HELSINKI UNIVERSITY OF TECHNOLOGY
Department of Electrical and Communications Engineering

Juha Saarnio

Managing Multinational Research Projects

Diplomityö, joka on jätetty opinnäytteenä tarkastettavaksi
diplomi-insinöörin tutkintoa varten Espoossa 30.5.2000

Työn valvoja Dosentti Kalevi Kilkki, TkT

HELSINKI UNIVERSITY OF TECHNOLOGY

ABSTRACT OF THE MASTER'S THESIS

Author:	Juha Saarnio
Name of the Thesis:	Managing Multinational Research Projects
Date:	May 30, 2000 **Number of pages:** 55
Department:	Department of Electrical and Communications Engineering
Professorship:	S-38 Telecommunications Technology
Supervisor:	Docent Kalevi Kilkki, Dr. Tech.

This thesis is an overview of the management of multinational and multicultural research projects in the framework of the European Union. It aims at answering the questions of how to apply for an EU project, what constitutes its management, what problems might arise in the application phase, during its course of running and after it has ended and also it helps the reader to decide when it is appropriate to start an EU project.

Research and development are encouraged by the European Commission through the funding of Framework Programmes under which research programmes reside. In this thesis a case study is conducted in a project called the Integrated Multimedia Project, IMMP. IMMP is a recently finished project that belonged into a research programme ACTS under the Fourth European Framework Programme.

Large multinational research projects are cumbersome to manage due to their quite fragmented nature. A project can be fragmented as a result to its size, organisational involvement, research topics, culturality and so on. There is also quite a heavy load of bureaucracy involved. All these issues should be conceptionalised before starting with a project of this sort. Problems can be caused by a great number of deadlines, reporting, consensus mechanisms, false expectations, partner selection, manpower allocation, the exchange of employees and result dissemination. On the other hand, participating in a EU project can prove to be very fruitful. There are opportunities to be seized that are unique to the multicultural nature of the projects.

As a whole, participating in a European collaboration project can be quite rewarding, provided that the possible pitfalls lurking on the way can be circumvented or alleviated through proper planning and skilful management.

Keywords: Project Management, EU, Multinational Research Project

TEKNILLINEN KORKEAKOULU DIPLOMITYÖN TIIVISTELMÄ

Tekijä:	Juha Saarnio
Työn nimi:	Monikansallisten tutkimusprojektien johtaminen
Päivämäärä:	30.5.2000 **Sivumäärä:** 55
Osasto:	Sähkö- ja tietoliikennetekniikan osasto
Professuuri:	S-38 Teletekniikka
Työn valvoja:	Dosentti Kalevi Kilkki, TkT

Tämä diplomityö on läpileikkaus monikulttuurisien ja samalla monikansallisten projektien johtamiseen Euroopan Unionin tutkimusohjelmissa. Työn tavoitteena on vastata kysymyksiin kuinka anoa projektia EU:n ohjelmaan, kuinka projektia voidaan ohjata, mitä ongelmia on odotettavissa sekä missä tapauksissa kannattaa harkita projektin korottamista EU-projektiksi.

Euroopan Komissio rohkaisee eurooppalaista tutkimusta ja kehitystä rahoittamalla puiteohjelmia, joissa tutkimusohjelmat ja projektit toimivat. Tässä diplomityössä esitellään Integrated Multimedia Project, IMMP, esimerkkinä EU-projektista. IMMP kuului juuri päättyneenä projektina tutkimusohjelmaan nimeltä ACTS ja tämä puolestaan EU:n neljänteen puiteohjelmaan.

Suuret monikansalliset tutkimusprojektit ovat raskaita johtaa synnynnäisen rikkonaisuutensa vuoksi. Projekti voi olla rikkonainen kokonsa, osallistujiensa, aiheensa tai vaikka kulttuurillisuutensa vuoksi. Tällaisten projektien johtaminen vaatii myös paljon byrokratiaa. Kaikkien näitten asioiden sisäistäminen on tärkeää ennen kyseisenlaisen projektin suunnittelun aloittamista. Projektin suunnittelun ja sen kulun aikana sekä sen päättymisen jälkeen voi ilmetä ongelmia seuraavien asioiden kohdalla: aikarajojen pitäminen, raportointi, päätöksenteko, odotukset, kumppanien valitseminen, henkilötyön jakaminen, työntekijöiden vaihtuminen sekä tuloksista tiedottaminen. Toisaalta EU-projektiin osallistuminen voi osoittautua hyvinkin hedelmälliseksi. Monikansalliset projektit tarjoavat monta ainutlaatuista tilaisuutta, joihin kannattaa tarttua.

Kokonaisuutta ajatellen voi sanoa, että eurooppalaiseen yhteistyöprojektiin osallistuminen kannattaa, jos ottaa huomioon edellä lueteltuihin ongelmiin varautumisen huolellisen suunnittelun ja taitavan johtamisen kautta.

Avainsanat: Projektinjohtaminen, EU, monikansallinen tutkimusprojekti

PREFACE

The work for this master's thesis was carried out in the Nokia Research Center in the Communication Systems laboratory. I would like to thank all those who have contributed to the work.

I would like to express my gratitude to my supervisor Docent Kalevi Kilkki for his guidance during my work for the thesis. I am also very grateful to the people with whom I have discussed issues surrounding EU project management.

I would also like to thank all the people involved in the Integrated Multimedia Project, IMMP.

Helsinki, May 30, 2000

Juha Saarnio

Table of Contents

List of Figures

List of Abbreviations

AAL5	ATM Adaptation Layer 5
ACM	ACTS Management Committee
ACTS	Advanced Communications Technologies and Services
ADSL	Asymmetric Digital Subscriber Loop
APRR	Annual Project Review Report
ATM	Asynchronous Transfer Mode
CATV	Cable TV
CD-ROM	Compact Disc Read-Only Memory
CWC	Cable and Wireless Communication, Ltd.
DG	Directorate General
EC	The European Commission
EU	The European Union
FP	Framework Programme
FTP	File Transfer Protocol
HE	Head-End
HFC	Hybrid Fibre Coax
HTML	HyperText Mark-up Language
HTTP	Hypertext Transfer Protocol
HUT	Helsinki University of Technology
IMMP	Integrated Multimedia Project
IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
IST	Information Society Technologies
IT	Information Technology
IWU	InterWorking Unit
LAN	Local Area Network
MHEG	Multimedia and Hypermedia Expert Group
MPEG	Moving Picture Expert Group

NH	National Host
PC	Personal Computer
PDF	Portable Distribution Format
PO	Project Officer
POTS	Plain Old Telephone Service
QoS	Quality of Service
RF	Radio Frequency
RTD	Research and Technological Development
R&D	Research and Development
SCART	Syndicat des Constructeurs d'Appareils Radio Récepteurs et Téléviseurs
SMHI	Sveriges meteorologiska och hydrologiska institut
STB	Set-top box
TA	Technical Audit
TIP	Technological Implementation Plan
UOC	Universitat Oberta de Catalunya
UPC	Universitat Politècnica de Catalunya
VoD	Video on Demand
WP	Work Package
WWW	World Wide Web
XDSL	Any kind of Digital Subscriber Line technology

1. Introduction

This thesis analyses a now finished large multinational and multicultural EU project that belonged to a research and development programme Advanced Communications Technologies and Services (ACTS) under the Fourth European Framework Programme. The project, Integrated Multimedia Project, IMMP, is mainly analysed from the administrative point of view. The document explains the whole process of writing and submitting a proposal to the European Commission, as well as, gives insight into the administrative issues a project coordinator runs into during the lifetime of a project. The document also illuminates some of the pitfalls that may realise themselves at some point in time during the project's run. The final part of the document sheds light on some contractual and legal issues and also lists all the different documents that need to be incorporated in a project proposal.

The main rationale behind this thesis is its goal of trying to answer the question: "How can the administering of a multinational project be made easier?" There are a multitude of different difficulties when putting a project proposal together, applying for a project, reporting on the project work and disseminating the project results. These can prove to be very cumbersome to manage and this thesis aims at giving insight into these problems and attempts to give some tools for the reader helping with the handling of these issues. Discovering these pitfalls in advance hopefully benefits a project manager considering taking on such a grand undertaking. This is the main subject of this thesis and it is discussed in chapter 7.

The thesis can also be used as a proposer's guide to submitting a project proposal into a research programme within the EU. Even though the document describes the procedure from ACTS point of view, there are not many differences to submitting a proposal to another R&D programme within the Community. At the time of writing this document, the Fifth Framework Programme has started and two rounds of proposals have been submitted to its Information Society Technologies (IST) Programme. As this is the current IT programme, some differences between ACTS and IST are also highlighted.

The writer of this thesis has been involved in the administration of IMMP for more than four years. Most of the practical insight in this document spurs from this relationship. Since IMMP was an ACTS project this also constitutes to the fact that examples throughout this document come from this source. Many pieces of information also come from discussions with people involved in other projects and the administration of those.

It is hoped that the reader finds this thesis a useful and interesting guide and is encouraged into submitting a proposal for a EU project. The Community Research and Development programmes are a great way of doing R&D work in a multicultural environment and contributing to the well-being of the whole Europe.

2. Background

Since its beginning, the European Union has funded numerous research programmes belonging to several Framework Programmes. The recently finished research program ACTS belonged to the 4th Framework Programme, which ran from 1994 until 1999. The following chapter introduces the reader to this R&D programme.

2.1 What is ACTS?

Advanced communications technologies and services are crucial for consolidation of the internal market, for Europe's industrial competitiveness and for balanced economic development. The services are a vital link between industry, services sector and market as well as between peripheral areas and economic centres. They are also a pre-requisite for social cohesion and cultural development. All of these considerations have been for many years important concerns of European policy [ACOVR97].

In order to carry out the work needed to build a future information society, EU funded an advanced research program called ACTS (Advanced Communications Technologies and Services). This integrated programme harboured a total of 157 research projects.

ACTS supported the world's largest set of linked trials, experiments and demonstrations under a budget of 670 Me. Being the first EU programme that had world-wide participation, ACTS supported 23 National Hosts that offered test-beds and network facilities to the member projects. These hosts allowed individual projects to carry out trials spanning many countries, using the latest technologies. [ACTS95], [ACINT97]

The European Commission has produced a paper called the **White Paper on Growth, Competitiveness and Employment** in which it is proposed that the Member States of the European Union, and the European institutions, should together focus on five priorities:

- Promotion of the use of information technologies, particularly in the public sector, but also through promotion of teleworking.
- Promotion of investment in basic trans-European services, for Integrated Services Digital Network (ISDN) and high-speed networking.
- Creation of an appropriate regulatory framework to ensure competition, guarantee universal service and security of information and communication systems.
- Development of training on new technologies.
- An increased industrial and technological performance in European business, notably through increasing research and technology development.

