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**Communication to the European Parliament and the Council concerning
R&D in Learning Technology - Developing European Learning through Technological
Advance**

(DELTA)

Final Report on Performance and Results

**(presented by the Commission pursuant to Article 9 of the Council Decision 88/417/EEC on
the Programme DELTA)**

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EXECUTIVE SUMMARY

The DELTA Exploratory Action was launched by the Council Decision of June 29, 1988 as a pre-normative and pre-competitive technology exploration in the field of learning technology. The budget was 20 MECU, and the duration for 24 months. In the spring of 1989, 28 research and development projects and 2 studies were inaugurated. Of these a mid-term and a final technical audit has been carried out. All projects are scheduled to finish in March 1991.

In the view of the Team of Assessors the Exploratory Action was successful in stimulating incremental research and development in an area of central importance for the future of Europe. The programme has produced a number of significant results and even led to development of products or services that are at the point of immediate exploitation on the market. It has furthermore played a decisive role in focusing the future research and development effort in the area of learning technology on the most significant issues, and thereby fulfilled the central role of an Exploratory Action. Particularly, it has created a much greater awareness of the problems of the field, as borne out by the validation considerations of the assessors. A significant number of the original objectives and deliverables of the action have been met. Furthermore the action has been decisive in making possible a reasoned evaluation of the original aims of the action as set out in the Annex II of the Council Decision, and as assessed by the Team of Assessors.

A number of central concepts and hypotheses were contained in the original Decision and implemented in the workplan. The projects chosen for support covered the workplan quite well, and the results of the projects as demonstrated in the technical audit 1990 has proven, that the Exploratory Action has provided decisive results, that will help in developing and evaluating the central concepts and hypotheses.

The Exploratory Action has clearly shown that there is a need, and a potential, for further research and development in the area, and that there is a significant European dimension of added-value in the development of learning technology.

The report is in two parts. The first part is the Assessors' View, where the results of the action as presented to the assessors, who were participants in the technical audit 1990, are evaluated in relation to the aims and objectives contained in the original Council Decision, and a second part, the annexes, where Commission staff present background information on the action, an overview of its main results, their exploitations and the future perspectives presented by the action.

DELTA Final Report

0 Introduction

This is the final report on the DELTA Exploratory Action produced in accordance with the Article 9 (2,3) of the Council Decision of June 29, 1988. It is in two parts. The first part of the report was prepared by the following independent assessors:

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The assessors wish to acknowledge the full support and assistance of the staff of the DELTA Central Office in preparing their part, the annexes of the final report. The assessors have drawn extensively on the documents prepared by the staff and on other reports and materials prepared in connection with Operation 1992 and on the results of the final technical audit. The assessors acknowledge their debt to the many individuals and groups who have contributed to the Exploratory Action and to its review and auditing. They particularly want to express their thanks to the technical auditors.

Assessment of the DELTA Exploratory Action

The DELTA Exploratory Action was decided by the Council of Ministers on June 29, 1988 as a part of the Framework Programme. The action was "...designed to stimulate incremental research and development which will enable new technologies to be incorporated in the tools and infrastructure supporting advanced learning, in particular open and distance learning in the community. ... to make available to the final users, at a minimum cost and with minimum delay, the learning equipment and systems which will enable an increased demand for education, training and retraining to be met in the most economical way."

In the opinion of the assessors the Exploratory Action, as a pre-normative and pre-competitive technology exploration, was successful in stimulating incremental research and development in this field, and has provided valuable insights into the further measures required to give effect to the wider aims that the action was designed to meet.

As a consequence the DELTA Exploratory Action has made a significant contribution to the general aims of the Framework Programme, in particular by contributing to the potential wider access to education and training.

This first part of the final report will contain the following sections:

1. Assessment of the objectives and deliverables of the Exploratory Action
2. Validation considerations on the initial assumptions
3. Management of the DELTA programme
4. Evaluation and Assessment of key concepts
5. Future key issues
6. Other considerations
7. Concluding remarks.

1. Assessment of the objectives and deliverables of the Exploratory Action.

In the view of the team of assessors the DELTA Exploratory Action has met the following objectives and deliverables as stated in the original Council Decision:

- (a) to test the approach to work collaboration on a European level within the framework envisaged by DELTA

While this objective has been achieved, a significant further advance will require a more committed involvement by the main European actors. These key actors include broadcasting companies, PTTs, publishing companies, universities and IT companies.

- (b) to validate the initial assumptions about the relations between the actors, the objectives and priorities of work best suited for cooperation on a European level.

The assessors' comments on the initial assumptions, in light of the results of the Exploratory Action, are set out in a separate section (See 2 below). In summary their views are that while these assumptions are still valid, they are stated in such general terms that they provide a somewhat limited basis for prescriptive action.

- (c) to do initial work for the most promising activities to be undertaken in the future.

The assessors' comments on this issue are set out in a separate section. In summary their views are:

- firstly, that there is a need to direct attention to the application of the new technologies in areas of acute need for education and training in the Community;
- secondly, that a greater emphasis should be placed on support for the application of technology in education and training, rather than on the development of the technology itself;
- thirdly, that there is a need to address the critical factors which determine the successful application of new technologies in education and training.

- (d) to provide tangible results as part of the Exploratory Action.

The results in this connection are assessed in the following section on deliverables:

The DELTA Exploratory Action specifically aimed at the following deliverables:

- (1) *functional specifications for the categories of learner station referred to above and for the interfaces which will enable them to link to the peripherals and other equipment of future systems.*

While some progress was made towards the development of specifications, the objective of defining functional specifications was not met. However, in the view of the assessors the objective was somewhat unrealistic having regard to the timescale, the resources available, and to the lack of prior clarification with regard to the requirements the specifications were to satisfy.

- (2) *functional specifications for the equipment and the software required for the efficient operation of the authoring and production activities.*

Some prototypes and specifications were developed but little progress made in the preparation of functional specifications. Here too, the comment made about point (1) applies. Specifically the deliverable was not met because the projects were too far removed from the requirements of the potential users.

- (3) *specification for the software and the hardware support which enable advanced knowledge bases to be constructed together with specification for the access language.*

This deliverable in general relates to the use of Advanced Information Processing and Artificial Intelligence. In the view of the assessors, while the use of AI tools has potential applications, there are significant basic research problems still to be solved. While some useful work was undertaken on the construction and use of databases in education, there is evidence of widespread scepticism with regard to the wider objective, and little chance of achieving significant implementation within a reasonable timescale.

