



EUROQUALITY

Final report

Assessment of the impact of the actions completed under the 3rd and 4th Community Framework Programmes for Research; survey for the Five-year Assessment of Community research activities (1999-2003)

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EXECUTIVE SUMMARY

The study “*Assessment of the impact of the actions completed under the 3rd and 4th Community Framework Programmes for Research; survey for the five-year assessment of Community research activities (1999-2003)*” was undertaken by a consortium of three companies, Decisia, HLP Developpement, Euroquality. It was commissioned by Directorate General Research (contract n°EVA5-CT-2002-00002) to be used as an input to the Five-year Assessment (1999-2003) of Framework Programme Research.

The study was implemented during 2003 using an Internet-based questionnaire survey of participants in the 3rd and 4th Framework Programmes (FP). In total around 2200 participants responded to the survey, covering many different types of organisation including large firms, SMEs, contract research organisations, universities and non-profit research organisations. The research projects and activities covered by the survey started during the period 1990 to 1998 and in general can be characterised as transnational strategic research or technological development. Nearly 80% of all the survey respondents had participated in previous Framework Programmes.

MAIN CONCLUSIONS

Perhaps the most obvious and important conclusion is that the participants responding to the survey are nearly unanimous (91%) in their belief that they have achieved their objectives.

1. In terms of strengthening the scientific and technological bases of Europe, the assessment has revealed a remarkably high level of success. 93% of respondents noted they had achieved their scientific and technological goals. More generally, more than three quarters of respondents indicated a ‘very positive’ or ‘positive’ scientific and technological impact. 84% of respondents indicated that they had improved or developed tools and techniques as a result of their work.

In the same direction the results of the survey appear to indicate that one of the main strengths of Community research activity is linked to the quality of the projects themselves and the performance of the research teams.

2. Within the context of European added-value, the evidence underlines very clearly how Framework funding plays an important role in leveraging new research activities, supporting existing research networks and also acting as a catalyst for the development of new ones. 49% of respondents to the survey recorded that at the end of the activity they would be supporting their research with their own resources and 43% with other funding. 23% of respondents noted that new researchers had been employed as a result of the research activity, and in two thirds of these cases there had been new collaborative ventures with other research partners.

A large number of respondents (77%) estimated that their network-oriented goals had been achieved. Moreover, many of the unanticipated benefits of research activities seem to be linked to the networking dimension (collaboration with international teams, visibility and international image...).

3. The data shows that 46% of respondents believed that they had a 'positive' or 'very positive' socio-economic impact. Set against this, for around half of the respondents there was no clear result, indicated by the fact that the activity was seen to have a neutral socio-economic impact. It should be kept in mind not only that socio-economic impact represents a very broad and to some extent intangible concept for the respondent, but also that for many participants, the primary aim was indeed the research activity itself.

In overall terms, when asked about the balance between costs and benefits for the organisation as a result of participation in the research activity, 30% of respondents indicated there had been significant benefits and 32% reported there having been "small" benefits. Only around 6% of respondents reported that the costs had exceeded benefits, of which 1.7% indicated "significant losses".

4. As regards dissemination and transfer of knowledge - including training -, 72% of respondents considered the impact as 'positive' or 'very positive'. As would be expected and reflecting the strong position on scientific and technological achievements, 'publications' and 'presentations' were cited as the most important forms of dissemination for project results, these being used by almost 90% of respondent organisations. For respondents from FP4 the internet was also seen as an important mechanism, being cited by 49% respondent organisations.

The impact of projects on human resources in a general sense was underlined by many of the comments made under the open questions; in particular, reference was made to the development and improvements to careers or training and increased ability to work in different cultural contexts. More precisely, at least one third of the respondents (34%) expressed the view that their organisation's participation had led to an increased number of research staff. While it appears that training was not at first considered as a primary focus by respondents, at the end of the project it was however considered as one of the important results of the research (by 76% of the respondents).

5. The assessment has examined the different types of users benefiting from Community research activities. The results show that as well as supporting directly the different classes of enterprises, including the manufacturing and services sectors, the research is well integrated within Europe's research and innovation systems. Indeed, the largest single group of users of Community research was noted as "Scientific community/Researchers" (81%). Manufacturing industries were cited as users of the research by nearly half of the respondents and services by around one third of them.

6. Finally, on the question of what were the future expectations of impacts over the next ten years, respondents listed first 'improved international cooperation' followed by 'enhancement of career development of researchers' and 'improvement of the competitiveness of European industry'.

7. In terms of evaluation process, the assessment highlighted the difficulty of mounting a comprehensive questionnaire-based survey simultaneously across all the areas of the Framework programmes. In part, this is due to weaknesses in the continuous updating of the database of information on participants, especially those from projects completed some time ago. More than this, there remains a very practical problem in constructing a single survey instrument which can satisfactorily address all of the many different features of FP activities, and different stages of implementation and exploitation and still provide an aggregated assessment of impact. It seems that a continuous and user-oriented culture of evaluation still has to be developed further within the Commission as well as among the research community.

SYNTHÈSE

L'étude "Assessment of the impact of the actions completed under the 3rd and 4th Community Framework Programmes for Research; survey for the five-year assessment of Community research activities (1999-2003)" a été menée par un consortium composé de trois entreprises, Decisia, HLP Développement et Euroquality. Elle a été réalisée pour le compte de la Direction Générale de la Recherche (contrat n° EVA5-CT-2002-00002) afin de servir de base d'information pour l'évaluation quinquennale (1999-2003) du Programme Cadre de Recherche.

L'étude a été effectuée au cours de l'année 2003. Une enquête utilisant un questionnaire Internet a été menée avec comme cible les participants aux 3^{ème} et 4^{ème} Programmes Cadres (PC). Au total, environ 2200 participants ont répondu au questionnaire, représentant de nombreux types d'organisations (grandes entreprises, PME, centres de recherche privés, universités et associations de recherche à but non lucratif). Les activités et projets de recherche couverts par l'enquête ont débuté entre 1990 et 1998 et peuvent de manière générale être caractérisés comme des actions de recherche et développement stratégiques et transnationales. Près de 80% des répondants avaient participé à un programme-cadre précédent.

CONCLUSIONS PRINCIPALES

La conclusion la plus évidente et sans doute la plus importante est que les participants à l'enquête sont presque unanimes (91%) dans leur conviction d'avoir atteint leurs objectifs.

1. En termes de renforcement des bases scientifiques et techniques de l'Europe, l'évaluation a révélé un niveau particulièrement élevé de succès. En effet, 93% des répondants ont déclaré avoir atteint leurs buts scientifiques et technologiques. Plus généralement, plus de trois quarts des répondants ont indiqué qu'un impact scientifique et technologique « positif » ou « très positif » avait découlé de leurs activités. 84% des répondants ont affirmé que les résultats de leur travail étaient l'amélioration ou le développement d'outils et de techniques.

Dans la même ligne, les résultats de l'enquête montrent qu'un des points forts des activités de recherche communautaire est la qualité des projets eux-mêmes et la compétence des équipes de recherche.

2. Dans le contexte de la valeur ajoutée européenne, il apparaît très clairement que le financement du programme-cadre joue un rôle de levier important en faveur de nouvelles activités de recherche, constituant un support pour les réseaux de recherche existants et agissant comme catalyseur pour le développement de nouveaux réseaux. 49% des répondants à l'enquête mentionnent qu'à la fin de leur projet ils le poursuivront avec leurs propres ressources et 43% avec un autre financement. 23% des répondants indiquent que de nouveaux chercheurs ont été

engagés suite à leur activité de recherche impliquant pour deux tiers des ces cas de nouvelles collaborations avec d'autres partenaires de recherche.

Un grand nombre de personnes interrogées (77%) ont estimé que leurs buts ont été atteints en termes de mise en réseau. D'ailleurs, une bonne part des bénéfices inattendus des activités de recherche semblent être liés à la dimension de « mise en réseau » (collaboration avec des équipes internationales, visibilité et image internationale...).

3. Les données montrent que 46% des répondants pensent que leurs activités ont eu un impact socio-économique « positif » ou « très positif ». Face à cela, la moitié des personnes interrogées n'ont pas vu d'impact socio-économique clair. Il doit être gardé à l'esprit que non seulement l'impact socio-économique est un concept très large, et intangible dans une certaine mesure, mais aussi que pour de nombreux participants, le but principal était l'activité de recherche elle-même.

Globalement, lorsqu'ils ont été interrogés sur le rapport coûts/bénéfices de la participation à l'activité de recherche pour leur organisation, 30% des personnes ont répondu que les bénéfices avaient été « significatifs » et 32% ont répondu que les bénéfices ont été « faibles ». Seulement 6% ont estimé que les coûts avaient dépassé les bénéfices, parmi lesquels 1,7% font état de « pertes significatives ».

4. En ce qui concerne la dissémination et le transfert des connaissances (y compris la formation), 72% des personnes ont considéré l'impact comme étant « positif » ou « très positif ». Sans surprise et reflétant la perception très positive des retombées scientifiques et technologiques, les publications et les présentations, réalisées par près de 90% des organisations, ont été citées comme étant les formes de dissémination des résultats du projet les plus importantes. Pour les acteurs ayant mené un projet sous le 4^{ème} PC, l'Internet a été vu comme un mécanisme important et cité par 49% des organisations interrogées.

L'impact des projets sur les ressources humaines en général a été souligné dans de nombreuses réponses aux questions ouvertes. En particulier, des références ont été faites quant à l'amélioration du développement des carrières et de la formation ainsi qu'à l'accroissement des capacités du travail dans différents contextes culturels. Plus précisément, plus d'un tiers des répondants (34%) ont déclaré que la participation de leur organisation avait mené à un accroissement des effectifs de recherche. Même lorsque la formation n'a pas été ciblée dès l'abord comme un point essentiel, elle est cependant considérée comme un résultat important à la fin du projet (76% de l'ensemble des répondants).

5. L'évaluation a examiné les différents types d'utilisateurs bénéficiant des activités de recherche communautaire. Les résultats montrent que la recherche apporte un soutien direct aux différents types d'entreprises, incluant les secteurs de la fabrication et des services, et qu'elle est bien intégrée dans le système d'innovation et de recherche européen. En effet, le groupe de bénéficiaires des activités de recherche le plus souvent cité (à 81%) a été : « chercheurs / communauté de la recherche ». L'industrie manufacturière a été citée par près de la moitié des interrogés, et le secteur des services par près d'un tiers d'entre eux.

6. Finalement, en ce qui concerne les impacts attendus sur les dix prochaines années, les répondants ont mis l'accent d'abord sur l'« amélioration de la coopération internationale », puis « l'amélioration du développement des carrières des chercheurs » et « l'amélioration de la compétitivité de l'industrie européenne ».