These priorities that can be further broken into smaller actions were followed by every ACTS project. [RAT97]

2.2 ACTS projects

There were 33 countries taking part in the projects within ACTS. These included all the 15 EU member countries, most of the rest of the European countries and a few countries outside Europe including USA, Canada and Japan. The ACTS projects were formed as consortiums between organisations in these countries. [ACTS97] Usually, a project consortium had around ten partners from around five countries but some large projects linked together more than ten countries. Of course, the more countries involved in a project, the stronger organisation is required to co-ordinate the work.

Individual demonstrations and trials undertaken with support from the programme were either small and carefully focused local events, or equally very large-scale international demonstrations of advanced communications. The latter actively involved dozens of different countries, and were often associated to major exhibitions or conferences.

What made ACTS unique amongst the EU's research programmes was that individual project results were brought together, and synergies were built up through an in-built concertation mechanism. This ensured that projects were made aware of the results of

each other, and that cooperative initiatives developed naturally to address the Programme objectives, and to produce coherent results supported by a broad base of expertise and participating organisations. It is the Programme results of ACTS that will make a substantial contribution to relevant standardisation, and help build guidelines for the development of longer-term policy goals covering the European communications sector. [ACPRO97]

The EU actively seeks international co-operation in a number of economic sectors, amongst which communications and related Information Society issues are prominent. In the communications business, the commercial interests of equipment manufacturers, network operators and major corporate users all have an international focus. Communications is in itself, a truly international business. Europe's promotion of international co-operation in this sector is therefore fully in-line with strong business interests.

Many major obstacles of a technical, economic and political nature have still to be overcome, before a global information society can become reality. Given the scale of investment needed to upgrade existing services and network infrastructure to future multimedia applications, “backing the wrong horse” would prove to be a very costly, and perhaps fatal mistake for any single organisation or country acting alone. The developed countries of the world and their major organisations therefore have little choice but to cooperate with each other to determine the basic standards that will set the framework for open competition, and rapid commercial take-up of advanced communications services. In this context international initiatives like the G7 Pilot Projects are considered to have a very important, and catalytic role to play in developing the infrastructure necessary for an Information Society.

3. Applying for and running a project

This section outlines the procedure for submitting a project proposal to the Commission. It discusses preparing a proposal and its way into a project. The reader is also familiarised with Commission-supplied tools for proposal creation. This chapter starts with the assumption that a proposal will be accepted. This, however, is in most cases not true. In the call for proposal on average only about one fifth of the proposals are accepted to a programme. In these cases the Commission provides the consortium with evaluation comments, which are most helpful if the consortium chooses to pursue the issue and modify the proposal accordingly for the next call.

3.1 Preparing a proposal

There are certain periods of time when project proposals are accepted. When such an opportunity arises, the Commission will announce a call for proposals. This will have an ending date before which the proposal must be submitted. In IST, there are also calls for proposals that have a continuous submission scheme, but RTD project proposals are handled through calls with a fixed ending date. The continuous submission calls are therefore omitted in the rest of the text.

Preparing a project proposal starts with defining a subject for a potential project and finding suitable partners for the project consortium. A lot of help in building a project consortium can be found by going through the consortia of previous or on-going EU projects. At this time the proposer should download all of the Commission-supplied guides and other relevant documentation from the programme web site.

When it is decided that a consortium wants to submit a project proposal to the Commission the coordinator asks the Commission for a proposal number. This number will accompany the proposal all the way through the submission, evaluation and negotiation cycle. The form for requesting a proposal number for an IST call can be found within a guide document on the IST web site.

The Commission provides guidelines for writing the proposal. These guidelines specify all the obligatory information that need to be present in the proposal. The Commission also provides two pieces of software, which are used in the proposal preparation. The first is a program called CAPPlus and it is a project information and contract database. The second is called sealing software and it is to be used in conjunction with CAPPlus. The sealing software is an encrypting package specifically prepared for a certain proposal. When the proposal is ready to be sent to Brussels, the sealing software is used to encrypt the proposal and seal the database. The software extracts a key from the encrypting process and this is written in a sealing report that needs to be sent by fax to the Commission. The sealed database can then be uploaded via FTP to Commission's server, sent via a courier or taken in by hand.

3.2 From proposal to project

After a proposal is submitted the Commission confirms receiving the proposal within ten working days after the call for proposals has expired. After that the proposals sent by potential project consortia go through technical evaluation. Quite often receiving some modification suggestions. Usually also the number of man months offered is lowered.

In the case of an ACTS proposal the evaluation results will be discussed in an ACTS Management Committee (AMC) in which all the national delegates participate. This happens quite soon after the technical evaluation. After yet another AMC meeting the results are published.

The proposal can be accepted as it is but usually it is accepted with modifications. If it is accepted with modifications then a phase called negotiation starts. In the negotiation phase the proposal is modified in the way that it better fits into the research program framework. This negotiation phase consists of three rounds of which the first two mould the project plan into shape and the third one finalises the CAPPlus data. At least the two first rounds take place in Brussels but the third one can be handled electronically.

After the proposal has been accepted a contract between the Commission and the project consortium is drawn. Usually the contract does not cover the whole project

duration and needs to be amended if the project continues successfully. In the contract the Commission also agrees to take on partial financing of the project.

One part of the contract is of particular interest and that is the Technical Annex. The Technical Annex consists of tables extracted from the CAPPlus software and a complete project plan. This document is the base document, which the project follows during its lifetime. In the Annex the current year is described in fine detail (activity level planning) and the rest of the project in coarse detail (work package level planning). Once a year the Contract, CAPPlus information and the Annex are upgraded accordingly and sent to the Commission for approval.

3.3 Project organisation

When a proposal turns into a project a contract is signed between the Commission and the project partners and a project officer is assigned to the project. A project officer is a civil servant within the Commission who acts as a middleman between the project management and the Commission. He is a very important person as he guides the project into a suitable and wanted direction when important steering decisions are made.

At this point the project should also identify its need for any internal or external project steering groups or co-ordinating committees. Beside the obvious project manager the project needs at least a technical manager and a project assistant. The technical manager keeps the project on a right technological track and the project assistant acts as the project manager's right arm. The project manager and the project assistant form an entity called the project office through which all material prepared by the project are passed to the Commission.

The project consortium consists of full partners and associate partners. The full partners might have subcontractors bringing in extra knowledge and special skills needed in the project. These partners usually sign a consortium agreement, which describes all the legal aspects of the project. Even though the consortium agreement is not mandatory, it is recommended as it helps resolve any arising concerns between the project partners. The Commission provides a standard-term template for the consortium agreement. In the document the partners' rights and obligations, handling

of background and foreground information, disclosure issues and such are described. Figure 1 below depicts the roles of the different project partners and their interrelationships.

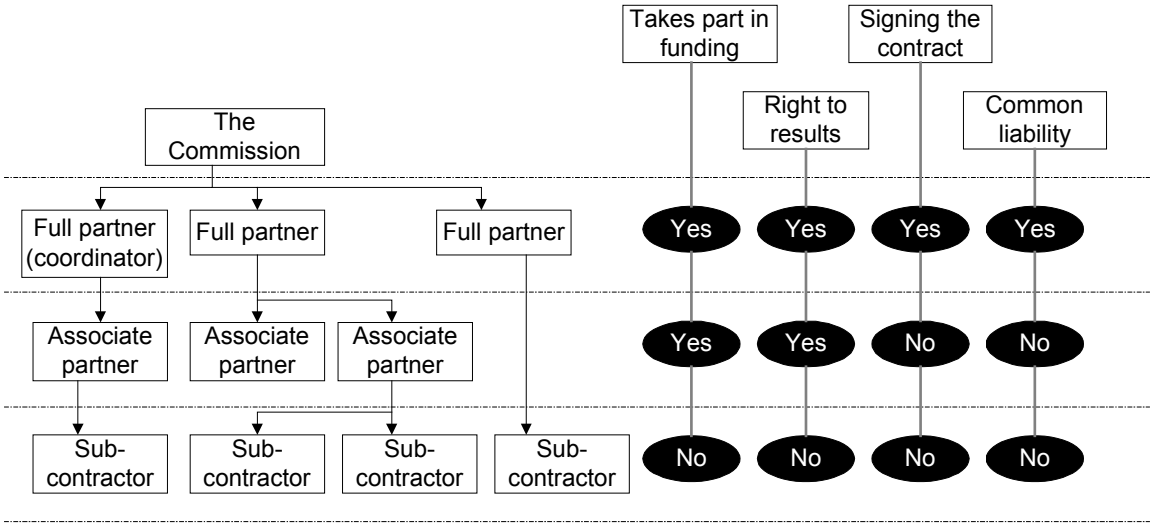

Figure 1 Project participants and their interrelationship in the project

If the project is split further into finer parts we first discover work packages or WPs. These are separate units in which the project work is carried out. Each WP requires a work package leader. The full partners usually take the responsibility for a WP and the leader, or leaders in case of several WPs, comes from within that organisation. Sometimes it might be wise to appoint a WP co-leader, as well. This might be the case if the workload of a WP is high and more than one partner is heavily involved in the work carried out by the WP.

The WPs, in turn, are divided into activities, which may or may not run for the whole project length. There might also be work packages which need not run for the whole duration of the project. Each activity takes on a specific and well-focused task within the work package. It may be beneficial for the project to appoint activity leaders, as well as work package leaders. This being the case at least with large projects where many partners share the work of a single activity.

The work package structure is designed in such a way that research and implementation work is well balanced. The research should give implementation and development ideas and guide the work in these work packages while another work

package evaluates the feasibility of the trials and demonstrations produced and provides feedback to the beginning of the cycle. This whole process is monitored by the project management work package. Figure 3 below illustrates a typical project organisation. In this example the actual implementation work is divided into three separate work packages from which the trials spawn. Trials are evaluated and feedback flows back to the top to form a self-correcting guidance system.

A project's timing scheme required by the Commission is illustrated in Figure 2. The active activities and deliverables due can be seen in the picture at one glance. In the picture all the work packages and the activities contained therein are shown on the left side. The arrow length represents the length of an activity and the ends of the arrows mark the starting and ending points of an activity. One important (and often confusing) issue that can be noted by looking at this picture is that the project years and calendar years do not necessarily coincide. A figure of this sort can very well prove to be an invaluable tool in keeping the project on schedule.

