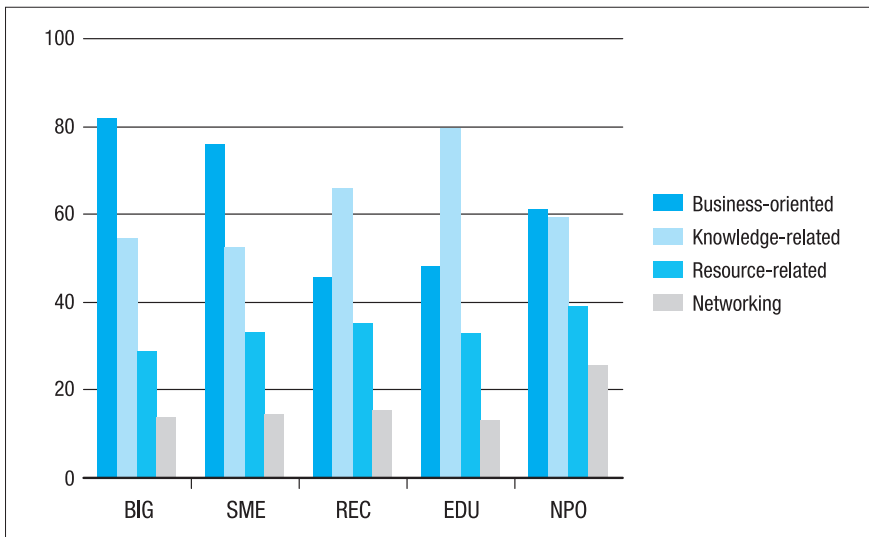


Figure 4 b. Expected results: respondents who regarded *knowledge-related* goals as important.

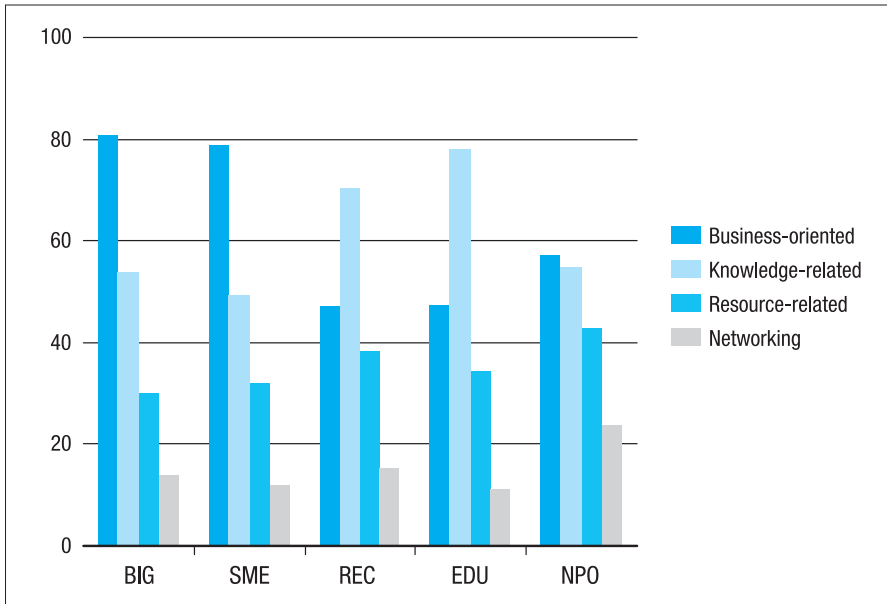


Figure 4 c. Expected results: respondents who regarded *resource-related* goals as important.

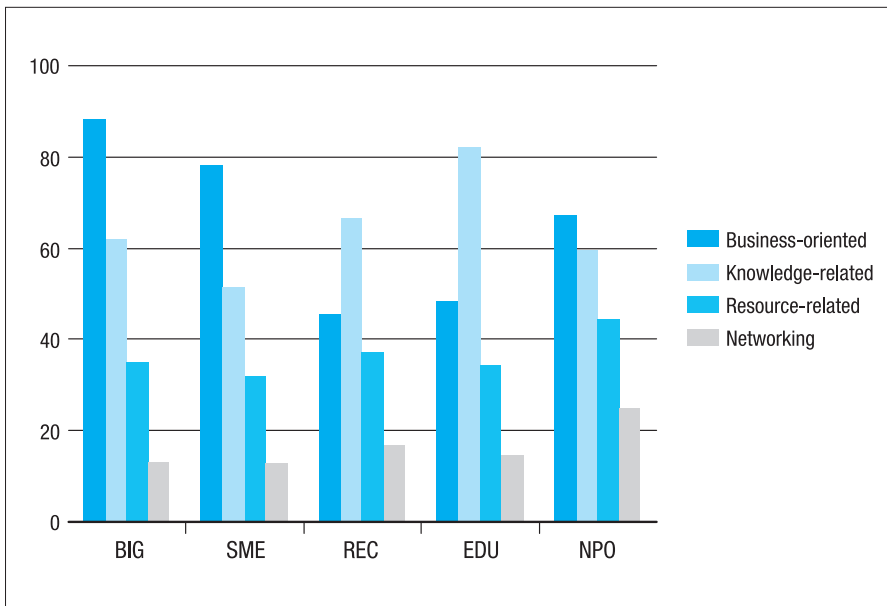


Figure 4 d. Expected results: respondents who regarded goals related to *networking* as important.

Appendix 5

Questionnaire for Company Participants



Group for Technology Studies

Experiences of the Fourth Framework Programme

(Companies)

Project

(The following information has been pre-filled. Please change if not correct.)

Title of EU research project
Acronym of EU research project
Acronym of EU research programme
Participating organisation
Person in charge

Position of organisation in EU project:

Co-ordinator
Partner
Associated partner
Subcontractor

Partners

What kind of partners participate(d) in EU project?

(Please tick the appropriate box below if there is (was) at least one organisation of the kind.)

	Domestic	Foreign
Research centre	<input type="checkbox"/>	<input type="checkbox"/>
University	<input type="checkbox"/>	<input type="checkbox"/>
Client firm	<input type="checkbox"/>	<input type="checkbox"/>
Direct competitor (competing with similar products in the same markets)	<input type="checkbox"/>	<input type="checkbox"/>
Indirect competitor (competing with similar products in different markets)	<input type="checkbox"/>	<input type="checkbox"/>
Subcontractor	<input type="checkbox"/>	<input type="checkbox"/>
Other, what? _____		

Did you know your partners before this project?

(Please tick the box that best corresponds to your situation)

I knew most of them beforehand
I knew some of them beforehand
I only knew some/had only met them in conferences
I knew hardly any of them beforehand

Did you take the initiative to start the research project?

Yes No

Tick below the person/organisation on whose initiative you took part in the project?

Respondent

Directors of own organisation

Co-ordinator (other than the respondent)

Finnish partner:

Research centre: VTT
Other

University

Firm

Foreign partner:

Research centre

University

Firm

Importance of Project

What prompted your company to participate in this European collaboration?

Please assess the importance of each point using the following scale 5-1:

5 = very important, 1 = of no importance.

Partners have complementary skills and knowledge

In order to obtain research equipment and material

In order to promote standardisation at European level

The research problem concerns several EU countries or the whole of EU

In order to obtain research funding

European collaboration improves the reputation of the research group / own organisation

European collaboration opens up new markets

European collaboration opens up new research topics

New contacts

Other, what? _____

What is the importance of EU funding for the research?

