

EUROPEAN COMMISSION
INFORMATION SOCIETY DG

Case Studies on High Impact Projects

Final Report

Executive Summary

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Executive summary

1. Objectives of the study

The ‘High Impact Study’ had three major objectives:





- * To develop a pragmatic methodology for detailed impact assessment (in both quantitative and qualitative terms) of EU research funded projects.
- * To apply this methodology to case studies of ten ‘high impact’ projects in the ICT area funded under previous Framework Programmes, and to collect quantitative and qualitative data describing these impacts. The study also assesses the chronology of the project and its relation to impacts.
- * To describe the ‘critical success factors’ for each case study, identify any common factors, clearly identify the contribution made by EU research funding and the role played by participation in an EU funded research project in achieving the identified impacts.

2. The methodology at a glance

The methodology presented in this report is designed to measure the impact of EU research funded projects in both qualitative and quantitative terms, using indicators and other data collection techniques. It is also intended to provide an understanding of the process of generating impacts, to identify the factors of impact as well as the role of EU funding and EU project management in realising the impact. The methodology is not specific to the 10 case studies analysed in the framework of this study - it is an overall methodology that may be applied to impact assessment of IST projects in the future.

The impact assessment methodology developed and applied during this study consists of several successive steps which are described in the following table. The methodology is described in detail in Section 2 of this report.

PROJECT IMPACT ASSESSMENT METHODOLOGY

1		Definition of impact indicators	comprehensive and applicable to all projects; indicators customised to the assessment objectives
2		Selection of projects	criteria and tools (pre-assessment fiches for screening) obstacles when selecting projects
3		Assessment tools	In-depth assessment, interview guidelines and questionnaires
4		Data and information collection	desk research, face-to-face and phone interviews, problem of data intractability and impact attribution

3. Key Findings of the Case studies on high impact projects

The methodology outlined above has been applied to 10 projects in the ICT area selected by the Commission Services. These projects were funded under the 4th Framework Programme (only the AIT pilot project under the 3rd) and represent three different programmes: ESPRIT, ACTS and TAP.

In view of their primary objectives, these projects may be grouped as:

- * Development and deployment of smart card systems in the transport or health sector (CALYPSO, NETLINK).
- * Development and validation of semiconductor manufacturing technologies (BATEL, FASE).
- * Development, validation or trial application of software systems for database operation or e-commerce (MDA, SEMPER).
- * Introduction of voice recognition technology in public transport (ARISE).
- * Development of high resolution graphics systems for the health sector (OMI-VIEW).
- * Development of one of the major UMTS standards (FRAMES).
- * Definition of user needs regarding IT tools in the aerospace and automotive industry as well as development of suitable compatible products (AIT, a cluster of 13 ESPRIT and 10 BRITE-EURAM projects).

Most of the projects were completed in early 2000 with only ARISE, OMI-VIEW and SEMPER being completed in late 1998 or in 1999. In total these projects represent an overall budget of 137.4 M € with 67.6 M € EU funding.

The main overall impacts resulting from these projects – either already realised or expected – can be grouped according to a taxonomy of different categories of socio-economic impact.

Economic impacts

There are substantial economic impacts resulting from some of the projects surveyed.

Increased Turnover

About 18 months to 2 years after completion, exploitation of project results already led to impressive cumulated additional sales: for instance, commercialisation of the technology developed in BATEL resulted in sales of about 640 M €, exploitation of FASE to 150 – 200 M € while commercial activities based on the AIT cluster is estimated to have resulted in additional turnover of between 100-220 M €. It is worth emphasising also that these are *permanent* effects (as opposed to once-off events) likely to recur on an ongoing basis.

The FRAMES project has already had major economic effects resulting from investment in network equipment for mobile telecommunications. There are in addition vast *potential* economic gains depending on the take-up of third-generation mobile phones in the coming years. However, in many ways the great success of FRAMES lies not in commercial exploitation but in its market structuring effects and its establishment of standards (building on the success of GSM in the 1990s).

