



**COST Technical Domain:
"FPS - Forests, their Products and Services"**

COST Action E-36

Modelling and Simulation in the Pulp and Paper Industry

Mid-Term Evaluation Report

(No official COST-Document)

Tampere, June 4-5, 2006

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1. Executive Summary of Evaluation

This report is the Mid-Term Evaluation of COST Action E36 "Modelling and Simulation in the Pulp and Paper Industry" of the COST Technical Domain "FPS - Forests, their Products and Services".

The Chairman of this Action is Dr Johannes KAPPEN from PTS – Papiertechnische Stiftung – Department of System Analysis, Process Concepts and Simulation, Hessesstrasse 134 80797 Munich – Germany (E-mail: johannes.kappen@ptspaper.de).

E36 is an Action of the *Pulp and Paper* Sector of the FPS Domain. Action E36 had its entry in force on October 9, 2003 and will end on January 21, 2008.

The main objective of the Action, as stated in its Memorandum of Understanding (MoU) is "to promote the development and application of simulation techniques in the pulp and paper manufacturing processes".

"This is to:

- minimise environmental impact,
- increase productivity,
- increase cost-competitiveness."

"The benefits will be the better understanding of the operation of the processes and their associated control loops. Thus, solutions can make progress on currently pending problems in the paper industry: design of improved or new product properties, higher paper quality, optimised wet end chemistry, better runnability and low environmental impact."

"As simulation and advanced control is not yet common in the paper industry, special attention will be given on the topics of:

- the current use of simulation software,
- recommendations on the exchange of know-how contained in models,
- suitable software tools and requirements for further software development."

"It is also possible to reveal the applicability of new modelling and simulation tools, that have been developed for other modern industries, to the pulp and paper industry."

"The pulp and paper industry has much knowledge to exchange on this topic with other industrial sectors, including the chemical, medical, mechanical, telecommunications and aviation industries."

The scope of the Action, as defined in the MoU, which had been limited quite much in the preparation phase, appeared still quite broad to the Action Management Committee, and in its first meeting, they decided to revise it in order to adapt it to the available means. The Evaluation Team fully supports this decision.

The three Working Groups cover the following technical areas:

A) Modelling and Simulation of the Pulping and the Paper Production Processes

Working Group A concentrates on off-line simulation with particular focus on :

- standard model interfaces for model portability

- evaluation, calibration and validation of models
- properties modelling
- water system chemistry modelling
- optimisation and simulation
- resource saving
- intelligent models
- grade-change optimisation
- data reconciliation
- diagnostics system
- state-of-the art and who is who, in modelling and simulation

B) Online Use of Simulation in the Pulp and Paper Production Processes

Working Group B concentrates on on-line simulation, with particular focus on :

- dynamic optimisation, MPDS, algorithms and applications
- combining physical simulators, grey box models and black box modelling
- diagnostics, model based, simulation based
- easy interfacing to data: acquisition, pre-processing, storage
- soft sensors
- wet end dynamics
- combination of off-line data and on-line data:
 - managing uncertain data, optimal filtering
 - multirate sampling, irregular sampling, missing data
- MPC Control actions

Working Group B intends also to produce a **book** about the findings of the Action.

C) Use of Simulation Software in the Pulp and Paper Industry

Working Group C intends to bring software developers and users together with the aim of providing:

- a survey on the current use of simulation software
- recommendations on the exchange of know-how contained in models
- a report concerning recommendations on suitable software tools and requirements for further software development

This Action, has developed in a succession of five meetings up to now:

Brussels, January 22-23, 2004

Kick-off meeting

Munich, March 8-10, 2004

Conference, Management Committee and Working Groups meetings in PTS

Copenhagen, September 22-25, 2004

Conference, Management Committee and Working Groups meetings together with SCANSIMS 2004 conference

Annecy, April 27-29, 2005

Conference, Management Committee and Working Groups meetings together with ATIP DOTS meetings

Espoo, October 5-7, 2004

Conference, Management Committee and Working Groups meetings in VTT

Tampere, June 4-5, 2006

Conference, Management Committee and Working Groups meetings together with Control Systems 2006 Conference

All meetings had satisfactory attendance, in particular due to the fact that it was most of the time linked to other events, and participants are quite unanimous to report that organisations were very good and scientific interest high.

2. Summary of Evaluation Team recommendations

The global score reached by this Action is 83 %, one of the highest met up to now by the Evaluators. The Action appears very well managed by the Action Chairman and the Working Group leaders.

The recommendations of the Evaluation Team are nevertheless the following :

- *The Action is well managed, the Working Groups are working well. The general line should be kept.*
- *It would be very useful that a common project in FP7 be proposed by this group.*
- *Some participants are requiring more extensive written information and better dissemination of results. This could be the focus of the second period.*
- *The links to industry and end users should be enhanced in the second period.*
- *A inquiry about internal assessment should be conducted in the near future.*
- *More presentations of solutions to practical problems are expected from participants.*
- *A more interactive web page could be proposed.*
- *Some complementary funding for Action specific work and for writing publications would be very welcome, as many extra tasks are required from participants outside their normal activities. STSM could be used in this way.*

3. Overview of Action E36

This report is the Mid-Term Evaluation of COST Action E36 "Modelling and Simulation in the Pulp and Paper Industry" of the COST Technical Domain "FPS - Forests, their Products and Services".

E36 is an Action of the *Pulp and Paper* Sector of the FPS Domain. Action E36 had its entry in force on October 9, 2003 and will end on January 21, 2008.

3.1. - Action identification data

The action identification data sheet is attached at the end of the Appendix.

3.2. - Objectives

The main objective of the Action, as stated in its Memorandum of Understanding (MoU), is "to promote the development and application of simulation techniques in the pulp and paper manufacturing processes".

"This is to:

- minimise environmental impact,
- increase productivity,
- increase cost-competitiveness."

"The benefits will be the better understanding of processes operation and of their associated control loops. Thus, solutions can make progress on currently pending problems in the paper industry: design of improved or new product properties, higher paper quality, optimised wet end chemistry, better runnability and low environmental impact."

"As simulation and advanced control is not yet common in the paper industry, special attention will be given on the topics of:

- the current use of simulation software,
- recommendations on the exchange of know-how contained in models,
- suitable software tools and requirements for further software development."

"It is also possible to reveal the applicability of new modelling and simulation tools, that have been developed for other modern industries, to the pulp and paper industry."

Cross-sectorial opportunities

"The pulp and paper industry has much knowledge to exchange on this topic with other industrial sectors, including the chemical, medical, mechanical, telecommunications and aviation industries."

"Cross-sectoral fertilisation could be multiplied by a COST Action that had as its goal to stimulate international contacts between workers from the pulp and paper industry and other sectors."

International scope

"An informal survey has identified groups working on modelling, simulation and advanced control for the European pulp and paper industry in France, Germany, Sweden, Finland, UK, and Slovenia. Groups of major world significance are active in the USA, Canada, China and several other non-European countries."

3.3. - Technical description and implementation

The initial MoU was defining three Working Groups under the following description:

A) Modelling and Simulation of the Pulping and the Paper Production Processes

"Working Group A will cover all topics concerning the modelling and simulation of the whole pulping and paper production process. This includes the chemical reactions in digesters, the complex pulp washing process, the modification of fibre properties during the process in the stock preparation, the modelling of the complex wet end chemistry and the modelling of water loops and energy balances.

Special attention will be given to use of dynamic process simulation, real-time simulation tools and model validation tools".

B) Online Use of Simulation in the Pulp and Paper Production Processes

"Working Group B will concentrate on the use of simulation models during the operation phase. It focuses on the simulation-based decision making, multivariable process control, fast data acquisition, high dimension data analysis and reduction, non-linear system modelling and multivariable system optimisation."

C) Use of Simulation Software in the Pulp and Paper Industry

"Working Group C intends to bring software developers and (possible) users together in order to come to agreements on contents, features, relevance and performance of software products. Existing software packages should be evaluated. User needs and goals for further developments are to be elaborated. Discussions will include the development and the use of software packages. The Working Groups will organise discussion meetings on a regular basis. Other activities, such as STSMs, organised conferences and workshops, will also be conducted.

Working Group C is specially intended to exchange knowledge between the Working Groups and to foster the development of better simulation tools with a high compatibility across platforms used. This Working Group will therefore have a different schedule, organising dedicated workshops to meet with suppliers and developers of software in order to exchange knowledge and enhance software development."

3.4. - Adaptation of the scope of the Action

The discussions before the approval of Action E36 in the Technical Committee "Forestry and Forest Products" have been quite extensive, as the first drafts of the MoU were judged extremely broad.

The first meetings of the Action (Kick-off, Management Committee) also found that the proposed MoU was still too wide compared to the existing research capacities in the Member States, in the Pulp and Paper area.