The project would have been carried out without EU funding

Project was carried out faster

Project was carried out on larger scale

The project was carried out with different objectives

The project would not have been carried out

Please describe the importance of the EU project for the technology strategy of the company

- It is of strategic importance
- It is of potential future importance
- It is of marginal importance

Please describe how important the following goals were for your company in joining the collaboration.

*Please assess the importance of each point using the following scale 5-1:
5 = very important, 1 = of no importance.*

a) Business-related goals

- Qualitative improvements in products
- Product diversification
- Increase of productivity
- New or substantially improved production processes
- Expansion of markets
- New business activities
- Monitoring competitors
- Technology transfer
- Prototypes
- Software
- Norms and standards
- Patents
- Licenses

b) Knowledge-related objectives

- New scientific knowledge
- Monitoring scientific and technology development in the field
- New or substantially improved research methods or equipment
- Publications
- Training of personnel
- Post-graduate degrees

c) Knowledge of relevance for the following societal questions or services

Please use the same scale as above. If the matter is significant explain in more detail.

- Environmental questions _____

- Health care and nutrition _____

- Transportation _____
- Telecommunications _____
- Energy saving and management _____
- Urbanisation and related problems _____
- Employment _____
- Problems related to ageing population _____
- Security-related questions _____
- Education _____
- New promising growth areas _____
- Other, what? _____ _____

d) Other objectives

- Sharing risks and costs
- Research funding
- Joint use of equipment
- Added visibility or prestige of own research or organisation
- Dissemination of research results
- Preparing a research proposal
- New contacts
- European co-operation
- Other, what?

Collaboration

Could you influence the following matters?

Please use the following scale 5-1: 5 = very much, 1 = not at all.

- Orientation of research
- Choice of partners
- Preparation and formulation of the application
- Realisation of the project

Have you had problems with your partners concerning the following aspects?

Please describe their difficulty using the following scale 5-1: 5 = a lot of problems, 1 = no problems at all.

- Intellectual property rights
- Reliability of the partners in accomplishing the tasks
- Divergent objectives with partners
- Change of partners' objectives
- Change of own objectives
- Reorganisations within participating organisations
- Cultural differences in communication and working methods
- Partners' varying know-how and skills
- Problems concerning management and administration of financial matters
- Management skills of the co-ordinator
- Too large a consortium
- Too ambitious objectives
- Insufficient funding
- Different technical solutions and standards
- Other, what? _____

Project Success

Please tick the alternative that best describes the novelty and research objectives of the project.

- The project is on the forefront of the research area internationally
- The project is of average quality in international comparison
- The research is of good quality but not very innovative
- The project tests and elaborates previous discoveries
- The is oriented toward applications and therefore not very ambitious in terms of research questions

Has the EU project been successful (so far)?

- Yes
- Partly yes, partly no
- No

Please explain the respects in which the project has been successful.

Please tick the box if the corresponding statement characterises project success.

- We achieved technical and scientific objectives
- We learnt new technical and scientific knowledge and skills
- We learnt to work in an international project
- We succeeded in developing commercial products
- Other, what? _____

Please explain the respects in which the project has been less successful.

Please tick the box if the corresponding statement characterises problems of the project

- Objectives were unrealistic
- Objectives or end products were not achieved
- Participants' commitment was weak
- There was no concrete cooperation
- Some of the research problems were trivial
- The quality of research was mediocre
- Other, what? _____

Research Results and their Impacts

What are the results and impacts expected or achieved so far?

Please also report for projects which are ongoing.

a) Business-related results and impacts

	Achieved	Expected
Qualitative improvements in products	<input type="checkbox"/>	<input type="checkbox"/>
Product diversification	<input type="checkbox"/>	<input type="checkbox"/>
Increase of productivity	<input type="checkbox"/>	<input type="checkbox"/>
New or substantially improved production processes	<input type="checkbox"/>	<input type="checkbox"/>
Expansion of markets	<input type="checkbox"/>	<input type="checkbox"/>
New business activities	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring competitors	<input type="checkbox"/>	<input type="checkbox"/>
Technology transfer	<input type="checkbox"/>	<input type="checkbox"/>
Prototypes	<input type="checkbox"/>	<input type="checkbox"/>
Software	<input type="checkbox"/>	<input type="checkbox"/>
Norms and standards	<input type="checkbox"/>	<input type="checkbox"/>
Patents	<input type="checkbox"/>	<input type="checkbox"/>
Licenses	<input type="checkbox"/>	<input type="checkbox"/>

b) Knowledge-related and technological results and impacts

	Achieved	Expected
New scientific knowledge	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring scientific and technology development in the field	<input type="checkbox"/>	<input type="checkbox"/>
New or substantially improved research methods or equipment	<input type="checkbox"/>	<input type="checkbox"/>
Publications	<input type="checkbox"/>	<input type="checkbox"/>
Training of personnel	<input type="checkbox"/>	<input type="checkbox"/>
Post-graduate degrees	<input type="checkbox"/>	<input type="checkbox"/>

c) Other impacts

	Achieved	Expected
Sharing risks and costs	<input type="checkbox"/>	<input type="checkbox"/>
Research funding	<input type="checkbox"/>	<input type="checkbox"/>
Joint use of equipment	<input type="checkbox"/>	<input type="checkbox"/>
Added visibility of own research group or own organisation	<input type="checkbox"/>	<input type="checkbox"/>
Dissemination of research results	<input type="checkbox"/>	<input type="checkbox"/>
Future research proposals	<input type="checkbox"/>	<input type="checkbox"/>
New contacts		

Importance of Project more generally

Has the project yielded results of relevance to the following socio-economic questions?

Please use the following scale 5-1: 5 = of great importance, 1 = of no importance at all.

If a point is relevant, please specify.

Environmental questions	<input type="checkbox"/>	_____

Health care and nutrition	<input type="checkbox"/>	_____

Transportation	<input type="checkbox"/>	_____

Telecommunications	<input type="checkbox"/>	_____

Energy saving and management	<input type="checkbox"/>	_____

Urbanisation and related problems	<input type="checkbox"/>	_____

Employment	<input type="checkbox"/>	_____

Problems related to aging population	<input type="checkbox"/>	_____

Security	<input type="checkbox"/>	_____

Education	<input type="checkbox"/>	_____

New promising growth areas	<input type="checkbox"/>	_____

Other, what? _____	<input type="checkbox"/>	_____

Have other users of results (such as public authorities) participated in the planning or implementation of the project or have they contributed to the development of applications?

Yes

No

If yes, which users? _____

Previous European Collaboration

Have you participated in the following forms of European collaboration?

	Yourself	Company (Unit)
Previous EU Framework Programme	<input type="checkbox"/>	<input type="checkbox"/>
EUREKA	<input type="checkbox"/>	<input type="checkbox"/>
COST	<input type="checkbox"/>	<input type="checkbox"/>
Other European programme	<input type="checkbox"/>	<input type="checkbox"/>

If you have or your unit has participated in the second or third EU Framework Programme, a) has previous collaboration helped you (your unit) in respect of the following aspects?

Please tick the box if previous participation has helped

Research planning

Preparing a research proposal

Choice of partners

Reconciling own research interests with those of partners

Actual collaboration with partners

Achieving results

Other, which? _____

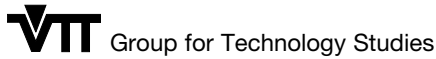
b) how many of your partners in this project collaborated with you in an earlier EU project?