Further increases in economic activity in the e-commerce sector resulted from the SEMPER project. The limitations of the access to relevant data mean that it is impossible to attribute the contribution of FRAMES and SEMPER with any precision to the very substantial overall effects on turnover in the areas involved. However, even if the contribution is very small in relative terms (as low as 1 or 2%), this nevertheless amounts to a very substantial return (running to hundreds of millions of € annually) on the initial outlay. These returns are also permanent and recurring in nature.

A precise rate of return on investment for the five projects with major economic impacts probably cannot be calculated because of the attribution problem in the case of FRAMES and SEMPER but it can be concluded nevertheless that, even by including only the actual benefits (as opposed to potential) a substantial proportion of the cost of the overall programmes involved was covered by the impact of these projects alone.

Competitiveness on Global Markets; Productivity and Employment

From the standpoint of business competitiveness, some of the projects surveyed have had major effects. FASE has resulted in one of the partners becoming global market leader in supplying furnaces to semiconductor manufacturers. In doing so, it has addressed a problem of European competitiveness by reducing the dependence of European chip manufacturers on Japanese suppliers. Also in the semiconductor field, BATEL reports significant cost savings and a 50% increase in productivity for one of the participating companies. This project also resulted in the creation of hundreds of additional jobs among the different partners. FASE also demonstrates significant cost reductions (40%) among one of the partners.

Partners exploiting the results within their own business processes have achieved cumulative total cost savings in the order of nearly 50 M € since completion of the project.

Spin-off effects via Public Service Investment

The projects surveyed have also given rise to significant spin-off economic effects in terms of investment in public services. In the case of NETLINK, for example, the Slovenian authorities invested in the region of 18 M € in setting up a nationwide health smart card system based on the NETLINK specifications. A similar plan will be implemented in Quebec but on a much larger scale (over 100 M €). CALYPSO also resulted in substantial spin-offs resulting from public investment in transport smart cards.

Impacts on the quality of life

NETLINK, CALYPSO and ARISE led to reference solutions and opened new markets in the smart card application and voice-based transport information. The new transport or health sector-related smart cards and voice-based transport information system already have or will

bring benefits to millions of citizens in Europe. Specifically, the projects involved impacted on the following groups (with accompanying frequencies where appropriate):

- * more than 6 million regular metro and bus users in several European cities per day,
- * 2 million Slovenian users of interoperable health smart cards,
- * millions of callers per month seeking information on train schedules.

The benefits of the projects consist of more convenient use of urban transport, facilitation of health treatment and administration, improved information on railway transport conditions. Advances in mobile telephony and in e-commerce are also among the benefits identified in the case studies and these will also result in significant effects on the quality of life of consumers through increased mobility and convenience.

Scientific / technological impacts

One of the principal findings of the study is that among the main impacts of the projects were the achievement of considerable scientific and technological standards. All of the projects had a considerable impact on the scientific domain concerned: projects like FRAMES, AIT, CALYPSO, NETLINK and ARISE provided and validated new technological solutions as the basis for further product-specific development and market activities of project partners and non-participants. The technological progress achieved in the remaining projects led to improved performance of products that are now being commercially exploited by the partners concerned.

FRAMES was the only project in the sample explicitly targeted on a new standard while other projects such as NETLINK contributed to standard setting and consolidation. FRAMES resulted in the global acceptance of one of the major standards for UMTS, the successor to the current GSM mobile communication standard that will be introduced in 2002/2003 giving European industry the lead in the mobile communication market as is already the case for GSM.

For all of the case studies, participation in these projects resulted in increased expertise and scientific skills for the partners. Many projects established new networks or strengthened existing ones. For some projects, the results and the co-operation with other partners led to new research projects or to continue or deepen research activities, e.g. MDA.

A detailed description of the impacts arising from the 10 projects is given in the case studies in Part B of the final report while a summary of the results for each case study is included in the body of this report.