- (4) *early identification of the standards important to learning which require to be negotiated, and the provision of the organisational framework whereby the learning input can be made to the ongoing international discussions on standards.*

The Exploratory Action was successful in drawing attention to the important issue of standardisation. However, it is not evident that specific standards of particular importance to education have been identified, or that any significant contribution to the international standardisation effort has been made. It is clear from the results of the action that there are few issues of standardisation of direct relevance to education and training, and that standards are determined by wider market forces. In this sense, the topic is now seen as less significant than was originally envisaged. This conclusion is a positive outcome of the Exploratory Action.

- (5) *continuous monitoring by the assessment of progress towards the specific goals which will be built into the detailed work programme,*

Considerable effort has been made to monitor the progress of the work programme, through auditing, concertations, panels and other relevant activities. In the view of the assessors this deliverable has been met.

2. Validation considerations on the initial assumptions.

Annex II to the Council Decision contained a number of considerations, which formed the rationale for the Exploratory Action. The view of the assessors on the validity of these considerations in the light of the results of the action are set out below:

identifiable advances in IT&T can enrich and enhance education and training.

This has proved to be a valid assumption. The Exploratory Action has provided valuable insights into those advances which can enhance education and training, and in relation to the measures required to provide for such enhancement.

the high degree of commonality in basic learning requirements at the Community level bring about economies of scale.

This assumption has to be accepted as true in a general sense. However, the situation in Europe is very different to that of large and comparatively uniform areas such as the US and Australia, where it has been shown to apply. It is not self-evident that this principle will apply as directly, to the same range of technologies, in Europe. We need to know much more about the cost-effectiveness and the market acceptance of the technology-based learning systems with which DELTA is concerned.

action in the field will ensure a supply of leading-edge equipment and systems.

The Exploratory Action was helpful in focussing the attention of the actors in the field on this issue. However, the action in itself has not, and probably of itself could not have, ensured supply of leading edge systems.

new opportunities will open up to the education profession in developing learning technology and their application in learning and training.

This is obviously still a valid assumption.

a sound basis for concerted action is formed by past and on-going work in the field.

The Exploratory Action has contributed to this sound basis, by facilitating concerted action in the field.

the opening of this innovative market will create opportunities for the Community IT&T sector.

The level of commitment by the European IT&T sector to the application of the new technologies in education and training is still somewhat unclear. The assessors accept the assumption, but see a need for further clarification of the market potential, so that the IT&T industry can be encouraged to participate more actively in the development of this field.

advances requiring the collaboration of several sector actors, in particular industry and educationalists,

The assessors agree that this is still a valid assumption, in particular if the needs of users, and the demands of the market are to be afforded a more central role, than was the case in the Exploratory Action.

The five assumptions forming the further rationale for the DELTA programme are self-evident and, in the view of the assessors, as valid today as at the initiation of the programme.

In the light of the assumptions considered above and of the objectives, the five action lines proposed were considered to be relevant and to be well conceived. However, the allocation of resources between action lines was less than satisfactory, in particular in relation to the tasks of Action Lines I and V. In general spreading inadequate resources over too wide a range of activities can have a detrimental effect on the quality of the projects. It would seem better, in any future action, to focus resources on a more selective range of areas.

3. Management of the DELTA programme

In general, it is assumed that proposers of European cooperative R&D projects are quite well equipped to manage such projects. However, the focus in DELTA on applications, and in particular the needs of small and medium-sized companies suggests that it would be useful to make available to project managers a course in the management of international collaborative projects. In addition all project participants should be given access to a distance learning based course on participation in such projects.

There is evidence of a need to combine and co-ordinate the contribution of the various partners at the end of the project. This is primarily a task for the project manager, however the DELTA Central Office project officer should have a larger influence in this regard.

In the view of the assessors the role of the Central office in running the programme ought to have been more powerful, so that the project officers could have ensured better finalisation, coherence and relevance of the projects, and in particular the wider dissemination of the generic results to other actors in the programme and to actors outside the programme.

The assessors accept the view of the final technical audit that the DELTA Concertation Meetings did not ensure that significant duplication between projects was avoided, or that potential synergies were explored or exploited fully. In the view of the assessors the provision of a mechanism for facilitating concertation and coordination between projects is important.

The view of the assessors is that the number of participants in the projects can have a significant influence on the quality of the output. In general the size of the consortia should not be too large, typically perhaps not more than 5 or 6 partners. In certain types of projects more partners will need to be involved, for example where projects are community-wide or are developed on existing networks. Similar problems can arise where partners are consortia, so that there are a number of partnership levels in the project. In general there should not be partners involved in more than a few number of projects, because if a company or organisation is involved in a larger number of projects its contribution tends to be limited and/or repetitive.

In general the audit procedure is seen as satisfactory. However the deliverables of the projects should be available to the auditors at least two weeks in advance of the audit. In addition, the schedule of the audit should take into account the special time needs of the various projects, for example in relation to presentation of prototypes and videos. The final report and the presentation to the auditors should not be duplicative, and the report and presentation should ensure a clear picture of the actual achievements of the project in relation to the objectives. In view of the importance of the audits for the continuation, or discontinuance, of projects the logistics of the audits needs further attention.

4. Evaluation and assessment of key concepts in DELTA in relation to the auditing of the projects and their deliverables

Action Line I: ELTA.

The establishment of ELTA was a main objective in relation to dissemination of results and the establishment of a future market for advanced learning technology. The Exploratory Action has been significant in contributing to the establishment of a number of networks between actors in the field. However the central project in this connection was "red flagged" at the final technical audit. It was the unanimous opinion of the auditors and the assessors that the objective of establishing a European umbrella organisation for the creation of awareness, contacts and promotion of technology-based learning is extremely important. However, the objectives of ELTA need to be revisited with a view to ensuring greater clarity of objectives. There would seem to be three possibilities:

- a scientific network of workers in the field, especially research workers
- an organisation for people involved with DELTA
- an organisation promoting the interests, especially the funding and market interests of actors in the field.

It is critically important that effective cooperation is established with the existing networks in the field of open and distance based learning.

Action Line II: PETE.

The PETE concept was advanced as an important one under three headings: authoring environment; communications; and delivery systems; all of which are related to interoperability. There were three projects dedicated to studying this concept, and in addition many other projects had relevance to it. A number of projects would seem to have duplicated each other, and would seem not to be in line with the state-of-the-art in this field - to some degree, perhaps due to the exploratory nature of the action. However, an analysis of the results suggests that such an environment could be constructed on the basis of software and hardware platforms already widely available, and that there is no need for a system specifically dedicated to the education and training field.

Future work in this area should be based on the following principles:

- facilitating portability between hardware and software systems already available in the market,
- the creation and facilitation of wider access to databases of learning materials,
- the encouragement of joint research between education and technology experts to facilitate the application of the new technologies in education and training.
- Particular attention should be paid to the acceptance of the products by the end-users (learners, teachers and authors).