It was decided to limit the scope of the Action to **realistic targets** and to favour the following topics in the different Working Groups:

A) Modelling and Simulation of the Pulping and the Paper Production Processes

Working Group A should concentrate on off-line simulation with particular focus on :

- standard model interfaces for model portability
- evaluation, calibration and validation of models
- properties modelling
- water system chemistry modelling

- optimisation and simulation
- resource saving
- intelligent models
- grade-change optimisation
- data reconciliation
- diagnostics system
- state-of-the art and who is who, in modelling and simulation

B) Online Use of Simulation in the Pulp and Paper Production Processes

Working Group B should concentrate on on-line simulation, with particular focus on :

- dynamic optimisation, MPDS, algorithms and applications
- combining physical simulators, grey box models and black box modelling
- diagnostics, model based, simulation based
- easy interfacing to data: acquisition, pre-processing, storage
- soft sensors
- wet end dynamics
- combination of off-line data and on-line data:
 - managing uncertain data, optimal filtering
 - multirate sampling, irregular sampling, missing data
- MPC Control actions

It was also decided at a this stage that Working Group B should provide, as deliverable of the Action, **a Book written by the participants on these various topics.**

C) Use of Simulation Software in the Pulp and Paper Industry

Working Group C should bring software developers and users together with the aim of providing:

- a survey on the current use of simulation software
- recommendations on the exchange of know-how contained in models
- a report concerning recommendations on suitable software tools and requirements for further software development

3.5. - Participation and coordination

Management Committee

The *Chairman* of this Action is:

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Participating Institutes and Companies

The following organisations are taking part in the Action :

Austria	ANDRITZ
Belgium	UCL
Denmark	HARTMANN
Eu	COST-ESF
Finland	VTT, KCL, OULU University, TAMPERE University,
France	CTP, EFPG, SOLARONICS
Germany	PTS, TU DRESDEN, TU DARMSTADT, VOITH,
Netherlands	MILLVISION, TNO, SAPPI,
Norway	TRONDHEIM University
Poland	PCZ
Romania	TUIASI
Slovakia	VUPC
Slovenia	ICP, PAPIR-VEVCE
Spain	UCM, University of GERONA
Sweden	MALARDALEN University, STFI-PACKFORSK
United kingdom	MANCHESTER University, UMIST, IGGESUND

Meetings of Management Committee

- Brussels, January 22-23, 2004

Kick-off meeting, Management Committee

- Munich, March 8, 2004
Management Committee in PTS
- Copenhagen, September 22, 2004
Management Committee, together with SCANSIMS 2004 conference
- Brussels, October 25, 2004
Steering Committee
- Annecy, April 27, 2005
Steering Committee together with ATIP and DOTS meetings
- Espoo, October 5-7, 2004
Management Committee in VTT
- Tampere, June 4-5, 2006
Management Committee together with Control Systems 2006 Conference

Meetings of the Working Groups

Brussels, January 22-23, 2004
Kick-off meeting

Munich, March 8-10, 2004
Conference, Working Groups meetings in PTS

Copenhagen, September 22-25, 2004
Conference, Working Groups meetings together with SCANSIMS 2004 Conference

Annecy, April 27-29, 2005
Conference, Working Groups meetings together with ATIP DOTS meetings

Espoo, October 5-7, 2004
Conference, Working Groups meetings in VTT

Tampere, June 4-5, 2006
Conference, Working Groups meetings together with Control Systems 2006 Conference

Short term scientific missions (STSM)

Alvaro Alonso	Spain	UCM	to	KCL	July 2004
Alvaro Alonso	Spain	UCM	to	PTS	August 2004
Georg Kamml	Germany	PTS	to	VTT	September 2004
Cornelia Lumpe	Netherlands	Millvision	to	STFI	October 2004

David Ravnjak	Slovenia	PPI	to	UCM	February 2005
Nejc Zakrajsek	Slovenia	PPI	to	PTS	April 2005
Esperanza Torres	Spain	UCM	to	VTT	July 2005
Kimmo Latva-Käyrä	Finland	TUT	to	UCM	April 2006
Desiree Somnitz	Germany	PTS	to	KCL	June 2006

3.6. - Results

A) Modelling and Simulation of the Pulping and the Paper Production Processes

The results of Working Group A are largely liked to the presentations made in the various conferences.

In the second Working Group in Copenhagen, 4 presentations were made :

- Jörg Reuter, Voith: "Numerical simulation of wet Pressing"
- Peter Fisera, Andritz: "Tuning of bleaching model"
- Asa Samuelson, STFI: "Mill validation of chemical equilibrium model for a bleach plant"
- Jari Lappalainen, VTT: "Experiences in model validation of plant scale dynamic simulation."

In the third Working Group in Annecy, there were two specific presentations:

- Jorg Reuter, Voith: "Modelling of capillary rewetting"
- Jan-Erik Gustafsson, STFI: "Modelling of wet pressing"

In the fourth Working Group in Espoo, there were two specific presentations:

- Erki Räsänen, VTT: "Fibre Chemistry – linking chemical and structural properties of fibres"
- Georg Kamml, PTS: "Recent development in CAPD (Computer Assisted Paper Design)"

Still in Espoo, 10 papers were presented in the Workshop on model validation:

- Erik Dahlquist, Mälardalen U. (Sweden): "Physical models and their validation for pulp and paper applications"
- Bert Lie, Telemark U. (Norway): "Model uncertainty and prediction capabilities"
- Georg Kammel, PTS: "Development of a tool to improve the forecast accuracy of dynamic simulation models for the paper process"
- Alvar Alonso, Angeles Blanco, Carlos Negro, UCM and Ignacio San Pio, HPM (Spain): "Validation as a crucial step for improving robustness of models: Application to paper quality predictions"
- Olli Saarela, KCL: "A simulation study of the validity of multivariate autoregressive modelling"
- Kimmo Latva-Käyrä and Risto Ritala, TUT (Finland): "Dynamic validation of multivariate linear soft sensors with reference laboratory measurements"
- Klaus Villforth, Samuel Schabel TUD (Germany): "Fibre classification – model development and validation"
- Rémi Vincent (Tembec), Martine Rueff and Christian Voillot (EFGP) "3-D simulation of handsheets made of different pulps"
- Jukka Valkama, Klaus Villforth, and Samuel Schabel, TUD (Germany): "An approach for modelling and optimizing industrial fine screening processes"

- Johannes Kappen, Wolfram Dietz, PTS: "Validation in mill practice: Accuracy of water/COD, heat and stickies simulations in P&P applications"

In the fifth Working Group in Tampere, the selected topic has been: "Modelling and simulation at the wet end", which is in itself a very huge theme where a lot has to be done in term of understanding, describing and modelling phenomena, in particular retention. Moreover high non-linearities in the physico-chemical behaviour of components and additives, adds to the complexity.

B) On-line Use of Simulation in the Pulp and Paper Production Processes

Working Group B is in charge of on-line simulation, monitoring, operations decision support, model-based control.

It was decided already at the first meeting to focus on producing **a book**. The focus is on on-line use of simulators, but there will also be chapters on steady state simulators and commercial software products.

Discussions on the goals and the contents of the book is the major activity during the workshops.

The present structure of the book Is the following:

- 1 – Introduction
- 2 – Modelling methods
- 3 – Use of simulation models
- 4 – System aspects
- 5 – Pre-processing of data
- 6 – Applications of simulation in the pulp and paper industry
- 7 – Benefits with installations
- 8 – Commercial simulation tools (requested from Working Group C)
- 9 – Applying new technologies

Different participants have volunteered to write different part of the book. There is a high engagement by the Group members.

C) Use of Simulation Software in the Pulp and Paper Industry

The main aim of Working Group C is to bring together software developers and users to exchange knowledge and enhance software development.

At the end of the Action, one can expect:

- a good overview of simulation in the paper industry,
- a better understanding of different software,
- a compilation of users needs,
- finding new possibilities for the future

The evaluation is made through three types of approach.

It uses first, a set of questionnaires:

- Survey of the current use of software by the COST Action members,
- Survey of software requirements,
- Survey of main specifications of different software packages,
- Survey of software performance assessment.

(All these reports are available.)

Then, it treats model problems with different software:

- simulation of a cleaning sequence,
- simulation of brown stock washing.

Finally, it will compile various application examples.

3.7. - Dissemination of results

Publications

J. Kappen und Ch. Bienert (Hrsg.); PTS 2004; PTS Symposium Simulation and Process Control for the Paper Industry PTS-MS 441

Paper in conference SIMS 2004 – Copenhagen - (March 2004)

Presentation Jean Paris - CRIP – Montreal – (21 pages)

Johannes Kappen, Erik Dahlquist, Jussi Manninen, Carlos Negro, Risto Ritala; A big leap forward – The new European COST Action E36 "Modelling and Simulation in the Pulp & Paper Industry" Lyngby, SIMS 2004, DTU, Danish Technical University, September 23rd – 24th 2004

Carlos Negro and Alvaro Alonso; Mini-Booklet concerning the use of simulation software, Madrid, 2004

Conférences européennes ATIP – De la recherche à l'industrie; Daniel Bouvron Revue du Papier Carton 80, May-June 2005

Programme "Modelling, simulation and decision support systems for process optimisation and industrial competitiveness" Annecy April 2005

NN: VTT 2005, Proceedings Model validation workshop (92 pages), Espoo, October 6th 2005

Session on modelling and simulation in the pulp and paper industry – 5th Mathmod Conference – Vienna - Argesim – Mathmod presentation (100 pages)

Angeles Blanco; Eric Dahlquist; Johannes Kappen; Jussi Manninen, Carlos Negro and Risto Ritala; Modelling and simulation in the pulp and paper industry – current state and future perspectives; (to be published soon)

Conferences and Workshops

Conference: Simulation and Process Control (Munich, March 2004)

Conference: Flexible and eco-efficient paper production through dynamic optimisation of operational tasks and scenarios (Annecy, April 2005)

Conference: Modelling, simulation and decision support system for process technical and economic optimisation – Potential industrial applications and perspectives on new technologies (Annecy, April 2005)

Workshop: Model validation (Espoo, October 2005)

Session in Conference: Mathmod (Vienna, February 2006)

Workshop on FP7 preparation (Tampere, June 2006)

Web site

Action E36 runs its own website at address: <http://www.coste36.org/>

The site is regularly updated about actualities of the Action.