4. The key factors leading to impacts

Due to the diversity of projects and the fact that they are few in number, the case studies do not provide a sufficient basis for a comprehensive and reliable statistical analysis of the factors and mechanisms leading to the identified impacts. However, the case studies show that several common factors considerably influenced the successful completion of the projects and the resulting impacts.

Overall Project Strategy

The most impressive impacts have been achieved by projects assembling major players in the market or technological domain concerned which provides the critical mass to push a project forward towards exploitation. There are several examples of this in the case studies – FRAMES and AIT perhaps being the most obvious ones.

The strategic role of the Programme

From the viewpoint of project strategy, the role of the Programme also appears to be an important contributory factor to the success of the project. The involvement of all stakeholders (users included) in many of these projects demonstrates one of the principal contributions a publicly-funded research programme can make to ensuring a socially-optimal outcome from its projects.

User Role

Representing the user role in the consortium is a major requirement for the achievement of impacts. That enables the project to perform research according to user needs and to foster exploitation and impacts. In such projects the user has validated the results of the project thus giving credible references for further exploitation. In total the partnership should represent the value chain of the market concerned to reflect and to consider both user needs and the driving force to exploit the results even outside the consortium. This finding is of interest in regard to the design of commercially-oriented projects for FP6.

Core Business

To complete a project successfully and, notably, to exploit the results efficiently, requires that the project and its market perspectives are covered by the strategic business orientation of the partners. Being in line with the core business strategy of the exploiting partners is the major driving force to exploit a project successfully and to achieve considerable impacts.

Ongoing Project Management

Consortium

Effective and efficient project management is not only required for successfully completing the project but to prepare exploitation as well. The project should be conducted with an eye to exploitation including constant monitoring of the market and the technological environment concerned. Knowing each other from previous projects helps to run a project efficiently and with exploitation as a major target.

Programme

From the perspective of the Programme, key factors in regard to the impact issue are the role of project management in redirecting project objectives (for example in the case of FRAMES) in response to evolving circumstances and in ensuring that the project results and impacts are maximised from a socio-economic perspective.

The organisational / administrative framework of an EU project was a major contribution for many projects on two levels: a previous EU funded project provided the background technological input and the partners were forced to run the project efficiently and in line with binding milestones. In this context the role and responsibility of the Project Officer was particularly emphasised in several projects especially his contribution in establishing a pathway and adapting the partnership or the work programme to keep the project on track.

EU support

The added value¹ of the EU intervention appears in diverse forms in the projects reviewed here. Principal among these are changes in behaviour engendered as a result of participation in EU projects. Such effects describe changes in the speed and *quality* of the outcome, for example, by ensuring participation in wider research networks and by orienting project objectives to accommodate socio-economic goals. Evidence of such behavioural effects is borne out in several of the case studies, NETLINK being one of the best examples. In practical terms, the effect of the EU programme can be described in terms of providing the credibility both to get internal support within the partner's organisation and to assemble a critical mass of market players, notably if the project requires the participation of major competitors, for example, in standardisation projects.

At a more basic level, some of the projects surveyed indicate that EU research funding is still an important factor in relieving financial constraints notably in cases where projects are conducted by SMEs or research institutes. Some projects in the sample very likely would not have been realised at all without EU funding or would have been performed on a significantly lower level.

The added value generated by the EU involvement can also be described in terms of bringing a European dimension to the projects in question. The principal example of this is in the commercial area where there is a market size dimension underlying the feasibility of projects. Projects such as FRAMES, FASE and BATEL were successful partly because they were aimed at very large (global) markets and would have been much more difficult to launch on the level of an individual member state or region.

Similar remarks can be made in regard to the establishment of standards and norms – the contribution to European standards is one of the principal objectives of research funding at EU level. Such standards can be more readily accomplished at EU level and there are several examples of this in the case studies. FRAMES is perhaps the most obvious example, but there are many others including NETLINK. EU involvement has meant that objectives such as standardisation have been built into the design and execution of the projects under review here; it is also in evidence in their outcome.