The assessors' view is that the results achieved by the Exploratory phase in Action Line II could be consolidated by the project officers, with the support of one or two experts, with a view to defining a more precise technical framework for a next phase.

Action Line III: Satellites.

The use of satellites for promoting education has been shown by the Exploratory Action to be a viable technical possibility. However it is important that the use of satellites be related to the real needs of target groups if they are to form part of an effective education and training programme.

Action Line IV: Standards.

It is the view of the assessors that the problem of standards, which was prominent in the original decisions on DELTA, has largely disappeared due to the technological development in the field of IT generally. It is of course still of paramount importance for the educational field to follow and relate to the development of standards in the information technology field.

5. Future key issues

The primary task of the assessors is to assess the effectiveness of the Exploratory Action to meet the objectives laid down by the Council Decision. However in view of the fact that an objective of the Exploratory Action was to identify promising areas for future work it is considered appropriate to give some indications of the general results of the final audit in relation to this objective.

There seems to be three areas where work should go on:

- i. there is a need to address the application of new learning technology particularly in areas of critical skill shortages where extensive application is required. One example is the field of language learning systems where there is a need for much more research on this type of learning situation and the systems requirements for it. It is an area of great European importance where there is a wide scope for added value,
- ii. there seems to be a need to move away from a narrow focus on the technology involved, to a focus more on the favourable conditions for the support of educational and training tasks by such technology,
- iii. this seems also to be the case in the area of application of the technology, where there are still a great number of unresolved issues related to the factors that determine the effective use of technology in education and training.

The assessors in general support the findings of the Strategic Review Board, as set out in Annex 5. However, they warn against interpreting the recommendation under item E for a formal system of evaluating the long term benefits of the Community programmes as a recommendation for the creation of large separate bureaucratic bodies to handle coordination and evaluation. Such coordination and evaluation has to be an integral part of the development of the area in the future.

6. Other considerations not related to the original Council Decision

In the course of the final technical audit a number of issues have repeatedly been raised. These are:

- i. the need for much more work on the cost-effectiveness of the technology and technological systems involved,
- ii. the need for much more work on market issues, and issues identifying impediments to the application of advanced learning technology,
- iii. the need for promoting, to a much larger degree, commitment by the central actors to this field,
- iv. the need for work in the area of quality assurance related to technology-based educational systems and services, this of course seen in relation to current and future industrial practices in this area.

7. Concluding remarks

In conclusion, the view of the assessors is that the Exploratory Action was useful, and that there is a need for further research and development in the area, taking into account the results of the Exploratory Action. Future work should focus more directly on the issues of application of the technology, rather than on the technology itself, especially on the social and human dimensions of such applications. There is a need to focus on the management of the programme to secure a closer integration between projects and a wider dissemination of the generic results emerging from projects. In particular there is a need to clarify objectives with greater precision, and to address critical issues of the factors affecting the effective application of new technologies in distance and open learning.

DELTA FINAL REPORT
ANNEXES

DELTA FINAL REPORT

ANNEX 1

ANNEX 1

DELTA EXPLORATORY ACTION BACKGROUND INFORMATION

The context of the DELTA Exploratory Action

The overall purpose of the Community's R&D activity is to enhance the global competitiveness of industry and the quality of life of its citizens, while redressing imbalances in regional, social and special needs.

DELTA EA is R&D in a sphere of activity in which 1/3rd of the population of the community engage in at any one time. Learning is the one continuous process which underlies most activities of advanced society.

The DELTA Exploratory Action aimed to demonstrate the following:

- building on existing developments;
- the actors willingness to collaborate;
- building for future consensus and detailed technical work;
- develop a basic infrastructure at a European level;
- demonstrate prototype results.

The DELTA Exploratory Action was also used to help to prepare a possible DELTA Main Phase which would demonstrate that the developments can be used to:

- prepare industry for the emerging and common market in educational tools and services;
- enable effective learning by the user to take place;
- stimulate private investment in the domain;
- increase the cost effectiveness of learning;
- overcome regional difficulties;
- solve sectoral problems and special needs on a European level;
- prepare a basis for external promotion of the services.

The DELTA Exploratory Action (EA) Workplan¹ formed the basis for a "Call for Proposals" published in the Official Journal on 2 July 1988. It was distributed to more than 5000 named actors and organizations in the field that were on the current DELTA EA address list. The Plan pointed at areas in which strategic research and development were needed and offered specific tasks to achieve the aims and objectives of the Council Decision².

The DELTA EA Workplan was divided into five Action Lines:

ACTION LINE I: LEARNING SYSTEMS RESEARCH

The objective of Action Line I is to enable the use of Community resources for the advance of learning technology to be optimised. To this end, mechanisms for exchange and dissemination of information are envisaged, in order to enhance the value of DELTA EA work and to inform the peripheral actors.

These mechanisms encompass congresses, seminars and concertation platforms.

¹ - adopted by the DELTA Management Committee on 29 June 1988

² - see DE0231

ACTION LINE II: COLLABORATIVE DEVELOPMENT OF ADVANCED LEARNING TECHNOLOGY

The central objective for Action Line II is to explore on technologies, systems and tools that would allow for new levels of efficiency and cost effectiveness. Tasks relate to those elements that form an open learning environment, such as the learner environment, support systems, authoring/production facilities and information resources.

For some aspects of future learning systems, a Portable Educational Tool Environment (PETE) is envisaged. This is seen as a central concept to be developed incrementally by harnessing advances already under development for other purposes, such as within the domain of software technology, and by building on progress and communication services over the coming decade.

ACTION LINE III: TESTING AND VALIDATION OF COMMUNICATIONS AND OF SATELLITE BASED OPEN FACILITY FOR TESTING (SOFT)

Because DELTA EA is aiming at a Community-wide environment, telecommunications are essential. The tasks under this Action Line correspond to the use of telecommunications and the requirements related to the use of terrestrial networks and satellites in open learning systems. Thus DELTA EA aims to take full and early advantage of advances in telecommunications.

ACTION LINE IV: INTEROPERABILITY

Creating a European market and making learning equipment and systems interoperate puts strain on standards and conventions. Action Line IV addresses the standardisation and conventions requirements within the DELTA EA framework. It aims to identify, by a top-down approach, necessary standards (incorporating or amending existing standards or defining new standardisation requirements), whereas Action Line II seeks to design tools that support or allow portability and interoperability.

ACTION LINE V: PROMOTION OF FAVOURABLE CONDITIONS

Focussing an emerging European market requires national and transnational tuning of the social, educational, fiscal and regulatory environment. Action Line V considers some of these conditions in the framework of DELTA EA.

Separate documents, "DELTA 89"¹ and "DELTA 90"² provide a detailed description of the work undertaken by individual projects in relation to the precise objectives and the context of the work as described in the Decision of the Council.