The site is hosted by Papiertechnische Stiftung (PTS)

Scientific and technical cooperation

The Management Committee is very active in the present phase of preparation of the 7th Framework Programme of the EU. In particular, Pr Risto RITALA from TUT has been leading the ICT Task force in charge of issuing proposals for the European FOREST Technology Platform, that the forest products sector has set up.

This task force has produced a very valuable and complete document as a result of their activities.

A good discussion took also place in Tampere on June 5, 2006 about the opportunities of submitting projects in the ICT field in response to the first calls of FP7.

Two external experts conferences have been organised by the Management Committee, bringing a lot of interest from the participants:

- Jean Paris École Polytechnique de Montréal – CRIP - Centre de Recherche en Ingénierie du Papier, Montreal

- Guy Dumont, University of British Columbia

The cooperation with Canada, where a lot of work is conducted on the topic of simulation in the pulp and paper industry, has been reinforced with this action.

3.8. - Economic dimension

On the basis of national estimates provided by representatives of Finland, Sweden, France, Germany, Spain, United Kingdom, Slovenia and the Netherlands, the economic dimension of the activities to be carried out under the Action has been estimated, in 2002 prices, at roughly 20 millions euros.

The budget of the Action is presently the following:

69 000 € for 2006

3.9. - Self evaluation

The Action has been conducting a self-evaluation by the distribution of a short questionnaire asking for expectations about the Action and suggested improvements to be done, during the Copenhagen meeting, in September 2004.

4. Mid-Term Evaluation

The meeting which took place at Tampereen Kylpyla Conference Centre, in Tampere (Finland), on June 4-5, 2006 was the focal point of Action E36 mid-term evaluation. The Evaluation Team attended the meetings, solicited views of participants and discussed the progress of the Action with the Chairpersons.

4.1. - Evaluation panel

The COST Forestry and Forest Products Technical Committee in its last meeting in Biel (Switzerland) on March 2-3, 2006, did not manage to designate a mid term evaluation team for Action E36, mainly due to the fact that the Tampere meeting was occurring during Pentecost weekend.

The COST secretariat finally suggested :

- Pr Jan M. OVERLI, Department of Energy and Process Engineering, Faculty of Engineering Science and Technology, Trondheim (Norway)
- Mr Jean-Paul VINCENT, Centre Technique du Papier, Grenoble (France)

The later was member of the COST FFP Technical Committee but had no particular involvement in COST Action E36.

- Mr Arne BEEN, COST Scientific Secretary for Action E36, is also a member of the Evaluation Team.

4.2. - Evaluation procedures

The assessment followed the base outline used in the evaluations of previous Actions and described in the Document "Guidelines for Assessment, Monitoring & Evaluation of COST Actions".

Questionnaire

The questionnaire which was used for the Mid-Term Evaluation, slightly improved from previous experience, is attached in the Appendix.

This questionnaire was sent out to the members before the Tampere meeting and distributed to all participants during the meeting.

Workshops documents and reports

The Conferences and workshops documents are listed in section 3.7 above.

To assess the impact and significance of the Action, full information was gathered about the five Workshops (programme, content, attendance).

The activities were evaluated for:

- content and quality,
- level and extent of participation,
- level of "between-meeting" actions, encouraging European networking.

5. Main points of Evaluation

5.1. - Users questionnaire

The Users Questionnaire has been computer treated using EXCEL spread sheets.

A mark from a maximum of 4 to a minimum of 0 (excellent = 4, bad =0) was used for each individual response.

Global score values were computed as a percent ratio of the cumulated marks divided by the maximum possible cumulated marks, taking into account the number of respondents in each case.

In the particular case of the Value Added assessment in terms of new contacts made from the Action, only 3 levels were used in the marking.

N.B. All the figures related to Evaluation have been moved to the Appendix of this report.

5.2. - Attendance to meetings

The figure hereunder describes the attendance in each of the five meetings.

Munich: 65

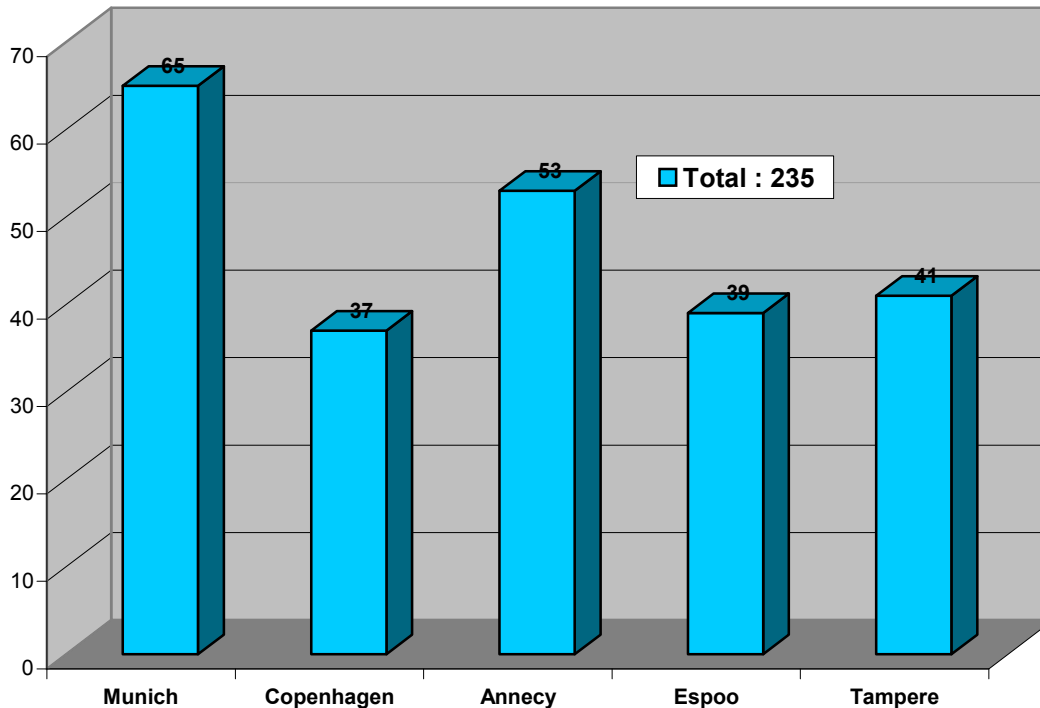
Copenhagen: 37

Annecy: 53

Espoo: 39

Tampere: 41

**COST E36 - Mid-term evaluation
ATTENDANCE**



The average participation in the Workshops is in the range of 20 persons, with about 80 % of the participants taking part several times.

Position of Evaluation Team

Considering that 14 countries are represented in the Action, a slightly stronger attendance could be expected. Most of the participants are national delegates, mainly from research organisations. Industry representatives are a few persons at each meeting.

The Action has made particular efforts to interact with software products companies.

5.3. - Evaluation of "Achievement of objectives"

The Action has in its first meetings closely reconsidered the objectives to be given to the Action, taking into account the available means. These were already listed in paragraph 3.4.

The overall score for "Achievement of Objectives" is 77%. Clearly, the participants meet their expectations.

The main comments of participants about the comparison of results versus objectives are:

- Working Group leaders and the coordinator are working hard to achieve the objectives and to facilitate the diffusion of activities.
- We are working on a book, that if successful, will hopefully be very valuable, and the purpose fulfilled completely.
- Action activities are well focused on objectives of the Action.
- Objectives are on a high level of abstraction: conceiving software: on a good way; cross sectorial opportunities: taken through control systems experts in the group; international scope: OK, 14 countries.

- Very useful for each research work.

Position of Evaluation Team

Working Group A

As noted by the Working Groups themselves in their self assessment, there are very wide areas of interest in the participants, and the interaction is more on discussing the more pertinent way of addressing the different type of issues, than on gathering ready-made solutions to specific problems.

The exchange of experience among the participants at different level of skill, seems extremely valuable in this particular field. This COST Action has a definite positive role in training young researchers!

Working Group B

The evaluation Team is very positive on the idea of writing a book, which should gather a large part of the knowledge available in the Action, as finally all 3 Working Groups will contribute. The availability of results is sometimes a problem in COST Actions; in this case they will be readily usable.

Working Group C

At a point it was thought that the use of a single simulation software in Europe, at least in the pulp and paper industry would largely improve the situation.

The experience seems to demonstrate that the types of problem are very diverse in size and complexity and that a single tool cannot fit all.

Training experienced specialists seems the right way ahead. Then it is more important to develop standard interfaces, for the people to be able to work together.

All together

The scope of the Action, is indeed extremely broad and even with making links with other industries specialists, which does occur in the Action, it appears difficult to cover completely the whole fields mentioned in the MoU.

The focus is more on practical application and development of useful tools and methods.

The Evaluation Team fully supports the Management Committee decision to favour fields where potential participants have interest, and does not recommend any change in this respect.

The Evaluation Team would qualify the "Achievement of the Objectives" as good and recognises that the Action breadth has probably been underestimated in the MoU.

5.4. - Evaluation of "Added value aspects"

Evaluation of "New contacts made through the Action"

The overall score for "New contacts made through the Action" is: 86 % with a good agreement of participants to recognize that "Some" to "Many" contacts have been made.

Evaluation of "New projects (National or European) made through the Action"

The overall score for "New projects as a result of the Action" is: 21 % with an average value of "One".

Evaluation of "Approximate value of new projects"

The overall score for "Approximate value of new projects" is: 36 %. The mid value is "10 K€" to "50 K€".

Evaluation of "Joint publications made with other participants through this Action"

The overall score for "Joint publications made with other participants through this Action" is: 32 % with an average value of "One" publication. The responses are somewhat scattered. Many have none, some have several joint publications.