Majority

Some

None

Questionnaire for Non-Company Participants



Experiences of the Fourth Framework Programme

(Other organisations)

Project

(The following information has been pre-filled. Please change if not correct)

Title of EU research project
Acronym of EU research project
Acronym of EU research programme
Participating organisation
Person in charge

Position of organisation in EU project

Co-ordinator
Partner
Associated partner
Subcontractor

Partners

What kind of partners participate(d) in EU project?

(Please tick the appropriate box below if there is (was) at least one organisation of the kind.)

	Domestic	Foreign
Research centre	<input type="checkbox"/>	<input type="checkbox"/>
University	<input type="checkbox"/>	<input type="checkbox"/>
Firm	<input type="checkbox"/>	<input type="checkbox"/>
Other, what? _____	<input type="checkbox"/>	<input type="checkbox"/>

Did you know your partners before this project?

(Please tick the box that best corresponds to your situation)

I knew most of them beforehand
I knew some of them beforehand
I only knew some/had only met them in conferences
I knew hardly any of them beforehand

Did you take the initiative to start the research project?

Yes No

Tick below the person/organisation on whose initiative you took part in the project?

- Respondent
- Directors of own organisation
- Coordinator (other than the respondent)
- Finnish partner:
 - Research centre: VTT
 - Other
 - University
 - Firm
- Foreign partner:
 - Research centre
 - University
 - Firm

Importance of Project

What prompted you to participate in this European collaboration?

*Please assess the importance of each point using the following scale 5-1:
5 = very important, 1 = of no importance.*

- Partners have complementary skills and knowledge
- In order to obtain research equipment and material
- In order to promote standardisation at European level
- The research problem concerns several EU countries or the whole of EU
- In order to obtain research funding
- European collaboration improves the reputation of the research group / own organisation
- European collaboration opens up new markets
- European collaboration opens up new research topics
- New contacts
- Other, what? _____

What is the importance of EU funding for the research?

- The project would have been carried out without EU funding
- Project was carried out faster
- Project was carried out on larger scale
- The project was carried out with different objectives
- The project would not have been carried out

Please describe the importance of the EU project for other research projects done in your group. Does the project concern essential themes?

- It is of central importance
- It supports other research activities
- It is of marginal importance

Please describe how important the following objectives were for your organisation in joining the collaboration.

Please assess the importance of each point using the following scale 5-1: 5 = very important, 1 = of no importance.

a) Knowledge-related objectives

- New scientific knowledge
- Monitoring scientific and technology development in the field
- New or substantially improved research methods or equipment
- Publications
- Training of personnel
- Post-graduate degrees

b) Objectives related to commercialisation

- Taking part in the commercialisation of products
- Prototypes
- Software
- Norms and standards
- Patents
- Licenses

c) Objectives of importance for the following societal questions or services

Please use the same scale as above. If the matter is significant explain in more detail.

- Environmental questions _____

- Health care and nutrition _____

- Transportation _____

- Telecommunications _____

- Energy saving and management _____

- Urbanisation and related problems _____

- Employment _____

- Problems related to ageing population _____

- | | | |
|----------------------------|--------------------------|-------|
| Security | <input type="checkbox"/> | _____ |
| | | _____ |
| Education | <input type="checkbox"/> | _____ |
| | | _____ |
| New promising growth areas | <input type="checkbox"/> | _____ |
| | | _____ |
| Other, what? _____ | <input type="checkbox"/> | _____ |
| | | _____ |

d) Other objectives

- | | |
|--------------------------------------------------------------|--------------------------|
| Sharing risks and costs | <input type="checkbox"/> |
| Research funding | <input type="checkbox"/> |
| Joint use of equipment | <input type="checkbox"/> |
| Added visibility or prestige of own research or organisation | <input type="checkbox"/> |
| Dissemination of research results | <input type="checkbox"/> |
| Preparing a research proposal | <input type="checkbox"/> |
| New contacts | <input type="checkbox"/> |
| European cooperation | <input type="checkbox"/> |
| Other, what? _____ | <input type="checkbox"/> |

Collaboration

Could you influence the following matters?

Please use the following scale 5-1: 5 = very much, 1 = not at all.

- | | |
|------------------------------------------------|--------------------------|
| Orientation of research | <input type="checkbox"/> |
| Choice of partners | <input type="checkbox"/> |
| Preparation and formulation of the application | <input type="checkbox"/> |
| Realisation of the project | <input type="checkbox"/> |

Have you had problems with your partners concerning the following aspects?

Please describe their difficulty using the following scale 5-1:

5 = a lot of problems, 1 = no problems at all.

- | | |
|-----------------------------------------------------------|--------------------------|
| Intellectual property rights | <input type="checkbox"/> |
| Reliability of the partners in accomplishing the tasks | <input type="checkbox"/> |
| Different partner objectives | <input type="checkbox"/> |
| Change of partners' objectives | <input type="checkbox"/> |
| Change of own objectives | <input type="checkbox"/> |
| Reorganisations within participating organisations | <input type="checkbox"/> |
| Cultural differences in communication and working methods | <input type="checkbox"/> |
| Partners' varying know-how | <input type="checkbox"/> |

- Problems concerning management and administration of financial matters
- Management skills of the co-ordinator
- Too large a consortium
- Too ambitious objectives
- Insufficient funding
- Different technical solutions and standards
- Other, what? _____

Project Success

Please tick the alternative that best describes the novelty and research objectives of the project.

- The project is on the forefront of the research area internationally
- The project is of average quality in international comparison
- The research is of good quality but not very innovative
- The project tests and elaborates previous discoveries
- The is oriented toward applications and therefore not very ambitious in terms of research questions

Has the EU project been successful (so far)?

- Yes
- Partly yes, partly no
- No

Please explain the respects in which the project has been successful.

Please tick the box if the corresponding statement characterises project success.

- We achieved technical and scientific objectives
- We learnt new technical and scientific knowledge and skills
- We learnt to work in an international project
- We succeeded in developing commercial products
- Other, what? _____

Please explain the respects in which the project has been unsuccessful.

Please tick the box if the corresponding statement characterises problems of the project

- Objectives were unrealistic
- Objectives or end products were not achieved
- Participants' commitment was weak
- There was no concrete cooperation
- Some of the research problems were trivial
- The quality of research was mediocre
- Other, what? _____

Research Results and their Impacts

What are the results and impacts expected or achieved so far?

Please also report for projects which are ongoing.

a) Knowledge-related and technological results and impacts

	Achieved	Expected
New scientific knowledge	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring scientific and technology development in the field	<input type="checkbox"/>	<input type="checkbox"/>
New or substantially improved research methods or equipment	<input type="checkbox"/>	<input type="checkbox"/>
Publications	<input type="checkbox"/>	<input type="checkbox"/>
Training of personnel	<input type="checkbox"/>	<input type="checkbox"/>
Post-graduate degrees	<input type="checkbox"/>	<input type="checkbox"/>

b) Results and impacts related to commercialisation

Taking part in the commercialisation of products	<input type="checkbox"/>	<input type="checkbox"/>
Prototypes	<input type="checkbox"/>	<input type="checkbox"/>
Software	<input type="checkbox"/>	<input type="checkbox"/>
Norms and standards	<input type="checkbox"/>	<input type="checkbox"/>
Patents	<input type="checkbox"/>	<input type="checkbox"/>
Licenses	<input type="checkbox"/>	<input type="checkbox"/>

c) Other impacts

Sharing risks and costs	<input type="checkbox"/>	<input type="checkbox"/>
Research funding	<input type="checkbox"/>	<input type="checkbox"/>
Joint use of equipment	<input type="checkbox"/>	<input type="checkbox"/>
Added visibility of own research or research group	<input type="checkbox"/>	<input type="checkbox"/>
Dissemination of research results	<input type="checkbox"/>	<input type="checkbox"/>
Future research proposals	<input type="checkbox"/>	<input type="checkbox"/>
New contacts	<input type="checkbox"/>	<input type="checkbox"/>

Importance of Project more generally

Has the project yielded results of relevance to the following socio-economic questions?