7. En termes de processus d'évaluation, l'étude a mis en évidence la difficulté de mettre en œuvre une enquête basée sur un questionnaire visant simultanément tous les domaines des programmes-cadres. Ceci est dû en partie à la faiblesse de la mise à jour continue des données des participants, surtout ceux dont les projets sont terminés depuis longtemps. Au-delà de cet aspect, des problèmes pratiques subsistent lorsqu'il s'agit de construire un instrument d'étude permettant de réaliser une évaluation d'impact agrégée qui tienne à la fois compte de toutes les caractéristiques des activités des programmes-cadres et des différents degrés de mise en œuvre et d'exploitation de ces activités. Une culture de l'évaluation menée de manière continue et en partenariat avec les utilisateurs devrait être davantage développée, tant au sein de la Commission que du côté de la communauté de recherche.

ZUSAMMENFASSUNG

Die Umfrage zur *“Bewertung der Auswirkungen der abgeschlossenen Maßnahmen der 3. und 4. Forschungsrahmenprogramme der Gemeinschaft – Umfrage im Hinblick auf die Fünfjahresbewertung der gemeinschaftlichen Forschungstätigkeit (1999–2003)”* wurde von einem Konsortium bestehend aus 3 Firmen, Decisia, HLP Développement und Euroquality. Sie wurde im Auftrag der Generaldirektion für Forschung (Vertrag Nr.: EVA5-CT-2002-00002) als Grundlage für die Fünfjahresbewertung (1999-2003) des Forschungsrahmenprogramms durchgeführt.

Die Meinungsumfrage wurde im Laufe des Jahres 2003 übers Internet durchgeführt. Die Zielgruppe, Teilnehmer der dritten und vierten Rahmenprogramme, bestand aus mittleren und großen Unternehmen, gemeinnützigen und privaten Forschungszentren und Universitäten. Insgesamt haben zirka 2200 Personen an der Umfrage teilgenommen und den Fragebogen übers Internet ausgefüllt. Die Forschungsprojekte und –aktivitäten, die von dieser Umfrage abgedeckt werden, begannen in der Zeit zwischen 1990 und 1998 und können als transnationale strategische Forschung oder technologische Entwicklung angesehen werden. Fast 80% der befragten Teilnehmer hatten schon an vorherigen Rahmenprogrammen teilgenommen.

WESENTLICHE SCHLUSSFOLGERUNGEN

Vermutlich die augenfälligste, aber ohne Zweifel die wichtigste Schlussfolgerung ist, dass die Teilnehmer der Umfrage nahezu einstimmig (zu 91 %) angaben, ihre Ziele erreicht zu haben.

1. Was die Konsolidierung der wissenschaftlichen und technischen Grundlage Europas angeht, ergibt sich aus dieser Evaluation ein äußerst hohes Erfolgsniveau, denn 93 % der Befragten gaben an, ihr Ziel im wissenschaftlichen und technologischen Bereich erreicht zu haben. Im Allgemeinen konnten drei Viertel der Befragten nach Projektschluss einen „positiven“ oder sogar „sehr positiven Einfluss“ im wissenschaftlichen Bereich erkennen. 84 % der Befragten bestätigen außerdem Verbesserungen oder die Entwicklung von Hilfsmitteln und Techniken als Ergebnis ihrer Arbeit erzielt zu haben.

In dieselbe Richtung gehend scheinen die Ergebnisse der Umfrage darauf hinzuweisen, dass eine der Hauptstärken der gemeinschaftlichen Forschungsaktivitäten mit der Qualität der Projekte selbst und der Kompetenz der Forschungsteams zusammenhängt.

2. Im Zusammenhang mit dem europäischen Mehrwert zeigen die Umfrageergebnisse sehr klar, dass die Rahmenprogrammförderung eine wichtige Rolle spielt, wenn es darum geht, Forschungsaktivitäten in Schwung zu bringen, vorhandene Forschungsnetzwerke zu unterstützen und die Entwicklung neuer Netzwerke zu stimulieren. 49 % der Befragten gaben an, dass sie am Ende des Projektes ihre Forschung mittels eigener Ressourcen weiterführen würden, 43 % mit Hilfe anderer Förderung. 23 % der Befragten vermerkten, dass neue Forscher als Folge der Forschungstätigkeit beschäftigt wurden und in zwei Dritteln dieser Fälle hatten sich neue gemeinschaftliche Unternehmungen mit anderen Forschungspartnern ergeben.

Ein großer Teil der Befragten (77 %) meint, ihre Ziele im Hinblick einer Vernetzung erreicht zu haben. Darüber hinaus scheint ein großer Teil der Verdienste im Bereich der Forschung unerwarteterweise auf die Vernetzung zurückführen zu sein (Zusammenarbeit mit internationalen Teams, internationale Transparenz und Image...).

3. 46 % der Befragten finden, dass ihre Aktivitäten „positive“ oder „sehr positive“ sozioökonomische Auswirkungen gezeigt haben. Demgegenüber hat die andere Hälfte der Befragten keinen klaren Einfluss im sozioökonomischen Bereich feststellen können. Es gilt dabei nicht nur die Tatsache zu berücksichtigen, dass das Konzept der sozioökonomischen Auswirkungen sehr umfangreich und in gewisser Weise schwer greifbar für den Befragten ist und vor allem dass für die meisten Teilnehmer das Ziel in der Forschung selbst liegt.

Nach dem Kosten-Nutzen Verhältnis für die Organisation in Zusammenhang mit einer Teilnahme an einer Forschungstätigkeit befragt gaben 30 % der Befragten an, einen beachtlichen Gewinn erzielt zu haben, wogegen 32 % auf einen „geringen“ Gewinn verwiesen haben. Beachtenswert ist, dass 6% des Befragten angaben, dass die Kosten den Gewinn überschritten haben und 1.7 % davon bestätigen einen „bedeutenden Verlust“ erlitten zu haben.

4. Was den Wissenstransfer – inklusive Training - angeht, haben 72 % der Befragten die Auswirkungen als „positiv“ oder „sehr positiv“ empfunden. Wie erwartet und die starke Position der wissenschaftlichen und technologischen Errungenschaften widerspiegelnd, sehen 90 % der Befragten Publikationen und Präsentationen als die wichtigsten Formen der Verbreitung von Projektergebnissen an. Für 49 % der befragten Teilnehmer des vierten Rahmenprogramms, hat sich das Internet als grundlegendes Werkzeug erwiesen.

Die Auswirkungen der Projekte auf die Personalressourcen im allgemeinen Sinn wurden mehrere Male in den Antworten auf die offenen Fragen betont, speziell wurden dabei der Fortschritt was die Karriereentwicklung und Ausbildung angeht und die Ausweitung der Kapazitäten in verschiedenen kulturellen Zusammenhängen zu arbeiten, genannt. Genauer gesagt, mindestens ein Drittel der Befragten (34 %) hat bestätigt, dass die Teilnahme ihrer Organisation zu einer höheren Anzahl von Beschäftigten im Forschungsbereich geführt hat und dass der Weiterbildung ursprünglich weniger Aufmerksamkeit geschenkt wurde, aber dass sie am Ende des Projekts als sehr wichtig anerkannt wurde.

5. Die Evaluation war darauf ausgerichtet die verschiedenen Arten der Endnutzer, die von den gemeinschaftlichen Forschungsaktivitäten profitieren, zu ermitteln. Die Ergebnisse zeigen, dass die Forschung, die verschiedene Arten von Unternehmen (inklusive Produktions- und Sektoren) unterstützt, gut in den europäischen Forschungs- und Innovationssystemen integriert ist. Tatsächlich wurde die Gruppe der „wissenschaftlichen Gemeinschaft/Forscher“ als größte individuelle Gruppe (mit 81 %) der Nutzer an der gemeinschaftlichen Forschung genannt. Der Produktionssektor wurde von fast der Hälfte der Befragten, der Sektoren von rund einem Drittel der Befragten als Nutzer an der Forschung genannt.

6. Abschließend, zur Frage der Erwartungen bezüglich der Zukunft (im Hinblick auf die kommenden 10 Jahre) wurden Verbesserungen in den Bereichen der internationalen Zusammenarbeit, gefolgt von Verbesserungen im Bereich der Karriereentwicklung für Forscher und der Wettbewerbsfähigkeit der europäischen Industrie genannt.

7. Im Zusammenhang mit dem Prozess der Bewertung zeigen die Ergebnisse dieser Umfrage wie schwierig es ist, einen Fragebogen zu erstellen, der alle Bereiche der Rahmenprogramme umfasst. Das rührt von einer gewissen Schwäche der „Instandhaltung“ der Datenbankeinträge über die Teilnehmer her, speziell jener, die ihre Projekte schon vor einiger Zeit beendet haben. Weiters verbleibt das sehr praktische Problem der Erstellung eines einzelnen Umfrageinstruments, das die Gesamtheit der vielen verschiedenen Merkmale der Rahmenprogrammaktivitäten und die verschiedenen Stufen bei der Durchführung und Nutzung befriedigend anspricht und gleichzeitig eine zusammenfassende Bewertung der Auswirkungen zulässt. Es erscheint, dass innerhalb der Kommission sowie auch innerhalb der Forschungsgemeinschaft eine fortlaufende und benutzerorientierte Bewertungskultur noch weiter entwickelt werden muss.

1 INTRODUCTION

Community Research Framework programmes (FP) have been running for more than twenty years. They have been drawn up in line with society and citizens' concerns and have evolved to reflect overall Community policy options. With the development of the internal market in the background, for FP3 (1990-1994), and the Maastricht Treaty or the White paper on Growth Competitiveness and Employment, for FP4 (1994-1998), emphasis has been put on the role of Community research programmes as incentives to maintain and reinforce the position of European Union research in the world, with a deeper involvement in international aspects, coverage of societal issues and wider contribution to other EU policies for FP4.

Successful research activities are essential in maintaining the competitiveness of European industry as well as benefiting European citizens and improving their quality of life, health, environment and employment. Community programmes for research and technological development (RTD) can confirm the importance of coherent investments in science and technology. There is a clear need to make sure funds allocated under the programmes are spent in the most cost-efficient way. Moreover, knowledge and experience gained from the projects should be shared by current and future participants, and should inform the decision-making process on the future of European research policy.

This report reviews the scientific and technological impact of projects and programmes, the impact in terms of transfer of knowledge (including training) and the socio-economic impact of research actions completed under the 3rd and 4th Community Framework programmes for Research. The whole survey is supported by factual data and figures.

The analysis highlights the relationship between the impact of the actions and the objectives, as well as the methods of implementation defined within FP3 and FP4. Relevance, efficiency, usefulness, sustainability and appropriateness of the actions are particularly examined.

