

**COMMISSION OF THE EUROPEAN COMMUNITIES**

SEC(92) 512 final

Brussels, 25 March 1992

***INTERMEDIATE REPORT  
OF THE DOSES PROGRAMME***

**(Presented by the Commission)**

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## **0. FOREWORD**

This document is the intermediate report as requested in Article IV of the Council decision taken to set-up the DOSES programme (O.J. L 200 20 June 1989). It is based on an evaluation paper worked out by Mr. W. Molenaar, Vakgroep S&M FPPSW, Rijksuniversiteit Groningen, Grote Kruisstraat 2/I, 9712 TS Groningen who is an independent expert. This paper draws attention to both the positive achievements of the programme and its shortcomings. Each separate phase of the programme development is described and commented upon. The evaluation report is preceded by a short section as conclusions and suggestions.

## I. CONCLUSIONS AND SUGGESTIONS

The conclusions drawn in the intermediate programme assessment are positive. While it is too soon to assess fully the results of the work which is going under way, there are sound reasons to believe that DOSES will

- contribute towards further substantial progress, facilitating and improving the production and utilization of statistics;
- lead to closer cooperation between producers, disseminators, users and researchers in the Member States.

However, further measures are required to be taken if the statistical domain is to reach the point where it can incorporate modern knowledge-engineering techniques fully (DOSES has a budget of 4 Mecu). In addition the progress in the fields of statistics, computer science, artificial intelligence and hardware is so rapid that further efforts will need to be made for the period after 1993.

The work to be carried out will require an extension of the DOSES projects and a broadening of their scope should be made in order to provide more comprehensive coverage of new techniques and technologies likely to be of benefit to statistics.

Domains such as:

- large-scale electronic transfers of statistics and of associated data for validation and interpretation purposes;
- statistical databases;
- the use of statistics for decision-making;
- the construction, management, utilization and dissemination of nomenclatures;
- access to statistical information and techniques for less-experienced or less well-equipped users;

will also need to be covered.

R&D in these domains requires an additional impetus at European level for the following reasons:

- pooling the expertise which exists in the Member States should allow more rapid progress to be made and quality-levels comparable to those in the USA and Japan to be achieved;
- the existing national institutions (statistical institutes, research centres, universities, software development firms) are unable to invest sufficiently in pre-competitive projects of the type co-financed by DOSES, which are essential for progress and innovation;
- Europe will not be able to keep abreast of its competitors on the world market through national projects alone.

Provision should also be made for specific measures to make the results achieved in DOSES usable in a production environment.

## II. SUMMARY OF THE EVALUATION PROGRAMME REPORT

On June 20, 1989, the EEC Council decided on the institution of a specific programme for the research and development of statistical expert systems (DOSES). Article IV of the Council Decision announces a review of the programme by the Commission in its second year of implementation. An evaluation by an independent outsider was considered to be a useful building block for such a review.

The main conclusions are:

- although it is too early to be able to give an in depth assessment of the substantive results of DOSES, there are good reasons to predict that it will fulfill its goals: it will mean a major step towards incorporating artificial intelligence knowledge technology into the production and use of statistics by a joint effort of multinational cooperation;
- the procedures followed for preparing, selecting and monitoring the projects subsidized under the DOSES programme have largely been careful and effective; on some relatively minor aspects this report presents some remarks and proposals for amendment.

In order to avoid a misinterpretation of this report, a few qualifying remarks should be added to these positive conclusions. As regards the positive substantive effect of DOSES, the reader should be warned that the road towards practically useful contributions of artificial intelligence techniques to statistics has proven to be longer than was expected ten years ago: statistical expertise is not easily formalized into rules and facts that can be processed by an inference engine, and it is very context dependent. In the past few years, however, the available tools and knowledge have improved. It is a problem for those working in the field that the demands have also risen: there is a tendency to view the remarkable growth in flexibility, depth and user friendliness of modern software as almost trivial, and to formulate even far more ambitious goals for the near future.

A second aspect is that the funding of a small number of pilot projects, to be undertaken by multinational teams under a very tight time schedule, is in itself totally insufficient for a major change in the field of statistics. It is a general experience that innovative projects for research and software development meet unforeseen problems on the way and generally do not deliver all the end products formulated at their inception. Moreover, even if all projects fully achieve their ambitious aims, nobody should think that in 1993 our problems will be over. It is the expected indirect effects of the projects on research and development within the EC that is a main motive for the positive first conclusion.

As regards the procedural aspects, it should be taken into account that the phenomenon of European funding for multinational projects is relatively new. DOSES has learnt from experiences of similar programmes such as ESPRIT or COMETT, but for the statistical community this was the first major funding operation at the European level.

Generally the DOSES team has succeeded in overcoming this difficulty; the amount of space devoted in this report to the problems that were encountered should not be misinterpreted. It only means that it takes more space to signal deficiencies and motivate suggestions for improvement than to express a positive opinion.

This report consecutively discusses the aspects of the DOSES operation, mostly in historical order but sometimes grouped by content. Each topic begins with a brief summary of the factual information, followed by comments.

This summary section ends by a recapitulation of some topics on which a critical remark or an amendment proposal have been made:

Section III.1: the emphasis on the participation of major producers, distributors or users of statistical data should not lead to neglecting the problems of their minor counterparts, such as smaller firms or local authorities.