Please use the following scale 5-1: 5 = of great importance, 1 = of no importance at all.

If a point is relevant, please specify.

Environmental questions and policy	<input type="checkbox"/>	_____

Health care and nutrition	<input type="checkbox"/>	_____

Transportation	<input type="checkbox"/>	_____

Telecommunications	<input type="checkbox"/>	_____

Energy saving and management	<input type="checkbox"/>	_____

Urbanisation and related problems	<input type="checkbox"/>	_____

Employment	<input type="checkbox"/>	_____

Problems related to aging population	<input type="checkbox"/>	_____

Security	<input type="checkbox"/>	_____

Education	<input type="checkbox"/>	_____
	<input type="checkbox"/>	_____
New and promising growth areas	<input type="checkbox"/>	_____
	<input type="checkbox"/>	_____
Other, what? _____	<input type="checkbox"/>	_____

Have users of results, other than firms, participated in the planning or implementation of the project or have they contributed to the development of applications?

Yes

No

If yes, which users? _____

Previous European Collaboration

Have you participated in the following forms of European collaboration?

	Yourself	Other researchers in the department/unit
Previous EU Framework Programme	<input type="checkbox"/>	<input type="checkbox"/>
EUREKA	<input type="checkbox"/>	<input type="checkbox"/>
COST	<input type="checkbox"/>	<input type="checkbox"/>
Other European programme	<input type="checkbox"/>	<input type="checkbox"/>

If you have or your unit has participated in the second or third EU Framework Programme, a) has previous collaboration helped you (your unit) in respect of the following aspects?

Please tick the box if previous participation has helped

Research planning

Preparing a research proposal

- Choice of partners
- Reconciling own research interests with those of partners
- Actual collaboration with partners
- Achieving results
- Other, which? _____

b) how many of your partners in this project collaborated with you in an earlier EU project?

- Majority
- Some
- None

Collaboration with companies

Have you collaborated with companies before this EU project?

Please tick the relevant box if you have collaborated with companies

- In Finland
- In other European countries
- Outside Europe

For respondents who collaborate with companies in this project:

What prompted you to collaborate with companies?

Please tick the relevant box.

- Opportunity to participate in the commercialisation of research results
- Possibility to use sophisticated instruments
- Opportunity to learn from companies about the development of the field
- Company partners came along with the project, no special reason
- Other, what? _____

Are you satisfied with your collaboration with companies?

- Yes
- Somewhat
- No

Will you or your organisation benefit economically from the commercialisation of the results?

- Yes
- No
- Do not participate in commercialisation

Appendix 6

Tables for Figures in the Text

Fig. 1. Finnish participation in EU framework programmes

	Projects	Participations
2nd Framework Programme	77	91
3rd Framework Programme	427	538
4th Framework Programme	1850*	2637**

* Estimate.

** Final figure; source: National Technology Agency (Tekes)

Fig. 2. The Fourth Framework Programme: Distribution of participants in shared-cost projects by sector in Finland and the EU average

Distribution of Finnish participants			Distribution of participants in the EU*	
	N	%		%
Large Companies	278	19	Large Companies	19
SMEs	212	14	SMEs	17
Research Centres	448	30	Research Centres	25
Universities	374	25	Universities	30
Non-profit organisations	170	11	Non-profit organisations	9
Total	1482	100	Total	100

N=20674

* Source: Second European Report on S&T Indicators 1997.

Fig. 3. The extent to which organisations other than firms collaborated with firms

	REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%
In collaboration with firms	333	67	152	68	116	58	65	84
Not in collaboration with firms	161	32	69	31	82	41	10	13
Missing	6	1	2	1	2	1	2	3
Total	500	100	223	100	200	100	77	100

Fig. 4. Collaboration between companies and research centres or universities by programme line

	Projects with cross-sector collaboration		Nr of projects in the database	Company participations		Nr of all participations
	N	%	N	N	%	N
Information and Communications Technologies	111	67	166	108	45	242
Industrial Technologies	69	97	71	51	54	94
Environment	24	35	69	5	6	86
Life Sciences and Technologies	69	63	110	29	21	140
Energy	63	60	105	57	43	132
Transport	36	82	44	25	40	62
Targeted socio-economic research	3	16	19			19

Survey data

Fig. 5. Share of partners the respondent knew before the project

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Knew hardly any	118	15	46	17	25	15	21	19	72	14	33	15	20	10	19	25
Knew only few	134	17	51	19	31	19	20	18	83	17	38	17	30	15	15	19
Knew some	290	37	102	37	63	39	39	35	188	38	70	31	89	45	29	38
Knew most	219	28	70	25	40	25	30	27	149	30	79	35	58	29	12	16
Missing	14	2	6	2	3	2	3	3	8	2	3	1	3	2	2	3
Total	775	100	275	100	162	100	113	100	500	100	223	100	200	100	77	100

Fig. 6. Share of initiators and their role in project

	ALL		Coordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Initiator	179	23	83	78	93	14	3	12
Not initiator	575	74	23	22	536	83	16	62
Missing	21	3			14	2	7	27
Total	775	100	106	100	643	100	26	100

Fig. 7. Goals by sector: share of respondents who regarded one or several goals in the categories mentioned as important*

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	440	57	258	94	155	95	103	93	194	39	93	42	61	31	40	52
Knowledge-related	674	87	216	79	132	80	84	76	458	92	208	93	191	96	59	77
Resource-related	526	68	168	61	93	57	75	68	358	72	162	73	154	77	42	55
Networking	542	70	178	65	100	61	78	70	364	73	167	75	145	73	52	68
ALL	N=775		N=275		N=164		N=111		N=500		N=223		N=200		N=77	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Fig. 8. Goal profiles for firms

			BIG		SME	
			N	%	N	%
1: Business :Expanding business activities	New business activities		39	24	31	28
	Product diversification		60	37	53	48
	Expansion of markets		62	38	53	48
	Average			33		41
2: Business: Productivity	Increase of productivity		47	29	32	29
	New or substantially improved production processes		70	43	41	37
	Average			36		33
3: Business: Technology monitoring and transfer	Monitoring competitors		17	10	10	9
	Technology transfer		34	21	32	29
	Average			16		19
4: Business: Property rights protection	Patents		8	5	4	4
	Licenses		5	3	6	5
	Average			4		5

Fig. 8. Goal profiles for firms

		BIG		SME	
		N	%	N	%
5: Business: Output orientation	Software	36	22	36	32
	Prototypes	39	24	30	27
	Norms and standards	25	15	14	13
	Average		20		24
6: Knowledge: Scientific knowledge orientation	Monitoring scientific and technology development in the field	101	62	65	58
	Added visibility or prestige of own research group or organisation	58	36	60	53
	New or substantially improved research methods or equipment	62	38	41	36
	New scientific knowledge	61	38	34	30
	Average		44		44
7: Knowledge: Scientific output	Publications	20	12	12	11
	Post-graduate degrees	6	4	6	5
	Training of personnel	38	23	29	26
	Dissemination of research results	27	17	24	21
	Average		14		16
8: Networking: Collaboration orientation	European co-operation	70	43	66	58
	New contacts	86	53	69	61
	Preparing a research proposal	24	15	25	22
	Average		37		47
9: Resource orientation	Sharing risks and costs	52	32	27	24
	Research funding	62	38	62	55
	Joint use of equipment	12	7	13	12
	Average		26		30