As specified in the terms of reference, this assessment is intended to provide information to help the external expert panel of the Five-year Assessment (1999-2003) and, more widely, policy makers to answer the following questions:

- *Were the objectives (scientific and technological, transfer of knowledge -including training- and socio-economic) of the framework programmes achieved?*
- *Were the means and procedures for implementation suited to the objectives?*
- *Was the level of funding appropriate?*
- *What impacts have Community research activities had and is this impact sustainable?*
- *What needs did the results and effects fulfil?*

1.1 EU-funded research under FP3 and FP4

Framework programmes have been one of the major instruments for supporting research activities at Community level, with the first Framework programme running from 1984 to 1987. FP3 ran from 1990 to 1994 and FP4 from 1994 to 1998. Over the course of successive framework programmes, both the scale of activity and the scope of activities covered have changed significantly. First of all, between FP3 and FP4 there was a major jump in the level of funding; FP3 had a budget of 6.6 billion and FP 4 had a budget of 13.12 billion. Second, FP4 saw a major expansion in the type of research activities supported and amongst other things, this included the introduction of support to socio-economic research. At a more general level still, the full range of framework programmes including the current FP6 has seen a shift in relative weight away from such areas as energy research and to some extent research on communication and IT, towards areas such as life sciences and environment. Throughout all the framework programmes, including FP3 and FP4, the majority of research spending has been distributed through transnational co-funded research activities involving both private and public sector research partners, and various schemes for training and mobility.

Table: Framework Programme 3	
Specific Programmes and research areas	Community Funding
Information and communications technologies:	2490,84
. Information technologies	1516,68
. Communications technologies	548,46
. Development of telematic systems of general interest	425,70
Industrial and materials technologies:	996,93
. Industrial and materials technologies	839,52
. Measurement and testing	157,41
Environment:	581,17
. Environment	464,35
. Marine sciences and technologies	116,82
Life sciences and technologies:	831,60
. Biotechnology	184,14
. Agriculture and agro-industrial research, including fisheries	373,23
. Biomedical and health research	149,49
. Life sciences and technologies for developing countries	124,74
Energy:	1052,37
. Non-nuclear energies	259,38
. Nuclear fission safety	230,67
. Controlled nuclear fusion	562,32
Human capital and mobility	581,13
Dissemination and exploitation of knowledge resulting from the specific programmes	66,00
TOTAL	6 600

Annual report 1995: COM (1995) 443 final, 28 September 1995

Table: Framework Programme 4	
Specific Programmes and research areas	Community Funding
Information and Communications Technologies	3668
. Telematics Applications	913
. Advanced Communications Technologies and Services (ACTS)	671
. Information Technologies (ESPRIT)	2084
Industrial Technologies	2140
. Industrial and Materials Technologies (BRITE/EURAM)	1833
. Standards, Measurements and Testing (SMT)	307
Environment	1157
. Environment and Climate	839,52
. Marine Sciences and Technologies (MAST III)	157,41
Life Sciences and Technologies	1709
Biotechnology (BIOTECH 2)	595,5
Biomedicine and Health (BIOMED 2)	374
Agriculture and Fisheries (FAIR)	139,5
Energy	2412
. Non Nuclear Energy (JOULE - THERMIE)	1076
. Nuclear Fission Safety (NFS 2)	441
. Controlled Thermonuclear Fusion (FUSION)	895
Transport	263
Targeted Socio-Economic Research	147
Cooperation with Third Countries and International Organisations	575
Dissemination and Exploitation of Results	352
Stimulation of the training and mobility of researchers	792
TOTAL	13 215

Annual report 1999: COM (1999) 284 final/2, 25 June 1999

2 METHODOLOGY

The study was implemented in five stages:

- a. Preparation of a questionnaire based on analysis and revision of a questionnaire used at the time of the previous Five-year Assessment;
- b. In parallel with stage (a), preparation of basic address data to be used in the survey;
- c. A test-run of the draft survey including amendments following the results obtained;
- d. Distribution and collection of questionnaires (including encoding, mailing, registering responses, follow-up of non-respondents, analysis, etc);
- e. Analysis of the responses and preparation of a Draft report to be discussed with the European Commission services.

In addition, various draft and intermediate documents were prepared throughout the study for presentation and discussion at the study steering group. An edited set of this supporting material is contained in the annexes to this report.

2.1 Questionnaire

In preparing the questionnaire, the primary aims were to both make a shorter document than the one used in the previous study and also adjust it to new realities. In particular, questions dealing with original aims and motivation of the research participants were substantially modified in order to reflect the fact that many projects took place some years ago and the individuals involved were less likely to have clear recollections on such issues. Considerable changes were made in order to remove apparent overlaps between the various sections. The estimated time taken to complete the questionnaire was significantly reduced.

The test phase was implemented using a selected sample of 88 participants who were invited to complete the questionnaire. 24 questionnaires were returned and this was followed by phone interviews, on the basis of which a revised questionnaire was produced.

A copy of the questionnaire is included as Annex 1.

2.2 Conducting the survey

A database of projects names and participants for FP3 and FP4 was constructed.¹ This database was used throughout the study; to support the printing and dispatching of questionnaires, management of the survey itself and later analysis of responses.

The survey was based on use of an electronic questionnaire which could be accessed via DECISIA's website. Framework programme participants were first sent a message explaining the context of the survey and inviting them to participate in the exercise. Those that chose to participate were given two options; either complete the questionnaire on line or download the questionnaire and return a paper copy to DECISIA.

Around 12,000 e-mail contacts were targeted in a first round asking them to participate in the survey. This initial contact was followed up three more times as a reminder to those that had not yet completed a questionnaire. Due to the low rate of response in the first round, a further 5,000 participants were contacted by postal mail in a second round. Out of around 20,000 participants who were contacted in the course of the survey around 2200 usable responses were received.

On the whole this level of response was acceptable even if somewhat disappointing and below what had originally been anticipated. Almost all of the key areas of the programmes were covered by sufficient numbers of respondents in order to build a reasonable picture. For three programmes – 'Fusion', 'TSER' and 'Innovation'- the number of respondents was not considered as statistically representative and therefore these domains have not been included in the graphs that are presented in Annex 3. The main issue for these activities was the small size of the original sample - 21, 52 and 26 respectively – rather than the rate of response to the questionnaire. It should be pointed out furthermore, that research activities in Fusion are carried out by organisations having "Contracts of Association" with Euratom. All twenty-one Associations were contacted and six of them answered, which can be considered a reasonable level of response. With TSER a different issue arises. This programme aims to act upon political decisions concerning the basis for harmonious and durable socio economic development for the EU. As such it is less directly relevant to those parts of the survey concerned with technological achievements.

A brief analysis was undertaken by DECISIA in order to determine some of the reasons for non-response. This showed that in around two thirds of cases the reason for the non-response was possibly due to some form of error in the basic address data, often because the individuals involved had moved post. Lack of interest in the survey or the fact that the participant had recently been involved in another similar survey, were also cited as important explanations for non-response.

¹ Non-nuclear energy was covered by a very recent evaluation – *'Impact assessment of non-nuclear energy projects implemented under the Fourth Framework Programme, EUR 20876-* and was therefore not included in this assessment

2.3 Sample of respondents

Considerable effort was given to make the survey as representative of the different facets of the research activities being covered. Some of the main criteria included the research areas (specific programmes) of FP3 and FP4, the country of origin of participants and the type of participant, including whether or not they were from the public or private sector.

In terms of design, the study gave equal attention to research activities under both Framework programmes but the level of response coming from FP3 activities has proved to be very limited, perhaps one reason being that many of these were completed nearly 10 years ago. Accordingly, it has not been possible to provide a separate analysis for FP3 and therefore all results presented are an aggregate of FP3 and FP4 activities combined.

2.4 Analysis of results

As well as standard tabulation of the results of the survey, a number of specialised techniques were also employed to provide further insights.

- ✓ Automatic characterisation - key questions are characterised by all the available data, in categories of increasing importance. This method shows which other variables these indicators are linked to, and the strength of the links. It highlights the *main facts* of the analysed question or *describes the profile* of some minor population. This method is a powerful device for cross tabulations.
- ✓ Exploratory multidimensional and typological analysis - These enable information to be synthesised by measuring all the parameters, benefiting from the complex interrelations between replies to reveal stable structures that can be expressed simply. The result is presented graphically. Two analyses of this type were used in connection with “knowledge-oriented and technological achievements” (questions C1) in relation to “scientific and technological impacts” (question D9) and “results of the research” (questions C1 to C4) in relation to “achievements of the goals” (questions C5).

The result is based on different respondent profiles (typology): surveyed people from the same group are similar according to their answers to the selected questions.

- ✓ Statistical analysis of the open ended questions - DECISIA uses quantitative methods for the analysis of text data (also called text mining): these methods have the joint benefit of synthesising the mass of information brought by mining data (responses to the open questions), and of linking them to the “numerical” data (coming from the closed questions).

For many of the questions in the survey, especially those concerning broad issues such as achievement or reactions to participation in the research activity, it was decided to analyse the results in aggregate form without subdividing according to the

types of organisations involved or the activity being covered. On other issues where it was felt that these touched more specifically on the needs of certain sectors or where there was likely to be some bias according to sectors or types of organisation then further analysis has been provided.

Basic checks were carried out to ensure that the sample of respondents was broadly representative of the population of participants in FP3 and FP4, in particular according to the nature of organisations and the type of research involved. Blank responses to questions were found in nearly all cases to be in the region of 5-10%.

The statistical results in the report are total percentages calculated for each question on the basis of the whole sample of 2,174 respondents, which includes the actual responses as well as any blanks or missing values. Wherever appropriate an additional figure has been provided and described as 'expressed percentage', calculated on the basis of actual responses and excluding missing values.

In the annexes, results are 'expressed percentages'. Section IV of Annex 3 contains tables which provide both 'expressed percentages' and 'total percentages'.

It is also worth drawing the reader's attention to the sub-sample analyses which are presented throughout the report, in which percentages have been obtained referring to a sub-sampled population e.g. of those respondents that indicated 'yes', x% of this group also believed that.....

3 ASSESSMENT OF ACHIEVEMENTS AND IMPACTS

This section gives the main results of the survey for the different categories of impact that have been analysed. This covers not only the specific results of the research work itself but also the broader set of impacts that come from participation in the research activity such as organisational change, networking impacts and impacts on research capacity. More detailed results of the survey are contained in Annexes 2, 3 and 4.

3.1 Goals achievement

Whilst the primary focus for the survey was on the impact of the research activities, the survey also dealt with the respondents' perceptions of the level of achievement against the goals that were set. This gives a perspective on the effectiveness of the research activities.