Section III.4: the 70 day period between the first call for proposals and the deadline for submission was too short.

Sections III.4 and III.5: the numerous additional restrictions on the eligibility of proposals, such as the composition of the teams, have posed problems for many proposers.

Sections IV.1 and IV.4: there is sometimes a tendency to overburden the project managers by asking for too much detail.

Section IV.3: a lighter submission and decision procedure for coordinated action projects is proposed.

Sections IV.5 and IV.6 discuss problems that may arise in the final phase of the current projects and in the further promotion of the DOSES goals in the future.

### III. DOSES PROGRAMME

The programme "Development Of Statistical Expert Systems" (DOSES) was conceived in 1987. The first call for proposals took place in April 1989; at the end of that year the first contracts were signed. The first section discusses the goals and themes of DOSES.

#### III.1 Goals and themes

A concise statement of DOSES goals is found in the preface by H. Christophersen in the 12 page DOSES information booklet CA-55-89-762-EN-C:

"The creation of a single European Market will lead to a growing need for statistics for many sectors of economics, which must be comparable, trustworthy and timely. This situation makes it natural that Europe should play an active role in developing new statistical tools.

Some new methods growing out of research into Artificial Intelligence are becoming available. We must try to profit from them in order to improve the quality of our data, to make the data more readily accessible and to extend the range of services offered to the user."

Page 5 of the booklet reads as follows:

"DOSES (Development Of Statistical Expert Systems) is a multiannual programme (3.5 years) aiming to promote the coordinated development of statistical expert systems through:

- regular consultation between interested parties (national statistical institutes, universities, industry, community);
- support for multinational research and development projects carried out jointly under the agreed guide-lines.

The aim is to enhance capacity to produce and use statistical information employing advanced data processing techniques.

The programme will be of value not only to statisticians but also to users of statistical information.

Two main types of activity are envisaged:

- coordinated action projects involving research and development in areas of interest to statisticians and users of statistics in the Member States;
- shared-cost projects generating and supporting specific joint projects within the Community.

Community funding is available for the above activities."

The booklet then presents a brief explanation of coordinated projects and shared-cost projects, outlining the four themes for the latter:

1. Preparation of a complete system for automated information processing;
2. Documentation of data and of statistical methods;
3. Access to statistical information;
4. Forecasting.

An excellent further description of the origins and aims of the DOSES programme is given in the paper by Nanopoulos and Defays that opens the Proceedings of the 1987 DOSES Seminar.

*Comments: The goals have been judiciously chosen and appear to cover the most important areas where expert system technology anno 1989 could meet the practical needs of the intended class of users. The time was ripe for a multinational effort to modernize production and use of statistics by building more knowledge into the software, and without some special funding such projects would hardly come off the ground. The emphasis on practical usefulness was relevant.*

*Some reservations:*

*a) The intended class of users was restricted to "major producers, distributors or users of statistical data"; indeed it was announced that ideally at least two of such parties should be among the participants of shared-cost projects. Although this is understandable given the tasks of Eurostat and the National Statistical Institutes, similar problems arise far more frequently and probably more heavily for MINOR producers, distributors and users of statistical data.*

*Business firms, non-profit organisations and local authorities, for example, collect data or place orders for data collection without having the support and expertise in data collection, data analysis and data interpretation that is available within the major organisations.*

*The beneficial impact of the DOSES programme on the economic, social and political activities within the Member States would have been enhanced if the restriction to "major" - meaning in practice official statistics as used by national statistical institutes and Eurostat - had been relaxed.*

*If this was not considered desirable on a short term basis, then at least consideration could have been given to the long range effects of the funded proposals for the much larger group of minor producers, distributors and users. The criteria for successful expert systems listed by Haton (Proc.DOSES Seminar, p.30) apply even more to this group:*

- the expertise is scarce or is not well substantiated;*
- it is concentrated on one place though used at several locations;*
- decisions must be taken under difficult conditions.*

*b) It appears that theme 1 aims at full scale implementations covering the whole range of statistical activity (from study design to interpretation of results, as worked out by Peare and by Prastacos in the Proc.DOSES Seminar, p.49-70). A later formulation of theme 1 reads "Preparation of a complete system for automated information processing in a particular field". Even with this restriction added, it appears overly ambitious to expect that such an undertaking could be successfully finished in 3.5 years. It looks as if themes 2 and 3, perhaps also 4, identify subsections or branches of the statistical trajectory for which the incorporation of artificial intelligence technology has to be solved, before an integrated system comes within reach. This would also apply to other subsections and branches. On the other hand, an advantage of the ambitious formulation of theme 1 is that it encourages researchers to think about internally consistent and compatible solutions for the whole statistical trajectory, in which metadata go from one phase to another and in which the software architecture is sufficiently rich for all phases.*

*c) A third objection had to do with the time schedule and the rules for projects, and will be discussed in section III.4.*

### III.2 Preparatory phase

The intention to launch the DOSES programme was made public during a seminar in Luxemburg in December 1987 with roughly 100 participants.

The proceedings (343 pages) were published by Eurostat in 1989 under the title "Development Of Statistical Expert Systems". They were distributed to the participants and to persons showing an interest in the programme.

A working party met in Luxemburg on 3-4 March 1988 (cf. doc. EUROSTAT/D2/DOSES/4).