Fig. 9. Goal profiles for non-firms

		REC		EDU		NPO	
		N	%	N	%	N	%
1: Networking: Collaboration orientation	Added visibility or prestige of own research group or organisation	132	59	120	60	29	38
	New contacts	134	60	116	58	40	52
	European co-operation	125	56	114	57	45	58
	Preparing a research proposal	65	29	58	29	11	14
	Dissemination of research results	93	42	92	46	25	32
	Average		49		50		39
2: Knowledge: Scientific outputs	Publications	56	25	108	54	9	12
	Post-graduate degrees	25	11	73	37	2	3
	New scientific knowledge	154	69	153	77	11	14
	Average		35		56		10
3: Business: Output orientation	Software	39	17	22	11	22	29
	Prototypes	45	20	26	13	23	30
	Average		19		12		29
4: Business: Commercialisation	Patents	9	4	16	8	2	3
	Taking part in the commercialisation of products	35	16	21	11	21	27
	Average		10		9,25		15
5: Resource orientation	Joint use of equipment	19	9	23	12	7	9
	Sharing risks and costs	29	13	18	9	16	21
	New or substantially improved research methods or equipment	107	48	91	46	30	39
	Average		23		22		23

Fig. 10. Societal relevance of the project goals by sector: share of respondents who regarded at least one of the societal goal items as important

	N	%	
ALL	656	85	N=775
BIG+SME	214	78	N=275
BIG	127	77	N=164
SME	87	78	N=111
REC+EDU+NPO	442	88	N=500
REC	193	87	N=223
EDU	178	89	N=200
NPO	71	92	N= 77

Fig. 11. Additionality

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
High additionality	388	50	127	46	70	43	57	51	261	52	119	53	104	52	38	49
Low additionality	372	48	141	51	90	55	51	46	231	46	100	45	94	47	37	48
Missing	15	2	7	3	4	2	3	3	8	2	4	2	2	1	2	3
Total	775	100	275	100	164	100	111	100	500	100	223	100	200	100	77	100

See Appendix Table 3.5 for information about the classification into high vs. low additionality.

Fig. 12. Strategic importance of EU project by sector

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Of strategic/ central importance	285	37	83	30	40	24	43	39	202	40	88	39	99	50	15	19
Of potential future importance / supports other research activities	403	52	141	51	92	56	49	44	262	52	118	53	94	47	50	65
Of marginal importance	73	9	43	16	28	17	15	14	30	6	15	7	6	3	9	12
Missing	14	2	8	3	4	2	4	4	6	1	2	1	1	1	3	4
Total	775	100	275	100	164	100	111	100	500	100	223	100	200	100	77	100

Fig. 13. Results achieved by sector

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	302	39	180	65	106	65	74	67	122	24	55	25	40	20	27	35
Knowledge-related	614	79	204	74	126	77	78	70	410	82	185	83	177	89	48	62
Resource-related	556	72	197	72	115	70	82	74	359	72	168	75	146	73	45	58
Networking	468	60	161	59	95	58	66	59	307	61	143	64	126	63	38	49
	N=775		N=275		N=164		N=111		N=500		N=223		N=200		N=77	

Types of achievements summarised in the above table are reported in more detail in Appendix. Tables 4.1a-4.1d

Fig. 14. Expected results by sector

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	448	58	211	77	132	80	79	71	237	47	99	44	94	47	44	57
Knowledge-related	484	62	138	50	86	52	52	47	346	69	145	65	157	79	44	57
Resource-related	247	32	79	29	46	28	33	30	168	34	75	34	65	33	28	36
Networking	111	14	34	12	20	12	14	13	77	15	34	15	26	13	17	22
	N=775		N=275		N=164		N=111		N=500		N=223		N=200		N=77	

Types of achievements summarised in the above table are reported in more detail in Appendix Tables 4.1a-4.1d

Fig. 15. Societal relevance by sector

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Goals	656	85	214	78	127	77	87	78	442	88	193	87	178	89	71	92
Achievements	506	65	163	59	90	55	73	66	343	69	156	70	141	71	46	60

Absolute values and percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

Fig. 16. Project success in Framework Programmes

	Second and Third Framework Programmes		Fourth Framework Programme	
	N	%	N	%
Successful	282	66	461	59
Partly successful	18	4	280	36
Not successful	49	12	20	3
Missing	76	18	14	2
	425	100	775	100

Fig. 17. Project success in the Fourth Framework Programme by sector

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Successful	461	59	150	55	92	56	58	52	311	62	144	65	134	67	33	43
Partly successful	280	36	111	40	67	41	44	40	169	34	71	32	61	31	37	48
Not successful	20	3	8	3	2	1	6	5	12	2	5	2	1	1	6	8
Missing	14	2	6	2	3	2	3	3	8	2	3	1	4	2	1	1
	775	100	275	100	164	100	111	100	500	100	223	100	200	100	77	100

Fig. 18. Research quality

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
The project is on the forefront of the research area internationally	280	36	84	31	54	33	30	27	196	39	89	40	93	47	14	18
The project is of average quality in international comparison	261	34	83	30	51	31	32	29	178	36	86	39	73	37	19	25
The research is of good quality but not very innovative	55	7	21	8	13	8	8	7	34	7	15	7	13	7	6	8
Subtotal	316	41	104	38	64	39	40	36	212	42	101	45	86	43	25	32
The project tests and elaborates previous discoveries	51	7	23	8	12	7	11	10	28	6	9	4	8	4	11	14
The project is oriented toward applications and therefore not very ambitious in terms of research questions	78	10	38	14	19	12	19	17	40	8	11	5	7	4	22	29
Subtotal	129	17	61	22	31	19	30	27	68	14	20	9	15	8	33	43
Missing	50	6	26	9	15	9	11	10	24	5	13	6	6	3	5	6
Total	775	100	275	100	164	100	111	100	500	100	223	100	200	100	77	100

Fig. 19. Project success by previous framework programme experience

	Previous participation (respondent or someone else in the unit)		No previous participation	
	N	%	N	%
Successful	240	61	221	58
Partly successful, partly not	143	36	137	36
Not successful	8	2	12	3
Missing	3	1	11	3
Total	394	100	381	100

Fig. 20. Influence on project of previous framework programme experience

	Previous participation (respondent or someone else in the unit)		No previous participation	
	N	%	N	%
Orientation of research	210	53	185	49
Choice of partners	108	27	89	23
Preparation and formulation of the application	186	47	138	36
Realisation of the project	231	59	199	52
Total	394	100	381	100

Fig. 21. Project success by acquaintance with partners

	Knew most		Knew some		Knew only few		Knew hardly any		Missing	
	N	%	N	%	N	%	N	%	N	%
Successful	167	76	179	62	58	43	53	45	4	29
Partly successful, partly not	47	21	100	34	71	53	59	50	3	21
Not successful	5	2	8	3	2	1	5	4		
Missing			3	1	3	2	1	1	7	50
Total	219	100	290	100	134	100	118	100	14	100

Fig. 22. Influence on project by acquaintance with partner

	Knew most		Knew some		Knew only few		Knew hardly any		Missing	
Orientation of research	166	76	147	51	41	31	39	33	2	14
Choice of partners	109	50	67	23	13	10	7	6	1	7
Preparation of application	144	66	120	41	36	27	22	19	2	14
Realisation of project	148	68	166	57	57	43	55	47	4	29
	N=219		N=290		N=134		N=118		N=14	