The question was broadly subdivided into the four categories of knowledge oriented, network oriented, organisation and management oriented and commercial and exploitation oriented. On the basis of these categories the survey shows that the respondents perceived the highest level of achievement – a remarkable 93% - had been with 'knowledge and technological' goals. This finding can be linked with a similarly high level of reported success in terms of 'network' goals, which would appear to underline the importance of a successful collaborative partnership as a key factor in successful research activities.

Types of goal	Yes or mainly yes' for goal achievement for <u>all</u> respondents group	Yes or mainly Yes for <u>private sector</u> respondents group	Yes or mainly Yes for <u>public sector</u> respondents group
Knowledge and technological	93%	91%	95%
Network	77%	74%	80%
Organisational and management	67%	67%	67%
Commercial and exploitation	41%	49%	36%

The result that only 41% of all respondents felt they had achieved their commercial and exploitation oriented goals has to be treated with some caution. This figure has to be balanced by the fact that a substantially higher proportion of the private sector respondents (49%) indicated they had achieved their commercial goals. Similarly, 37% of all respondents considered that commercialisation and exploitation were not applicable to their particular activity, with 70% of this group from the public sector.

It is notable that of those respondents that reported having achieved their commercial and exploitation-oriented goals, 86% of respondents also reported having achieved their organisational and management goals. This may reflect some degree of crossover in the minds of respondents between the two issues. Again focusing on the respondents which reported having achieved their commercial and exploitation goals, 32% of respondents also reported 'increased turnover, market share or productivity'; 69% of respondents reported having achieved, either a 'very few', a 'few', 'significant', or 'very significant' financial returns, and 52% of respondents plan for the future exploitation of the results.

The survey also addressed the question of how important were unanticipated benefits against the achievement of goals. The result showed that 15% of the respondents felt the unanticipated benefits were more important than the goals they had set.

Further analysis of how respondents' perception of goals achievement maps against the impacts of the research is provided in section 3.8.4.

3.2 Scientific and Technological impacts

The key findings of the study reveal a high level of impact in a number of areas including the maintenance of expertise in a research area, the development and evaluation of tools and techniques, knowledge integration and the exploration of new or alternative technology paths. Details of the results of the survey, with individual data for public and private sector respondents, are provided in table 2.

Table 3: Knowledge-oriented and technological achievements			
	Yes or mainly yes for <u>all</u> respondents group	Yes or mainly Yes for <u>private</u> <u>sector</u> respondents group	Yes or mainly Yes for <u>public</u> <u>sector</u> respondents group
Maintenance of expertise in a research area	89%	82%	94%
Exploration of new, alternative technology paths	77%	80%	75%
Reorientation of RTD portfolio towards longer-term RTD	35%	33%	36%
Reorientation of RTD portfolio towards shorter-term RTD	21%	28%	17%
Development, evaluation or improvement of tools and techniques	84%	85%	83%
Production of publications, PhDs etc.	70%	48%	85%
Enhanced skills of RTD staff and training of researchers	76%	70%	81%
Increased number of research staff	34%	25%	40%
Increased knowledge integration across disciplines	71%	67%	74%

The survey provided some interesting findings on the reorientation of RTD as a result of participation in the research activities. Whereas both private and public respondents (around 35%) were equally likely to engage in more longer-term work, a smaller number reported that the effect would be to steer activities towards shorter term work. Perhaps not surprisingly this statistic was considerably higher for private than public sector respondents.

In addition to the data reported in table 3, the survey also provided analysis of respondents' views at a more general level on the level of scientific and technological impacts on their organisation, ranging from 'very negative' to 'very positive':

- 25% of the respondents indicated 'very positive' scientific and technological impacts (30% - expressed percentage);
- 51% had 'positive' impacts (61%- expressed percentage);
- 8% of the respondents had 'no' or 'negative' scientific and technological impacts from the project² (9%- expressed percentage);
- among the respondents who reported a 'very positive' scientific and technological impact, 45% were universities;
- among the respondents who reported a 'positive' impact, 73% also indicated 'positive' impacts for dissemination and the transfer of knowledge - including training. However 47% of these also indicated that the activity had produced small benefits.

Among the respondents indicating 'no' or 'negative' scientific or technological impact, 32% were SMEs, 55% of these considered that the project had no impact on their competitive position, and 25% thought that that they had not, on the whole, achieved the objectives. 50% of these respondents reported that the research team was dissolved at the end of the project.

It is interesting to observe how a pattern emerges amongst those respondents indicating high levels of scientific and technological impacts. For instance, of the 84% of respondents that indicated they had been successful with the development, evaluation or improvement of tools and techniques, 81% of these also reported the exploration of new, alternative technology paths. Generally, those respondents with high levels of success in science and technology are also successful on the commercial side as well. Again, of the 84% that reported the development, evaluation or improvement of tools and techniques, many of these also achieved commercial and exploitation-oriented results.

Figures 1 and 2 provide further analysis of different groups according to key characteristics and the response given to different questions.

² Answers "Neutral", "Negative" or "very negative"

Figure1: Analysis of responses for two groups - whole sample and those who replied 'very positive' to scientific and technological Impacts - with respect to their type of organisation and responses to questions D3, D4, D8 (Data based on the method of automatic characterisation)

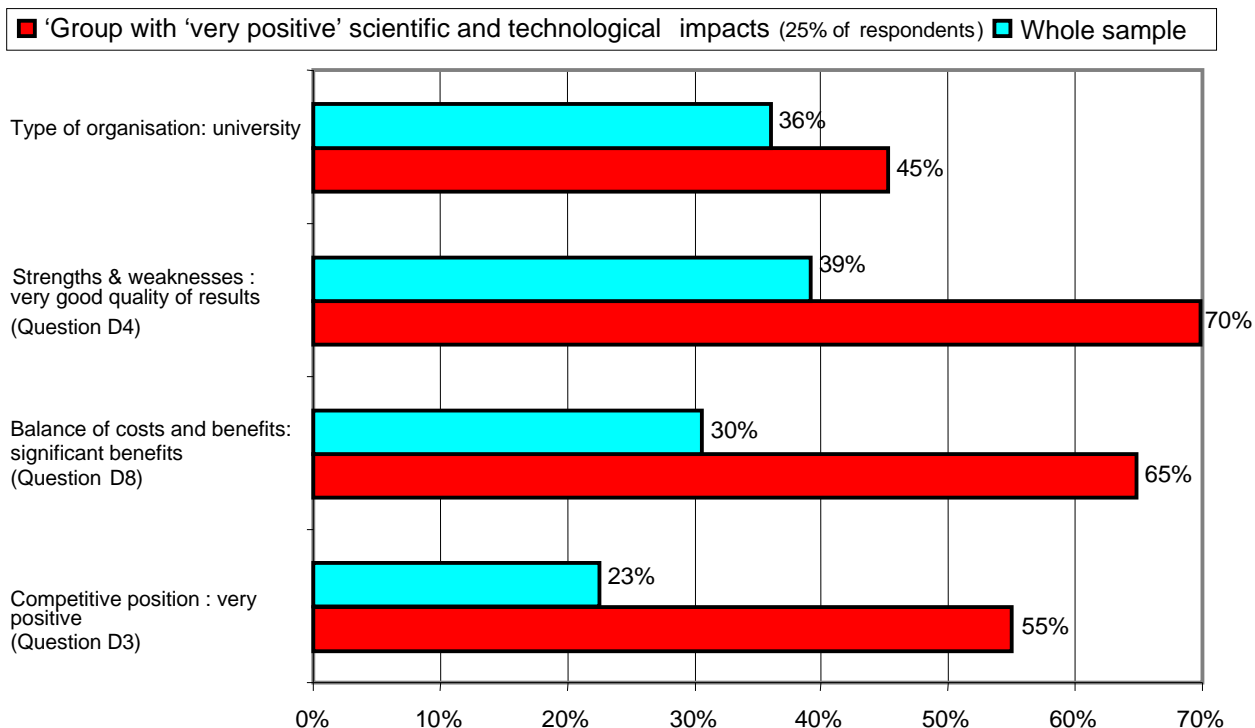
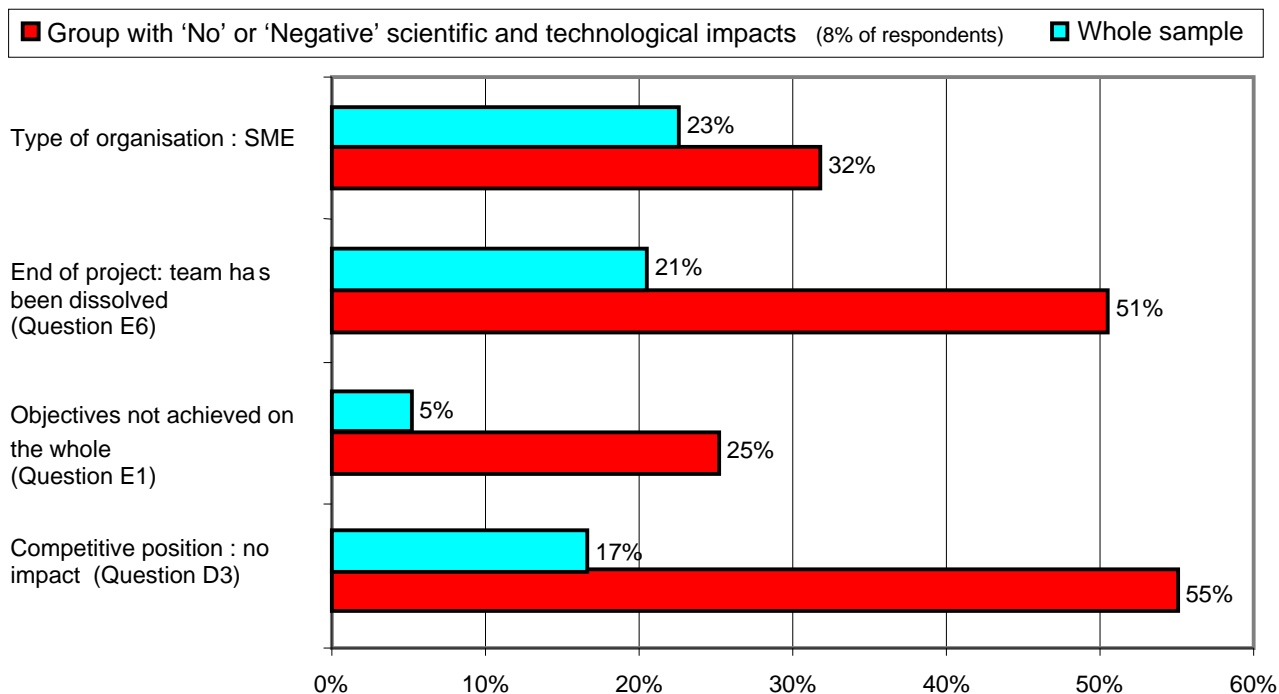


Figure 2: Analysis of responses for two groups - whole sample and those who replied 'No' or 'Negative' to scientific and technological Impacts- with respect to their type of organisation and responses to questions E6, E1, D3 (Data based on the method of automatic characterisation)



3.3 Network-oriented impacts

The survey addressed the question of how networking had been improved, examining both research and commercially oriented factors such as links with customers.