It consisted of delegates of the Member States, three invited experts and a number of Eurostat staff members. The group commented on the proposed programme and on the draft decision for the Council. The original six themes were reduced to four.

It was announced that the Commission would be assisted in the management of the programme by an advisory committee (CAN) and a group of four "wise men"; both will be discussed in section III.3 below. The intention was announced to obtain a favorable decision from the Commission within a few months, and from the Council during the second half of 1988. An invitation to tender or a call for expressions of interest would be prepared by the end of the year 1988. All those present were asked to promote and support the ideas of the DOSES programme and to send any relevant information to Eurostat.

*Comments: A major effort has been undertaken to insure that the formulation of the objectives and the organisational setting of the DOSES programme would be known to, and acquired the approval of, the many persons and institutions for which it was relevant. The seminar proceedings are of high quality and the March 1988 meeting seems to have well performed its double function of informing the participants and allowing them to influence the course for the next year.*

### III.3 Organisational Setting

#### a. Eurostat Staff

The DOSES programme has been led and coordinated by Eurostat staff.

*Comments: The work has been performed with much dedication and skill.*

As was announced in the March 1988 meeting, two committees were formed in order to assist in the management of DOSES.

#### b. The Committee of an Advisory Nature (CAN)

The CAN consists of two representatives of each Member State plus the representative of the Commission (chairman). Its procedures and tasks are found in doc. EUROSTAT/D2/DOSES/11. Among others, the CAN provides to the Commission information, advice and support on scientific/technical matters and R&D policy. Specific matters on which the CAN opinion is sought include selection of projects, evaluation measures, departures from rules, participation of third country organisations and arrangements for the dissemination, protection and exploitation of the results of DOSES-funded research.

*Comments: The CAN has played a very useful role in the management of the DOSES programme. Already in the March 1988 meeting of the Working Party later formalized into the CAN, the information given by the national representatives on the activities already undertaken (per state and internationally) as well as the comments on the originally proposed six themes for shared-cost projects have led to improvements in the proposals. In later stages, CAN members had a useful influence on DOSES activities, both during CAN meetings and via written consultations. Its contribution could have been more important at the selection stage of the projects.*

*The idea of having two CAN representatives per Member State rather than one was put forward at the March 1988 meeting, in order to have representatives from national statistical offices and ministries of research. This idea appears potentially useful for a smooth flow of information, from the national level to the European level and vice versa. The functioning of the CAN members within their own national setting, however, lies too far from the DOSES programme to be evaluated here.*

*The CAN has regularly met. It is of course unavoidable, given the high qualifications of its members, that some persons have missed some meetings. In most instances, however, nearly all Member States were represented, and moreover direct contacts with the secretary have occasionally mitigated the effects of absence.*

*Article 9 of the CAN Rules of Procedure says that a representative ... must declare any interest in a project undergoing evaluation or having been selected for financial support. No such declarations of mixing of roles have taken place.*

c. Group of Wise Men

Already in January 1988, some top experts were invited to be members of a small advisory board with three main tasks:

- advice on the technical aspects of the programme;
- study of bids and opinions;
- evaluation of reports.

The "Wise Men" or "Sages" on this board were not allowed to tender for contracts under DOSES.

*Comments: In many respects the existence of this scientific advisory group has been very valuable for the DOSES programme.*

*Their independence and reputation has enhanced the acceptability of both the selection for funding and the progress evaluation of projects funded. Decisions to reject a proposal, to propose major amendments, or to criticise the development of a funded project, are for obvious reasons difficult to accept for the project teams. It is of the utmost importance that there exists a maximum trust in the quality, the fairness and the transparency of such decisions. Both the reviewing of scientific papers and the funding of research projects showed that expressions of disappointment, and even conflicts, can never be fully avoided. Indeed there is evidence of them in some DOSES files. Human decision making on the value of scientific work is of course fallible. The case of the DOSES evaluations presents some novel aspects which made the task even more difficult. The "Wise Men" have all shown a laudable dedication to their sometimes ungrateful role within DOSES.*

*The composition of the group is the result of the intention to achieve a balanced representation of fields (university statistics, official statistics, artificial intelligence and software development) and nationalities. The price to be paid for such a balance is a strong heterogeneity. However, the four Wise Men have still developed a common team spirit, both between themselves and with the Eurostat staff.*

#### III.4 Call for proposals

With the help of those present at the March 1988 meeting, the 12 page booklet already mentioned was mailed to a large address base of potentially interested persons. Following the statement of goals and themes already discussed under that heading, the final page of the booklet listed some eligibility conditions and mentioned the availability of a DOSES Information Package (Call for Expression of Interest). This appeared April 20, 1989 and was mailed to over 500 addresses. Simultaneously, a short call for proposals appeared in the Official Journal No C 99/7. In the Journal and the booklet, a deadline of June 30 for shared-cost projects was announced "to hold if the Council decides on the project in May".

The Information Package contained, in more detail than the booklet, a statement of the DOSES goals, a description of the form and content of the coordinated action projects and the four themes for shared-cost projects, eligibility and financial conditions, evaluation and management criteria, and model forms with a one page description how to format a proposal.

Participation in the DOSES programme was open to all companies, all educational establishments, all research institutes and any type of public or private organization, as well as to individuals. Several restrictions, however, have been imposed with the aim of obtaining project proposals that best meet the DOSES goals.