The allocation of the financial resources of the Programme to the different Action Lines:

1 Action Line I	1.669 Mecu
2 Action Line II	10.654 Mecu
3 Action Line III	2.284 Mecu
4 Action Line IV	2.120 Mecu
5 Action Line V	0.683 Mecu

Under the CCAM contract a total of 0.220 Mecu was allocated to two additional projects.

¹ - DE0498

² - DE1858

GENERAL DESCRIPTION	IMPLEMENTATION OF DELTA
Decision Title Duration Community financial contribution Financing of EFTA participants Number of actors involved Overall Objective Scope Nature of the Cooperation	88/417/EEC of 29 June 1988 OJ 206/20-28 of 30.7.88 Developing European Learning through Technological Advance (DELTA) EXPLORATORY ACTION 01/07/88 to 30/06/90 20 MECU representing less than 50% of the total effort in excess of 45 MECU Universities & research institutes can claim 100% EC contribution to marginal costs incurred by projects Partners from EFTA countries do not receive funding from the community but inversely, contribute to the management expenses EFTA national administrations establish in general comparable financial conditions for EFTA partners An estimated 200 partners collaborate in the 30 projects In the interest of learning, harnessing identifiable advances in information technology and telecommunications expected in future years The Exploratory Action phase of DELTA does not have the resources or the time to met the full range of challenges. It seeks therefore to: (a) Stimulate and confirm the disposition and will of the actors to work together within the framework envisaged by DELTA (b) Validate initial assumptions about the relations of the actors and the more detailed definition of the problems to be tackled (c) Probe into the most promising activities to be undertaken in the future (d) Provide some tangible results, possibly by way of selected demonstrations and experimentation, within the limits of resources available, including an initial approach to problems of standardisation and agreements on common practices Pre-normative, technology exploration and investigation of non-technological factors
Participation in DELTA is open to all organisations established in the Community and EFTA Countries	
University, Research and Learning Interest Telecoms Administrations Telecom/It Industry Other Industry:Telecom/IT user Media publishers Service Providers Other not listed above	<p style="text-align: right;">87 8 32 12 10 15 12</p>
<p style="text-align: right;">total</p>	<p style="text-align: right;">176</p>
Small & Medium Sized enterprises EFTA Participation Countries Total Different Organisations Number of Consortia Number of Participations Number of Organisations	<p style="text-align: right;">Not recorded CH,N 3 3 30 200 176</p>

DELTA Interworks with	Organisations active in related subjects
CEN/CENELEC/ETSI Council of Europe EFTA national administrations ESPRIT FAST COMETT EUROTECNET EURODICE	Periodic consultation meetings Via periodic meetings and expert advice Via Commission internal collaboration Periodic briefings and consultation sessions Via Commission internal collaboration Via Commission internal collaboration Via Commission internal collaboration Via Commission internal collaboration
DELTA Integrates with	Other policies at Community and national level
Standardization policy	Via COM DG XIII/E
DELTA Management	Follows industrial practice
Programme management Project management	Responsibility of the Commission supported by the DELTA Management Committee Responsibility of the project consortia
DELTA Work plan	Describes in the context of the objectives all work which is to be carried out under the programme
Definition of the rationale and tasks Revision and update Impact Assessment and Forecasting International Contacts	Developed with the sector actors concerned Results are reviewed by the Commission after 12 months and reported to the European Parliament and Council A systematic survey of world-wide developments in the field of IT&T applied to learning technologies In addition regular contacts with Member States to identify specific requirements Visits and contacts of projects with related actions world-wide and participation in conferences and meetings
Dissemination of DELTA Results	Is built into the programme, via a specific set of tasks
Programme level Project level Within the Programme Within the Project Consortia Quality control	Yearly progress reports to Council and Parliament as well as yearly "Technical Reports" Projects disseminate their own results in scientific fora and via publishing inc. Electronic media Deliverables from DELTA projects are shared with related DELTA projects and final results are mostly in the public domain Every six weeks, concertation meetings bring together all project leaders and some of their team members with the Commission to review progress and exchange results Regular project internal meetings assure transparency, coordination and dissemination of the results while the work is progressing Project Officers assess the deliverables and follow the monthly management reports Once a year independent external experts carry out a Technical Audit of all projects Once a year the actors are reviewed by a high level Strategic Audit

Tendering & Evaluation of Proposals	Public call for tender followed by anonymous evaluation by independent experts
Competitive Tendering Conditions for participation Technical and Managerial Evaluation Strategic and Political Evaluation Contracting Monthly Management Reports Red Flag Procedure Yearly Project Progress Report Annual adjustment of the Project Adjustment in the course of the year Deliverables	After adoption of the Workplan, the choice of proposals was made on the basis of a public tender (02.07.88) Two independent partners not all established in the same Member State, one of the partners must be an industrial undertaking Within each project a partner must be concerned with learning interests, and 50% must be contributed to finance by partners Proposals submitted were assessed by independent experts and unanimously agreed. With Member States via the DELTA Management Committee, ESPRIT Advisory Board were briefed, and DG V involved directly A Model Contract is offered which has been developed with sector actors It is used for all contracts, although some adaptations are made to accommodate specific cases This serves essentially the needs of Project Consortia to monitor progress of work and identify problems If a project or a partner in a project encounters unforeseen serious problems he signals this to partners and the Commission by "raising the Red Flag" in the Monthly Management Report. If invited the Commission calls a meeting to resolve the problem, otherwise the issue is addressed within the consortium. Each Project prepares an Annual Report After one year, the Technical Annex of the contracts are reviewed on the basis of Audits and adapted for the following period Adjustments can be carried out in the light of the results of the "concertation meetings" Unless these are major changes they are agreed with the Project Officer and recorded without amendment of the contract Each project identifies tangible results which are referred to as "Deliverables" Quality and timeliness are verified by Project Officers and as part of the Technical Audit
DELTA Auditing	Follows industrial practice to conform to Community rules
Mid-Term Review Strategic Audit and Requirements Assessment Technical Audit Management Audit Financial Audit	Communication reviewing the progress of DELTA against the objectives stated in the Decision. It is based on the results of specific "audits" addressing the strategic, technical, and managerial, and financial performance Done by independent experts as a basis for the DELTA mid-term review and revision of the Framework Programme It examines DELTA with respect to strategic and policy objectives of the Community in an international context Evaluates the performance of all DELTA projects with respect to specific objectives Evaluates the performance of the Commission in its responsibility for the management of the programme Verifies the correct use of public moneys. Projects and the Commission Service in charge of DELTA are investigated
Exploitation of DELTA Results	Is part of the contractual commitment of the projects
Industrial property rights	Rest with the partners in a project. Depending on the circumstances special provisions are agreed between the partners. The Model Contract considers graduated provisions for access to the results of other projects and the conditions for exploitation.
Final Assessment	An independent assessment team draws up including on the performance and results of the action, and it is responsible for the Final Report.