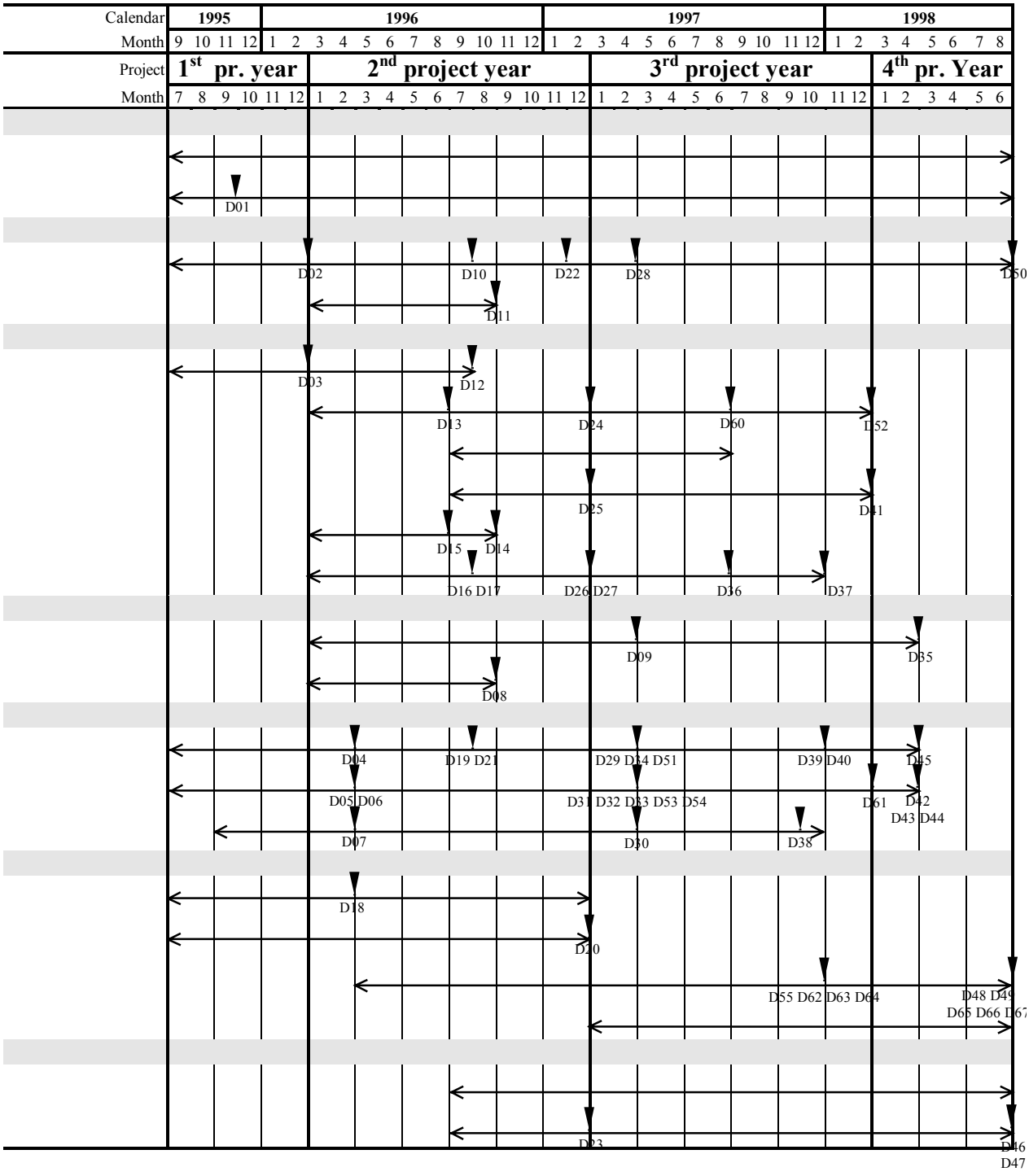

Figure 2 Timing of activities and deliverables

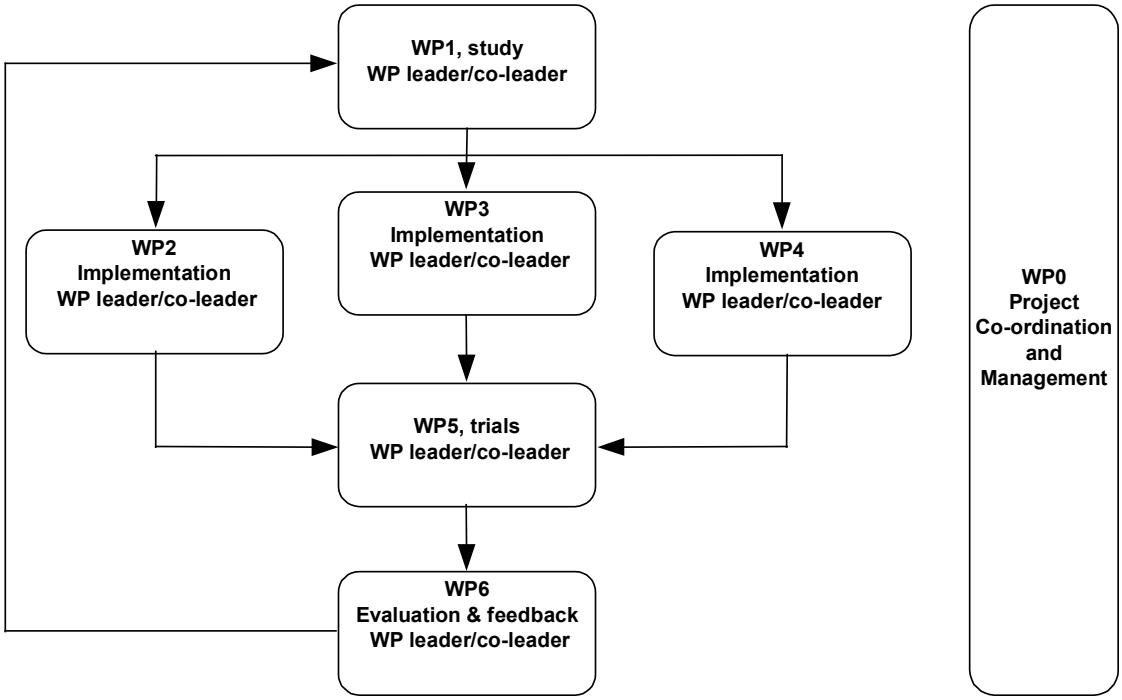

Figure 3 The interrelationships of the work packages

3.4 Technical annex

Technical annex is part of the contract between the project consortium and the Commission. The annex describes the project in detail and serves as a project manual. The technical annex, containing the project plan, is invaluable to the project. It begins with an overall description of the project. From this first part the project objectives and the plan to achieve them can be extracted. The annex then describes the project plan as a whole by introducing the work packages that make up the project. The man months planned for each work package and their division between the project partners can also be found here. The annex also introduces the deliverables the project is planning on releasing and the project timing plan.

In the next section of the annex the current project year is described in detail. The work packages are split into activities and all the on-going activities are explained. The man months expended by a certain partner working for a certain activity are also

shown. From here it is easy for the project partners to check for information and update themselves on the project progress.

As the project moves into another year all the information within the annex are updated. A new year is expanded into the current year and the annex is modified to include information about the project achievements so far. It also needs to hold explanatory information when, and if, the project has failed to deliver something that was planned.

3.5 Project deliverables

The project revolves around writing and submitting several deliverables. Deliverables are the main output of the project. These are usually paper documents but can also be software or other such material entities. The actual nature of a deliverable can be prototype, report, specification, tool or other if the deliverable fits into none of the former categories. These are a part of the project plan and bind the project contractually. There are intermediate and major deliverables of four different confidentiality classes, namely public, restricted, limited and internal.

The deliverables have all a planned submittal date in the technical annex. This date does not actually specify the day when submission should occur; just the month and the project year in question are given. The submission date is therefore commonly interpreted as being the last day of the month in question. It is not good practise to delay a deliverable. If there is a good reason to deviate from the project plan in this way the contract terms could be changed by negotiating a new schedule with the project officer but it is much easier to submit the deliverable on time and update it later by submitting a second version.

If the original project plan needs to be changed due to, for example, unforeseen technology developments in the world the changes are best implemented during the annual update to the plan. Any changes during the project year are very difficult. The only relatively easy change is to schedule some additional deliverables to the project plan. There can also be a need for additional deliverables that need not be submitted to the Commission at all. These kinds of documents can be used to distribute important information between the project partners.

3.6 Cost claims

The Commission agrees to take on some of the costs for a project when a project contract is signed. The payment method the Commission uses is advance payment. This means that the Commission pays a certain advance to the coordinating partner of the project and that advance is further distributed down the chain of project partners. When the project starts the project partners start logging the time they have spent working for the project and report this monthly to the coordinating partner. He then collects the information and submits an annual cost claim to the Commission. This cost claim is checked against the advance (or advances) already paid and the Commission pays another of which size is based on a relation between the size of the earlier advance and the cost claim. This is a nice way of dealing with project cost since partners get their share of the Commission contribution in advance and do not need to use their own budget to pay for the Commission's part and be reimbursed afterwards. If, when the project finishes, some part of advance remains unused, it is simply returned to the Commission.

3.7 Technical audit

When the project has been running for some time, it is time to present the results and advances attained so far. This is what the annual technical audit is for.

The Commission carries out a technical audit (TA) once a year in Brussels. During the audit all the projects participating in the research programme are studied carefully and decisions are made whether they should continue, be modified or discontinued altogether. The audit for a particular project is carried out by a group of experts called auditors. These auditors are people from European companies and organisations that have been requested by the Commission to take on the task of evaluating projects.

When the audit nears, the Commission will provide the projects with a date and time. The auditors' identities will remain a secret. The auditors have been trained for the task during the week before audit and they have been given necessary information of the projects they have been selected to evaluate.

When the time of the audit draws closer the project will need to prepare a document called the Annual Project Review Report (APRR). This report will be written according to instructions from the Commission and it will contain all relevant information of the project's progress. It will concentrate mostly on whether the project has attained all its goals for the period in question and whether it has done all the work planned. The auditors will use the Annual Project Review Report, as well as, the project's technical annex as a basis for the evaluation.

The project will also need to prepare a presentation and possibly some demonstrations showing the progress made. Maximum of four people from the project can take part in the audit and the hearing will take place behind closed doors. The people present usually include a chairperson, about ten auditors, the project's project officer and, of course, the people presenting the project. The hearing starts with the project's presentation for which the time is limited to 24 minutes (within ACTS) then it is time for the auditors to ask questions and the whole process is over in an hour. The project might also have some time scheduled for a demonstration, which is a more informal event without timing. Also the people presenting the demonstrations may differ from those taking part in the actual audit.