*Comments: Generally the call for papers was carefully formulated. However, this stage of the DOSES programme gives rise to several remarks.*

*The first has to do with the time schedule. The Council decision was taken on June 20, 1989, much later than originally intended. The June 30 deadline for submission was maintained, however. As the call for proposals appeared April 20, this implies that proposers had at most 70 days to prepare their proposals. For those who still had to seek partners after April 20, this made it virtually impossible to submit a well considered proposal, which would have to be circulated among partners, discussed and revised, and submitted with all signatures implying intensive and final commitments for each partner.*

*Even for those who had been present at the 1987 Seminar or had been informed by the national CAN representatives or by Eurostat much earlier than April 20, the final conditions for eligibility and formatting of the proposal have probably contained some unpleasant surprises leading to additional work under heavy time pressure.*

*The advantage for groups with early knowledge and already established international cooperation could be viewed as unavoidable, perhaps even desirable given the higher probability that their projects would be successful. Even if the Eurostat staff made a major effort to ensure a fully open and fair competition, the unhappy maintenance of a too tight submission deadline, however, carried the risk that some parties involved could feel some doubt about this intention.*

*Moreover, publishing the rules only 70 days before the deadline had undesirable side effects for both the proposers and for Eurostat, given that both parties would benefit from well considered proposals.*

*Summarizing, assuming that an earlier publication of the call for proposals was impossible, extension of the deadline by three months would have led to more and better proposals. A still better idea, apparently originally considered by DOSES, would be a two stage procedure: submission and reviewing of 3-5 page intentions, followed by full sized proposals only for those who survived the first round, or who felt that the grounds for initial rejection could easily be changed. Of course this would have implied a later starting date for the projects. Given the time elapsed since the December 1987 Seminar, and given the intended duration of 3.5 years, this appears like a minor damage. As things went now, 22 teams involving 99 partners must have invested an enormous energy to produce 1006 pages of proposals within a time horizon of 70 days, and many other teams may have given up halfway.*

*A second remark concerns the restrictions for proposals. The main goal is clear: enhance capacity to produce and use statistical information employing advanced data processing techniques and results from artificial intelligence. The plethora of unfinished projects and unused software in this area anno 1988 has led the DOSES team to the wise step of selecting four themes in consultation with interested parties on the basis of their usefulness from the point of view of the producers and users and the feasibility given the state of the art of expert system techniques and tools (DOSES booklet, p.8). It was desired to obtain proposals that would be scientifically innovative and at the same time would lead to prototypes that really worked to the satisfaction of the intended user group. The latter aspect must have been a major motive to stipulate that at least two of the partners in a proposal must be major producers, distributors or users of statistical data. It is clear from the proposals that this condition has led to some interesting cooperation between e.g. academic research groups and major institutions or firms.*

*A similar positive effect should be expected from another restriction, namely that at least two independent parties from different Member States must cooperate in each project.*

*On the other hand, it has to be pointed out that such important side benefits cannot be reaped without paying a price. It is quite possible that some teams well qualified to fulfill the main task (of producing innovative software) were unable to meet the side conditions. They may have refrained from submitting proposals, or they may have hurriedly sought partners without a thorough consideration whether there was enough common ground for a close cooperation. Fortunately there is no reason to suspect that this situation holds for the projects that were chosen to be funded. It should be observed, however, that the task of the project leader and the leaders of the partner teams is rendered more difficult by the obstacles involved in scientific cooperation at distances of hundreds of miles between groups with different national and organisational subcultures.*

*The final view on this delicate dilemma is to stay optimistic, however.*

*It will take some more money and some more energy to achieve the same quality level in such heterogeneous teams. But the additional gain is that important groups in almost all countries of the EC will learn to overcome cultural differences in a joint project, that expertise in different fields will be brought together, and that the end products of the project will be more readily acceptable to diverse groups of potential users. It can be expected that such learning experiences have a transfer to other groups surrounding the cooperating partners, and to other forms of cooperation (between nations as well as between academic science, commercial enterprises and non-profit institutions).*

*A third objection concerns the clarity of the call for proposals. It turned out that no satisfactory proposals pertaining to themes 2 and 3 were obtained in the first round, possibly due to less knowledge in the field than was assumed. This led to the initiative for a special workshop, to be discussed in section III.6. Moreover, the concept of a coordinated action proposal also seems to have been insufficiently specified, as will be discussed in section IV.3.*

### III.5 The 22 initial proposals

By June 30, 1989, 22 proposals for shared-cost projects had reached Eurostat headquarters.

*Comments: Given the problems discussed in the previous section, it is a pleasant surprise that 22 teams still managed to meet the deadline.*

*The 22 proposals show an enormous diversity in numerous aspects. The number of pages varies from 6 (a mere letter of intent) to 110 (with an informative detailed description of the software modules). The correlation between length and informativeness is far from perfect.*

*Some very good proposals had less than 40 pages and other ones with more than 100 pages were lagging far behind.*

*a) The first section of each proposal lists the financial summary plus the general information and cost specification per partner, on forms provided by Eurostat. Time pressure has evidently formed an obstacle for some proposers, but in the majority of cases these forms are complete and informative.*

*The spread across nations is illustrated in the following table:*

	UK	F	B	NL	GR	D	I	E	IR	DK	P	L	CH	N	S	Tot.
Prime proposer	7	4	2	2	2		1		1	2			1			22
Present as partner	11	7	7	5	5	4	4	5	2	2	2	1	1	1	1	58
Total partnerships	22	16	13	9	7	8	6	6	4	2	2	1	2	1	1	100