Fig. 23. Non-firm respondents: success by collaboration with firms

	REC			EDU			NPO		
	Successful			Successful			Successful		
	N	%		N	%		N	%	
Firms in the consortium	94	62	N=152	73	63	N=116	29	45	N=65
No firms in the consortium	50	72	N=69	61	74	N=82	4	40	N=10

Note: Only those who reported something of their partners are included in the category “No firms in the consortium”

Fig. 24. Project success and strategic importance

	Of strategic importance		Of potential future importance/ Supports other research activities		Of marginal importance		Missing	
	N	%	N	%	N	%	N	%
Successful	218	76	223	55	19	26	1	7
Partly successful, partly not	65	23	166	41	45	62	4	29
Not successful			11	3	8	11	1	7
Missing	2	1	3	1	1	1	8	57
Total	285	100	403	100	73	100	14	100

Fig. 25. Problems in collaboration*

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Divergent objectives with partner	541	70	197	72	119	73	78	70	344	69	160	72	123	62	61	79
Reliability of the partners in accomplishing the tasks	520	67	180	65	107	65	73	66	340	68	160	72	125	63	55	71
Cultural differences in communication and working methods	508	66	185	67	109	66	76	68	323	65	151	68	115	58	57	74
Partners' varying know-how and skills	446	58	167	61	101	62	66	59	279	56	133	60	100	50	46	60
Too ambitious objectives	436	56	162	59	100	61	62	56	274	55	119	53	103	52	52	68
Problems concerning administration and financial matters	426	55	160	58	94	57	66	59	266	53	111	50	99	50	56	73
Insufficient funding	423	55	136	49	74	45	62	56	287	57	122	55	117	59	48	62
Management skills of the coordinator	381	49	132	48	81	49	51	46	249	50	111	50	91	46	47	61
Change of partners' objectives	375	48	134	49	85	52	49	44	241	48	112	50	87	44	42	55
Reorganisations within participating organisations	324	42	145	53	88	54	57	51	179	36	88	39	59	30	32	42
Too large a consortium	319	41	117	43	72	44	45	41	202	40	90	40	75	38	37	48
Different technical solutions and standards	269	35	118	43	73	45	45	41	151	30	62	28	44	22	45	58
Intellectual property rights	251	32	95	35	59	36	36	32	156	31	71	32	57	29	28	36
Change of own objectives	246	32	104	38	64	39	40	36	142	28	59	26	52	26	31	40

* Matters that were regarded as problems at least to some degree: values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Fig. 26. Problems by success*

	Successful		Partly successful or not successful	
	N	%	N	%
Intellectual property rights	134	29	116	39
Reliability of the partners in accomplishing the tasks	279	61	238	79
Divergent objectives with partners	288	62	250	83
Change of partners' objectives	182	39	193	64
Change of own objectives	111	24	134	45
Reorganisations within participating organisations	171	37	152	51
Cultural differences in communication and working methods	271	59	234	78
Partners' varying know-how and skills	227	49	216	72
Problems concerning management and administration of financial matters	234	51	191	64
Management skills of the co-ordinator	169	37	212	71
Too large a consortium	163	35	154	51
Too ambitious objectives	212	46	222	74
Insufficient funding	237	51	184	61
Different technical solutions and standards	139	30	130	43
	N=461		N=300	

*Matters that were regarded as problems at least to some degree: values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Figures 27-29. Problems in consortia of non-firm respondents*

	REC				EDU				NPO			
	Firms in the consortium		No firms in the consortium		Firms in the consortium		No firms in the consortium		Firms in the consortium		No firms in the consortium	
	N	%	N	%	N	%	N	%	N	%	N	%
Intellectual property rights	53	35	18	25	36	31	21	25	23	35	5	42
Reliability of the partners in accomplishing the tasks	116	76	44	62	74	64	51	61	47	72	8	67
Divergent objectives with partners	118	78	42	59	74	64	49	58	50	77	11	92
Change of partners' objectives	82	54	30	42	58	50	29	35	34	52	8	67
Change of own objectives	45	30	14	20	33	28	19	23	24	37	7	58
Reorganisations within participating organisations	69	45	19	27	41	35	18	21	27	42	5	42
Cultural differences in communication and working methods	113	74	38	54	73	63	42	50	50	77	7	58
Partners' varying know-how and skills	98	64	35	49	63	54	37	44	41	63	5	42
Problems concerning management and administration of financial matters	75	49	36	51	55	47	44	52	48	74	8	67
Management skills of the coordinator	83	55	28	39	54	47	37	44	40	62	7	58
Too large a consortium	70	46	20	28	47	41	28	33	30	46	7	58
Too ambitious objectives	90	59	29	41	60	52	43	51	45	69	7	58
Insufficient funding	84	55	38	54	64	55	53	63	41	63	7	58
Different technical solutions and standards	46	30	16	23	32	28	12	14	38	58	7	58
	152	100	71	100	116	100	84	100	65	100	12	100

*Matters that were regarded as problems at least to some degree: values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Fig. 30. Companies in collaboration with other companies

	BIG+SME	
	N	%
Finnish client firm	68	25
Foreign client firm	85	31
Finnish direct competitor	19	7
Foreign direct competitor	59	21
Finnish indirect competitor	9	3
Foreign indirect competitor	94	34
Finnish subcontractor	45	16
Foreign subcontractor	38	14
With Finnish firm	109	40
With foreign firm	186	68
	N=275	

Fig. 31. Vertical versus horizontal collaboration relationships

	BIG+SME		BIG		SME	
	N	%	N	%	N	%
Horizontal	61	22	32	20	29	26
Vertical	81	29	46	28	35	32
Mixed	80	29	52	32	28	25
Other	46	17	30	18	16	14
Missing	7	3	4	2	3	3
Total	275	100	164	100	111	100

Fig. 32. Company network types by industry

	Information and communication technologies		Electrical machinery, electronics		Chemicals, chemical products		Energy		Metal		Services		Other branches*	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Horizontal	11	15	1	6	7	32	6	32	6	14	22	30	8	28
Vertical	23	32	7	39	4	18	2	11	17	40	19	26	9	31
Mixed	28	39	4	22	5	23	9	47	6	14	22	30	6	21
Other	8	11	5	28	6	27	1	5	13	30	7	10	6	21
Missing	1	1	1	6			1	5	1	2	3	4		
Total	71	100	18	100	22	100	19	100	43	100	73	100	29	100

*Forest, food, construction, and textiles, clothing, and footwear industries

Fig. 33. Company network types by programme line

	Information and Communications Technologies		Industrial Technologies		Environment		Life Sciences and Technologies		Energy		Transport	
	N	%	N	%	N	%	N	%	N	%	N	%
Horizontal	17	16	12	24	1	20	8	28	14	25	9	36
Vertical	34	31	18	35	0	0	6	21	19	33	4	16
Mixed	37	34	12	24	2	40	6	21	11	19	12	48
Other	16	15	9	18	2	40	9	31	10	18		
Missing	4	4							3	5		
Total	108	100	51	100	5	100	29	100	57	100	25	100

Fig. 34. Additionality by company network type

	Horizontal		Vertical		Mixed		Other		Missing	
	N	%	N	%	N	%	N	%	N	%
High	30	49	33	41	44	55	18	39	2	29
Low	29	48	48	59	36	45	26	57	2	29
Missing	2	3					2	4	3	43
Total	61	100	81	100	80	100	46	100	7	100