External factors

The factors named above may be controlled by the partners and the EU programme management. However, some factors had a considerable influence on the project impacts which cannot be directly influenced by management, for example, changes in overall economic conditions, market changes or the emergence of new technologies affecting the

¹ European added value is a critical concept from an EU research evaluation perspective and has been defined in a recent report as *'the value resulting from EU support for RTD activities which is additional to the value that would have resulted from RTD funded both by public authorities at regional and national levels and by the private sector alone'*.

environment in which project results could be exploited. Project management therefore should include mechanisms to monitor market or technological trends to adapt the project objectives and tasks correspondingly if necessary.

5. Conclusions / Lessons to be Learned from the Study

On Impact

1. The projects surveyed in this study show a wide range of impacts across a variety of socio-economic themes. Principal among these are economic effects, impact on quality of life, on scientific and technological knowledge and on standardisation (FRAMES). In some cases the economic impact is substantial in terms of turnover (BATEL, FASE) and in its effects on competitiveness in world markets (FASE, FRAMES) while in others, the impact of the project has been felt by very large numbers (millions) of users (ARISE, CALYPSO).

While the projects reviewed have had a substantial impact and that some elements of this impact can be measured using, *inter alia*, appropriate indicators and data collection techniques, it has proved difficult nevertheless to collect data describing it in full.

2. In moving towards FP6, the evidence from the study shows that establishing critical mass may be significant in the context of the design of 'high impact' projects of the future. This has been a critical success factor in projects such as AIT and FRAMES. The participation of users and the representation of the entire value chain in the composition of project partnerships were also identified as key factors for project success in the case studies under review. These issues of user participation and project partner composition may be worthy of close examination for the design of large integrated projects for FP6.

In identifying interoperability as a factor for success in the case studies (AIT, NETLINK), the study findings point to possible consequences for the design of integrated projects under FP6 where, in principle at any rate, there should be sufficient scope for incorporating it in the setting of objectives.

3. The case studies show that high impacts of EU funded RTD projects are mainly caused by factors which may be influenced to some extent by the EU programme mechanisms. Notably the structure of the partnership and the role of partners may be influenced starting from the evaluation and negotiation phase. EU funding is required to provide a kind of seed funding and support to make projects happen which otherwise would not be realised.

From a project management perspective, the internal EU programme and project management structures result in projects being run efficiently throughout their life-cycle, as well as in targeting exploitation of the results and the intended impacts.

4. One of the findings of the study is that the EU label effect or the added credibility of projects because of the participation in EU funded programmes was a factor in their success (the ARISE and CALYPSO projects are good examples).

5. Another aspect of the European dimension having a bearing on impact is in the commercial area where there is a market size factor underlying the feasibility of projects. Projects such as FRAMES, FASE and BATEL were successful partly because they were aimed at very large (global) markets. From an evaluation perspective, the conclusion could be drawn that large integrated projects in FP6 with commercial objectives could take this into account in their design.
6. Similar remarks can be made in regard to the establishment of standards and norms – the contribution to European standards is one of the principal objectives of research funding at EU level. In some cases this effect was due to factors such as European market dimension (FRAMES) or in others to the development of prototype European systems (NETLINK).

On Methodology

1. The study provides an outline of how an impact assessment system could be constructed. It should nevertheless be recalled that these case studies were carried out on highly successful projects with clearly defined objectives and achievements. Even in such relatively benign circumstances, the data constraint proved to be a significant obstacle. The conclusion that the task is feasible should therefore be carefully qualified. Systematic impact assessment of IST projects cannot take place without some form of centralised data collection system. Existing measures in this respect are either inadequate in their design or lack the necessary technical support and infrastructure to be useful. For impact assessment, data collection moreover is not sufficient on its own - it needs to be supplemented by other measures.
2. There are certain pre-conditions for implementing a suitable impact assessment scheme for IST projects:
 - Project impact occurs mainly in the years following project completion. Impact assessment is therefore likely to be carried out for example 2-3 years after the completion of projects. This requires contacts to be maintained at least with the project co-ordinators for a period of time beyond current practice. There are implications for how this is to be achieved. The relationship with the Project Co-ordinator, the key stakeholder, needs to be nurtured in order to ensure there is a solid relationship at the point of impact measurement. The role of the Project Officer is key to safeguarding this relationship.
 - The project partners would be required to provide data after the completion of the project on the basis of their exploitation of the results.