*This indicates a relatively strong proposal activity in the United Kingdom, France, Belgium, the Netherlands and Greece. As it includes some non-eligible proposals and some very minor partnerships, not too much weight should be attached to the data.*

The majority of prime proposers are employed by a university or a research institute, the others mostly represent a consulting firm or software bureau. Among all partners, the vast majority are again universities or research institutes. In most proposals, only one or even no major producer, distributor or user of statistical data is found as a formal partner; in some cases a letter from an entity representative for this category was attached, or the intention to approach one was mentioned. It is plausible that time pressure was the major reason for this very frequent violation of the eligibility condition requiring at least two participants, based in different Member States, from this class of major producers, distributors or users.

The following table gives the frequency distribution of the 22 projects as regards number of countries, number of EC countries and number of partners involved in the project:

	1	2	3	4	5	6	7	8	Total
# countries	4	6	6	6					22
# EC countries	4	7	7	4					22
# partners	3	2	3	3	1	5	3	2	22

The one-country proposals (from UK, I, DK and NL) were considered non-eligible on formal grounds; some of them were hardly more than a letter of intent. The four projects that were funded have 4,4,3,3 countries (all EC) and 6,8,6,4 partners, respectively.

The costs for which EC funding was initially asked varied between 183,000 and 1484,000 Ecus. Given the impression that some costs had been overestimated, negotiations with the proposers were initiated that led to substantial reductions both in tasks and in costs. The final contracts for the four funded projects show substantially lower amounts. In one case, unclarity about the funding of a part of a project that DOSES was not willing to subsidize has led to serious problems (see section IV.2). For all projects it must have been problematic to produce a valid and effective lower budget in the few weeks between the announcement of acceptance and the signature of the contract.

b) The second section is the core of each proposal. It should contain a technical summary, a discussion of the project background, and a project plan with time schedule, subdivided into work packages and indicating the role of the partners. Here enormous differences in quality are found. The scientific background is sometimes left undiscussed, or is not substantiated by a literature list. On the other hand, some proposers write a good overview of the field, but omit any information on how this state of the art will play a role in their project. Work plans differ from very meager to excellently specified.

It is evident that scientifically innovative software projects are characterized by a tension between planning and discovery. For most projects the insights to be incorporated in the software still have to be established, and the usefulness of the tools still has to be investigated. This makes it difficult to specify a detailed work plan for the whole project period of several years.

In particular for partnerships at different locations, however, a careful planning of the project stages is a *conditio sine qua non*. Even for the ten best proposals, this was sometimes a little problematic. In some cases, planning seemed to be so tight that very little leeway for unforeseen problems was offered. In particular, too little time was reserved for try-outs of the various components and prototypes, and for revision in the light of partners' findings. The results of a DOSES project should be scientifically innovative, but also satisfactory for the class of intended users. Although many proposers have formed excellent teams, it seems that some have been overly ambitious as regards innovation, and not enough concerned about the satisfaction of users.

Leaving out two very incomplete proposals, nine were most relevant for theme 1 (automated information processing), four for theme 2 (documentation of data and methods), three for theme 3 (access to statistical information) and four to theme 4 (forecasting).

c) *The third section of a proposal describes the roles and qualifications of each partner, with curricula vitae of the key persons involved. There was an enormous variation in length and informativeness. Although most partners succeed in giving a clear overview of what they do, and how this is relevant for the current proposal, for other partners this remained rather unclear. Some proposers or their partners have included curricula vitae of 5 to 10 pages per person, listing masses of unreviewed papers and activities totally unrelated to the project.*

### III.6 Review and funding decision

During July and August 1989, the proposals were each reviewed by five independent experts in the field. They rated the projects on 24 aspects as excellent, good, fair or poor, and had to choose a summarizing recommendation from:

- a) accept as it is;
- b) accept after minor revision;
- c) accept after major revision;
- d) do not accept.

Moreover, additional pages encouraged to give free format comments on technical and management aspects.

A synthesis of the reviews by the Wise Men and Eurostat staff took place September 20-22, 1989. The short recommendations by the Wise Men (about 5-15 lines per proposal) were discussed by the CAN at its September 29 meeting. This led to the decision to fund four projects (1,6,12 and 18) pertaining to themes 1 and 4, with some amendments and budget cuts. The conclusion that none of the projects for themes 2 and 3 were of top quality led to the decision to issue a new call for proposals for these themes only. A one page letter with the positive or negative conclusion was mailed to each proposer.

*Comments: There was usually a very close agreement between the reviewers, both on the item scores and on the recommendations.*

*Also at the level of individual reviewer-project combinations there is not always perfect conformity between summed item scores and final recommendation. This is perfectly justifiable, because the check-list does not cover all quality aspects of a proposal, and reviewers may attach more weight to certain aspects than to others. The free format comments on technical and management aspects often explain such apparent discrepancies.*

*An item which was often scored very high, in these eight proposals, was item 3 "conformity with the programme of work". An item which obtained many low ratings was item 17 "identification of major technical risks". More generally the eligibility items obtained far higher scores than the sections "technical merits" and "soundness of organisation". It is quite understandable that reviewers express more doubts in these areas. In particular, one may argue that a proposer perceives no major technical risks (otherwise why write a proposal ?) or at least that (s)he has little reason to emphasize them (which would damage one's own chances for funding).*

*The reviewer teams have performed well and their recommendations seem to have identified the overall best projects.*

In the next step, the coordinator added summary scores for the soundness of the costs and for the quality of the team. Then the Wise Men formulated their summarized comment for the CAN meeting.