It is entirely up to the project to decide upon a presentation format but the organisers need to be informed about the needed equipment and connections. The organisers provide things like overhead projectors and telephone lines for the demonstrations. All other equipment must be brought in Brussels by the project. It might be advantageous to have handouts of the demonstrations and project flyers, as well as, paper copies of the actual audit presentation to be handed out to the auditors.

After the audit the auditors prepare their evaluation statement and the project is informed about the outcome. There are three possibilities: the project continues as planned, the project continues but it needs modifications or the project goes into an in-depth audit. The most common case is that the project continues but some modifications need to be incorporated. Based on the ACTS evaluation data of a single audit, only a fraction of projects continue without modifications and similarly a small number end up in the in-depth audit. The majority of the projects require modifications in order to continue.

The in-depth audit is a separately arranged event that may last a long time. During the event the project in question is thoroughly assessed and all problems identified. The project may either continue with heavy modifications and corrections to its structure or it may end. Either way, the in-depth audit is something that needs to be avoided. This can be done by fulfilling the contractual terms, keeping the project on time and preparing a good audit presentation.

3.8 Amending the project contract

In the case of a successful audit hearing the project continues modified or, more infrequently, unmodified. This means that the CAPPlus database and the technical annex need to be updated to reflect the situation. When the project year changes, a new year must be made active, i.e. the work package level project plans for the year in question must be changed into activity level plans. Also the real man month information is updated into the database and man month plans for the future are updated. It might also be the case that the project contract ends at this time. Therefore a new contract must be signed and submitted to the Commission along with all the rest of the information. When the Commission is satisfied with all the information, they create a new copy of the contract, which the coordinating partner then delivers to all the rest of the project partners and a new project year is on its way.

3.9 Main differences between ACTS and IST

As the 4th Framework Programme has drawn to a close and the 5th FP programmes have started, a word on differences between the two is in order.

The Fifth Framework Programme (FP5) defines the European Union's strategic priorities for Research, Technological Development and Demonstration activities for the period 1998-2002. FP5 has been conceived to help solve problems and to respond to major socio-economic challenges such as increasing Europe's industrial competitiveness, job creation and improving the quality of life for European citizens. Emphasis is placed throughout on the process of innovation to ensure the output of EU research is translated into tangible benefits for all [FP5].

The programme within FP5 that corresponds to ACTS is IST. This programme promotes a user-friendly information society. IST is a single, integrated research programme that builds on the convergence of information processing, communications and media technologies. IST has an indicative budget of 3.6 billion Euros and is managed by the Information Society DG of the European Commission [ISTa].

The guidelines for contract preparation under the two programmes are quite similar. It is recommended that the proposer stops by the IST contract preparation web site and downloads copies of the following documents [ISTb]:

- Guidelines for contract preparation for coordinators of IST projects
- Contract Preparation Forms (the desired version)
- TU "ELECTRA" (Excel application to assist in completing the contract preparation forms
- Special clauses and conditions for contracts in the IST programme
- IST Contract negotiation FAQ
- FP5 Model Contracts
- Guidelines on major financial provisions for cost reimbursements research contracts
- Additional FP5 administrative info
- A copy of a Java-based contract database tool (ProTool)

These documents give all the necessary information for the contract preparation. They are freely downloadable from the IST website both in Portable Distribution Format (PDF) and Microsoft Word document formats.

One notable change is that the project partner names have changed from one programme to another. In IST the full partner is called a principal contractor, the

associate partner is called an assistant contractor. The subcontractor still has the same name. There are some additional changes to the roles and responsibilities of the contractors. These changes can be reviewed in the contract preparation guidelines outlined in the documents listed above.

Another change for the better is the new contract data-storing tool provided by the Commission. The previous tool was called CAPPlus and it was very complicated to master and tricky to use. Changing the information stored in the database was quite tedious and tasking. The new tool is a much better alternative for storing the consortium data. The tool is called ProTool and it is a Java-based computer program that helps in preparing the administrative part of the application forms for almost all actions of the 5th Framework Programme. It also allows for electronic submission of the full proposal to the European Commission [ISTc]. The latest version of the tool can be downloaded from the website http://www.cordis.lu/fp5/protool/download/home.html.

4. Contracts

This section describes the most important contracts that are formed between the Commission and the project consortium and within the project consortium. The section is mainly referred from [ELO95].

4.1 Model contract

The main contract for EU's R&D projects is based on a model contract prepared by the Commission. The parties for this contract are the Commission and the contractors. One of the full partners is acting as the project coordinator. The following are the general conditions listed in the model contract.

Implementation of the work (Part A)

All general communications with the Commission shall be through the coordinator. The payments coming from the Commission are distributed via the coordinator as well. The project officer at the Commission is the main contact person for the coordinator. The Commission also appoints external experts to supervise project progress. These *technical auditors* must have access to places where the work is being done and to project documents. In addition to technical auditing, the Commission or the external experts appointed by the Commission may also perform financial auditing.

Third parties may also join EU's R&D projects as an associate partner or subcontractor. The difference between the two is that the Commission finances an associated partner and the full partner finances a subcontractor. Subcontractor is not entitled to make use of the project results.

Project termination. A project may be terminated before the project objectives have been reached. However, this is an extraordinary situation, but might happen in a situation where:

- Major technical or economic reasons substantially affect the project.
- The exploitation potential of the results of the contract significantly diminishes.

If the reason for termination is relevant only for one full partner, the whole project does not have to be terminated.

The Commission may immediately terminate the contract, or the participation of any full partner, by written notice:

- Where remedial action to rectify non-performance within a reasonable period of time (minimum of 1 month) has been requested by the Commission and has not been satisfactorily taken, or for any serious financial irregularity.
- If there is a change in ownership of a full partner, associate partner or an affiliate that is likely to affect the project or the interests of the Community.

If a partner is withdrawn from the project before the project objectives have been reached, access rights to work performed on the project before termination shall be transferred to any replacing partner performing the project. If a partner has not fulfilled the objectives, which where set for his responsibility and therefore the project objectives have no been reached, the partner is obligated to pay the expenditures and possible financial losses for other partners.

Publicity, Exploitation and Transfer of Technology (Part B)

Partners shall take appropriate action to protect the foreground information that could be used for industrial or commercial application. The ownership of foreground information is simple: the full partner or associate partner generating it is the sole owner. Where partners agree that there shall be joint ownership of foreground information, they shall agree amongst themselves on the action to be taken for such protection. A partner, which is a joint owner of foreground information, may disclose and non-exclusively license that foreground to third parties without the consent of and without accounting to any other partner.

At universities the ownership belongs typically to a person who has made the work. On the contrary, at industrial communities the ownership belongs to company. The model contract leaves those issues to local legislation. However, each partner shall ensure that it is able to grant the access rights.

Partners are obligated to exploit the foreground information themselves or give access rights for another entity to use them. This can be done while keeping the interests of the Community in mind. All the foreground information generated in the project is free to use amongst the partners without any fee. The associate partners have access rights to foreground information if such information is needed in their work for the project.

The following rules are used when a partner will grant access rights:

- Access rights are granted only if requested
- Access rights for foreground or background information must be used only for purpose which they are granted and may be subject to appropriate undertakings as to confidentiality
- The use of background information is conditional upon the partner being free to grant such rights
- Access rights cannot be sub-licensed
- Proprietary information muse be duly marked

Access rights for foreground shall be granted on transfer conditions to:

- Community RTD undertakings for their work in the specified RTD programme or a related RTD programme.
- Associated state RTD undertakings for their work in the specified RTD programme.
- Related associated state RTD undertakings for their work in the related RTD programme.

Access rights for background information are granted only for full partners to be used in their R&D activities. Associate partners have very limited access for background: The associate partners must be established in the Community or and associated state and working in the project with the agreement of the relevant partner granting the rights.

Financial management and cost statements (Parts C and D)

Allowable costs are those actual costs, which are necessary for the project and can be substantiated. Allowable costs after the project termination shall be limited to those relating to the reporting, review or evaluation requirements of the contract.

The Commission pays not more than 50 % of allowable costs for partners. The rest of the costs must be obtained from other sources. Non-profit-making communities, e.g. universities, are allowed to obtain 100 % of allowable costs from the Commission (so called additional costs). The Commission pays 25-50 % of the Commission's portion to the project coordinator in advance. The coordinator shall supply those Euros to partners according to the contract.

The Commission, or persons authorised by it, shall be entitled to carry out audits up to two years after the completion date or the termination of the contract. They shall have complete on-site access at all reasonable times to personnel engaged on the project and all documents, computer records, and equipment relating to the project, or, when necessary, be entitled to require the submission of any such documentary evidence.

4.2 Other contracts

4.2.1 Consortium agreement

The model contract is mainly used to regulate facts that are relevant to the Commission. The consortium agreement is used to regulate facts that are relevant to relationship between partners, e.g. project management, mutual work-division, and publication of the project results. On the Annex IV of the model contract are some examples of which facts can be taken into consortium agreement:

- Delivering funding through other partner than a project coordinator
- Delivering funding directly from the commission to a partner
- Arrangement of pre-payments

4.2.2 Associate contract

An associate contract is a bilateral agreement between a third party and a full partner. In this contract is defined the contents of the third party's work and quality, liabilities, and possible enlargements for minimal access rights described in model contract.

4.2.3 Subcontract

A contract between a full partner and a subcontractor is called a subcontract. It defines the contents of the third party's work and quality, liabilities, possible access rights for project results, and funding of the work.

4.2.4 Non-Disclosure agreement, confidentiality contract

If the consortium agreement is not done before the actual project proposal is submitted to the Commission, it may be profitable to make a confidentiality contract to keep the possible revealed business secrets among conferees. The confidentiality agreement includes the duration of the agreement and a short description of what has been agreed to keep confidential material. The agreement should treat each partner equally.

5. Technical guide to proposals

The following chapter describes how proposals should be presented and also the functions and formats of individual sections of the proposal. Guidance is also given at a more detailed level, e.g. by indicating how to complete the necessary forms.

5.1 Documentation for proposers

Associated with the call for proposals itself are a number of documents, which will assist in the preparation of a proposal. These are briefly:

5.1.1 General Information

This document provides an overview of the programme, proposals and evaluation procedures. It includes the ACTS third call task descriptions, which set out the background and objectives for the new work to be carried out. Proposers must clearly indicate how their proposals relate to this framework in terms of the objectives and scope of the work and the specific tasks addressed.

5.1.2 Call for proposals

The call for proposals is formally published in the Official Journal of the European Communities. It is a short announcement describing the scope of the call for proposals and the deadline for submission.