On the research side the picture that emerges is of a high level of success. 82% of all respondents indicated that the research activity had brought access to complementary source of expertise with the same percentage noting the transfer of expertise, know-how and technology. Better cooperation with universities and research institutes was reported by 75% of respondents.

Further analysis reveals a complex picture but one with mostly complementary findings. For the group that noted accessing complementary sources of expertise through networking (82%), other network-oriented impacts seem to be strongly linked:

- transfer of expertise, know-how and/or technology -87%;
- enhanced reputation and image- 84%;
- formation of new and lasting European research partnerships and networks- 81%;
- better cooperation with universities and research institutes-80%
- trans-national mobility and/or training of researchers-55%;
- network-oriented goals were widely perceived as being achieved-85%;
- participated in the project for the value of the partnership- 86%.

Furthermore, of the 81% of the respondents that achieved transfer of expertise, know-how and/or technology, nearly all reported they had achieved their knowledge-oriented and technological goals in the project. Nearly two thirds of those respondents also achieved their organisational and management goals in the project.

Turning to commercially oriented networking, it would appear that the results show a more modest level of impact. Half of the respondents indicated that participation in the research activity had produced better cooperation with firms. Although only around 24% indicated the formation of new long-lasting business alliances and a similar number reported better cooperation with customers. Follow-on entry into RTD and business collaborations in the private sector was reported by around 30% of respondents. Two thirds of the respondents also indicated that a new and lasting European partnership or network had been formed.

On the question of innovation related impacts, 51.5% (61% - expressed percentage) of all participants reported impacts in terms of the 'development or supporting of transfer of knowledge - including training -' (65% for just the public sector) Of this group:

- 71% of respondents indicated there had been 'proactive dissemination of project results';
- 20% of respondents indicated 'very positive' impacts on dissemination and transfer of knowledge - including training -;
- 72% of respondents reported the impact on dissemination and transfer of knowledge - including training - to be 'positive' or 'very positive' (87%-expressed percentage);
- 11% of respondents reported negative or neutral impacts on dissemination and transfer of knowledge - including training.

Among the 20% of respondents that indicated 'very positive' dissemination and transfer of knowledge - including training - impacts, two thirds considered the quality of results and outputs was a strong point. 74% were universities, 63% had basic research as a primary focus. In the text comments linked to this question, the comments frequently emphasised the international dimension using superlative adjectives. Of the 52% of respondents that reported 'positive' impacts, 61% continued the RTD with their own resources at the end of their project. The text comments suggested that respondents choose to disseminate through publications but not necessarily in the area of the project. Visibility of the organisation, notably at international level, seemed important in this context.

Among the respondents who perceived a 'negative' and 'neutral' impact regarding dissemination and transfer of knowledge - including training - (10% neutral, 1% negative or very negative), half of them were enterprises and 27% didn't achieve the objectives of the project as a whole. For 17.5% of these the utility of results and outputs was generally scored low. The text comments showed that this respondent group generally didn't promote dissemination and transfer of knowledge - including training - as a target.

Finally, the results of the survey provided strong evidence of the fact that impacts on networking were frequently seen as an unanticipated benefit of the research activity. Particular benefit was seen with the links established with participants outside the Member States.

3.4 Commercial and exploitation oriented impacts

The survey covered these issues at several levels including first the specific outputs of the research activities such as new software, products, processes or services. Second were the commercial impacts of the research and third were a wide number of more general effects concerning the innovation process itself. Some of the key results on commercial and exploitation-related impacts are contained in table 3.

In the category of specific outputs, the strongest finding is that 67% of private sector respondents and 53% of all respondents reported the development of demonstrators, prototypes, pilots etc. Other strong results were shown with the development of products, process, and software. These findings suggest quite clearly an impressive

level of translation between new knowledge derived from research and the development of new technology, especially given the fact that the results cover all the different types of activities supported by the FP. The percentage of respondents reporting the development of services (around 30% for both the all respondents and private sector groups) could on the face of it suggest a lower level of achievement although the results have to be taken in the context that services represented a relatively small share of the overall total research effort. We should also take account of the fact that it is generally very difficult to distinguish between the development of technology and the provision of services (in which a technology might be involved).

Table 4: Commercial and exploitation impacts			
	Yes or mainly Yes for all respondents group	Yes or mainly Yes for private sector respondents group	Yes or mainly Yes for public sector respondents group
Production of demonstrators, prototypes, pilots etc.	53%	69%	43%
Implementation of field trials	37%	47%	31%
Development or improvement of new software or codes	40%	48%	35%
Development or improvement of new products	38%	47%	31%
Development or improvement of new processes	42%	45%	41%
Development or improvement of new services	28%	35%	22%
Patent(s) and license(s)	19%	22%	18%
Increased turnover, market share or productivity	17%	26%	12%
Cost savings	27%	34%	22%
Improved competitiveness	49%	60%	42%
Development or improvement of European standards	22%	23%	22%
Learning to work in new markets	23%	32%	17%
Proactive dissemination of project results	56%	56%	55%
Development or support of transfer of knowledge - including training -	52%	45%	56%

As regards commercial impacts, the results suggest a rather complicated picture. At one level only around 26% of private sector respondents reported increased turnover, market share or productivity. At the same time, an impressive 60% of the same respondent group reported there had been improved competitiveness. Given that 42% of the public sector group also reported improved competitiveness, we

could perhaps assume that the results under this heading were not necessarily those strictly relating to the respondents themselves but rather were the expressed opinions on the impact of the research at a more general level. This picture appears to be corroborated by the results concerning the level of financial returns from the research activity for the responding organisation, with respect to which around 30% of the respondents reported either 'significant' or 'very significant' financial returns (58% if those reporting 'few' returns are also included). The results concerning levels of return for 'other' organisations were the same as those for the reporting organisation, suggesting either a remarkable degree of similarity or that the respondents did not understand the question fully.

The results showing the commercial returns for SMEs are similar to those for the private sector group as a whole. For SMEs with between 50 to 250 employees, 49% reported having had either 'few', 'significant' or 'very significant' financial returns while the figure was around 60% for SMEs with less than 50 employees.

Finally on the subject of commercial impacts is the question of where this would be achieved. Taking just the group (41%) of those respondents that felt they had achieved their commercial and exploitation oriented goals, 46% of these reported that they would be exploiting the research results in national markets only and 52% in other EU markets.

Turning to the question of how the research activities supported developments at the level of the innovation system, the survey revealed that around one quarter of all respondents believed that new or developed European standards would result from the activities. This is perhaps not entirely surprising given the supposed public good nature of some of the research activities covered and the position in research teams of many key public sector players for the development of standards but it is nonetheless a significant result. The survey also revealed that some of the commercial benefits other financial such as being able to work in new markets - 32% of private sector respondents. That 17% of public sector respondents also reported this impact either confirms the commercial orientation of an increasing number of these organisations or possibly that the question was interpreted in terms of allowing public sector research organisations to work in new spheres – as such a finding of obvious relevance to the objectives of integrating and restructuring that are at the heart of the European Research Area concept.

22% of the respondents have encountered obstacles in the process of commercialising their research. For this group, the main factor seen as enhancing the commercialisation prospects is funding (32%), followed by the product development and further cooperation with other partners (29%). The picture for SMEs is broadly the same, with 34% of the respondents considering that further funding would enhance the commercialisation and 31% believing that further development would be necessary.

3.5 Employment and human resources impacts

The issues split into several sub-points concerning the level of employment, quality of work in general and training effects.

On the question of the overall impact of participation in the research activities on the level of employment, the figures show a mildly positive impact. 57% of respondents indicated that there had been 'no impact' on the level of employment, 30% indicated a 'positive' impact and 5% indicated a 'very positive' impact. On the other hand less than 0.4% of respondents indicated a 'negative' or 'very negative' impact. These results can be compared with other results showing that for 34% of respondents their participation had increased the number of R&D staff.

As regards training, around 80% of the respondents believed their participation had led to enhanced skills of the research staff and training of researchers. In line with these results, the survey showed that 54% of respondents felt that the training received by the researchers in the course of the research activity would have a 'positive' impact on their career development and 24% of the respondents felt that there would be a 'very positive' impact. Only 17% believed there had been a 'neutral' impact and less than 1% felt there would be a 'negative' or 'very negative' impact. Besides, 53% of respondents indicated that the research activities will enhance the career development of the researchers over the next ten years.

Finally, nearly 75% of respondents offer the view that their participation in the project had had a 'positive' or 'very positive' impact on the quality of work in the organisation. 65% reported that participation in the research activities had led to an increased ability to work in different cultural contexts.

"It has enabled (us) to build around the project results a business which is today worth about 13M€ revenues and which has been established as a separate fully owned company at the beginning of 2003. It has generated employment and profits to us and to clients' companies which have been using the product."

"A Finnish company was started (coordinating partner). Today it has almost 200 employees and manufacturing plants in five different countries."

"One particular interest to the project is a new form of inter-enterprise coordination structure. The coordination structure adopted by the maritime industry is especially important since it often determines the ability to react to market changes flexibility and in many cases also a large part of the administrative overhead and competitiveness."

"Project has allowed (us) to create new jobs in my department due to its side effects (increased knowledge and man-power). This is also valid for some other project partner. "

"It helped in developing the technology necessary to build commercially viable fast ferries."

Text mining analysis of responses to open-ended question

3.6 Organisational or management impacts

Under this heading the survey grouped a relatively diverse set of seven issues: 'generation of in-house contributions to the project', 'access to additional funds', 'improved managerial capabilities', 'cost-sharing between partners', 'technological risk-reduction', 'financial risk-reduction' and the 'reduction of in-house contributions to the project'.

Based on the evidence the general conclusion is that participation in Community research has a positive effect on the internal dynamism of the organisation, reinforcing in-house contributions to a project, allowing access to additional funds and improving managerial capabilities.

First, perhaps the most striking finding is that 68% (76% - expressed percentage) of the respondents noted that the activity had generated in-house contributions to the project and among these, 62% also achieved cost-sharing between partners and 66% had accessed additional funds. This importance of the research activity in terms of leveraging additional funding is confirmed by the figures showing that 59% (64% - expressed percentage) of the respondents reported gaining access to additional funds. Among this group, 76% also generated in-house contributions to the project.