The main comments of participants are:

- Proposals and collaboration are under discussion.
- A network of contacts have been made that will lead to joint projects.
- It takes more time to develop new projects.
- Good level of joint publications and new contacts.
- Projects under preparation, more to come in second half for FP7 calls.

Position of Evaluation Team

The Evaluation Team considers that the achievements from the „Added Value“ point of view are satisfactory.

Considering that the Action is only two years old and that few European calls for proposals are still open in 2006, we could hardly expect many new projects.

The networking of participants is now operational and a lot of consultations are going on to prepare the first coming calls of the 7th Framework Programme. It was indicated in Tampere that the Action intended to set up a proposal in line with its activities. The Evaluation Team strongly recommends to follow up the idea.

5.5. - Evaluation of "Management aspects"

Evaluation of "Overall management of Action"

The overall score for "Management and organisation of the Action" is: 83 % with a good agreement of participants to qualify it as "Good" to "Excellent".

Evaluation of "Organisation of meetings"

The overall score for "Organisation of meetings" is: 90 % with a good agreement of participants to qualify it as "Excellent".

Evaluation of "Distribution of documents (including minutes, etc)"

The overall score for "Distribution of documents" is: 80 % with a good agreement of participants to qualify it as "Good".

Evaluation of "Internal assessment of Action progress"

The overall score for "Internal assessment of Action progress" is: 75 % with a good agreement of participants to qualify it as "Good".

The main comments of participants about "Management" are :

- Excellent chairman; an internal assessment was performed during the life of the Action.
- Internal query performed.

Position of Evaluation Team

The overall management of the Action is excellent. The meetings are efficiently run and organised. the distribution of documents is excellent. The support documentation provided to the Evaluation Team is excellent.

The internal assessment is quoted as excellent to fairly good. The Evaluation Team would suggest to make an inquiry about internal assessment in a coming meeting.

Globally, the Evaluation Tam recommends maintaining management at current high level.

5.6. - Evaluation of "Dissemination aspects"

Evaluation of "Publications from meetings"

The overall score for "Publication from meetings" is: 77 % with a good agreement of participants to qualify it as "Good".

Evaluation of "Accessibility of documents"

The overall score for "Accessibility of documents" is: 74 % with a good agreement of participants to qualify it as "Good".

Evaluation of "Publicity and marketing (national and international) made"

The overall score for "Publicity and marketing" is: 85 % with a good agreement of participants to qualify it as "Good" to "Excellent".

The main comments of participants are:

- Publishing workshop proceedings on website is a good way of publishing our work.
- Several public reports have been produced. Many contacts with suppliers have been carried out in the Working Groups.
- Good opportunity to gather COST meetings with national or international events (ATIP, CONTROL SYSTEMS ...).
- Presentations at several national conferences as well as international, in some journals and papers.
- The Action has collaborated with many conferences and workshops. Reports are available and a review book is planned.

Position of Evaluation Team

The participants favour a combination of Action meetings with other conferences and seminar in the pulp and paper area.

Publications from meetings and accessibility of documents are quoted as good. It appears nevertheless that some contributions are distributed in the meetings, but not always documented in the minutes.

*The Evaluation Team recommends that a better publicity / marketing of **the results** be in focus in the second two years period. Cooperation between Working Groups could probably also be developed in this matter.*

5.7. - Evaluation of "Participation aspects"

Evaluation of "European breadth"

The overall score for "European breadth" is: 68 % with a good agreement of participants to qualify it as "Good".

Evaluation of "Overall participation"

The overall score for "Overall participation" is: 80 % with a good agreement of participants to qualify it as "Good".

Evaluation of "How many short term scientific mission has your organisation been involved in ?"

The overall score for "Number of STSM" is: 51 % meaning a mean value of 2, but with a lot of scattering, many participants having none and many having four.

The main comments of participants are :

- Very high number of STSM accomplished.
- The STSM were used by a reduced number of partners. This exchange should be open to all partners.
- Include more people from industry.
- STSM have been of high scientific level and have allowed several common publications.

I have been involved in hosting 3 STSM visits and found them very useful for getting to know other people, their work, and building basis for further cooperation.

Position of Evaluation Team

European breadth and overall participation is good.

Industry participation compared to other Actions is fairly good (cf Annecy meeting). The Evaluation Team would recommend to extend the links to simulation software companies, which could also promote the Action book.

What is remarkable at this point is the number of STSM already conducted (4 in 2004, 4 in 2005 and probably 6-7 in 2006). Pr Angeles Blanco, as STSM Manager is very active in promoting STSM's which are much value-adding.

5.8. - Evaluation of "Economic aspects"

Evaluation of "Cost of Action in relation to participation"

The overall score for "Cost of Action in relation to participation" is: 74 % with a good agreement of participants to qualify it as "Good".

Evaluation of "Cost of Action in relation to added value"

The overall score for "Cost of Action in relation to participation" is: 70 % with a good agreement of participants to qualify it as "Good".

The main comments of participants are:

- The participants are very active. For the COST programme the activities are economical, However efforts are needed from the Members. COST funds networking, not research. More involvement in new R&D projects is necessary.
- For the EU, the cost is very low in relation to the activities. For the leaders, the work is quite high without additional budget.
- Budgetary situation not always transparent.

Position of Evaluation Team

The Evaluation Team is rather positive about the cost of the Action in relation to participation and added value.

The Evaluation Team finds somewhat difficult to evaluate these "Economic aspects" and would appreciate the availability of some guidelines.

5.9. - Overall assessment

The overall score for " Action overall assessment" is: 83 % with a good agreement of participants to qualify it as "Good" to "Excellent".

The main recommendations for improving the Action are the following:

- There should be some funding for writing publications, books, etc
- More resources to carry out work.
- More presentation of solutions to practical problems.
- To improve the Action it is necessary to involve more industrial partners and end-users of simulation and simulation softwares.
- Keep and further improve the level of industry participation.
- More operational web page, to propose new projects for FP7.

Position of Evaluation Team

The score for the "Overall assessment of the Action" is one of the highest met in this exercise.

6. Conclusions

- The Action is well managed, the Working Groups are working well. The general line should be kept.

- It would be very useful that a common project in FP7 be proposed by this group.

- Some participants are requiring more extensive written information and better dissemination of results. This could be the focus of the second period.

- The links to industry and end users should be enhanced in the second period.

- *An inquiry about internal assessment should be conducted in the near future.*
- *More presentations of solutions to practical problems are expected from participants.*
- *A more interactive web page could proposed.*
- *Some complementary funding for Action specific work and for writing publications would be very welcome, as many extra tasks are required from participants outside their normal activities. STSM could be used in this way.*

7. Success story

Signatures

Pr Jan M. OVERLI
University of Trondheim

Date:

Signed:

Mr Jean-Paul VINCENT
Centre Technique du Papier - Grenoble

Date:

Signed:

Mr Arne BEEN
COST-ESF Secretariat

Date:

Signed:

Appendix

1. Evaluation Questionnaire

MID-TERM EVALUATION OF COST E36

NAME: COUNTRY:

Please rate the following aspects of the Action (tick appropriate box)

Achievement of objectives

Overall

Excellent	good	fairly good	poor	bad
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comment:	
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Added value aspects

New contacts made through the Action

Many	some	few	none
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

New projects (National or European) as a result of the Action

>3	3	2	1	none
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Approximate value of new projects

>500.000 EUR	>100.000 EUR	>50.000 EUR	>10.000 EUR	other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Joint publications made with other participants through this Action

>3	3	2	1	none
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comment:	
----------	--

Management aspects

Overall management of Action

Excellent	good	fairly good	poor	bad
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Organisation of meetings

Excellent	good	fairly good	poor	bad

Distribution of documents (including minutes, etc.)

Excellent	good	fairly good	poor	bad

Internal assessment of Action progress

Excellent	good	fairly good	poor	bad

Comment:	
----------	--

Dissemination aspects

Publications from meetings

Excellent	good	fairly good	poor	bad

Accessibility of documents

Excellent	good	fairly good	poor	bad

Publicity and marketing (national and international)

Excellent	good	fairly good	poor	bad

Comment:	
----------	--

Participation aspects

European breadth

Excellent	good	fairly good	poor	bad

Overall participation

Excellent	good	fairly good	poor	bad

How many short-term scientific missions have your organisation been involved with?