Meeting the Challenge

The challenge of exploiting the development of the telecommunications market is being met on the Community level by the telecommunications policy of the EC, of which the RACE Programme forms an integral part. Linked to the standardisation policy and the information market policy, it complements the related work in the framework of ESPRIT. By addressing the cost-performance balance of the communication infrastructure in Europe, ESPRIT and RACE are oriented towards meeting the requirements of the internal market, international competitiveness and the need to contribute to the socio-economic advancement of the Community. By building on this established work, the DELTA EA should have created the favourable conditions necessary for learning technologies with the current emphasis on distance and open learning.

The Objectives

The major goals of DELTA EA are as follows:

- To test the approach to work collaboration on a European level within the framework envisaged by DELTA EA
- To validate the initial assumptions about the relations between the actors, the objectives and priorities of work best suited for cooperation on a European level,
- To do initial work for the most promising activities to be undertaken in the future,
- To provide tangible results as part of the Exploratory Action. (see the following table)

In the table on the following page these objectives are expanded upon and listed. The table also shows how DELTA addresses them and the impact of the DELTA action is stated.

Review Summary Table

Objectives	Ways in which DELTA EA addresses these objectives	Impact of the DELTA EA work
Optimise use of Community Resources to advance learning technology	Multimedia information diffusion within DELTA EA community	Creation and diffusion of information on DELTA EA projects and on Advanced Learning Technology
	Studies on favourable conditions and catalogues of good practices	Improvement of the visibility of the favourable conditions for the development of Distance Learning in Europe
	Launching and animation of ELTA and studies on market, technology and standards	Creation and stimulation of a European Association on Learning Technology where all actors playing a role in the development of Learning Technology in Europe will converge
	Audit of the production methodologies and development tools used by main multimedia publishers in Europe	Stimulation and creation of a network of European suppliers of learning programmes, and improvement of the European Know-how for the production of multimedia learning materials
Increase Collaboration in the development of advanced learning technology	Prototypes & specifications for the communications aspects of DELTA EA elements based on a common applications platform	Production of a unified, PETE-related set of training prototypes on a European scale is expected through the participation of three European PTT authorities.
	Design & develop the shell of a knowledge-based system to represent the characteristics of a learner at different stages of understanding during training	Influence upon the more rapid construction & development of adaptable semi-automated training systems based upon knowledge acquisition
	Description, architecture & design of a tutoring, monitoring & production system for the DELTA EA open & distance learning environment	Influence upon European training & retraining systems with particular reference to systems exploitable through industry including elements of material production
	Architectural design of an authoring environment supporting the production of high quality and multimedia courseware	Will incorporate fully distributed authoring features for the first time in a PETE context.
	Formal functional specification of an open and modular suite of software tools supporting multiple strategy and multimedia authoring	Fully portable specifications will enhance transfer to the different European languages.

Review Summary Table

Objectives	Ways in which DELTA EA addresses these objectives	Impact of the DELTA EA work
	Functional and high level design specifications of learner expert system (LEX) based on a multilayer intelligent interaction management system	Will demonstrate an intelligent help system supporting different actors on both course level and interaction level. The help system will be modelled as an intelligent interaction management system.
	The definition of an <u>Open System</u> for <u>Instructional Design</u> (OS-ID) and the functional design of authoring facilities to be embedded in this OS-ID, complementary to PETE	Two open learning materials will be investigated in detail: simulations and hyper-media-based materials as well as several generic authoring tools.
	Integrated implementation and functional specification of an authoring toolset.	Will demonstrate a compatible approach for a wide range of computer-based teaching systems.
	Specification of a learner workstation for use in computer-aided manufacturing, production & design	Creation of an intelligent framework for the European industrial training, updating & retraining environments with particular relevance to rapidly changing industrial manufacturing systems
	Investigation & prototype of a multimedia database of learning materials with varying storage & access possibilities	An influential system for encouraging the means of storing, indexing & using multilingual educational materials in ways particularly adapted to distributed access
	Prototype architecture & system for a hardware/ software/services common applications platform (PETE)	Expected to enhance compatibility and use of the portable educational tool environment for European training.
	Provision of a framework & methodology supporting requirements capture for European training & retraining expressed as tools & toolsets based on the PETE concept	Clarification & ordering of the processes, constraints & policies for European industrial training systems
	Specification of a multi-purpose knowledge-based authoring environment for distributed open learning	Formalisation of cooperative, distributed authoring systems in particular reference to industrial training
Testing and Validation of Communications and Of SOFT	Evaluation of satellite educational facilities through a controlled experiment of satellite broadcasting using a Broadband Educational Medical Information Centre	Identification of technical and personal barriers in the areas of TV satellite communication and accreditation feedback link

Review Summary Table

Objectives	Ways in which DELTA EA addresses these objectives	Impact of the DELTA EA work
	Test and evaluate the effectiveness of using advanced information technologies in open learning systems	Creation of a permanent meeting point for different operators in view of a first experimental phase based on an intensive use of advanced information technologies
	Software specifications and educational and technical requirements of a private voice and data network via satellite	Linking up European institutions wishing to work together to produce jointly distance teaching and training materials
	Functional specifications of learner places in different environments using satellite transmission combined with audioconferencing	Definition of R&D plans concerning Europe-wide interactive distance learning using video connections
	Research on different potential applications ranging from the transmission of live programs and video-conferencing to the production and distribution of interactive teaching materials	Reduction of production and distribution costs of interactive learning materials by means of a communications network and an extensive knowledge base
	Functional specifications and development of a learner/ teacher station using advanced technology (databases, interactive video, computer-conferencing, courseware, slow-scan TV)	Guidelines and proposals for open distance learning systems to be used for the definition of future learning systems
	Cost benefit analysis of multilingual pan-European educational television broadcasts	Inquiry into the potential for course accreditation and distributing database services on satellites within an educational service
Interoperability	Recommendations for definition of European standards in the areas of information representation, user interface and application & exchange protocols	Recommendations to standard organisations for introduction of technical standards for educational technology
	Definition of European technical standards in relation to ALT on all ISO/OSI levels within a market integration strategy	On market integration, technical integration and harmonisation through interoperable standards
Promotion of Favourable conditions	Analysis of high-technology training needs of SMEs in Portugal and France	Requirements and options for open and distance learning for special regions (Portugal and South of France)

Review Summary Table

Objectives	Ways in which DELTA EA addresses these objectives	Impact of the DELTA EA work
	Identification of contributions and barriers for the uptake of educational technologies by SMEs in 4 European test regions and development of intervention strategies	Promotion of new educational technologies in the context of training in SMEs by means of propagation strategies
	Identification of factors inhibiting the use of distance learning and the actions needed to create a favourable environment (from the supplier as well as the user side)	Recommendations for actions stimulating the use of learning technology in Europe (by suppliers as users)

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RESULTS

Intermediate Results of the DELTA Exploratory Action

Nearly all work defined by the Decision for DELTA EA has been taken up within the resources available to the programme within the one Call for Proposals.