*Comments: The summaries are very adequate and fair.*

At the September 29 CAN meeting, the CAN discussed and accepted the recommendations of the Wise Men, and decided to fund the four projects 1,6,12,18, in some cases contingent upon revision and cost reduction. This meant two projects each for themes 1 and 4. As regards the other themes, it was stated that several projects had interesting features but none seemed acceptable as it stood. The CAN decided to issue a fresh invitation to tender, with invitation to those who had already sent a proposal for these themes to resubmit after considering the criticisms. Moreover, it was decided to have a workshop on metadata in January 1990 for clarification of concepts, dissemination of knowledge and facilitation of the formation of balanced teams.

*Comment: Proposals had to satisfy many different criteria, and in multi-attribute decision making differences of taste cannot be fully eliminated. Within this restriction, and given the novelty of the situation, the decisions of the CAN were careful and wise. This holds in particular for the introduction of a new round for themes 2 and 3 in combination with a workshop.*

*The communication of the CAN decisions to the proposers was less than optimal. Insufficient time was sometimes given for revision and more details could have been given to justify rejection.*

### III.7 Later shared-cost proposals

The second call for tenders was issued December 5, 1989. On January 29, 1990, a workshop "Expert systems and A.I.: the need for information about data" met in London (it was organized in the form of a Coordinated Action project). At the new deadline of April 30, 1990, 17 shared-cost proposals for themes 2 and 3 had been received, five of which were revisions of proposals rejected in the first round.

Expert reviewing led to recommendations of the Wise Men that were discussed by the CAN on June 1. The subset of six proposals listed in a first round as promising was discussed in the order of the Wise Men rating. Given the budget limitations, this led to the recommendation to fund projects 41, 42 and 34, with 31 and 40 to be added if money was available. In this round, rejection decisions were explained in more detail.

*Comments: the procedure being very similar to that of the first round, my comments can be shorter. The range in page length among the 17 second round proposals is 13 to 57 with one outlier of 125 pages.*

*The spread across nations is given in the following table:*

	UK	F	B	NL	GR	D	I	E	IR	DK	P	L	CH	N	A	Tot.
Prime proposer	6	2	1	1	1		4				1		1			17
Present as partner	9	4	6	5	2	9	7	5	2	2	2	1	1	1	1	57
Total partnerships	13	5	9	6	4	11	12	5	2	2	2	1	2	2	1	77

*Because several proposals are improved versions of rejected first round proposals, a fair comparison with section III.5 is difficult. It looks as if the active role of the UK persists, with more activity in Germany and Italy than in the first round.*

*The following table gives the frequency distribution of the 17 projects as regards number of countries, number of EC countries and number of partners involved in the project:*

	1	2	3	4	5	6	7	8	Total
# countries	1	4	5	5	1			1	17
# EC countries	1	5	5	5				1	17
# partners		3	1	4	4	4		1	17

*Apart from the one project involving eight partners in different countries, this table is very similar to that of the first round given in section III.5. The longer time span between call for papers and deadline may be the cause of having now only one single-country proposal, again rejected on formal grounds. The three projects that were funded from this round have 3,5,2 countries and 6,5,2 partners, respectively.*

*The costs for which EC funding was asked vary between 170,000 and 1108,000 Ecus. In this round too, lower amounts were incorporated in the final contracts, and again it is not quite clear whether, and how, such budget cuts were implemented without major damage to the projects. Five proposals belong to theme 2, nine to theme 3, two to both and for one the theme is unclear.*

*Given the longer time span and the feedback after the first round, it is no surprise to find less very weak proposals than in the first round. The required partnership of two major producers, distributors or users of statistical data continues to be a stumbling block. In some cases, it remains unclear what the team wants to achieve, and how.*

*The total set of seven projects that now receive funding appears to be well balanced in all major aspects.*



#### IV. DEVELOPMENT OF DOSES

##### IV.1 Monitoring progress

The first four contracts for shared-cost projects were signed in December 1989, and the remaining three in October, 1990. A system was worked out for monitoring of on-going projects (see doc. EUROSTAT/D2/DOSES/18). Its main components are reports and other deliverables provided by the prime contractor, and a Technical Review report written by the expert (Wise Man) responsible for the project. Such a review is foreseen once or twice a year. So far the report of the team has usually preceded a visit of a Wise Man to the site of the prime contractor in presence of most of the partners. The TR Report is viewed as "the main instrument to exercise control on the project performance and possibly to redirect it towards the achievement of the contractual objectives and the general aims of the DOSES programme". Allocation of EC funding for the next period is contingent upon a satisfactory TR Report.

*Comments: For the first four projects, this scheme for evaluation and continuation has now worked for two rounds, in the summer of 1990 and of 1991. Generally speaking its functionality has been established for three of the projects; in the fourth some problems arose.*

*It is obvious that an instrument for control of performance, with redirection where required, cannot be missed in any allocation of public funds for research. It is equally obvious that it should contain and regulate the option of denial of further funds for the hopefully rare cases in which a project fails.*

*Given that DOSES is rather small, both in project size and in number of projects, the general system of monitoring progress has been adequately chosen.*

##### IV.2 Results of the shared-cost projects

This section is based on the reports and recommendations of the Wise Men, and from the reports produced by the project teams.