>3	3	2	1	none

Comment:	
----------	--

Economic aspects

Cost of Action in relation to participation

Excellent	good	fairly good	poor	bad

Cost of Action in relation to added value

Excellent	good	fairly good	poor	bad

Comment:	
----------	--

Overall Assessment

Excellent	good	fairly good	poor	bad

Your recommendations for improving the Action

Comment:	
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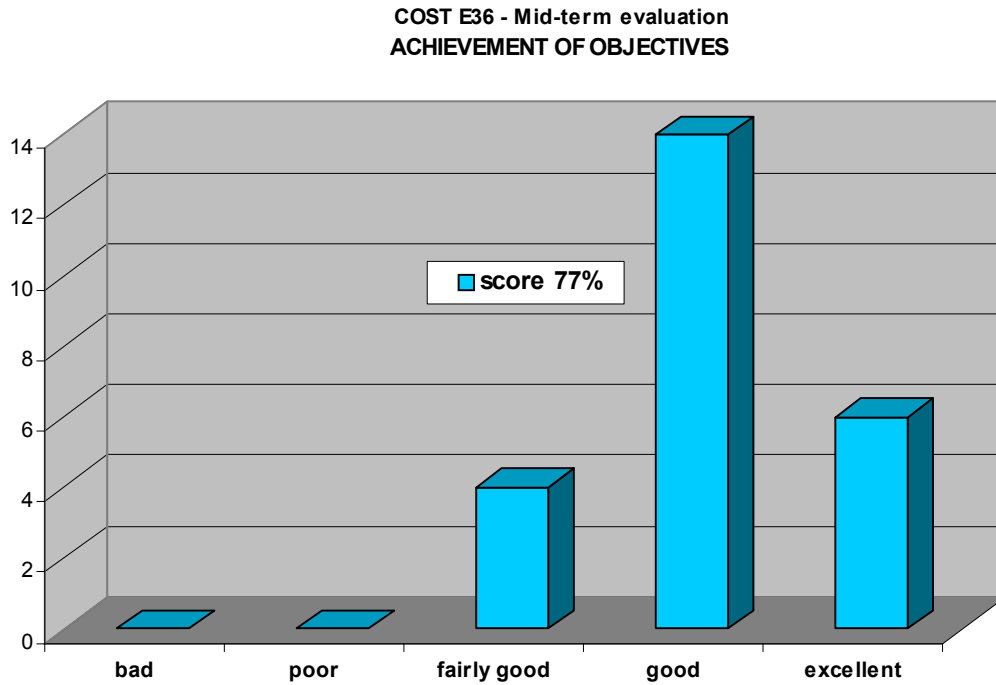
Your expectations for final results of the Action

Comment:	
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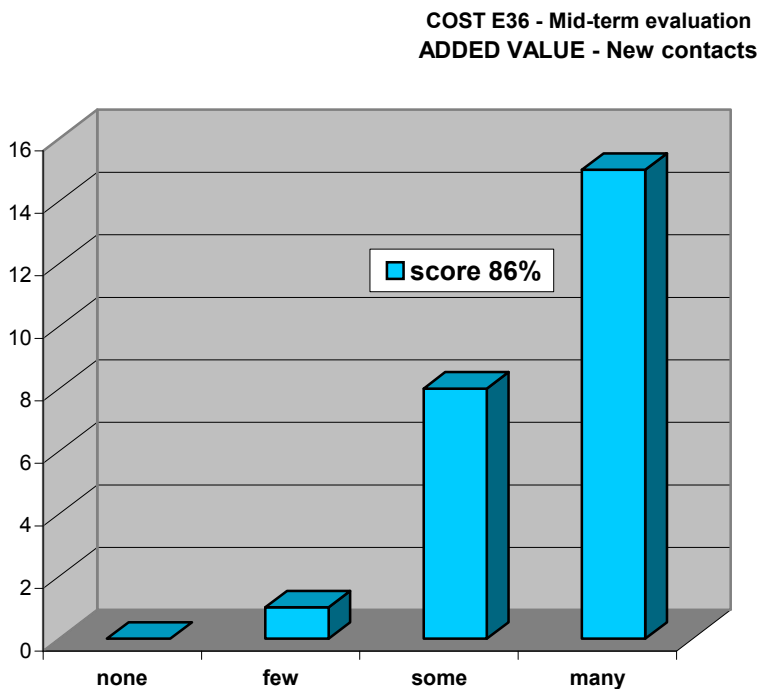
30.5.2006

2. Results of Evaluation Questionnaire

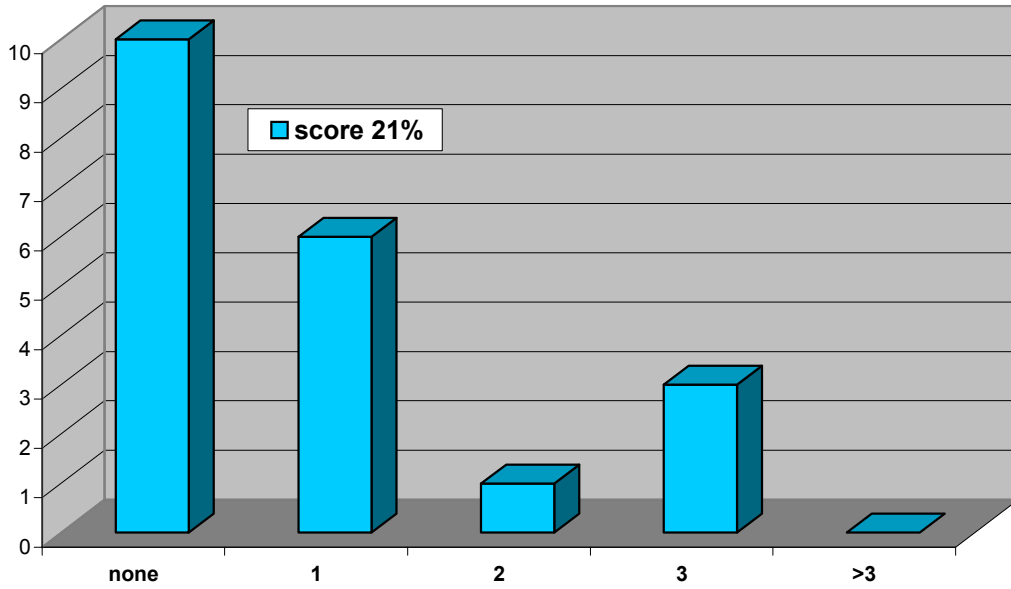
Achievement of objectives



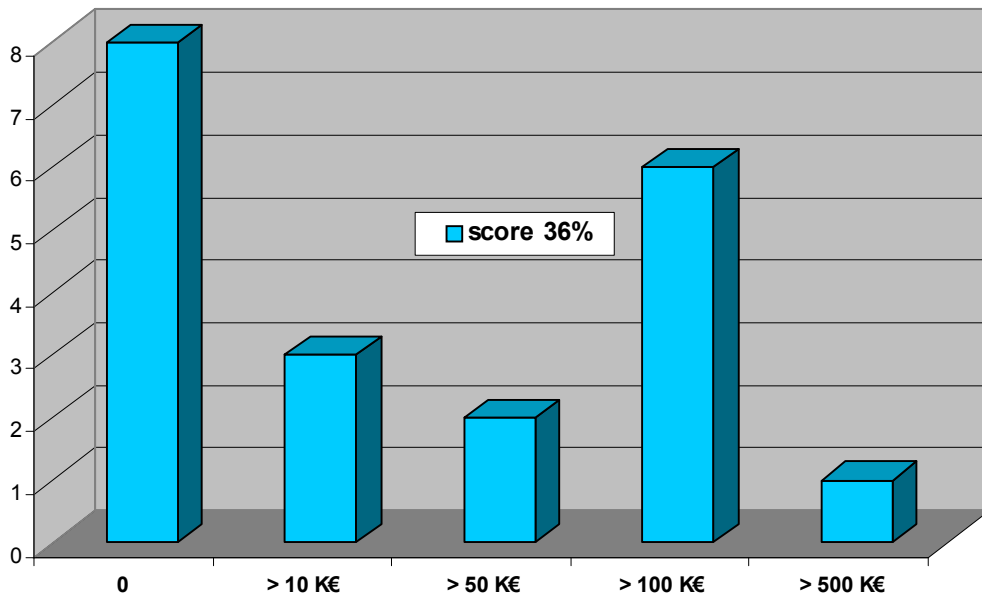
Added value aspects



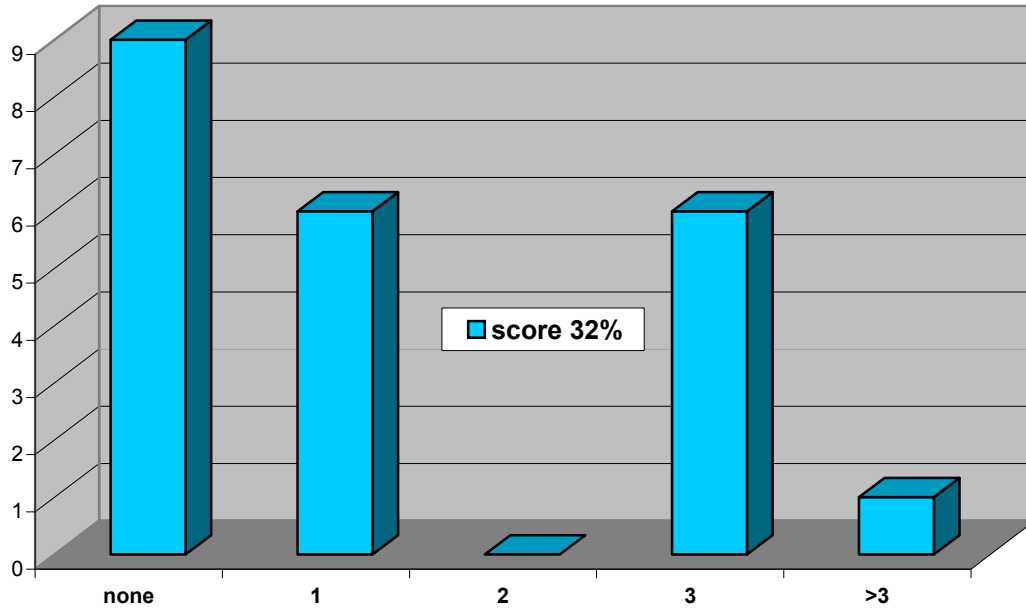
**COST E36 - Mid-term evaluation
ADDED VALUE - New projects**