Most of the 28 R&D projects started in March 1989 and are scheduled to finish in March 1991. Two study projects based on Proposals received, but too ambitious for the available resources, were funded by IT Action Plan resources and were audited as part of the Technical Audit for 1990.

At this stage the majority of the projects are still under way and entering the final phase of completion. Therefore many of the most strategic deliverables are not yet available. As a consequence an exhaustive and complete overview of deliverables and achieved results cannot be provided yet.

However, in accordance with the Technical Audit 1990, a concise overview of the major project achievements at this stage in the projects' work is given below. This overview is based on deliverables actually handed over to the Commission, the Annual Review reports submitted by the projects for the Technical Audit 1990 and demonstrations of prototypes at concertation meetings, the 'DELTA and Beyond' conference and the Technical Audit 1990.

Action Line I

This is a primary supportive action for the DELTA Exploratory Phase on concept formation and concertation of actors. Under Action Line I (and Action Line V), research is done on the identification of users, mediators, providers and producers requirements. Several DELTA projects are working together in the establishment of a platform for the continuous exchange of information based on their own findings and on the results achieved in the other Action Lines.

Summary overview of major intermediate results

D1025: PRECISE - Promoting and Realising ELTA through Communication & Information Strategies for Europe

- The DELTA and beyond Conference: 330 participants, of which 90 speakers and Commission people.
- 2 main seminars on specific DELTA results.
- Co-organisation (with the DELTA Unit) of 9 concertation meetings.

D1005: START-UP - Suppliers for Technological Advanced Requirements through Users Protocols

- A who's who data base: a detailed information on 731 European producers of technology-based learning materials
- The Interlaken symposium: 100 participants, the meeting of 63 European producers and 3 interim reports on pedagogy, technology, market.
- The audit of production review: 70 in depth interviews in 14 countries (EC + EFTA), a typology of producers validated by other DELTA projects.

D1023: INTERMAPS - Interactive Multimedia Access Publishing Services for DELTA

- Five issues of a newsletter, called 'DLT news', available in English, French, German.
- Two issues of the Multimedia Journal (including a video magazine).
- 13 issues of the 'DELTA bulletin' published in an electronic format on the teleconferencing service provided by EUROKOM.

Action Line II

The development of technical concepts is taking place within a number of projects under Action Line II. The shared objective of this research was to create new levels of efficiency and cost savings in the learning process.

Thus, the specification of the Portable Educational Tool Environment, new authoring tools, the application of artificial intelligence for user support and the re-use of learning material, were some examples of this research. Stemming from the Action there are several prototypes available, which have been demonstrated.

Some key players, the PTT Operators, have joined their efforts in a concerted manner to define a common European platform for the delivery of open learning services.

Summary overview of major intermediate results*D1003: ASAP - Animated Specification of A PETE*

- Prototyping and demonstration of a Common Platform for training application allowing portability.

D1004: ARTISAN - Intelligent Framework for the Industrial Environment

- Analysis of the training patterns in manufacturing industry, especially SMEs.
- Functional specification for the design of a learner workstation for the industrial environment.

D1006: ESSENTIAL - European Systems Strategy for the Evolution of New Technologies in Advanced Learning

- 19 workshops with DELTA projects on definition of user requirements for PETE.
- Functional specifications of generic ALT tools to be supported by PETE.
- Development of hypertext based learning system life cycle model to describe the whole life cycle of courseware, from the initial planning and production to the final use, in terms of user requirements.

D1007: TOSKA - Tools and Methods for a Sophisticated Knowledge-Based Authoring Environment

- Prototype of a tool for specification of a wide range instructional strategies which facilitates rapid prototyping.
- Prototype of a tool for the implementation of learner modelling techniques covering static learner attributes.

D1008: ACES - A Courseware Engineering System

- Analysis of user requirements.
- Development of 4 prototypes demonstrating systems that adapt to learners. These prototypes cover:
 - . database browser;
 - . curriculum support systems;
 - . user modelling;
 - . interaction management system.

D1009: MATIC - Multi-strategy Authoring Toolkit for Intelligent Courseware

- Development of a author centred conceptual model for the development of ITS.
- Experimental prototyping in order to assess the use practical knowledge based techniques to support an author.

D1010: AAT - Advanced Authoring Tools

- Development of two elaborate prototypes of a multimedia authoring system, incorporating:
 - . elaborated set of advanced editors for (Unit of Learning Material, sequence, multimedia frames);
 - . facilities for dialogue modelling, response analysis and rapid prototyping;
 - . ITS development system for both guided and discovery learning;
 - . C and Pascal programming support.

D1012: ESM-BASE - Author Support for Student Modelling in Multimedia Learning Processes

- Prototype of a multimedia database of units of learning material in Earth Science (Plate tectonics).
- Prototype of Multilingual user interface to multimedia database of learning material.

D1014: SAFE - Standard Authoring Facility Environment

- Architecture of an Intelligent Simulation Learning environment.
- Set of specifications for a Common Authoring Environment that can integrate authoring tools from different sources.

D1015: CAMCE - Computer Aided Multimedia Courseware Engineering

- Specification, including prototypes of dedicated tools, of a general architecture for cooperative courseware development, featuring:
 - . tool integration;
 - . multimedia object oriented database;
 - . advanced telecommunication facilities.

*D1016: NAT*LAB - NATural Learner Acquisition*

- Prototypes, incorporating advanced AI features, addressing knowledge acquisition by students.

D1020:TMIE - Tutoring and Monitoring Intelligent Environment

- Prototypes of a system for the implementation of tutoring and monitoring facilities and adding these on top of existing applications.
- The system has been applied to a series of existing and newly developed applications, these being Museum Security (in cooperation with the French Ministry of Culture); Poisons in Atomic Industry (in cooperation with the French Atomic Energy Commission - CEA); Bull E-mailsystem (an existing 3rd party application).

D1026:EPOS - European PTT Open Learning Service

- EPOS Common platform feasibility study showing the possibility of building a common platform for the EPOS projects successfully completed March 90.
- Functional specifications for the EPOS DEMO PROTOTYPE (Including: User environment and facilities, producer environment and facilities, personal mass storage, IRM, guidance system, tutoring system, monitoring system and communications) completed spring 90.