*Comments: Across the seven shared-cost projects, the vast majority of work packages are on schedule. In cases where they were scheduled to be finished at the time of the latest Technical Review now available, this means that reports and/or prototypes of software have been shown to the reviewers. In cases where their completion was scheduled at a later date, it means that there is evidence that the time limit will be met.*

*Of course there are also matters about which the Technical Reviews express some concern. For one project DOSES had decided to provide less than half of the total costs, given that its scope fell close to the boundary of the DOSES goals. Here, unfortunately, the effort to find funds for the remainder was unsuccessful up to now. This entails a serious risk that the project will remain unfinished. Even then, however, the progress made up to now will be useful for the team and for others.*

*Most of the concern in the Technical Reviews has to do with matters such as compatibility or ease of use (both for individual respondents producing data and for people using the whole system for finding information).*

*Summarizing, the Technical Review process has begun at an early stage of the projects, at which it is very difficult to express well founded predictions on the final outcomes of the projects as a whole. With two exceptions, the progress is satisfactory. In one exceptional case much effort has been spent on improvement, and a thorough investigation has led to a continuation decision. In the other exceptional case, it is hoped to find funds for its completion, and the partial results are also useful as they are.*

*The character of the projects makes it impossible at the present stage to summarize and evaluate the substantive results. In some cases it will eventually turn out that within the very tight time schedules, not everything promised in the proposal will be fully achieved. This as an inevitable consequence of the uncertainties that accompany innovation: discoveries cannot be planned, and progress on solving one problem sometimes shows that another problem was hidden behind it.*

*It can be expected that the major goals will be reached and that the set of shared-cost projects will produce a clear step forward in the use of knowledge technology in all phases of the production, distribution and use of statistical results.*

#### IV.3 Coordinated action projects

The second major type of project incorporated in the DOSES programme is that of "concerted action" or "coordinated action". This category had no fixed deadline for submission. Until August 1991, 16 proposals were received. Decisions are taken, usually after mailing the written comments of the Wise Men to the CAN members and considering the replies of both advisory groups.

The call for proposals states that coordinated projects imply "the coordination of work undertaken independently, but which is of general interest. Under this system, each participant finances his own particular part of the project. The Community foots the bill for coordination". On the next pages five types of project are listed:

- consultation between various interested parties (e.g. public administrations, research institutes, users of statistics, industries) in the form of workshops or other forms of communication and exchange;
- sharing and coordination of studies, reviews, software development;
- distribution of results, software development;
- establishment and updating of inventories of research workers, projects, articles and potential users;
- organization of international meetings.

*Comments: The correspondence on the CA projects gives the impression that there has been some unclarity about the concept of a CA project. This has led to:*

- a) a far too detailed proposal format;
- b) a very heterogeneous set of proposals;
- c) hesitations whether a proposal fell in the CA category.

*Quite understandably, the review and decision process for CA projects has been much lighter than for shared-cost projects.*

*So far the most successful activities reported pertain to classes 5 and 1 (international meetings and workshops). Where the activities have already taken place, the reports show that they have been successful (but of course here success is less directly measurable than for shared-cost projects). Some requests have been rejected because their content area falls too far from the DOSES goals.*

*This sector of the DOSES activity does not seem so far to have led to a stream of good proposals.*

*Proposers may have been deterred by the amount of detail required for writing a proposal, combined with a low prior estimate of the success probability and of the total sum that can be obtained.*

*In many European countries, there are national or even local funds for such light types of international collaboration that are better known to proposers-in-spe, and that are perceived to have higher success probabilities and lighter formats for proposals.*

*The DOSES procedures for obtaining and managing a coordinated action subsidy as announced in the July 1990 Information Package Annex A are almost a copy of those for shared-cost projects, which have a much longer time horizon and deal with much larger sums of money. The request that partners in other countries have agreed with the project and have specified their roles, qualifications and curricula vitae, for example, appears rather overdone as long as the international character of the activity can be established from the information provided by the proposer. In practice, DOSES has accepted requests for funding in which much less detail was given.*

*It is recommended that DOSES formally replace their procedures for coordinated action projects by a much lighter version with less managerial overhead, less restrictions, a very light form of contract and final report, and fast decisions. The CAN and the Wise Men could agree, for example, that Eurostat can decide on any request for less than 40,000 Ecus as soon as one Wise Man has been consulted and has given a favorable recommendation.*

*If this revision is accepted, it should be widely communicated, not only to the Official Journal and the DOSES address list recipients, but also to all major statistical journals and newsletters.*

*If the sum reserved for coordinated projects would not be exhausted in the last year of the current DOSES programme, in spite of its further promotion, then a further financial injection could be given to one or two of the shared-cost projects.*

#### IV.4 Financial management

For both types of projects, the prime contractor is given the full responsibility for the financial management of the project. The DOSES funding is paid in instalments, the last 10% being withheld until the project has produced the deliverables as specified. The project leader appointed by the prime contractor is responsible for payments to the partners and to third parties, and must provide proper evidence of payments to the DOSES office according to current EC regulations. The DOSES team has reserved money for its own costs (including also the costs for the Wise Men and the present evaluation). Each year the task package of managing this reserved sum of money is contracted out to the most favorable bidder.