5.1.3 Service Guide (and CAPPlus software)

This comprises technical details and supporting software required in the preparation of proposals. This is obtainable on the network at http://www.infowin.org/ACTS/.

5.2 Basic requirements

In preparing and submitting proposals, proposers are asked to follow closely the guidelines and instructions in the General Information and in the Service Guide. Failure to comply with these requirements may render a proposal unacceptable.

5.2.1 Responsibility for the proposal

The proposal must be submitted by a single organisation only ("the coordinator") who is acting on behalf of all the members of a consortium.

5.2.2 Structure of the proposal

Proposals must be prepared in three separate sections:

- Section 1 - administrative and financial data
- Section 2 - technical/management proposal
- Section 3 - participants' roles and qualifications

Section 1 is for Commission purposes only. Since it contains financial data the Commission keeps it confidential.

Section 2 is the basis for the technical evaluation of proposals, which is carried out by panels of independent external evaluators: The identities of proposers must not be disclosed anywhere in this section, in order to ensure an unbiased evaluation.

Section 3 identifies proposers and expresses their qualifications to carry out the work. It is only revealed to the evaluators after they have completed their analysis and report on Section 2.

5.2.3 Completeness of proposals

Proposals should be complete and in sufficient detail to ensure that their evaluation can be based on a full appreciation of all aspects of the proposal. Coordinators are responsible for ensuring that submissions follow the detailed submission procedures, and that they are complete with respect to the various sections required.

5.2.4 Language of proposal

Proposals may be submitted in any European Union working language. However, if the proposal were in a language other than English, an English translation would be of assistance in the evaluation.

5.2.5 Proposal numbering and identification

Proposals will be assigned a unique proposal number by the Commission for this third call. This number is provided by the Commission services on request.

If several members of a consortium have each requested a number, only one number should be used for the eventual proposal. Proposal numbers issued in earlier calls must not be used.

All pages of a proposal must bear the proposal number and must be dated and sequentially numbered within each of the three sections.

5.2.6 CAPPlus software

As an essential aid to the preparation of proposals, a software package is made available to proposers, called CAPPlus. A detailed description of how to use CAPPlus is contained in the associated Service Guide.

5.3 Format of proposal – General

In responding to the call for proposals, organisations will need to refer to the ACTS third call task descriptions. A proposal may address a whole task, a part of a task, or several tasks together.

As well as free text, the proposal requires the completion of a number of forms generated by the CAPPlus software. Proposers familiar with similar forms used in earlier calls should nonetheless read the requirements for completion carefully, as some of these requirements have changed. The forms are based on the overall duration of the programme.

The following requirements are common to all the forms:

- The proposal number must be shown on every form. This will uniquely identify the set of forms associated with each proposal;
- The date of preparation must appear on all forms;

- For the purposes of preparing the proposal, the operative commencement date of the work

- All Euro currency values must be expressed in k□ (thousands of Euro), rounded to the nearest k□. Total costs in k□ should be the sum of the rounded values not the rounded sum of exact values.

- Several of the forms require the use of certain codes and abbreviations. These are listed in the General Information document.

Special note: Submission of proposals concerning ACTS project enlargement or integration

Proposals associated with the enlargement or integration of existing ACTS projects may be presented either by a new proposing organisation or by an existing ACTS project(s).

In the former case the proposal must be prepared in collaboration with the target ACTS project(s). A letter of endorsement from the project(s) must be enclosed (in section 3 of the proposal), indicating that the project(s) is/are fully aware of the contents of the proposal being submitted and will carry out negotiations with the Commission services in the event that the proposal is successfully evaluated and is retained for contract negotiations. A proposal involving existing ACTS project(s), submitted by a new proposing organisation without the explicit endorsement of the project(s) concerned, will not be considered as admissible.

Such proposals must be presented in the same format as for new projects (i.e. sections 1, 2, and 3 must be completed) but should be streamlined in terms of contents.

The technical and financial details given in a proposal to broaden the participation in an existing ACTS project must reflect only the changes and additions proposed to that project. The existing technical annex of the contract should be summarised only to the extent that the additional proposed work is clearly identified and amenable to evaluation, and a clear distinction must always be drawn between the current, already funded, work and the proposed new activities.

5.4 Format of proposal - Section 1 administrative and financial data

Section 1 includes administrative data relating to the proposed project, a project summary and certain key cost information. The Commission keeps this data confidential. Section 1 is completed entirely by means of forms. These are forms M1, M1A, M1B, M2 and M3, for which formats are shown below.

The costs of partners not entitled to receive an EC funding contribution should not appear in any of these financial tables.

These forms are generated by the CAPPlus software, which automates the processes, calculations and checks here described. For this reason the use of CAPPlus is strongly recommended to proposers.

5.4.1 Form M1: GENERAL PROPOSAL INFORMATION

This is a single page form on which is entered the required summary information relating to the proposal as a whole.

Form M1 must be synthesised by the coordinator from information provided by all Partners on their Forms M2.

5.4.2 Form M1A: PARTICIPANTS LIST

The Form M1A lists all the participants in the proposal and identifies their relationships, size and country.

5.4.3 Form M1B: CUMULATIVE COST SUMMARY

The coordinator shall complete a Form M1B. It should include a *cumulative* annual cost breakdown for each partner that appears on the Form M1. The corresponding breakdown of community contributions requested should also be provided on this form.

5.4.4 Form M2: INDIVIDUAL PARTICIPANT INFORMATION

“Participants” include the coordinator, other partners, subcontractors and associate partners. Each such participant in the proposal must complete a single page Form M2.

In so doing they must:

- Ensure that all statistical information on Sector/Function/Country/Size and SME is completed, using the appropriate codes.
- Identify the parent organisation, if any, to which their company belongs.
- If a subcontractor/associate partner, name the partner to whom they are a subcontractor or with whom they are associated.
- Where the coordinator or a partner identifies a subcontract activity but the subcontractor is not yet known, the proposer must nonetheless complete an M2 Form to identify the subcontract effort and cost.
- All participants requesting an EC financial contribution *must* complete details of project costs, the percentage community contribution requested, and the value of the community contribution requested. Participants not eligible for funding *must omit* this information.

5.4.5 Form M3: LABOUR RATES

All participants, including subcontractors and associate partners, shall submit M3 Forms.

The M3 is a single page form on which all categories of staff to be used in the project are listed along with the estimate of the man-months, which they will expend. Their costs are derived from the man-months to be expended at the relevant monthly labour rates. Participants not eligible for funding *must* omit the sections concerning monthly rate and labour cost.

5.5 Format of proposal - Section 2 Technical/management proposal

Section 2 includes the detailed technical proposal, gives details of how the project will be managed and indicates the allocation of resources. It should in principle:

- Identify and justify the objectives;

- Describe the techno-economic options to be explored and the criteria for selecting between them;
- Outline the content and timing of the work programme, identifying work packages and milestones;
- Define the resources (numbers of personnel, facilities, major equipment, etc., but *not* named organisations nor money) to be deployed;
- Indicate the project management techniques to be adopted;
- Specify the expected results of activities, the review dates and procedures, and the Deliverable items e.g. reports, specifications etc.).

Section 2 must be presented using a pre-defined forms and format. These have been designed to allow the technical annex to a subsequent contract to be drafted with minimal additional effort.

Sufficient detail (typically 10-20 pages) should be given for Section 2 to serve as the basis for the technical annex of a possible contract. If more detail is submitted, this should be in the form of appendices or enclosures.

Section 2 is divided into two parts; Part A, which is an introductory part, and Part B, the main part containing project objectives and background as well as project plan and project management structures.

6. Case: IMMP

The Integrated Multimedia Project (IMMP) was an ACTS project under the project code of AC023. It ran from September 1995 until June 1999. The original project length was 36 months, but the project received two continuations in order to more deeply study the subject of multimedia delivery and finally in order to complete the work by studying multimedia broadcasting techniques. IMMP was a large project and more than 900 person months were invested into the research it carried out. The project involved 12 partners from a total of five European countries. The project partners were [IMMP99]:

- Nokia Corporation, Finland
- Digital Media Institute, Tampere University of Technology, Finland
- Helsinki University of Technology, Finland
- Cable and Wireless Communications Ltd, UK
- University of Salford, UK
- Telia AB, Sweden
- UI Design AB, Sweden
- Sonera Corporation, Finland
- VTT Technical Research Centre of Finland
- GMD FOKUS, Germany
- Universitat Politècnica de Catalunya, Spain
- Universitat Oberta de Catalunya, Spain

In addition to the partners the project was in close cooperation with Promentor Solutions, Finland and SMHI (Sveriges meteorologiska och hydrologiska institut), Sweden who provided content for the applications developed in IMMP.

6.1 Project background

The Integrated Multimedia Project (IMMP) has primarily studied the integration of interactive multimedia services and service architectures addressing both residential and business users and arranged trials. The evolution towards the new multimedia applications has taken place in a step-by-step fashion with successful services developed only after extensive end user evaluations. This process has been followed in the project emphasising end user trials and the feedback from them. IMMP found it necessary to run focused trials with selected services to understand the key issues: technical, human and commercial, which affect the successful deployment and end user acceptance of such services. Of particular relevance were the common new services that can be utilised in both business and residential areas.

In achieving its objectives and supporting the requirements of the ACTS programme, the project has

- Developed platforms and components that allow creative, interactive multimedia applications to be developed, used and tested. This includes those which can be used in existing networks
- Studied multimedia environments, applications, and integrated services
- Demonstrated and evaluated the feasibility of multimedia services within one operator environment and across several operator and country boundaries
- Evaluated and tested end user requirements and needs and measured the acceptance of these services
- Measured and studied the economic and social impacts, and developed technical and other options to minimise any negative effects

Multimedia applications and services will be, in the long term, stimulated by society demanding new ways to interact, behave and express ideas. This means, that one of the most important aspects to enforce the evolution is to concentrate on architectures that allow the development of a broad portfolio of applications. The project has promoted open multimedia platforms in the user trials.

It was believed in the project that the ultimate unification of residential and business applications requires a service architecture based on media integration, separation of application software from the underlying transport technologies, and common tools and guidelines for building applications.

6.2 IMMP trials

IMMP developed an international trial network, utilising multiple access networks and ATM switching, on which experiments with integrated multimedia services were made. The network was connected to the European ATM networks through the national hosts. The network allowed residential users access via the cable network and business users access through locally or remotely connected ATM networks.

Figure 4 below depicts the network infrastructure used in IMMP. The three trial areas in UK, Finland and Spain used ATM in their core networks. This was also true for the Swedish trial site but this late addition to the IMMP trial sites is not depicted in figure 4. All local trials were connected to the National Hosts. The different access networks complemented each other. In all countries at least some technical trials were executed using end-to-end ATM between PCs in office environment.