Second, there appears to be a cluster of related findings on the subject of how the research activity had had a combined impact on reducing risk and achieving savings for those involved. 47% (57% - expressed percentage) of the respondents reported they had achieved a technological risk-reduction and among these 64% had achieved a financial risk-reduction and 71% had achieved cost-sharing between partners. Finally, 54% (62%-expressed percentage) of the respondents reported achieving cost-sharing between partners and among these 54% also achieved a financial risk-reduction, 63% a technological risk-reduction and 36% realised cost savings. Interestingly, 84% of this group also reported having explored new, alternative technology paths.

Other findings were that 58% (67%-expressed percentage) of respondents reported improving their managerial capabilities and among these 59% also achieved a technological risk-reduction, 45% achieved better career prospects, 67% achieved a proactive dissemination of project results and 56% used Internet-based dissemination.

Respondents to the survey were more or less equally distributed into co-ordinators and non co-ordinators, with 54% acting as co-ordinator. They are mostly from EU Member States (84%-expressed percentage) and for nearly one third the EC funding contribution was greater than 250,000 euros. Most of these project co-ordinators indicated they had achieved their organisational and management goals for participating in the project (73%-expressed percentage) and had improved their managerial capabilities (65%-expressed percentage).

As regards the 46% of respondents that were not co-ordinators, 27% had EC funding less than 120,000 euros. 40% of this group had more than 8 project partners, 61% generated in-house contributions to the project and 56% considered they had access to additional funds.

3.7 Wider socio-economic and environmental impacts

3.7.1 Contribution to EU policies and EU enlargement

At a broad level, projects have contributed towards achievement of the objectives of European Union policies. Most important were the expected contributions, as indicated by 69% of respondents, in the domain of international co-operation, followed by improvements to the competitiveness of European industry and human resources development. In this last category, projects have enhanced career development and encouraged the training and mobility of the researchers. 23% of respondents indicated that the research activity would make inputs to regulations and other legislation.

Although the study did not deal in depth with the issues surrounding EU enlargement, nonetheless some interesting evidence on the subject was produced in particular, from respondents in the International Cooperation programme. Just over 90% of these respondents were from the public sector and around two thirds of them were concerned with basic research activities. For 66% of these it was their first participation in the EC FP (for the team). Two aspects stand out as being worthy of note. First, nearly two thirds of these respondents expected their research activities to lead to a 'better preservation of the environment' over the next ten years. Second, 54% of the respondents noted that their research activity was linked with other national or regional R&D projects within their own organisation. The picture that emerges appears to confirm certain commonly held understandings that extended access by the Candidate countries to the Framework programme will develop from a bridgehead of vanguard participants, typically well linked within the public sector and focused on basic research activities.

3.7.2 Health, quality of life and environment

It is notoriously difficult to address some of the more intangible aspects of socio-economic change through a questionnaire. The issue was covered in a number of different ways both asking respondents directly for their assessment of how the research would contribute towards quality of life, impacts on health and impacts on the environment.

Putting these results together, 30% of the respondents consider their participation would have benefits for the quality of life; 33% of the respondents think that the projects will have an impact on the quality of life over the next ten years and 23% of the respondents think that the projects will participate in improving health over the next ten years.

28% of the respondents consider that the results of their participation in the projects have improved the protection of the environment although 68% of this group had received funding from the Environment programme. 30% of all respondents think that their projects will have an impact on the protection of the environment over the next ten years.

“Helped plan more (for) cost effective health service.”

“Improvement of labour conditions in manufacturing metal industry.”

“Improvement of the evaluation of radiation risk.”

“The developed technology will increase re-vegetation of saline in desertificated areas in Mediterranean climate.”

“This project allows better protection of consumer health by providing harmonised and validated measurement methods for 38 pesticides that were considered of high priority for the EU Member States.”

“The results have fed (the) national policy debate on irrigation management.”

Text mining analysis of responses to open-ended question

3.8 Overall appreciation of projects

3.8.1 Sustainability of the research activities

Questions in the survey examined what happened at the end of the project and the types of obstacles encountered in reaching all the expected impacts and results. Both of these raise important issues about the sustainability of the research and innovation activity.

End of the research project

49% of respondents indicated that at the end of the activity they would pursue the research with their own resources or with other funding (43%). New projects are then more or less equally distributed into collaborative ventures with the same partners (44%) and with other partners (47%). If the project team is dissolved (20%), it doesn't mean the end of any research activity since in this group around a half (51%) of the respondents also indicated they would pursue the research activities in another EU programme and nearly one third (29.5%) began commercialisation of the results.

For the 47% of respondents who indicated that the project team concerned was beginning new collaborative ventures with other partners 68% are pursuing the research with other funding and 78% did not abandon RTD efforts in the area.

43% of the organisations' project teams pursued the RTD with other funding, 74% of these indicated they had begun new collaborative ventures with the same or other partners and 73% of this group were from the public sector.

38% of the organisations' project teams continued the RTD in another EU programme. Those 38% also did not abandon RTD efforts in the area in 78% of the cases and 67% began new collaborative ventures with partners. 38% had a very positive scientific and technological impact. 43% had significant benefits.

The recruitment of additional researchers was reported by 23% of respondents and of this group, 79% reported that the original research team had not been dissolved. Added to the fact that two thirds of the same group reported they had begun new collaborative ventures with other partners, this suggests a growing research effort. Of the 19% of respondents that reported having begun commercialisation of results, 77% of these were continuing the RTD with own resources (77%).

Of the 9% of the respondents that reported they had begun policy implementation at the end of the project, in 50% of these cases commercialisation of the research was also reported. More than two thirds (80%) of this group continued the RTD with own resources. At the end of the project, the organisation's project team was dissolved in 20.5% of the cases. Research efforts could be abandoned in the area for 28% of them, but 51% also continued the RTD in another EU programme. 47% had small benefits and 39% had no plans for future commercial exploitation.

9.5% of the respondents indicated that the project team had abandoned RTD efforts in the area at the end of the project and in 60% of these cases the research team was dissolved. A somewhat strange finding was that 60% of this group also pursued the RTD with other funding, perhaps suggesting that although the formal research effort was stopped, the research themes were incorporated into other work. .

Obstacles

Any examination of the obstacles to the success of the project has to be placed in context given that 91% of respondents indicated that on the whole, the objectives of the project were achieved.

When respondents felt they hadn't reached all expected impacts and results, they mainly identified as obstacles the 'technological difficulty' (52%), the 'poor performance of a partner' and 'insufficient funding' (36%). Respondents as a whole also pointed out the over ambitious projects and the restructuring or strategic shifts within the respondent's own organisation (31%) as playing a potentially negative role in the process of a project.

Out of the 15% of respondents which indicated that obstacles had been met in the recruitment of researchers, 'the availability of researchers' (about 45%), 'the qualification' (20%) and 'financial obstacles, difficulty to attract' (10%) are the main difficulties pointed out. More than one third of this group of respondents was involved in projects lasting more than 3 years. Notwithstanding those difficulties, nearly two thirds of these respondents, the majority being from universities, still expect that over the next 10 years training and mobility for researchers would be encouraged and that the career development of researchers would be enhanced.

22% of the respondents met obstacles in commercially exploiting the research. According to 60% of this group, 'product development' would enhance commercialisation prospects, and 57% thought that 'further funding' would enhance commercialisation prospects. Main obstacles encountered were the 'competition with alternative solutions' (32%) and a 'changed market situation' (27.5%). 55% had future plans for future commercial exploitation.

Of the 26% of respondents who did not meet any obstacles to commercially exploit

the research 59% also had future plans for future commercial exploitation. More than one third of them began the commercialisation of the project results at the end of the project, targeting other European markets and national markets.

48% of the respondents felt that the question of any obstacles to the commercial exploitation of the research was not applicable. 58% of them thought that having plans for future exploitation of project results was not applicable.

3.8.2 Costs and benefits

Given the complexity of the many issues involved, the survey also asked respondents for a global assessment on the costs and benefits to the organisation of participation in the research. The results, shown in table 5, indicate that for two thirds of respondents the activity was perceived to have generated benefit while only 6% perceived that they had incurred losses.

Table 5: Balance of costs and benefits	
Types of benefits	Respondents
Significant benefits	30%
Small benefits	32%
Losses = benefits	13%
Small losses	4%
Significant losses	2%

* 19% of all respondents did not answer this question

3.8.3 Strengths and weaknesses

When respondents were requested to estimate in a global sense the strengths and weaknesses of their project, the responses were for the most part highly positive: 67% to 84% of 'good' or 'very good' scores for the different issues that were listed in the question³. Two characteristics of the project stand out: the overall performance of the research team and the quality of the project results and outputs. At the other extreme, only very few issues were described as 'poor' or 'very poor' (4% on average and at the very most 6%). This perhaps indicates that potential weaknesses should be seen more in the sense of tendencies rather than actual weaknesses. Accepting this caveat, it can be noted however that respondents considered less positively the timeliness of projects results, followed by the adequacy of project resources.

³ Overall performance of the project research team, adequacy of project resources (human, financial, technical), timeliness of projects results and outputs, quality of project results and outputs, utility of project results and outputs – see questionnaire , question D4

The following analysis deals individually with each of the issues covered in the strengths and weaknesses question (D4).

Overall performance of the project research team

84% of the respondents considered the overall performance of the project research team a strength (35% of the respondents considered this quality as 'very good' and 49% as 'good'). Among the 35% of respondents considering this characteristic as 'very good', 76% had similar opinions for quality of project results and outputs, 48% for utility of project results and outputs, 41.5% for timeliness of project results and outputs and 32% for adequacy of project resources. 42% described all the impacts of the project as 'mainly positive'.

Among the 49% of respondents considering the overall performance of the project research team as 'good', 64% had similar opinions for quality of project results and outputs and 60% for the utility of project results and outputs. 68% described all the impacts of the project as 'mainly positive'.

Respondents considering this characteristic as 'poor' or 'very poor' represented 1.5% of all respondents.

Adequacy of project resources (human, financial, technical)

68% of the respondents considered the adequacy of project resources as a strength (15% of the respondents considered this quality as 'very good' and 53% as 'good').

Among the 15% of respondents considering this characteristic as 'very good', 72% had similar opinions for quality of project results and outputs, 54% for utility of project results and outputs, 61% for timeliness of project results and outputs. 99% considered that all the objectives of the project had been achieved.

Among the respondents considering this characteristic as good (53%), 59% had similar opinions for the timeliness of project results and outputs, 57% for overall performance of the project research team, 51% for quality of project results and outputs and 55% utility of project results and outputs. 95% of the respondents considered that they had achieved the objectives as a whole.

Respondents considering this characteristic as 'poor' or 'very poor' represented 6% of the all respondents.

Timeliness of project results and outputs

68% of the respondents considered that timeliness of project results and outputs were strengths (21% of the respondents considered this quality as 'very good' and 47% as 'good').