*Comment: It is wise that all DOSES money for a project goes to the project leader appointed by the prime contractor. This underlines the central role of the project leader and gives him/her the ultimate power to delay payments to partners until their task is satisfactorily completed. In the same spirit the rule about the last 10% is sensible.*

*In some cases it has been a problem for the project leader that the decision to fund the next phase of the project was taken at a very late date. It is recommended that such a decision is announced at least three months before the date at which the next phase is scheduled to begin. As far as bookkeeping of DOSES is concerned, too detailed cost statements should not be required from the contractor.*

#### IV.5 Dissemination of results

It is encouraged that the project teams submit their results to relevant journals. Moreover, the leaders of the projects have been invited to present their preliminary results at a conference to be held in Bonn in February 1992.

With respect to the end results, some regulation is formulated in an Annex II which is added to all contracts for DOSES projects. This regulates the rights and the duties of the contractors in general, but also as regards the products of the projects.

*Comments: The goals of DOSES projects are a combination of scientific research and software development. The tradition of the former is open communication, as opposed to commercial exploitation for the latter.*

*The attempted solution in the articles of Annex II appears to be satisfactory. Given the difference in interests, however, it can be predicted that some problems will still arise when the projects approach the state of completion.*

*DOSES seems to be well aware of the kind of products that can be expected to be available at the expiry date of the contracts: reports on the scientific progress, and prototypes with reports on their correctness and their try-outs on a few members of the intended user group. In most cases, this will not imply a portable, well documented and fully tested program package for which large scale distribution can start directly. If the raw product is attractive enough, a commercial software house or package distributor may be found who takes care of the further development. In other cases, the project team itself, a group of interested users, or a newly formed task group will have to undertake this.*

*It appears advisable that the DOSES team and the project leaders spend some timely consideration to this problem. DOSES should try to maximize the probability that the results of the funded projects become widely available to the group of potential users, including small organisations.*

*It is recommended to discuss policies that could encourage use of the DOSES results by nations in Eastern Europe and in the Third World. Statisticians in these countries have an enormous shortage of literature, hardware, software and technological skill. The United Nations, the International Statistical Institute and the European Community itself have some expertise in programmes trying to mitigate the effects of this shortage. Such experts could hopefully help to find ways to disseminate DOSES results outside of the European Community.*

#### IV.6 Conclusions and future policy

The conclusion of this mid-term evaluation of DOSES is positive. Although it is too early to fully evaluate the results of the work now in progress, there are reasons to assume that the DOSES initiative will lead to a step forward on the road to easier and better production and use of statistics, and also to more intensive cooperation between producers, distributors, users and researchers in the different Member States.

The evaluation of the DOSES operational procedures is also largely positive. The space devoted to some relatively minor aspects on which room for improvement is seen, should be explained by the desire to argue in detail why a few things could be done better. It takes one line to express agreement, and a page to explain disagreement; this should not be interpreted to mean that the page is more important than the line.

Seven shared-cost projects and several coordinated action subsidies will not be enough to bring the field of statistics to a stage where modern knowledge technology is fully incorporated. Moreover, the developments in statistics, informatics, artificial intelligence and hardware are so rapid that further efforts for the period after 1993 are required.

The field of new techniques and technologies for statistics is indeed wider than covered in the DOSES goal specification. For several reasons, research and development in this field should be stimulated at the European level. By bringing together the combined expertise available in the Member States, progress will be much faster and a quality comparable to that of the competitors in the United States and Japan comes within reach. It is moreover of the utmost importance that the products resulting from such research can be used both at the European level and within each Member State.

Europe needs continued encouragement of pilot projects in this area; individual statistical agencies, research institutes, universities and software developers are unable to invest enough in this kind of pre-competitive projects that are essential for progress and innovation. National projects will also be insufficient to ensure that Europe will not fall behind.

There is a growing interest in electronic data interchange on a massive scale, not only for industries but also for the public sector (think of financial, fiscal or legal data, for example). Without due care for the validity of such data, and for the metadata required for correct interpretation, the benefits of technological possibilities of massive data transport cannot be reaped. Areas that require attention are statistical aspects of databases, use of statistical data in decision support, nomenclature problems and accessibility to user groups with less advanced expertise and/or hardware.

One need not be a prophet to predict that telematics will be a fastly growing field, and that statistical operations of the mid-nineties will often be intimately tied to telematics. For example: if many households and all firms and institutions have PC's that can communicate via a network, both data collection and the search of data already collected will probably use an electronic long distance procedure. The examples of electronic mail, fax, literature search and bank transactions show that such developments are feasible, and that they have a major impact on society.

It is thus important to transform the modest DOSES programme into a wider and more permanent fund for R&D on new techniques and technologies that have to do with the correct and improved use of statistics.

This will only be possible if the major and minor producers and users of statistical data remain alert to promote their interests in the competition with other research areas. This condition underlines that statisticians not only have the task to produce high quality data, but also to convince others that high quality data are a decisive factor for successful management, both in the public and in the private sector. There are many examples that electronic data processing is fast, but requires additional precautions to safeguard the quality of decisions based on them. This is precisely the major aim of DOSES, and it is of benefit that the European Community has taken the initiative to encourage such developments.

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