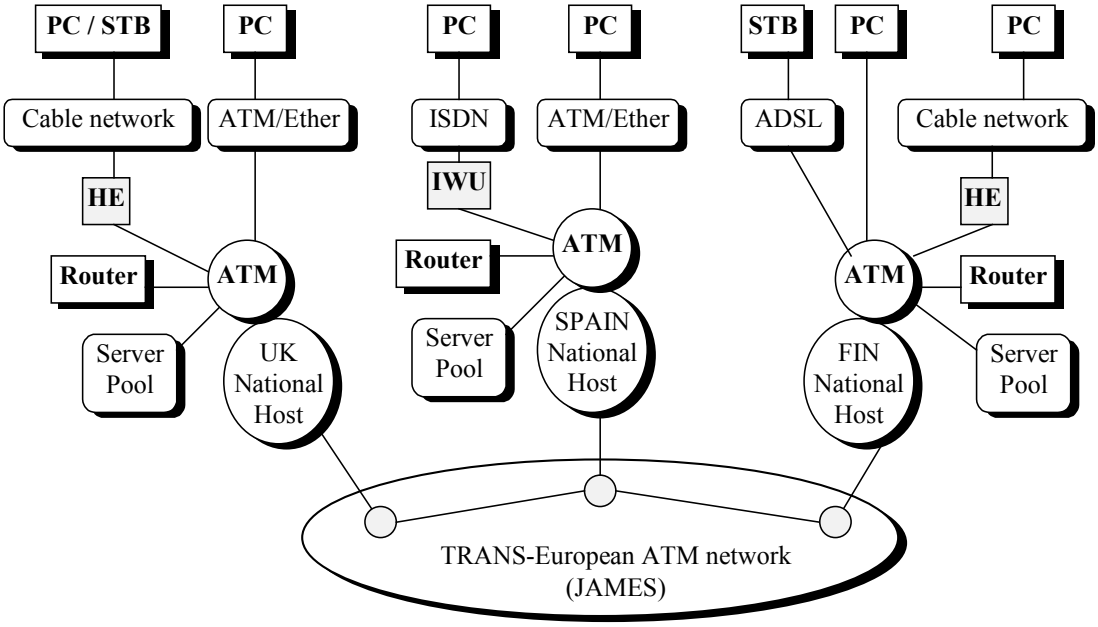

Figure 4 The IMMP trial network

The primary objective of IMMP was to study multimedia, its requirements and architectures. The intention was to gain understanding about multimedia services and technologies that are needed to offer services through communication networks. The technical approach was to run end user trials and to find and develop generic platforms and applications for the multimedia services to be trialed.

During the first two project years the project defined platforms and developed applications and software components to be able to run multimedia service trials at different trial sites. Some early trials were completed in the beginning of the project in order to verify feasibility of the existing services and to obtain end user feedback to get help defining the IMMP service concepts.

During the third project year IMMP set up and conducted a considerable number of trials with varying user profiles, network technologies, middleware components and applications. Every IMMP trial has had its own important role in contributing to this essential and comprehensive material that offers benefits to all of the multimedia market players, i.e. network operators, service provides, content providers, application developers and equipment vendors. The outcomes of the trials contribute to various elements that make up the multimedia marketplace.

The main trial sites were established in UK and Finland, where teleoperator partners: CWC and Sonera (originally Nynex and Telecom Finland) set up their multimedia trial sites by integrating them into existing Cable TV networks. Later on two Spanish universities (UPC and UOC) joined the project and they introduced an ISDN based trial network on top of an ATM core network. Also other partners have tested their multimedia applications, mainly on top of Internet and WWW. IMMP's last trial site was Telia in Sweden.

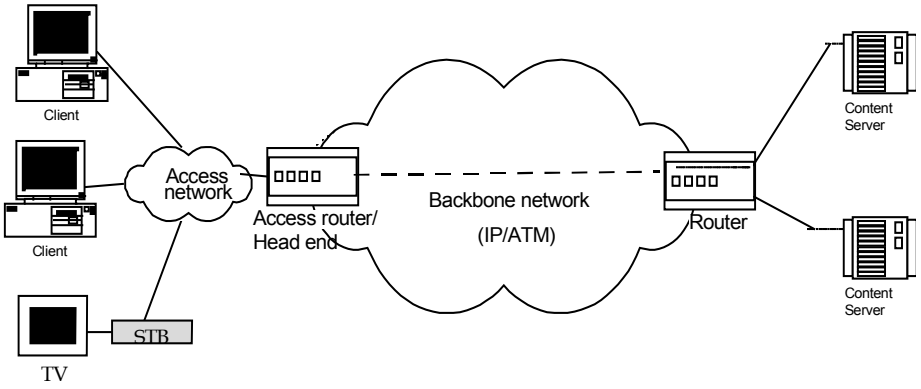

Figure 5 Principle multimedia network topology

6.3 Trial results from the IMMP services and applications

IMMP tele-education trials included lesson sharing, distance learning, Design of Robust Interactive Virtual Environments for learning (DRIVE for learning) and virtual campus type of distance learning environments. A lot of positive feedback resulted from these trials. Students seemed to accept distance learning and absorb information at least as well as in the case of conventional teaching. With virtual campus it was seen that all students were not self-disciplined enough to govern their own studies and needed teacher guidance. IMMP also converted a Windows CD-ROM based language study application into a Multimedia and Hypermedia Expert Group (MHEG) standard-based network language course. This was used as content in many trials and was also a subject to an in-house trial at Nokia. The application was also converted to HTML and Java. This version incorporated a billing system, which enabled setting up chargeable language courses that are usable with regular WWW-browsers.

Interactive advertising was trialed with such applications as WineHUT and WebAuction. WineHUT is a wine promoting WWW-service, which uses a technology called social filtering to send out customised information to the users enrolled in the system. Before its public release, the service was open for Nokia employees to try and several dozen people tried it. WineHUT users are asked to rate wines they have tasted and this information is used to create user profiles and personalised wine recommendations. The wine database is quite extensive and people have found the information and the wine recommendations very useful. WebAuction, in turn, uses WWW as an auction ground. The users were satisfied with the performance and considered the system a good place for selling items whose value is not easily determinable. The bidding system incorporated with the application has proven to be quite reliable.

Many of the IMMP trials were information service trials. Such trials included the high-speed cable TV data network trial in Finland and another cable modem trial in UK, which offered information services to end users through a high-speed cable modem. Sonera's Video on Demand (VoD) and Internet TV trials can also be categorised as information services. The Internet TV trial was run in conjunction with two hotels and offered Internet access from hotel rooms through a simple network computer and a regular TV set. IMMP also developed an information application that was extensively used at the trial sites as information content. The IMMP weather forecast application was an MHEG application, which provided localised weather forecasts. Once a day the application's weather data was updated from the Swedish meteorological and hydrological institute and it gave five-day forecasts for major cities throughout the European countries. This application was additionally customised for the Swedish trial site in order to provide weather data in greater detail and to perform better localisation. There seemed to be big demand for this kind of targeting and customisation. From the MHEG applications it was clearly seen that applications needed to be directly designed for MHEG rather than converted HTML and Java applications trying to maintain their capabilities and functionality.

In general the following results can be extracted from the multimedia application feedback. When designing multimedia applications the most important design issues

are consistency, reliability, ease of use and security, in this order. Also the end-user terminal limitations were faced in all major trials. This restricted the applicability of some multimedia services. Especially, Java-based applications tend to pose hard requirements on the end user equipment and software (memory, browser version, processing power). Although middleware is designed to be platform independent, in practice the applications must be designed to fit within the terminal limitations, i.e. TV resolution, set-top box memory limitations, display type, supported coding, etc. This applies in particular to Java and MHEG based applications.

6.4 Access networks in the IMMP trials

The current multimedia applications and services, which use communication networks, are designed for a rather low-speed Internet access and are more of the file transfer type than demanding interactive high-bandwidth applications. The next generation of multimedia applications will include high-bandwidth video, voice and other high-speed interactive services. For bandwidth-hungry applications, which early adopters usually use, there is a need for XDSL/HFC type of access. The users are sensitive for delays in services and they have ever-increasing need for bandwidth.

6.4.1 Data access via CATV network

The main IMMP trial sites were based on the Cable TV networks with data-access capabilities. The CATV networks were upgraded with two-way data communication capabilities by using RF modems and associated network equipment. The networks were then connected to the content servers using ATM core networks. The theoretical speed of the CATV data modem used at Finnish site was symmetric 4 Mbit/s, which in practice will produce about 1-2.5 Mbit/s capacity locally to the user. In UK the CATV modems shared channels of 768 kbit/s for upstream data and 10 Mbit/s for downstream data.

In the surveys after the trials, the users valued highest the high speed of the data system and the fact that the telephone line was not occupied. The system was mostly used between 15 and 21 hours on weekdays. The average usage time was about 2 hours a day per user. Also a major benefit, according to the pilot users, was the fact that the system could be continuously turned on.

The residential users were very interested in having a high-capacity connection to Internet offering many WWW-based services, e-mail, file transfer and other multimedia services. A modem that works at the link level can implement a virtual LAN that was an interesting alternative for business users. However the security problems inherent in the CATV networks reduced the interest to build, e.g. company LANs.

The major problems at CATV trials were detected to be ingress and group delay. Ingress is RF noise in the return channels of cable TV network. The ingress reduces the carrier-to-noise level by raising the noise level. The dynamic allocation of carriers is one solution to overcoming problems in the upstream channel. Dynamic allocation always searches for a clear carrier to be used. The system retains free frequencies to jump to in case of upstream carrier problems.

When expanding the two-way operations in the network, the antenna for the upstream interference builds up gradually. Finally the noise level of the upstream signal is too severe and prevents all two-way devices from operating. By deploying an addressable tap system the size of the upstream antenna can be greatly reduced to include only signals from subscribers with two-way connections. The addressable taps can be used to enable services remotely to the customer. Since it is easy to turn the tap on and off, new types of services can be provided to customers.

The old CATV network can be upgraded for two-way operation, but that causes initial cost to the operator. The equipment needed at the head-end are also quite expensive. Fortunately the price of the modems is decreasing and currently they are on quite reasonable level. At the moment the provision of the cable modem service is not feasible in large scale but will develop in the future along with standardisation and with markets.

The success of the cable modem will depend on the quality of service (QoS) it is able to offer. Bandwidth for forward and reverse paths, maximum delay, amount of packet delay variations and maximum length of packets are examples of QoS parameters. The future streaming applications like telephony and video on demand will need a

constant bit rate capability while the Internet connections are operational with the available bit rates.