Action Line III

In Action Line III, projects work on key aspects of the development of a **communications infrastructure for delivery and production of courseware** and for the exchange of information about courseware, investigating the critical issues of tariffing, encryption and multimedia transmission by satellite. Research has been done in essential fields for trans-European cooperation including cross-cultural comparisons. Most of the projects have an element of validation and testing built into them.

Summary overview of major intermediate results*D1013:CAPTIVE - Collaborative Authoring Production and Transmission of Interactive Video for Education*

- Simulation of ISDN by using audio conferencing for access and control of a multimedia database, download of material via direct broadcasting by satellite (Olympus).
- Development of a retrieval system for multimedia material, based on a knowledge base system (with AI features) containing descriptions and references.

D1011:LAT - Learning by Advanced Telecommunications

- Development of a dedicated front-end (for both teacher and student) for a distributed virtual classroom.
- 6 pilot experiments on the usage of video conferencing for language training.

D1012:OLE - Organisational Learning Enterprise

- Development and pilot testing (between Denmark and Portugal) of a computer conference with a dedicated man-machine interface, as well as a tele-writing system. (Electronic blackboard).

D1022:CHANNEL E - Development of an Educational and Training Satellite Service

- Continuous schedule of public broadcasts on TV on various educational / cultural topics.
- Promotional video on CHANNEL E and Commission activities related to the training sector.

D1027:SATDOC - A Satellite Mediated Controlled Experiment for Continuing Education and Monitoring Doctors

- Design and realisation of a dedicated decoder prototype, specially done for confidential encryption application (Eg. Medical).
- Pilot experiments with the developed decoder via Astra (PAL) and Olympus (D2MAC).

D1028:OLEW - Open Learning Experimental Workshop

- Experimental video conference using the Olympus satellite (results are available on video recordings).

CCAM:JANUS - Joint Academic Network Using Satellite for European Distance

- Review of standards for multimedia transmission by satellite.
- Survey of available technologies for signal processing for interactive two-way dialogue for joint course production.

Action Line IV

There are, at present, no specific standards for educational technology. Action Line IV projects have concentrated on to **recommending specifications, conventions and standards** for advanced learning technology on the top of existing and emerging standards and conventions as defined in RACE and ESPRIT.

Summary overview of major intermediate results*D1001:LEAST - Learning Systems Standardisation*

- Systems oriented reference model for flexible and distance learning.
- Specification of user requirements for IT&T based learning systems.
- Inventory of telecommunication services and related standard protocols relevant to flexible and open learning.

D1002:OSIRIS - Optimum Standards for Successful Market Integration of Multimedia On-Line Services

- Analysis of the reciprocal influence of markets and standards, from different perspectives (economic, psychological, sociological, organisational and technical).
- A large scale market analysis of expressed and latent user demands and current and emerging supply side strategies. Analysis of supply-demand interactions.
- Market testing of draft standards (technological & non-technological) with lead users across Europe.

Action Line V

The action addresses the issue of market uptake of learning technologies in Europe and the overcoming of market barriers. This would also encompass peripheral areas of the Community and the uptake of computer-based learning in Small and Medium Sized Enterprises

Several projects are examining market segmentation in the training environment, attempting to assess the adequacy of particular technologies for different market segments.

Summary overview of major intermediate results

D1017:EIOL - European Infrastructure for Open Learning

- A catalogue of 10 detailed case studies of good practices in open learning.
- An identification of 11 pan-European networks in the field of open learning.
- An analysis of public policies in relation to the development and explanation of open learning opportunities.

D1018:ETEE - Educational Technologies for European Enterprises

- Document identifying problems arising from use of new technologies for training within SMEs.
- Design and validation of a regional model for the diffusion of learning technologies to SMEs in the region "Pays de la Loire" (France).

D1019:PRO-DELTA - Portuguese Research on DELTA

- Profile of the market demand and supply for Advanced Technology Training in Portugal.
- Scenarios for the reception of an European Satellite Education Channel in Portugal.

D1024:EXVOC - Expert System Contribution to Vocational Training

- Experiments addressing the use of expert systems in vocational training in U.K., Portugal and Greece.
- A series of recommendations for using expert systems in vocational training.

CCAM:BISFACT - Distance Learning, Inhibiting Factors and the Creation of a Favourable Environment

- Market evaluation, analysis and field research on the views of suppliers and users of Open and Distance learning products and services in Europe.
- Two case study reports (business-plans) for the implementation of Open and Distance Learning in a SME and a large company.

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EXPLOITATION

Exploiting the results of the DELTA Exploratory Action

The research carried out is under a limit of 50% percent funding basis. Therefore it can be assumed that there are some competitive future advantages which enable the project partners to contribute with their own investments in this precompetitive research.

Each project active under the DELTA Exploratory Action provided a comprehensive view of how the results of investigation in the field of learning technologies could be exploited in terms of the improvement of this market sector and in terms of the potential benefits for the competitiveness of the consortia involved in the projects.

The DELTA Central Office asked each project to submit an Exploitation Paper describing how the consortium's research activity could be exploited in two separate environments:

- within the framework of the DELTA Workplan
- in a commercial setting.

Exploiting research in the commercial environment implies that consortia will have given some thought to their own strategic positioning within a competitive market. The consortia were asked to identify the value of their research in the light of expected developments in the market, and to describe how their R&D fits in with other commercially oriented functions within their organisations. Because the value of R&D depends on its place in an overall competitive strategy, DELTA Central Office stressed in particular that projects should identify how their work on state-of-the-art technology would position them in a competitive environment. These are fully described in the Exploitation of Results document¹.

Because of its nature of Exploratory Action, the concept of commercial return has to be regarded as a long term possibility, but nevertheless most of the results achieved have potential exploitation capabilities as stated in the exploitation reports - included in the full document - drawn up by the projects themselves and as reflected in the "Overview" section of the same document.

The main conclusions of the reports submitted by the consortia are that they are equipped with a better understanding of the learning technologies market, have succeeded in establishing a framework for collaboration and the work carried out has led them to a better competitive position.

Most of the consortia are envisaging to follow further the development of prototypes and services nearer to the market. These future developments include some spin-offs in the cooperative environment schemes fostered during the current exploratory action through international partnership and the concertation mechanisms already established.