Fig. 35. Additionality by industry

	Information and communication technologies		Electrical machinery, electronics		Chemicals, chemical products		Energy		Metal		Services		Other branches*	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
High	22	31	6	33	8	36	12	63	20	47	42	58	17	59
Low	47	66	10	56	13	59	7	37	22	51	30	41	12	41
Missing	2	3	2	11	1	5			1	2	1	1		0
Total	71	100	18	100	22	100	19	100	43	100	73	100	29	100

*Forest, food, construction, and textiles, clothing, and footwear industries

Fig. 36. Strategic importance of project by type of company networks

	Horizontal		Vertical		Mixed		Other		Missing	
	N	%	N	%	N	%	N	%	N	%
Of central importance	18	30	27	33	29	36	8	17	1	14
Of potential future importance	26	43	45	56	38	48	30	65	2	29
Of marginal importance	15	25	9	11	12	15	6	13	1	14
Missing	2	3	0	0	1	1	2	4	3	43
Total	61	100	81	100	80	100	46	100	7	100

Fig. 37. Strategic value by industry

	Information and communication technologies		Electrical machinery, electronics		Chemicals, chemical products		Energy		Metal		Services		Other branches*	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Of central importance	18	25	4	22	8	36	4	21	11	26	35	48	3	10
Of potential future importance	35	49	10	56	14	64	13	68	25	58	29	40	15	52
Of marginal importance	15	21	2	11			2	11	6	14	8	11	10	34
Missing	3	4	2	11					1	2	1	1	1	3
Total	71	100	18	100	22	100	19	100	43	100	73	100	29	100

*Forest, food, construction, and textiles, clothing, and footwear industries

Fig. 38. Type of networking and success

	Horizontal		Vertical		Mixed		Other		Missing	
	N	%	N	%	N	%	N	%	N	%
Successful	34	56	42	52	45	56	27	59	2	29
Partly successful, partly not	25	41	33	41	34	43	17	37	2	29
Not successful	1	2	6	7	1	1				
Missing	1	2					2	4	3	43
Total	61	100	81	100	80	100	46	100	7	100

Fig. 39. Problems by company networks*

	ALL		Horizontal		Vertical		Mixed		Other		Missing	
	N	%	N	%	N	%	N	%	N	%	N	%
Intellectual property rights	95	35	20	33	29	36	32	40	14	30		
Reliability of the partners in accomplishing the tasks	180	65	42	69	50	62	62	78	24	52	2	29
Divergent objectives with partners	197	72	40	66	57	70	69	86	29	63	2	29
Change of partners' objectives	134	49	23	38	38	47	52	65	20	43	1	14
Change of own objectives	104	38	21	34	33	41	29	36	21	46		
Reorganisations within participating organisations	145	53	29	48	49	60	48	60	19	41		
Cultural differences in communication and working methods	185	67	44	72	57	70	55	69	28	61	1	14
Partners' varying know-how and skills	167	61	40	66	46	57	55	69	24	52	2	29
Problems concerning management and administration of financial matters	160	58	35	57	45	56	53	66	26	57	1	14
Management skills of the coordinator	132	48	31	51	39	48	39	49	21	46	2	29
Too large a consortium	117	43	27	44	31	38	43	54	16	35		
Too ambitious objectives	162	59	38	62	42	52	56	70	25	54	1	14
Insufficient funding	136	49	27	44	37	46	53	66	19	41		
Different technical solutions and standards	118	43	21	34	39	48	40	50	16	35	2	29
	N=275		N=61		N=81		N=80		N=46		N=7	

*Respondents that had given values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Fig. 40. Proportion of co-ordinators by sector

	N	%	
ALL	199	13	N=1482
BIG+SME	68	14	N=490
BIG	40	14	N=278
SME	28	13	N=212
REC+EDU+NPO	131	13	N=992
REC	70	16	N=448
EDU	45	12	N=374
NPO	16	9	N=170

Source: VTT-Tekes database on Finnish participants in the Fourth Framework Programme

Fig. 41. Co-ordination and project success

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Successful	461	59	78	74	371	58	12	46
Partly successful, partly not	280	36	26	25	248	39	6	23
Not successful	20	3	2	2	16	2	2	8
Missing	14	2			8	1	6	23
Total	775	100	106	100	643	100	26	100

Fig. 42. Influence on project*

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Realisation of the project	395	51	95	90	290	45	10	38
Orientation of research	197	25	83	78	111	17	3	12
Preparation and formulation of the application	324	42	93	88	227	35	4	15
Choice of partners	430	55	82	77	340	53	8	31
	N=775		N=106		N=643		N=26	

*Respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = very much, 1 = not at all.

Fig. 43. The respects in which project was successful

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Achieving technical and scientific objectives	381	49	71	67	301	47	9	35
Learning new technical and scientific knowledge and skills	475	61	69	65	393	61	13	50
Learning to work in an international project	466	60	69	65	386	60	11	42
Succeeded in developing commercial products	92	12	19	18	72	11	1	4
	N=775		N=106		N=643		N=26	

Fig. 44. The respects in which the project was less successful

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Objectives were unrealistic	110	14	7	7	102	16	1	4
Objectives or end products were not achieved	99	13	10	9	86	13	3	12
Participants' commitment was weak	141	18	27	25	110	17	4	15
There was no concrete cooperation	119	15	8	8	108	17	3	12
Some of the research problems were trivial	23	3	3	3	17	3	3	12
The quality of research was mediocre	71	9	6	6	61	9	4	15
	N=775		N=106		N=643		N=26	

Fig. 45. A lot* of problems by position in project

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Intellectual property rights	39	5	6	6	31	5	2	8
Reliability of the partners in accomplishing the tasks	136	18	25	24	107	17	4	15
Divergent objectives with partner	132	17	22	21	106	16	4	15
Change of partners' objectives	95	12	15	14	79	12	1	4
Change of own objectives	33	4	6	6	26	4	1	4
Reorganisations within participating organisations	99	13	22	21	73	11	4	15
Cultural differences in communication and working methods	94	12	11	10	81	13	2	8
Partners' varying know-how and skills	88	11	14	13	73	11	1	4
Problems concerning administration and financial matters	113	15	16	15	92	14	5	19
Management skills of the coordinator	107	14	4	4	99	15	4	15
Too large a consortium	86	11	9	8	76	12	1	4
Too ambitious objectives	114	15	12	11	102	16		
Insufficient funding	90	12	15	14	73	11	2	8
Different technical solutions and standards	44	6	9	8	32	5	3	12
	N=775		N=106		N=643		N=26	

*Respondents that had given values 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Fig. 46. Problems at least to some extent* by position in project

	ALL		Co-ordinator		Other		Missing	
	N	%	N	%	N	%	N	%
Intellectual property rights	251	32	28	26	218	34	5	19
Reliability of the partners in accomplishing the tasks	520	67	84	79	424	66	12	46
Divergent objectives with partner	541	70	76	72	449	70	16	62
Change of partners' objectives	375	48	58	55	310	48	7	27
Change of own objectives	246	32	27	25	212	33	7	27
Reorganisations within participating organisations	324	42	59	56	259	40	6	23
Cultural differences in communication and working methods	508	66	71	67	426	66	11	42
Partners' varying know-how and skills	446	58	56	53	380	59	10	38
Problems concerning administration and financial matters	426	55	57	54	357	56	12	46
Management skills of the coordinator	381	49	33	31	342	53	6	23
Too large a consortium	319	41	36	34	275	43	8	31
Too ambitious objectives	436	56	52	49	377	59	7	27
Insufficient funding	423	55	62	58	354	55	7	27
Different technical solutions and standards	269	35	35	33	226	35	8	31
	N=775		N=106		N=643		N=26	

*Respondents that had given values 2, 3, 4, 5 or ticked. The scale 5-1: 5 = a lot of problems, 1 = no problems at all.