**COST E36 - Mid-term evaluation
ADDED VALUE - Approximate value of new projects**

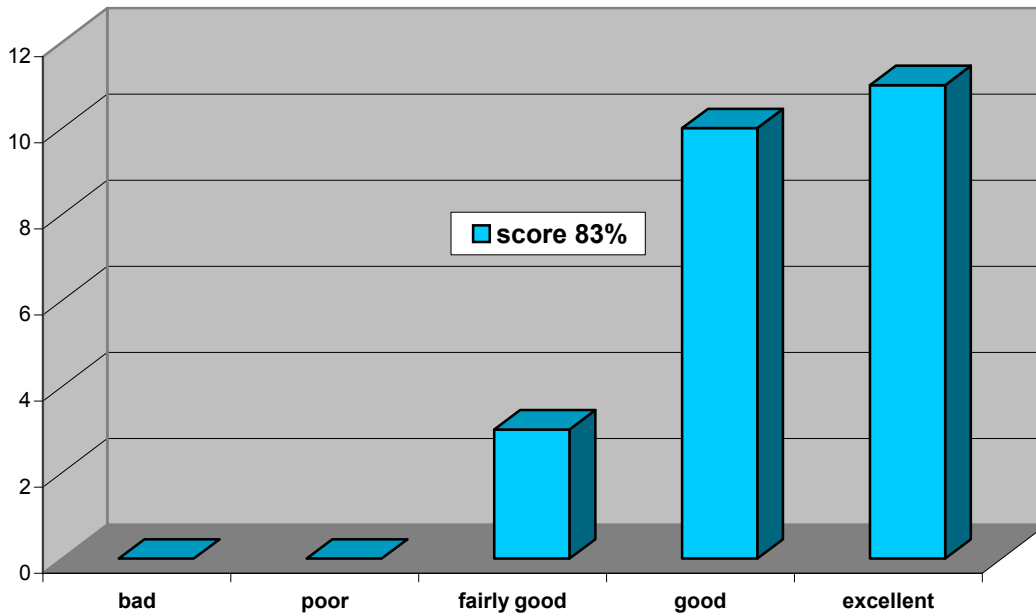


**COST E36 - Mid-term evaluation
ADDED VALUE - Joint publications**

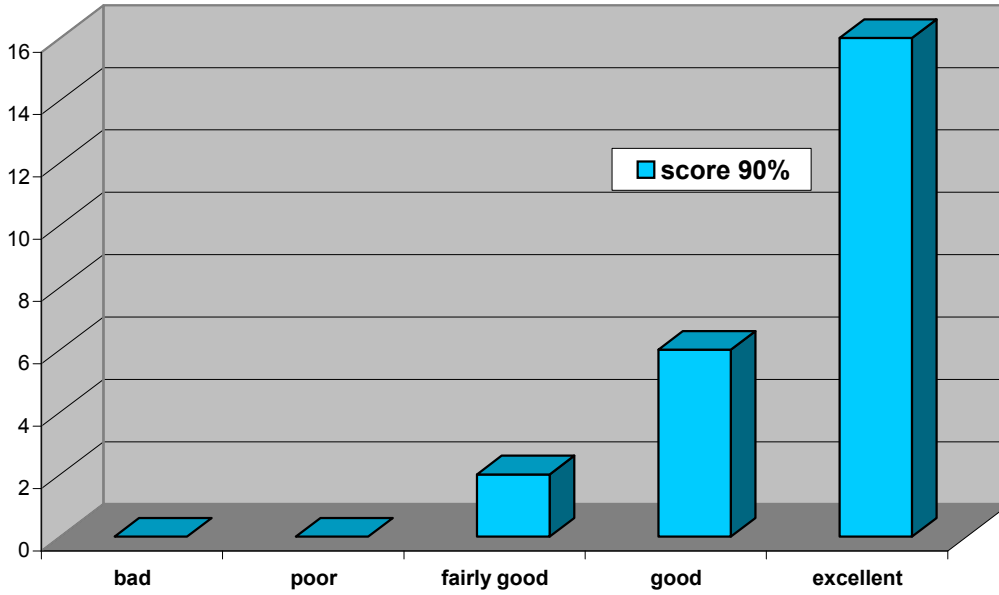


Management aspects

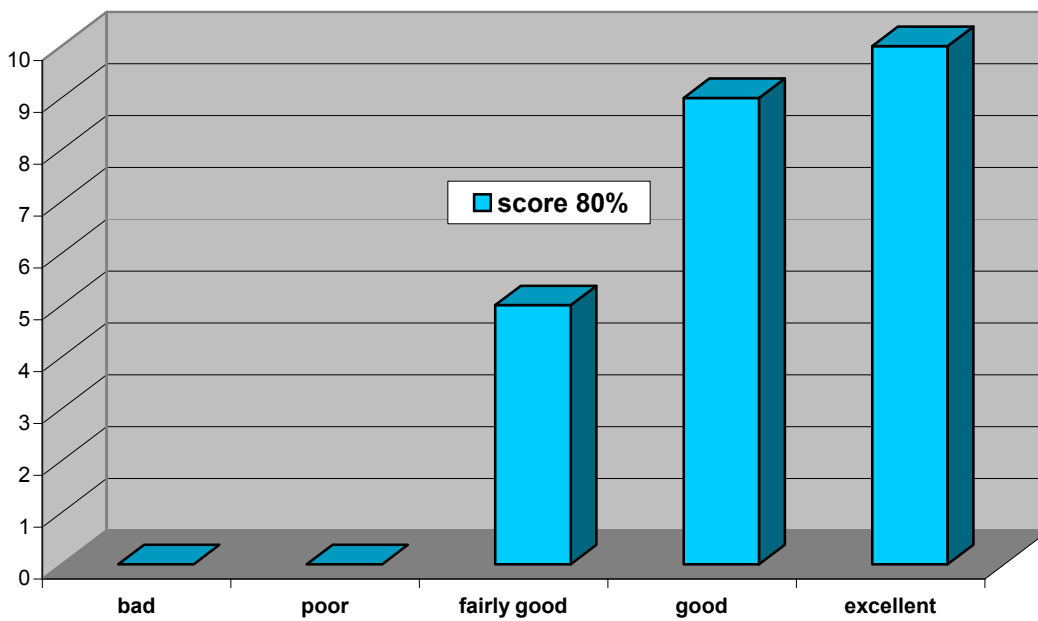
**COST E36 - Mid-term evaluation
MANAGEMENT - Overall**



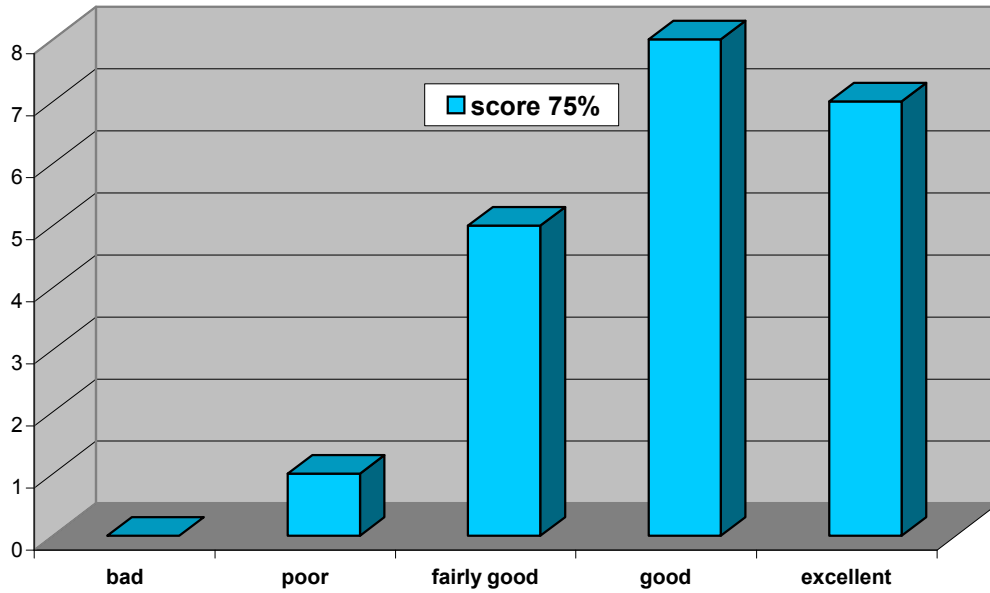
**COST E36 - Mid-term evaluation
MANAGEMENT - Organisation of meetings**