Among the respondents who indicated 'very good' (21%), 80% had similar opinions for the quality of project results and outputs, 44% for the adequacy of project resources, 68% for the overall performance of the project research team and 52% for the utility of project results and outputs. The impact of the project in terms of dissemination and transfer of knowledge - including training - was 'very positive' in 40% of the cases. 47% of this group were universities.

Among the respondents considering the timeliness of project results and outputs as good (47%), 57% had similar opinions for the quality of project results and outputs, 67% for the adequacy of project resources, 55% for the overall performance of the project research team and 59% for the utility of project results and outputs. Their primary focus was the training of the researchers in 40% of the cases.

Respondents considering this characteristic as 'poor' or 'very poor' represent 6% of the whole sample.

Quality of project results and outputs

84% of the respondents considered 'quality of project results and outputs' as a strength (39% of the respondents considered this quality as 'very good' and 45% as 'good').

Among the respondents that considered this criterion as 'very good' (39%), 43% had similar opinions for the timeliness of project results and outputs, 28% for the adequacy of project resources, 68% for the overall performance of the project research team and 50% for the utility of project results and outputs. In 40% of these cases, all the impacts of the project were reported as 'very positive'.

Among the respondents that considered this criterion as 'good' (45%), 58% had similar opinions for the timeliness of project results and outputs, 60% for the adequacy of project resources, 69% for the overall performance of the project research team and 65% for the utility of project results and outputs. 43% of the respondents had less than 499 employees.

Respondents considering this characteristic as 'poor' or 'very poor' represent 2% of the whole sample.

Utility of project results and outputs

75% of the respondents considered utility of project results and outputs as strength (25% of the respondents considered this quality as 'very good' and 50% as 'good').

Among the respondents that considered this criterion as 'very good' (25%), 45% had similar opinions for the timeliness of project results and outputs, 33.5% for the adequacy of project resources, 68% for the overall performance of the project research team and 80% for the quality of project results and outputs. All the impacts of the project were very positive in 45.5% of the cases. 83% of the respondents belonged to member states. 43% were universities. Their primary focus was basic research in 44% of the cases.

Among the respondents that considered it as 'good' (50%), 55% had similar opinions for the timelessness of project results and outputs, 60% for the adequacy of project resources, 59% for the overall performance of the project research team and 60% for the quality of project results and outputs. 96% considered they achieved the objectives of the project as a whole.

Respondents considering this characteristic as 'poor' or 'very poor' represent only 4% of the whole sample.

A further perspective on strengths and weaknesses is provided in Annex 4 which

examines the perception of different classes of respondent. This has allowed a better understanding of both scientific and technological achievements and the perception of impact. As an example, one of the groupings that perceived having the 'most successful' technological and knowledge oriented results was characterised as being composed more often of public organisations, with projects lasting more than three years.

3.8.4 From goals towards impacts

Respondents' reported achievements against the four main types of goals can be mapped against the answers given to the main types of impacts achieved.

Of the 93% of respondents (96% - expressed percentage) that indicated having achieved their 'Knowledge-oriented & technological goals', some of the reported impacts were:

- 'development, evaluation or improvement of tools and techniques' – 85%;
- 'continued the RTD with their own resources' – 51%;
- 'improved competitiveness' – 51%;
- 'increased turnover, market share or productivity' – 18%;
- 'developed or improved European standards'- 23%;
- 'new and lasting international research partnerships and networks' – 44%;
- 'improved career prospects' for those involved in the research- 35%;
- 'improved protection of the environment' – 29%;
- achievements against the goals as more important compared with their unanticipated results or benefits – 81%;

Of the 77% of respondents (84% - expressed percentage) that reported having achieved their 'Network-oriented' goals, some of the reported impacts were;

- 'accessing complementary sources of expertise by networking – 90%;
- 'new and lasting European research partnerships and networks' – 82%;
- 'new and lasting international research partnerships and networks' – 48%;
- conducting presentations in seminars as dissemination activities – 96%;
- 'new and alternative technology paths' – 79%;
- 'improved competitiveness'- 52%;
- 'increased turnover, market share or productivity' – 68%;
- 'developed or improved European standards' – 24%;
- 'improved protection of the environment' 30%;
- 'improved career prospects' for those involved in the research – 40%;
- 'achievements against the goals as more important compared with unanticipated results or benefits- 83%.

Of the 67% of respondents (76% - expressed percentage) that indicated having achieved their 'organisational & management goals', some of the reported impacts were;

- 'improved managerial capabilities' – 73%;
- 'technological risk reduction' – 57%;
- 'new and alternative technology paths' - 82%;
- 'development, evaluation or improvement of tools and techniques' – 90%;

- 'improved quality of life' – 40%;
- 'better career prospects' for those involved in the research – 43%;
- 'improved protection of environment' – 33%;
- 'improved competitiveness' – 65%
- 'increased turnover, market share or productivity' – 32%
- 'developed or improved European standard' – 26%;
- 'new and lasting international research partnerships and networks' - 46%.
- achievements against the goals as more important compared with their unanticipated results or benefits – 83%

Of the 41% (49% - expressed percentage) of respondents that indicated having achieved their 'Commercial & exploitation-oriented goals', some of the reported impacts were;

- 'new and alternative technology paths' – 80%;
- 'development, evaluation or improvement of tools and techniques' – 87%;
- 'improved quality of life' – 35%;
- 'better career prospects' for those involved in the research' -42%;
- 'improved protection of the environment'- 32%;
- 'improved competitiveness' – 55%
- 'increased turnover, market share or productivity' – 21%;
- 'developed or improved European standards' – 67%;
- 'new and lasting international research partnerships and networks' – 48%;
- achievements against the goals as the most important compared with their unanticipated results or benefits 83%.

The textual analysis linked to the achievement of these goals revealed that 15% of respondents reported some unanticipated benefits, and among this group over 80% considered their unanticipated results as the most important thing with respect to their achievements against the goals set. The most frequently mentioned unanticipated benefits were often linked to the creation of spin-off and to the networking added-value.

"We started interdisciplinary collaborations that were not predicted in advance in the field of molecular electronics."

"The networking benefits leading to better future alliances with research institutes were largely unanticipated."

"The development of new standards were not scheduled but finally achieved."

"Spin off in another market."

"New products by spin off."

"Spin off applications for the sensor systems we had been working on."

"European researchers maintained their leadership in a fundamental field."

"Considerably increased visibility in the scientific community."

"Discovering of a new area of application of ultrasound in neurology for a combined use both in diagnosis and therapy."

Text mining analysis of responses to open-ended question

3.8.5 Users of the results

According to the responses to the survey, the subsequent users of project results are mainly the scientific research communities both within the European Union (81% of respondents) and outside (71%).

54% of respondents indicated that the results were used, within the European Union, by the higher education communities. Next in the list came the manufacturing sector (49% of respondents), the service sector (30%), the primary sector (25%), the European Commission (24%), national/regional administrations (23%), citizens/consumers (19%) and international agencies (17%).

The responses also indicate some interesting connections between the types of users for research activities and the nature of the research itself. For example, of those respondents citing manufacturing industries as users of the research, around a third of these were involved in the *Industrial and Materials Technologies/Transports Programmes* and around a half were engaged in development of new products. For the service sector, a similar type of relationship can be observed. Of those respondents that cited the service sector as user of the researcher results, 40% of the projects involved concerned the development or improvement of standards and 43% related to systems integration.

The respondents saw the pattern of usage for research results as being the same both within and outside European Union with the ordering of the first five users the same for both categories.

3.8.6 Longer term impacts

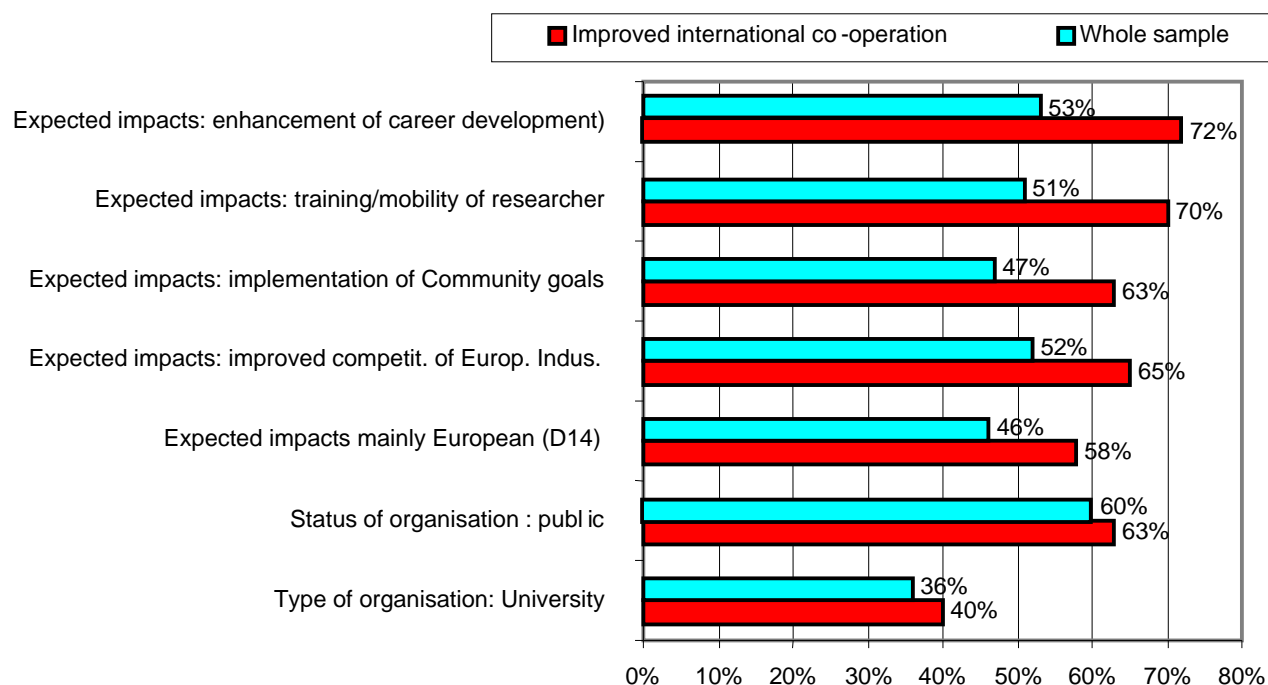
Respondents were asked to express their view on the impact over the next 10 years of their participation in the research activity. Improvements to international cooperation, enhancement of the careers of researchers, encouragement to training and mobility of researchers and improved competitiveness of European industry were, in order, the most cited likely future impacts. An analysis of the responses from those indicating improved international cooperation is given in figure 3.

Further analysis of the four most cited responses to this issue is as follows.