6.4.2 Data access via ADSL modems

Asymmetric Digital Subscriber Loop (ADSL) technology has potential to become largely used for residential access, because of the possibility to reuse the already installed copper pairs and asymmetrical connections. ADSL could be a relevant upgrade from plain old telephone service (POTS) modems, when the price is right. With up to 5.5 km ADSL link of 1,5 Mbit/s is applicable and the shorter the distance the better the bit rate possible.

An ADSL line and the modems enable three information channels: high-speed downstream channel ranging from 32 kbit/s to 6 Mbit/s, a medium-speed full duplex channel ranging from 32 kbit/s to 1 Mbit/s for interactive (or upstream) communications and an analogue POTS band.

IMMP has tested ADSL technologies at laboratory trial sites of Sonera. The studies were focused on testing existing commercial solutions for high-quality multimedia service provision systems by using ADSL technology as access to end-to-end ATM transfer.

The test arrangement had a video server on one test site, which was connected via ATM network, and ADSL access modems to a STB and TV sets at customer sites. The ADSL modem had ATM 25.6 Mbit/s interface to STB. The adaptation to the layers above is done via AAL5. This configuration made it possible to use end-to-end ATM connections, with help of ADSL modems.

At customer premises the STB was connected to a TV set via SCART interface. The system was controlled with a remote controller and with an infrared keyboard. The STB had the capability to decode video streams in MPEG1 and MPEG2 formats. For the Internet applications, the STB had an HTML browser and it was specifically tuned to show web pages on the TV screen with reasonable resolution. The STB had also the capability of starting MPEG video streams via web pages.

Technically the trialed system worked well and no major changes were needed for the architecture. There were several ADSL access systems available at the time and their maturity was at a reasonable level for pilot purposes. However, the configuration was not commercially feasible. The customers had need for customised services; VoD alone was not enough for customers.

The concept of using an STB and a TV set as a customer terminal for Internet access was found to be an interesting and promising idea. The pilot customers had a high interest for Internet via TV set and the Web-TV concept was developed as a spin-off from this trial. The Web-TV is based on a STB with built in modem and HTML browser. It can access Internet via POTS lines and is currently commercially available.

7. Case: IMMP -- Lessons learned

In this chapter the focus changes into analysing the problems and possibilities a large multinational project might have in store for the project manager. It is important to have a good understanding of these problem areas before selecting potential partners for a project and submitting a project proposal into a Community Programme.

The objective of this chapter is to give the reader sufficient understanding of the potential difficulties arising during the project preparation phase and during the project's run. The main aim of this chapter is to guide the project manager with his task and give tools for steering the project in an efficient and smooth manner. This should help the project manager in keeping the project on track and give insight into how to effectively communicate with the Commission. The main focus is on analysing several pitfalls and difficulties that have surfaced while steering IMMP in the fourth Framework Programme. The subjects discussed include in arbitrary order

- Project deadlines
- Reporting the project results to the European Commission
- Reaching consensus
- Relying on technological expectations
- Having customers or competitors as partners
- Manpower allocation between organisations
- Rapid exchange of employees
- Disseminating the project results

Finally some unique possibilities achievable only through multinational projects are analysed. These conclusions are reached through observations that have taken place during the more than four-year lifespan of IMMP.

7.1 Project deadlines

It is extremely hard to keep deadlines in a large multinational project. Multinationality almost certainly also implies multiculturality and having a multicultural staff in a project means that there are several differing attitudes towards deadlines. The nature and interpretation of deadlines tends to be quite flexible.

As the project staff in most cases is spread over a wide geographical area, some communication difficulties are to be expected. However, efficient communication is needed to cope with the problem of keeping deadlines. Consensus about the division of the project work and the timing of the milestones must exist from the beginning of the project. These are documented in the project plan's obligatory Gantt chart and Pert diagram. These graphic tools give a representation as to how the project is scheduled, what interrelationships there are between the tasks of the project and how the project flows. The project manager relies on the information within the project plan and must maintain constant communications with the task owners.

The deadlines manifest themselves perhaps best with the project deliverables. The deliverables are the means of reporting the project's technical advancement to the Commission and to the other interest groups. The deliverables are numbered and scheduled for delivery in the project proposal and plan. The submission of the deliverables is one of the tools the Project Officer uses to follow the advancement of the project. It is very important to submit the deliverables on time. If the deadlines drafted for the preparation and quality control of the deliverables slip, it might mean that unfinished deliverables or those with poor quality are submitted to the Commission. This is very undesirable, since not only is the project evaluated by the quality of the technical content in the deliverables but also by the timeliness of their delivery. It is obligatory to report the number of delayed deliverables in the Annual Project Review Report.

It is very helpful practise to assign the deliverable responsibility to a person responsible for a technology area that the deliverable handles. This person could be the work package leader, activity leader or a group of people working together on the issue. There should be an internal schedule crafted for the deliverables so that there is ample time for reviewing the deliverable and making the required changes prior to the

delivery to the Commission. This requires that all the deliverables have someone assigned for the evaluation and that the internal schedule allows time for changes, additions or corrections in the text or other content. As a final touch, the deliverable might pass through the project office and stylised by the project assistant. This work can be done easier if the project produces a template for the deliverables and other project documentation.

7.2 Reporting the project results to the European Commission

Many forms of reporting takes place within a European Union project. The project reports its spending through monthly reports where manpower and money expended is reported alongside with the tasks accomplished. These reports are all collected together in the annual Cost Claim reports, through which the financing of the project is calculated. As discussed in the previous section, technical advancement is reported through submitting pre-scheduled deliverables. The project must also submit Annual Project Review Reports, which are the basis for the project evaluation and the Annual Project Audit. The Audit result governs the continuation of the project and the possible changes to the project plan. When the project nears its completion there are additional reports that must be submitted. These include the Project End Report and the Technical Implementation Plan. There are also a number of horizontal projects integrating all this information and they send out a number of questionnaires that need to be filled in with (mostly quantitative) information about the project accomplishments. With all this reporting it is of utmost importance to device a good way of storing all of the project results so that the reporting needs can be easily satisfied.

There is a lot of value in taking into account in advance the format and requirements of the different reports and writing all the project results in a way that they can easily be published in all the required reports. It is a good practise to store all the resulting project information with the project office for easy inclusion into the reports. This enables the project office to produce reports with pre-filled information and the different project sites can focus their effort into furthering the project goals instead of re-writing all the required information for all the reports that come along. The information to focus on includes items such as

- Manpower budgeted
- Manpower spent
- Technical advancements by work package
- Contribution by the different partners
- Deliverables already submitted
- Contributions to standards bodies
- Research papers published
- Practical experiments
- Public demonstrations held
- Support of the Programme consensus mechanism
- Patents applied for
- Other relevant information

Perhaps the most crucial report for the project's success is the Annual Project Review Report, which governs the formal evaluation of the project. After submitting this report the project must focus on writing an Audit report for the annual project Audit hearing. Based on this meeting, the Annual Project Review Report and the Audit presentation the Programme external evaluators rate the project's success thus far and give recommendations as to whether the project may continue as planned, needs to be modified or is cancelled altogether.

As can be seen from above, failing on the reporting tasks can easily create many difficulties for the project and even halt the project's execution. This can easily be circumvented by planning the information gathering in an efficient way, keeping record of all the tasks the project has accomplished and preparing the reports well in advance.

7.3 Reaching consensus

The major internal decision making mechanism for the European Union projects is the project meetings. These meetings serve the purpose of information dissemination, achievement reporting and reaching consensus concerning future work and timetables. With a multicultural crowd it can prove to be difficult to reach consensus on how to interpret the plans, who should do what, to which depth something must be accomplished and how to proceed. An easy and efficient way of dealing with this is to discuss all these issues in the meeting and make sure that every attendant agrees with what has been proposed and fully understands what is being decided. The decisions cannot be extended to be proposed in post-meeting e-mail discussions and it is crucial to agree on all these matters before the meeting's end. The minutes taken during the meeting should reflect in clear words all the decisions made and state all the matters on which consensus was reached. It is to be noted that in many cases some of the attendants may leave the meeting before its scheduled ending. This is due to flights leaving at different times during the afternoon. It also might pay to have the meeting arranged in close vicinity to the airport in order to alleviate the problem of rush-hour transportation to the airport, which might in some parts of Europe take quite a lengthy period of time.

Making decisions to take a certain course of action can sometimes lead to non-working solutions. It is important to gather feedback in order to validate the course of action chosen. There is a tendency to continue with the plan even though the feedback would suggest otherwise. This is referred to as escalating commitment and it means that greater effort is put towards working for the previously defined goal even though the action taken does not seem to lead to a good solution. This can lead to failure and it is important to be able to change the work plan and re-evaluate the decisions taken in order to avoid the failure [Bailey91].

The minutes of the meeting should be promptly proofread and circulated amongst the project partners following the meeting. It is important that partners agree to what has been recorded and ratify the minutes in this manner. This also facilitates the keeping of the deadlines discussed in an earlier section of this chapter. It is also good to remember that issues decided upon can only be changed if all the partners involved in

the decision agree on the change. This can sometimes prove to be quite a burden. Especially in the cases when consensus must be reached on documents that need the signature of the signatories' of all the project partners.

Good meeting practises help maintain trust and openness between the project partners. This in turn helps in successful completion of the project.

7.4 Relying on technological expectations

With IMMP it became quickly apparent that the project had been too firmly tied up with a certain technological expectation. The project plan relied heavily on the emergence of ATM (Asynchronous Transfer Mode) as a major core network technology. When this expectation was not fulfilled, the project plan needed some alterations and the project was required to undergo modification based on the annual project evaluation.

When writing a project proposal it is important not to make the proposal too dependent on a certain technology. If the technology does not emerge or it is delayed, many problems will arise. It is safer to submit proposals working with multiple solutions. E.g. systems that can utilise any existing and upcoming transport networks.

As the European Union projects are often quite lengthy, usually 2-4 years, and the proposal phase takes quite a long time, there is plenty of time for the industry to change and develop between the project proposal submission and the project completion. This calls for careful planning and the use of adaptive technologies. Modular system structure helps in exchanging parts that have been affected by technology changes. Even though there might be a feeling that it could help to get the proposal through evaluation, submitting proposals based on purely technology hype should be avoided. The project can easily be left out on dry if it turns out that the expectation the project relies on is never realised or the sole purpose of the project vanishes in thin air when the commotion around the technology hype dies and there is nothing to work on.