**COST E36 - Mid-term evaluation
MANAGEMENT - Distribution of documents**

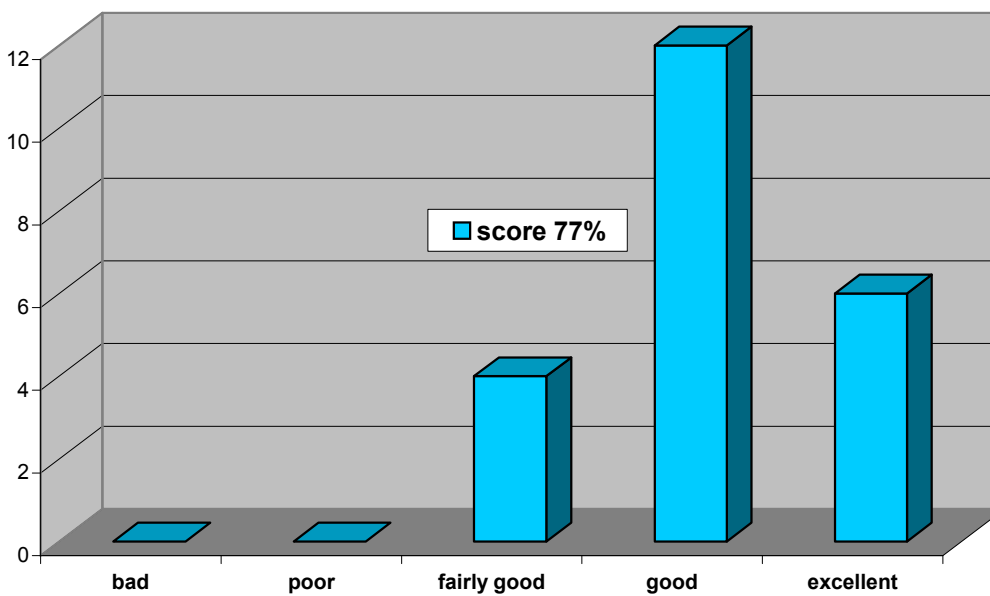


**COST E36 - Mid-term evaluation
MANAGEMENT - Internal assessment of Action progress**

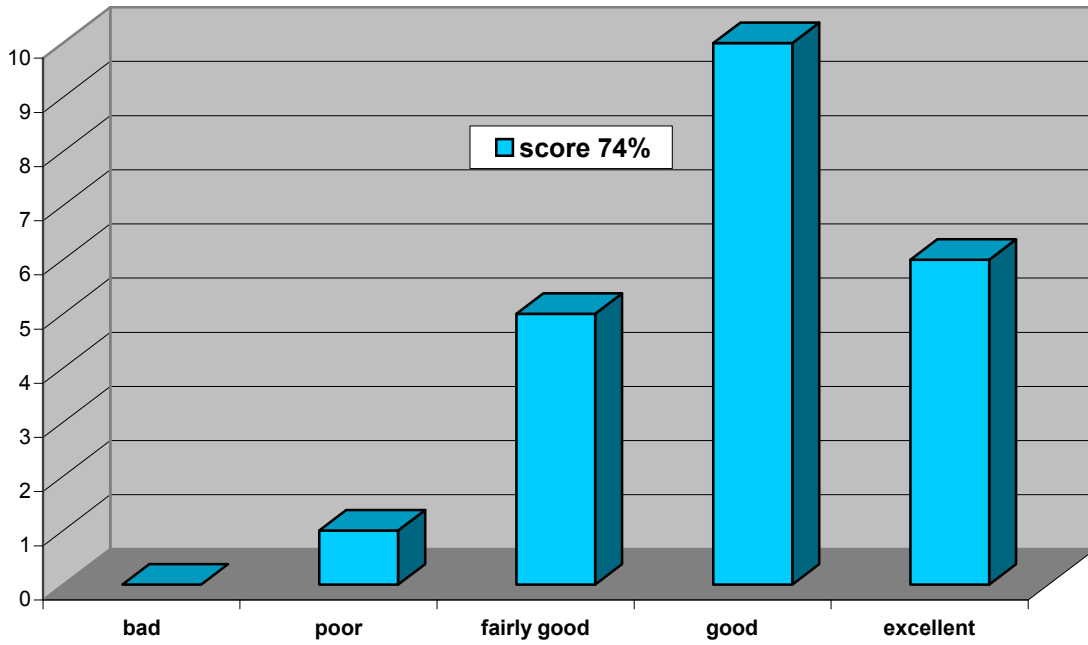


Dissemination aspects

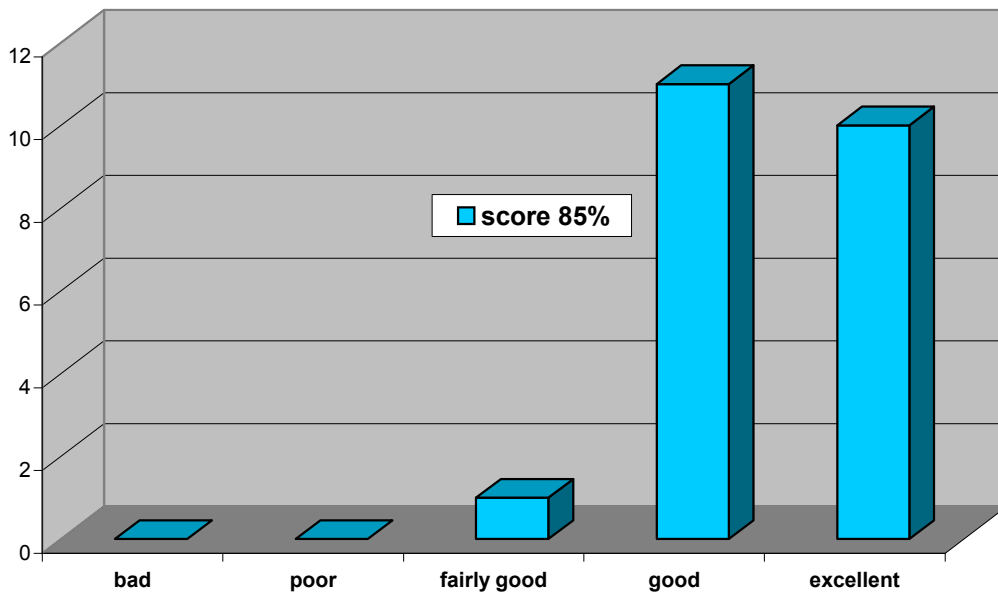
**COST E36 - Mid-term evaluation
DISSEMINATION - Publications from meetings**