1. The largest number of responses was for improvements to international cooperation – 69% (87% - expressed percentage), with 58% of this group expecting the impact will be mostly at the European level. 40% of this group came from universities. Respondents expecting such an impact also expect to enhance the career development of researchers (72%) to encourage training and mobility of researchers (70%), to improve the competitiveness of the European industry (65%) and to implement Community goals in general (63%).

6% of respondents indicated the impact was probably not likely and 5 % thought it was not applicable.

Figure 3: Respondents who expected to improve their International Cooperation over the next ten years: main characteristics of the responses (See questionnaire – question D13.11)



This graph presents data based on the method of automatic characterisation.

2. The second most cited possible impact was enhancement of the career development of researchers - 53% (68% - expressed percentage). Of this group, 47% came from universities. Other factors were that 94% of the group expect to see improved international cooperation, 83% to see encouragement to training and mobility of researchers and 63% the implementation of Community goals in general.

13% of the respondents indicated this impact was probably not likely and 11% thought it was not applicable.

3. Third most expected impact over the next ten years was improvement of the competitiveness of European industry - 52% (66% -expressed percentage), with 57% of this group expecting the impact to be at the European level. 34% of the group were enterprises. Respondents expecting such an impact also expected to improve international cooperation (87%), 63% expect to see implementation of Community goals in general and 41% expect to see development of standards.

9% of respondents indicated this impact was probably not likely and 18% thought that it was not applicable.

4. Fourth most expected impact was encouragement to the training and mobility of researchers - 51% (66%-expressed percentage), with 57% of this group expecting the impact to be at the European level. 47% of the group were universities. Respondents citing such a possible future impact also expected to see improved international cooperation (94%), enhanced career development of researchers (86%) and the implementation of Community goals (64%).

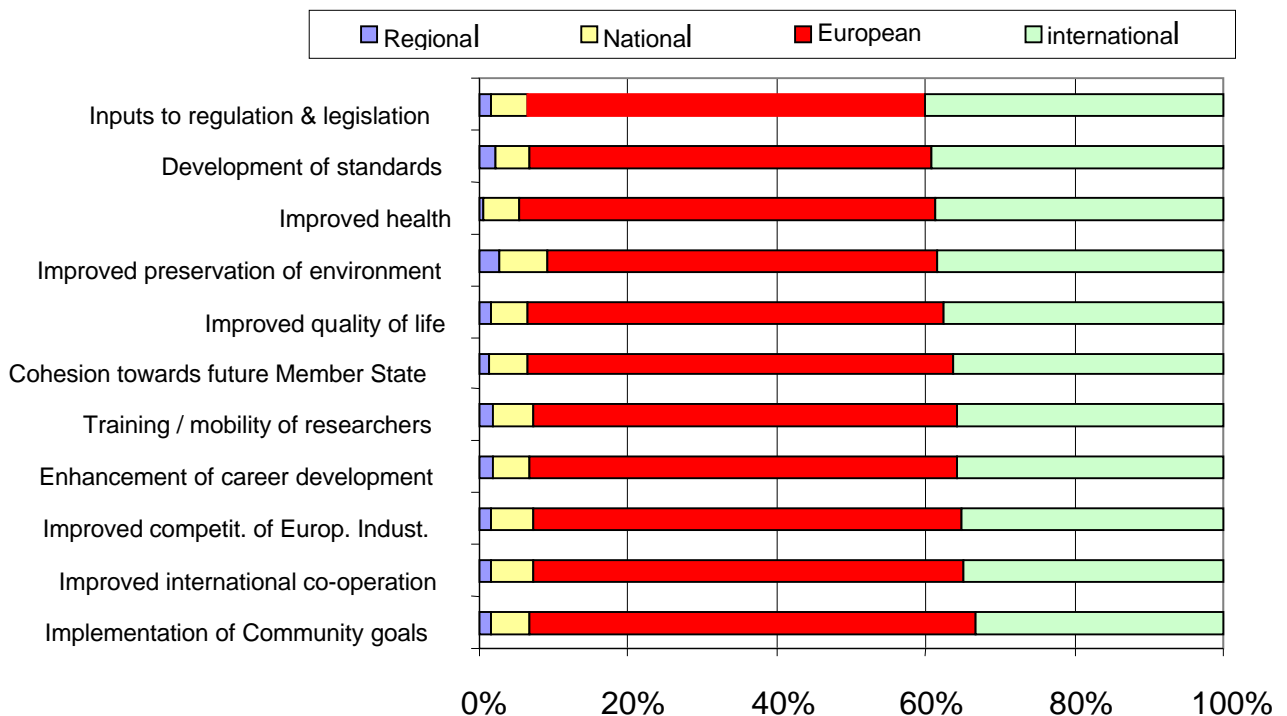
13% of respondents indicated this impact was not likely and 13% that it was not applicable.

Other likely impacts over the next ten years were, in order of importance, as follows:

- the implementation of Community goals in general - 47% (61%- expressed percentage);
- improvement of the quality of life - 32.5% (42%-expressed percentage);
- improvement of the preservation of the environment - 30% (39%- expressed percentage);
- the development of standards - 29% (38% - expressed percentage);
- improvement of health - 23% (31%);
- improvement of the cohesion towards future member states - 23% (30% - expressed percentage);
- improvement of inputs to regulation and legislation - 23% (30% - expressed percentage).

An illustration of the respondents' expectation on the geographical impact of the research over the next 10 years is given in Figure 4.

Figure 4: Geographical distribution of the expected impacts of the organisation's participation in the project over the next ten years (See questionnaire – question D13)



3.8.7 Snapshot of domain level features

Although the clear intention for this assessment was to provide an analysis of FP3/FP4 impacts at aggregate level, some detailed information on the survey results for different research domains is contained in Annex 4. Examples of characteristic features of the responses from these domains as well as points of similarity between domains are provided below.

In the Life Sciences domain, most respondents declared that the project results would improve not only health, but also the environment (45%-expressed percentage.). Future commercial exploitation was also less often planned than other domains. Concerning the Information and Communication Technologies, and the Industrial and Material Technologies / Transports domains, a common feature was the perception of respondents on achieving improved competitiveness for European industry (81% and 79%-expressed percentages.) In most cases a plan for commercial exploitation had been prepared. Concerning the Environment area, the projects were mainly targeting administrations (at least 50%- expressed percentage.) in non-E.U. countries (86% expressed percentage), contributing to preserve the environment and to regulations and legislation. In the Nuclear Energy Fission sector, the projects were regarded as having contributed to European standards (53% expressed percentage) and to preserve the environment (77% expressed percentage). For the INCO domain, the outputs were clearly a transfer of knowledge (74% expressed percentage.) and an improvement of co-operation. Researchers have estimated that the benefits of the Human Research projects were significant, with very good outputs on their career development, allowing them mobility between research centres and supporting training.

4 CONCLUSIONS

Perhaps the most obvious and important conclusion is that the participants responding to the survey are nearly unanimous (91%) in their belief that they have achieved their objectives.

1. In terms of strengthening the scientific and technological bases of Europe, the assessment has revealed a remarkably high level of success. 93% of respondents noted they had achieved their scientific and technological goals. More generally, more than three quarters of respondents indicated a 'very positive' or 'positive' scientific and technological impact. 84% of respondents indicated that they had improved or developed tools and techniques as a result of their work.

In the same direction the results of the survey appear to indicate that one of the main strengths of Community research activity is linked to the quality of the projects themselves and the performance of the research teams.

2. Within the context of European added-value, the evidence underlines very clearly how Framework funding plays an important role in leveraging new research activities, supporting existing research networks and also acting as a catalyst for the development of new ones. 49% of respondents to the survey recorded that at the end of the activity they would be supporting their research with their own resources and 43% with other funding. 23% of respondents noted that new researchers had been employed as a result of the research activity, and in two thirds of these cases there had been new collaborative ventures with other research partners.

A large number of respondents (77%) estimated that their network-oriented goals had been achieved. Moreover, many of the unanticipated benefits of research activities seem to be linked to the networking dimension (collaboration with international teams, visibility and international image...).

3. The data shows that 46% of respondents believed that they had a 'positive' or 'very positive' socio-economic impact. Set against this, for around half of the respondents there was no clear result, indicated by the fact that the activity was seen to have a neutral socio-economic impact. It should be kept in mind not only that socio-economic impact represents a very broad and to some extent intangible concept for the respondent, but also that for many participants, the primary aim was indeed the research activity itself.

In overall terms, when asked about the balance between costs and benefits for the organisation as a result of participation in the research activity, 30% of respondents indicated there had been significant benefits and 32% reported there having been "small" benefits. Only around 6% of respondents reported that the costs had exceeded benefits, of which 1.7% indicated "significant losses".

4. As regards dissemination and transfer of knowledge - including training -, 72% of respondents considered the impact as 'positive' or 'very positive'. As would be expected and reflecting the strong position on scientific and technological

achievements, 'publications' and 'presentations' were cited as the most important forms of dissemination for project results, these being used by almost 90% of respondent organisations. For respondents from FP4 the internet was also seen as an important mechanism, being cited by 49% respondent organisations.

The impact of projects on human resources in a general sense was underlined by many of the comments made under the open questions; in particular, reference was made to the development and improvements to careers or training and increased ability to work in different cultural contexts. More precisely, at least one third of the respondents (34%) expressed the view that their organisation's participation had led to an increased number of research staff. While it appears that training was not at first considered as a primary focus by respondents, at the end of the project it was however considered as one of the important results of the research (by 76% of the respondents).

5. The assessment has examined the different types of users benefiting from Community research activities. The results show that as well as supporting directly the different classes of enterprises, including the manufacturing and services sectors, the research is well integrated within Europe's research and innovation systems. Indeed, the largest single group of users of Community research was noted as "Scientific community/Researchers" (81%). Manufacturing industries were cited as users of the research by nearly half of the respondents and services by around one third of them.

6. Finally, on the question of what were the future expectations of impacts over the next ten years, respondents listed first 'improved international cooperation' followed by 'enhancement of career development of researchers' and 'improvement of the competitiveness of European industry'.

7. In terms of evaluation process, the assessment highlighted the difficulty of mounting a comprehensive questionnaire-based survey simultaneously across all the areas of the Framework programmes. In part, this is due to weaknesses in the continuous updating of the database of information on participants, especially those from projects completed some time ago. More than this, there remains a very practical problem in constructing a single survey instrument which can satisfactorily address all of the many different features of FP activities, and different stages of implementation and exploitation and still provide an aggregated assessment of impact. It seems that a continuous and user-oriented culture of evaluation still has to be developed further within the Commission as well as among the research community.

5 ANNEXES

Annex 1: Questionnaire

Annex 2: Main results

Annex 3: Main results by domains

Annex 4: Exploratory multidimensional and typological analysis