The legal and administrative implications of setting up an impact assessment system therefore need to be carefully explored. The design of the contract may need to be reviewed to ensure there is adequate provision for data collection while the implementation of appropriate data collection tools, particularly questionnaires, remains an important issue.

3. It is very important to emphasise that the issue of impact assessment is, moreover, not just a question of data collection systems. There are several elements involved in the process. The role of the Project Officer is clearly critical in providing an overall qualitative view of

how the project fared and creating a pathway to the network of stakeholders qualified to provide useful data. The role of the Project Officer in maintaining *institutional memory* is indispensable.

4. There are a number of other important features to take into account in approaching impact assessment. This study highlights the usefulness of a two-stage approach to measurement, using first a short universal impact assessment fiche to capture the broad elements of impact before making a selection in the second stage of the most promising projects for in-depth appraisal. This short universal assessment fiche could usefully be built into ongoing impact assessment practice (as is the case already in parts of the IST Programme).
5. It is clear that interviews with project participants and other stakeholders are an indispensable element in the design of an overall impact assessment system if the detailed nature of impacts are to be recorded, measured and understood. The agreement to such interviews will be facilitated if there is an ongoing positive relationship between the project participants and the Programme. *As was noted above, this has implications in terms of nurturing the relationship between the Project Officer, the Project Co-ordinator and the partners beyond the period of the contract.*
6. The attribution problem should not be underestimated. This is a significant conclusion of the report based on the evidence of several of the case studies which show that the problem continues to be intractable in many cases. No impact assessment system can handle all of the measurement and attribution issues raised in an exercise such as this and while the study outlines an impact measurement system, *the limits of what can be achieved should also be borne in mind.*
7. Some of the most important impacts recorded in the study are in the Scientific and Technological Knowledge and Quality of Life areas. However, there are particular difficulties in recording and measuring these effects because of the inadequacy of existing indicators. Development of new indicators in these areas should be given urgent priority in designing an impact measurement system.
8. The issue of quantitative data is one which requires further consideration. Although in some cases, particularly as regards direct commercial application, the data is readily available, it nevertheless often remains difficult to obtain precise quantitative data for project impacts. There is evidence from the study however that using data ranges or scaling factors can on occasion represent a solution to these problems.
9. The results of the study show clearly that European added value is generated by the EU research projects concerned. This added value is present in several forms but is sometimes difficult to identify and distinguish. Some projects demonstrate basic financial (or input) added value while for others, the evidence of the added value of the intervention is on the basis of changing the behaviour and quality of projects which would have gone ahead in some other form. From an evaluation perspective, the conclusion is that *more effort needs to be devoted to developing suitable criteria* for assessing this feature of IST projects.
10. In conclusion, the methodology developed, used and upgraded in this study has proven to be appropriate and applicable to the different case studies. It can be applied to other projects depending on the nature of the exercise and the quantity and quality of data

available. The use of the methodology in fact reveals the main challenges in impact assessment:

- access to the memory of the organisations concerning the process of impact generation: this mainly involves the partners in the projects. Access to this information is indeed critical as it is the only information available (the impacts are at the micro societal level so no statistical data from other sources exist);
- the issues of traceability of impacts and attribution of impacts to a diversity of factors, among them the EU contribution. Tracing impacts is made more challenging in particular in cases of multiple contributions to the impacts and complex organisations. Attributing impacts to factors implies that tracing is possible but also that the relative contributions of the different factors might be quantified in one way or another.