**COST E36 - Mid-term evaluation
DISSEMINATION - Accessibility of documents**

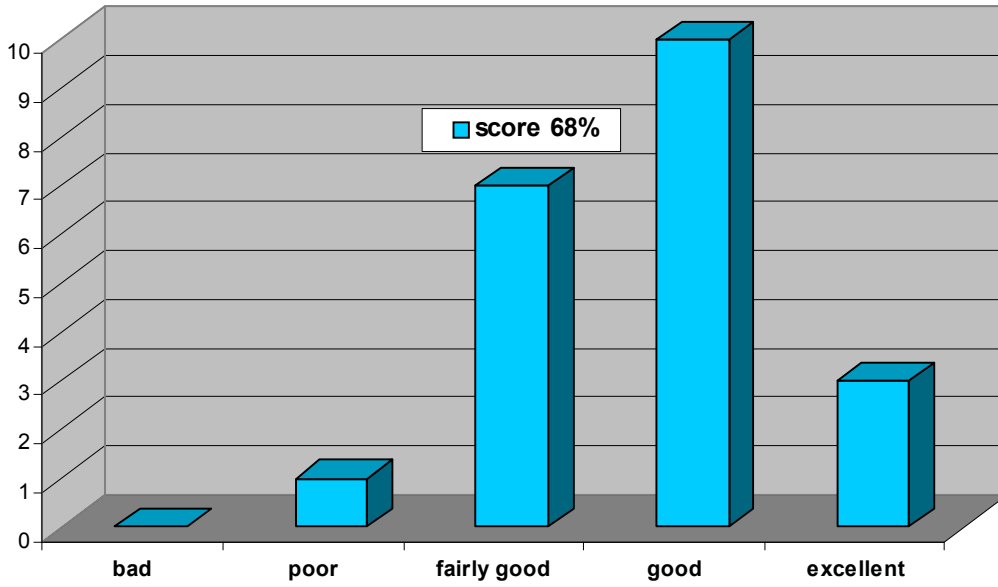


**COST E36 - Mid-term evaluation
DISSEMINATION - Publicity and marketing (national and international)**

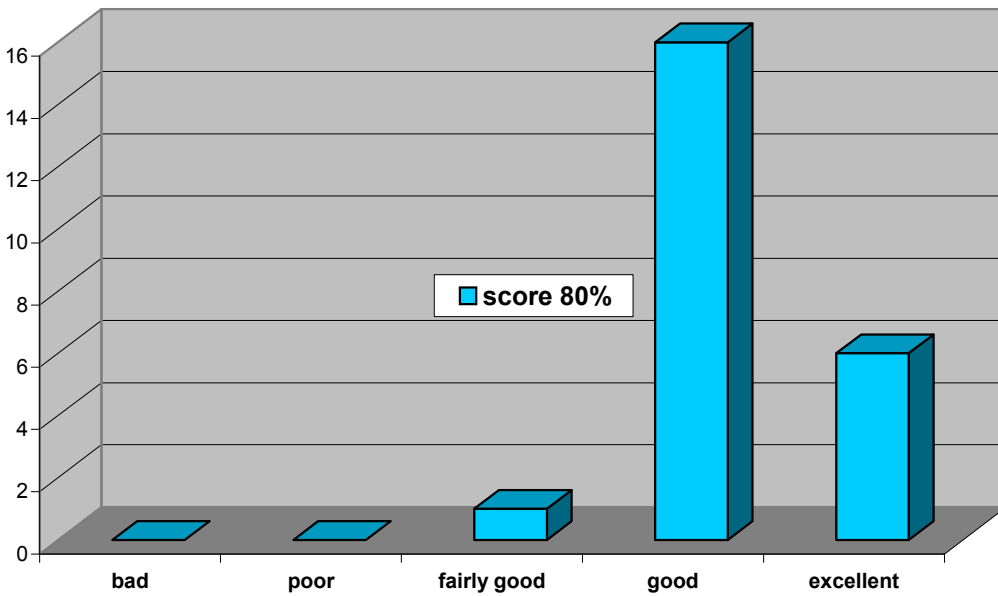


Participation aspects

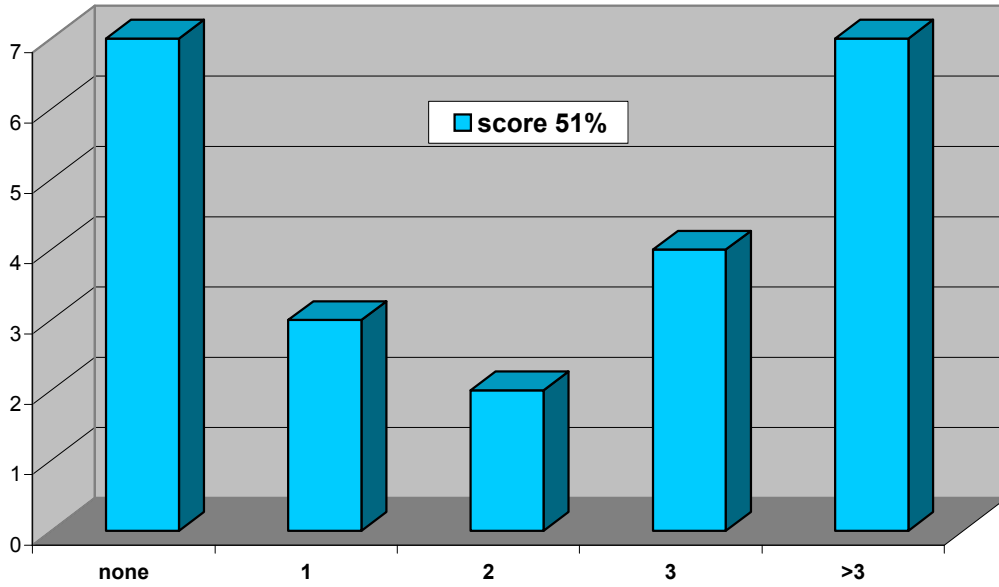
COST E36 - Mid-term evaluation
PARTICIPATION ASPECTS - European breadth



COST E36 - Mid-term evaluation
PARTICIPATION ASPECTS - Overall

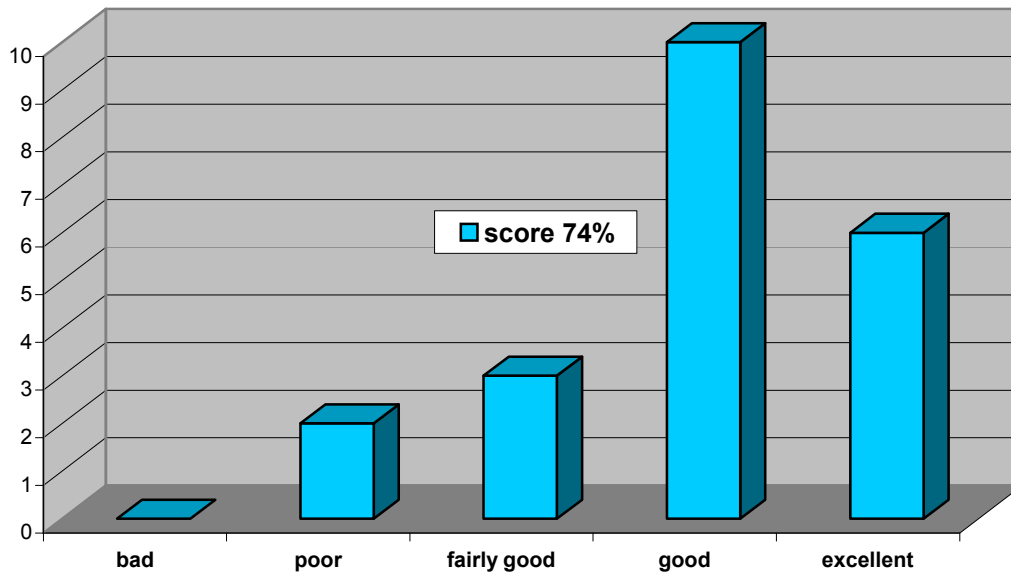


COST E36 - Mid-term evaluation
PARTICIPATION ASPECTS - How many Short Term Scientific Missions ?

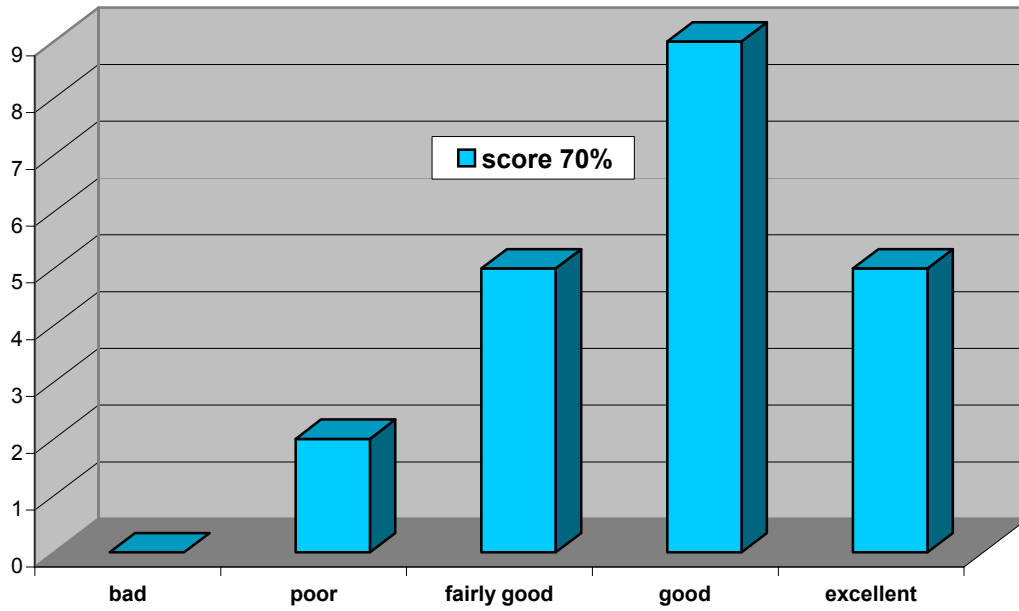


Economic aspects

COST E36 - Mid-term evaluation
ECONOMIC ASPECTS - Cost of Action in relation to participation

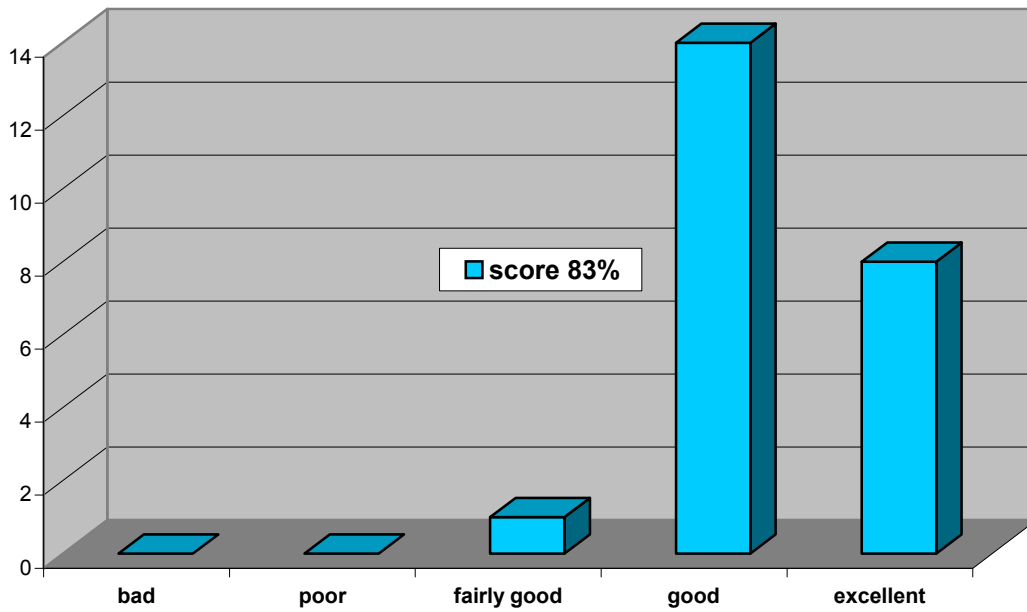


**COST E36 - Mid-term evaluation
ECONOMIC ASPECTS - Cost of Action in relation to added value**



Overall assessment

**COST E36 - Mid-term evaluation
OVERALL ASSESSMENT**



3. Action Identification Data



Action Identification Data

COST Action E36 – Modelling and Simulation in the Pulp and Paper Industry

TC Recommendation: 10/01/2003
CSO Approval: 06/02/2003
Start date: 22-23/01/2004
Duration: 48 months
Extension:
End date: 21/01/2008
Number of signatories: 14
Signatories and date of signature:

Austria		Greece		Poland	17/02/2006
Belgium	09/10/2003	Hungary		Portugal	
Bulgaria		Iceland		Romania	23/03/2004
Croatia		Ireland		Serbia & Montenegro	
		Israel		Slovakia	15/10/2003
Cyprus		Italy		Slovenia	09/10/2003
Czech Rep.		Latvia		Spain	08/09/2003
Denmark	06/10/2004	Lithuania		Sweden	09/10/2003
Estonia		Luxembourg		Switzerland	
Finland	31/10/2003	Malta		Turkey	
fYR of Macedonia					
France	09/10/2003	Netherlands	15/10/2003	U. Kingdom	02/12/2003
Germany	9/10/2003	Norway	25/06/2005		

Institutes of non-COST countries:

Area: Forests, their products and services

Action Web site: <http://www.coste36.org/>

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TC Rapporteur: *Harald GROSSMANN - Germany*

External Evaluator: *Jan M. OVERLI – NTNU - Energy and Process Eng. – Trondheim - Norway*

External Evaluator: *Jean-Paul VINCENT – CTP – Grenoble - France*

(1) Date of the first MC meeting.

(2) When the report is received by TC