7.5 Having customers or competitors as partners

If there is an existing customer-supplier relationship between project partners, it is sure to affect the project relationship. These two different relationships can unnaturally distort the actions of the two parties. This must be kept in mind when selecting partners for the project. It is better to separate these two relationships by only inviting such parties to the project with which the existing relationship has no or just a weak link to the subject of the proposal.

Projects where there are direct competitors as partners are justified only if the competitors aim at developing Europe-wide or worldwide standards in the subject of the proposal.

IMMP also had several network operators as partners. There was some reluctance with information sharing between the competitors and sometimes it proved to be cumbersome to extract the results from the tasks that these partners performed.

Care must be taken in selecting the partners for a particular project. The partners certainly need to fit within the scope of the project but they also need to fit together as organisations. In addition, evaluation of the partners' external liaisons needs to be conducted before making the final partner selection for the proposal. The proposal preparation meetings might not give the best overall picture of the partner fit. External information sources can prove to be invaluable in making this decision. For this same reason, many parties in the field tend to rely on relationships already proven in previous or simultaneous proposals and projects.

7.6 Manpower allocation between organisations

It is much better to have a few full time people working for the project as opposed to several people with only small percentage of their time allocated to the project. This is, of course, up to the partners themselves to allocate, but it is an important issue to bring up in the proposal preparation meetings. People with true commitment to the project's goals and most of their time dedicated to the project can accomplish much more and attain higher than average quality than many people working for the project every now and then.

Dividing the manpower into too small shares also translates into wasted manpower. Even so, partners often end up with great fragmentation in the manpower allocation. This can be due to the tendency to keep people involved with in-house tasks in addition to the project tasks. Some other reasons for this might include

- A tentative attitude towards the project
- Participating merely in order to scout for useful information
- Giving a lower priority to a shared project
- Planning on doing as little as possible
- Trying to plan for the greatest possible efficiency

Too small manpower share for a single partner or person also leads to weak commitment. This is the very thing to avoid. All the project partners must feel committed to the project in order for it to succeed. Greater level of commitment might be achievable through creating a moral guideline of a certain percentage of manpower of the project personnel dedicated for the project work. Even though the project manager is in no position to dictate what the project partners must do internally, this moral commitment to the project and its goals can prove to be enough leverage for alleviating this problem.

Even though being a free-rider can translate into being an un-wanted partner in the next round of projects, it is quite possible to find such a partner candidate when preparing a project proposal.

7.7 Rapid exchange of employees

In long projects the exchange of personnel becomes a big issue. Changing people means also changing ideas and shifting focus. New people have new interests and they want to promote them in order to justify their coming into the project at a later stage.

A new person in the project also means that some manpower is spent in acquiring knowledge about the project and in this sense greater inefficiency. As the new person

familiarises himself or herself with the project, new ideas and viewpoints start also developing. Incorporating these novel perspectives might prove difficult or impossible at this late stage. This could be interpreted as reluctance in accepting the newcomer into the group. If, on the other hand, it is possible to incorporate these late-breaking ideas with the existing project work structure and items of interest, care must be taken not to shift the project focus or motives.

These small disruptions in the project flow must also not be let to have an effect on the project quality. Project quality depends on the people working for the project, not the organisations, which they represent. As people leave and enter the scene, it can affect the quality of the work. It is important to listen to people's ideas and opinions, but at the same time it is imperative not to disrupt the workflow and to keep the focus that the project work plan suggests.

7.8 Disseminating the project results

When a long project has started gathering momentum and is beginning to realise the first results, it is important to start also thinking about disseminating the results. Fulfilling the obligations towards the Commission is easy to remember as the project plan clearly states the schedule for the project deliverables. The harder part is to remember the timely informing of the other project stakeholders. If the organisation in question is not a non-profit organisation, at least half of the costs are borne by someone else than the Commission. This surely implies an obligation to give out relevant information from the project.

It is important to supply the funding parties with relevant information during the course of the project in order to ensure that the project and its goals are remembered. A multi-year project is sure to achieve many valuable pieces of information before its end. The best can be taken out of these information if they are delivered fresh. This also translates into good publicity for the project. However, this can only work for the project if there are results to disseminate. Giving project reviews with no real messages attached can quickly mean rapidly reducing number of people in the audiences and lost interest in the stakeholders' eyes.

It is important to plan the dissemination of the results depending on the nature, appropriativeness, timeliness and quality of the results achieved. The medium through which the information are given is also an issue demanding some thought. People can be initially informed and further kept aware of the project by writing some generic articles about the project into the company newsletter. This can even flush out people that otherwise would not have ended on any personal e-mail lists. The more personal, however, the information delivery gets, the more care must be taken to select the appropriate pieces of data to be handed out. This assures the continued interest in the project.

When the project finally draws into its conclusion, there are a multitude of reports to be filled out and sent to the Commission. These reports include at least the final Annual Project Review Report, the Project End Report, the Technical Implementation Plan and a number of questionnaires from both the Commission and some of the horizontal projects gathering data for their own reports to the Commission. Having completed all this reporting creates a certain sense of euphoria and actively prevents from remembering to satisfy the information hunger of the other interest groups. Their needs must also be served, however tiring it is to keep repeating the same message over in numerous forums.

7.9 Opportunities unique to multinational projects

The previous sections have dealt with a number of difficulties and problems associated with multinational research projects. It might have created a feeling that that is all these projects are about. There are, however, many possibilities and opportunities achievable only through projects of these kind. These include inter-company and inter-country networking, exchanging thoughts with people from different cultures and self-assessment through cultural exchange. These issues are opened up a bit further in the following paragraphs.

Networking with other people is important but creating a working network across country, culture and company boundaries is a great opportunity. A good relationship with people that are likeminded and of the same orientation gives a good foundation for future cooperation. These trusted alliances are often called upon when an

opportunity arises to take part in a new undertaking of some sort. This helps alleviate many of the problems mentioned above and also reduces time required for project preparation. It is much easier to work with people already known than to build the relationship from scratch every time a project is started.

As culture affects how people see different things, it at the same time helps enrich the project outcome. It can also create added value for all the project partners as novel ideas and points of view are brought into the discussion. It also teaches the project participants some basic facts about cultural differences in working methods and the pace of work. This is an enriching experience in itself. Learning new ways of working and thinking can also lead to self-improvement through self-assessment. Having the opportunity of broadening one's own comprehension of things must not be passed by.

7.10 Why EU research?

There are many good reasons for seeking research collaboration through the EU Programmes. These include for example

- Too few own resources
- Networking
- Image-building
- Organisational visibility
- Risk management
- Knowledge-building

The reasons listed above apply for small, medium and large companies alike, except for the first one. Big companies or corporations have usually an ample supply of resources but small and medium sized firms welcome the additional boost provided by the Commission to their research and development aspirations. Large corporations must look further in order to justify entering a cooperative venture of a research nature. All organisations and people look forward to building networks. This is well

served by the EU projects. Image-building and organisational visibility are easily achieved through successful collaboration. Risks can be managed because of cost and time-sharing. Shared risk lowers the bar for taking part in unsafe bets. Additionally, being a part of a research consortium can heighten organisational knowledge.

There are certainly also times when it pays better to start an in-house project. When the research is about a subject close to the core competence of the firm or the results are expected to ensure the continued above average returns of the company. Sharing a project with someone translates into sharing the fruits of the project, too. The Intellectual Property Rights (IPR) produced by the project belong to all of the principal partners and to a lesser extent to the other parties. This must be taken into account when planning to start a shared venture.

8. Conclusion

This thesis has delved into the domain of EU projects. An introduction has been given to preparing a project proposal and project management. It is hoped that this document will inspire researchers and engineers alike in taking part in on-going and future EU research programs.

The document identifies and analyses several potential project management difficulties surrounding multinational research projects. Management actions are recommended for dealing with these problem areas should such difficulties surface. This study is intended to provide the potential project proposer an insight into the managerial challenges facing the project manager taking on the responsibility of leading a project consortium through a Community RTD programme.

One way of seeing the EU research projects and the Commission contributing to their funding is an economical one. The Commission cannot be seen as simply subsidising Community organisations. However, this is one of the things that are actually taking place. Cost sharing gives even the small players an opportunity to take part in costly research work and exploit the results of large R&D projects. The projects act as a catalyst to Europe-wide well-being in the form of employment, technical progress and social networking.

Even though there are many identifiable difficult issues surrounding projects of multinational nature, there can be equally many beneficial reasons for partaking. Research and development are a catalyst for progress and innovation. If there is a motivation to do collaborative research work that crosses country and cultural borders alike, the European Union offers a grand possibility for this through the Framework Programmes.

References

[ACINT97] "Introduction to the ACTS Programme", 1997. URL: http://www.infowin.org/ACTS/ANALYSYS/intro_s.htm

[ACOVR97] "ACTS Overview", 1997. URL: http://www.infowin.org/ACTS/ANALYSYS/chap1.htm

[ACPRO97] H. Stewart, Concertation Steering Group and HA Domain Rapporteur, "Process for the Production and Maintenance of Guideline Documentation". March 1997. URL: http://www.infowin.org/ACTS/ANALYSYS/CONCERTATION/gl-reva1.htm

[ACTS95] R. Huber. “Advanced Communications Technologies and Services: European RTD”. European Commission, DG XIII-B, 1995. ISBN 92-827-4717-4.

[ACTS97] P. Morris. “The European Information Society at the Crossroads”. Delta Press Ltd, UK. July 1997. ISBN 0-903622-80-7.

[Bailey91] J. Bailey, J. Schermerhorn, J. Hunt, R. Osborn. “Managing Organisational Behaviour”. Jacaranda Wiley Ltd. 1991. 2nd ed. ISBN 0 471 33461 8, pp. 375-376

[Elo95] N. Elo, M. Lampola, V. Lindroos. “EU:n tutkimus ja kehityshankkeiden sopimusopas”. Suomen EU-T&K-sihteeristön julkaisuja, 1995. Vol. 2. ISBN 951-0534-9.

[FP5] "Fifth Framework Programme home page". URL: http://www.cordis.lu/fp5/home.html

[IMMP99] "The Integrated Multimedia Project website". URL: http://www-nrc.nokia.com/immp/

[ISTa] "The Information Society Technologies home page".
URL: http://www.cordis.lu/ist/home.html

[ISTb] "The Information Society Technologies contract preparation home page".
URL: http://www.cordis.lu/ist/cont-prep.htm

[ISTc] "The Information Society Technologies ProTool home page".
URL: http://www.cordis.lu/fp5/protool/

[RAT97] “Rationale for the EC Commitment to Advanced Communications”. 1997. URL: http://www.uk.infowin.org/ACTS/ANALYSYS/general/workplan/actsgp1/act2.htm