Fig. 47. Participations by non-profit organisations in the survey data

	N	%
Authorities	11	14
Municipalities and local federations	30	39
Hospital districts	3	4
Educational establishments	5	6
Federations, associations and foundations	17	22
Ministries	6	8
Miscellaneous	5	6
Total	77	100

Tables for Figures in the Appendix 4

Fig. 1. Previous participation in framework programmes

	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Previous participation (respondent or someone else in the unit)	394	51	104	38	64	39	40	36	290	58	158	71	103	52	29	38
No previous participation	381	49	171	62	100	61	71	64	210	42	65	29	97	49	48	62
Total	775	100	275	100	164	100	111	100	500	100	223	100	200	100	77	100

Fig. 2a. Companies: goals* by previous collaboration

	Previous participation (respondent or someone else in the unit)		No previous participation	
	N	%	N	%
Business-oriented	98	94	160	94
Knowledge-related	81	78	135	79
Resource-related	60	58	108	63
Networking	75	72	103	60
Societal relevance	86	83	128	75
	N=104		N=171	

*Respondents who had given one or several goals in the category value 4 or 5 (using scale 5-1: 5 = very important, 1 = of no importance) or ticked.

Fig. 2 b. Companies: business-oriented goals by previous collaboration

	Previous participation (respondent or someone else in the unit)		No previous participation	
	N	%	N	%
Qualitative improvements in products	43	41	76	44
Product diversification	45	43	68	40
Increase of productivity	26	25	53	31
New or substantially improved production processes	33	32	78	46
Expansion of markets	53	51	62	36
New business activities	34	33	36	21
Monitoring competitors	15	14	12	7
Technology transfer	29	28	37	22
Prototypes	30	29	39	23
Programmes	28	27	44	26
Norms and standards	18	17	21	12
Patents	4	4	8	5
Licenses	4	4	7	4
	N=104		N=171	

Absolute values and percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked.
The scale 5-1: 5 = very important, 1 = of no importance.

Fig. 2 c. Non-firm participants: business-oriented goals by previous collaboration

	Previous participation (respondent or someone else in the unit)		No previous participation	
	N	%	N	%
Taking part in the commercialisation of products	43	15	34	16
Prototypes	63	22	31	15
Software	51	18	32	15
Norms and standards	32	11	19	9
Patents	15	5	12	6
Licenses	8	3	4	2
	N=290		N=210	

Absolute values and percentage shares have been calculated taking into account the respondents that had given values 4, 5 or ticked.
The scale 5-1: 5 = very important, 1 = of no importance.

Fig. 3a. Achieved results: respondents who regarded business-oriented goals as important*

Achieved results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	257	57	173	67	103	66	70	68	84	43	40	43	23	38	21	53
Knowledge-related	359	79	196	76	122	79	74	72	163	84	81	87	55	90	27	68
Resource-related	336	74	189	73	111	72	78	76	147	76	73	78	47	77	27	68
Networking	278	62	156	60	93	60	63	61	122	63	64	69	40	66	18	45
	N=452		N=258		N=155		N=103		N=194		N=93		N=61		N=40	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who had achieved one or several results belonging to the category.

3b. Achieved results: respondents who regarded knowledge-related goals as important*

Achieved results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	263	39	147	68	89	67	58	69	116	25	51	25	40	21	25	42
Knowledge-related	560	83	171	79	107	81	64	76	389	85	176	85	172	90	41	69
Resource-related	509	76	164	76	98	74	66	79	345	75	161	77	143	75	41	69
Networking	423	63	132	61	79	60	53	63	291	64	137	66	121	63	33	56
	N=674		N=216		N=132		N=84		N=458		N=208		N=191		N=59	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who had achieved one or several results belonging to the category.

Fig. 3c. Achieved results: respondents who regarded resource-related goals as important*

Achieved results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	208	40	117	70	64	69	53	71	91	25	39	24	34	22	18	43
Knowledge-related	441	84	132	79	75	81	57	76	309	86	138	85	142	92	29	69
Resource-related	434	83	142	85	81	87	61	81	292	82	135	83	125	81	32	76
Networking	342	65	106	63	59	63	47	63	236	66	110	68	104	68	22	52
	N=526		N=168		N=93		N=75		N=358		N=162		N=154		N=42	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who had achieved one or several results belonging to the category.

Fig. 3d. Achieved results: respondents who regarded goals related to networking as important*

Achieved results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	215	40	119	67	67	67	52	67	96	26	44	26	34	23	18	35
Knowledge-related	455	84	139	78	81	81	58	74	316	87	147	88	131	90	38	73
Resource-related	413	76	132	74	73	73	59	76	281	77	133	80	114	79	34	65
Networking	376	69	129	72	76	76	53	68	247	68	119	71	99	68	29	56
	N=542		N=178		N=100		N=78		N=364		N=167		N=145		N=52	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who had achieved one or several results belonging to the category.

Fig. 4a. Expected results: respondents who regarded business-oriented goals as important*

Expected results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	345	76	206	80	130	84	76	74	139	72	60	65	49	80	30	75
Knowledge-related	265	59	133	52	82	53	51	50	132	68	59	63	47	77	26	65
Resource-related	150	33	76	29	44	28	32	31	74	38	32	34	21	34	21	53
Networking	63	14	34	13	20	13	14	14	29	15	9	10	7	11	13	33
	N=452		N=258		N=155		N=103		N=194		N=93		N=61		N=40	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who expected one or several results belonging to the category.

Fig. 4b. Expected results: respondents who regarded knowledge-related goals as important*

Expected results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	395	59	172	80	108	82	64	76	223	49	95	46	92	48	36	61
Knowledge-related	440	65	116	54	72	55	44	52	324	71	137	66	152	80	35	59
Resource-related	225	33	66	31	38	29	28	33	159	35	73	35	63	33	23	39
Networking	102	15	30	14	18	14	12	14	72	16	32	15	25	13	15	25
	N=674		N=216		N=132		N=84		N=458		N=208		N=191		N=59	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who expected one or several results belonging to the category.

Fig. 4c. Expected results: respondents who regarded resource-related goals as important*

Expected results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	307	58	134	80	75	81	59	79	173	48	76	47	73	47	24	57
Knowledge-related	344	65	87	52	50	54	37	49	257	72	114	70	120	78	23	55
Resource-related	185	35	52	31	28	30	24	32	133	37	62	38	53	34	18	43
Networking	74	14	22	13	13	14	9	12	52	15	25	15	17	11	10	24
	N=526		N=168		N=93		N=75		N=358		N=162		N=154		N=42	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who expected one or several results belonging to the category.

Fig. 4d. Expected results: respondents who regarded goals related to networking as important*

Expected results**	ALL		BIG+SME		BIG		SME		REC+EDU+NPO		REC		EDU		NPO	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business-oriented	330	61	149	84	88	88	61	78	181	50	76	46	70	48	35	67
Knowledge-related	363	67	102	57	62	62	40	51	261	72	111	66	119	82	31	60
Resource-related	195	36	60	34	35	35	25	32	135	37	62	37	50	34	23	44
Networking	85	16	23	13	13	13	10	13	62	17	28	17	21	14	13	25
	N=542		N=178		N=100		N=78		N=364		N=167		N=145		N=52	

*Values 4, 5 or ticked. The scale 5-1: 5 = very important, 1 = of no importance.

**Respondents who expected one or several results belonging to the category.