Projects Adding Value to Other Community Programmes

The reports submitted by the projects for the Exploitation of Results document (see above) indicate that several Community programmes will benefit as a result of the DELTA exploratory research, principally COMETT, RACE, ESPRIT, LINGUA, EUROTECNET, Community policy on SMEs, and dissemination programmes such as SPRINT. The relationship between DELTA and these programmes can be understood by tracing two lines of development:

¹ - DE1439

- Upstream research in which DELTA projects link into ESPRIT and RACE and adapt technologies for use in training and education. DELTA projects are adapting basic research in multimedia systems under ESPRIT to ensure they are compatible with the requirements of the training and educational domain. DELTA projects are adapting also the work of RACE and in addition developing new services for transmission on the emerging broadband communications network.

- Downstream research in which DELTA technologies are used within Community training programmes and to some extent within basic research programmes such as ESPRIT (particular that concerned with the application of Artificial Intelligence). DELTA research will be utilised in COMETT projects and by EUROTECNET, broadening familiarity with new techniques and testing technologies in real learning environments. Examples include client group developments in which DELTA research is utilised to benefit specific client group needs, such as language training (LINGUA) and SMEs.

This combination of upstream and downstream activities, and the spread of DELTA research to different client groups, makes DELTA a pivotal programme in Community Research and Development and in Community training policy.

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FUTURE PERSPECTIVES

Operation 1992

The Council of Ministers, by agreeing to adopt the DELTA EA for R&D in the domain of advanced learning technology, initiated an action to investigate the issues and potential of the harnessing of technology to the problems of life long learning, and to consider further actions if necessary. In this context the Commission undertook "Operation 1992".

In January 1989 a Call for Ideas was launched. More than 200 groups or individuals responded. Together with the ideas contained in the proposals to the Exploratory Action, and the extensive technical panels and consultations held, they constitute a very substantial background for a reinforced activity in the domain.

So, as part of the complementary measures undertaken during the DELTA EA, the Operation 92 planning exercise was conducted in parallel with the first 30 projects to outline and identify the potential requirements of a major strategic action in the domain of advanced learning technology applied to flexible learning.

The investigation was developed by leading actors from a number of private, semi-public and public, regional, national and other international initiatives in the domain. Part of their brief was to ensure the concertation with national activities in the domain. Nominations to the various panels and Boards were scrutinised by the DELTA Management Committee.

The process of deriving technically aligned specifications involved the

- strategic review, carried out by the Strategic Review Board (SRB)
- requirements analysis, conducted by the Requirements Board (RB)
- technical development, analysed by the Technical Panels (TP)

These panels contained representatives from the different sector actors in the domain: universities, research establishments, Information and Telecommunications industry, national administrations and publishing companies.

Thus, in total, Operation 92 reflected the thinking and contributions of over 2000 individuals and organisations gathered in an open Call for Ideas. The objective of the Operation 92 initiative was to identify the need for further work and to take the Information and Telecommunications technologies for learning purposes (Advanced Learning Technologies or ALT), already under investigation in the DELTA EA, into the next stage thereby leading to the achievement of an integrated European flexible and distance learning service.

The result was the document "Operation 1992: Investigation of requirements and options in the field of R&D in Information and Communications Technology based Learning - Consolidation of Results"¹. It gathered the views and specific tasks identified within the outstanding objective of any R&D Programme to be launched in this field. In May 1990 it was circulated to the DELTA address list of those interested in the development and application of advanced telematic services in the field of Training and Education within Europe.

A summary overview of Operation 1992 is provided in the following paragraphs.

¹ - GE0393

Strategic Review Board

The Strategic Review Board found that the following actions should be considered:

A. The Community should undertake a number of large scale experiments in flexible learning via electronic networks. These experiments are needed in order to test the logistics and viability of training and educational services in real, large scale network learning situations. In the same context the Community should explore the possible benefits of a European Electronic University.

B. Telecommunications costs are a major barrier to the development of distance learning in educational institutions. The Community must find ways of reducing the cost of telecommunications tariffs to educational and training institutions and of reducing the costs of hardware and software.

C. The private sector is increasingly important in the development of training services, especially in its relationship with public sector and educational institutions. The Community should continue to support this and provide support for the development of a dynamic private sector training industry. A forum in which the public and private sector could share strategic thinking might be of benefit.

D. The relationship between rapid innovation in learner technology, changing training requirements and learner needs, should be investigated. An educational technology investigation is needed, possibly contributing to a new conceptual framework for flexible and distance learning.

E. A formal system of evaluating the long term benefits of current Community programmes in educational technology should be introduced. This should provide an administrative mechanism for ensuring the evaluation of specific programmes and overall Community policy.

F. The Commission should provide better coordination between DELTA and other Community programmes and policies. Development of an educational technology support system should be coordinated with Community structural policy, as well as with the Task Force Human Resources and the DGs V, XVI and XXIII.

The Requirements Board

The mission of the Requirements Board was to address, on an industrial strategy level, future requirements and options in distance and open learning in the light of international developments and specific European conditions and prepare the scope for the Technical Panels. The scope included all industrial, service and technological aspects which are relevant to defining a consistent strategy for actions of sector actors including, where required, the advancing of governmental actions. The scope was correspondingly comprehensive and took into account the convergence between IT, Telecom and Broadcasting.

The board itemised the following topics for the three TPs:

1. Identification of major requirements and options in telecommunications as required to support sustained economic, industrial and social progress.
2. Identification of the objectives and milestones to be achieved in industrial and services developments.

3. Identification of the associated technological capabilities are of importance for Europe to possess in an open international competition for equipment and service provision.
4. Identification of the domains for which cooperation on a European scale offers significant advantages either in terms of financial resources, expertise, risk reduction or time-saving.
5. Formulation of recommendations for the Revision of the Framework Programme for European cooperation in RD&T.

These translated into priorities :

1. Vocational training/retraining is the first target group in the flexible social Europe of "full" employment.
2. For every action there must be a clear market rationale. If it is not known WHY an investment is made, and what its payback potential is, then it will not be made (hence the emphasis on evaluation and assessment in the proposals itself).
3. Work specified must be incremental, with flexibility and with intermediate successes, or generic spin-off at different stages, all of which is important for visibility and credibility. Flexibility is crucial in R&D.
4. Educationalists must play a stronger role in shaping the future, and must be trained to exploit new approaches. It is clearly not well addressed in DELTA Exploratory Phase. More mainstream educationalists are in the panels.
5. An objective of DELTA must be to enable people to make better decisions about educational technology. Information networks; human, paper or electronic, are an essential component of a strategic programme based on collaboration, concertation and cooperation.
6. The need for incremental type work reduces risk, as well as increasing visibility and concept of success, which helps momentum and perception of success.
7. Special recognition should be given to factors affecting use, or lack of use, of technology in learning in the infrastructure domain. Problems are not only technical but are often frustratingly trivial.
8. Economies of scale to satisfy growing demand is only plausible through collaboration and cooperation, since collaboration gives value for money in R&D through the multiplier effect and the value chain.
9. If we are to offer educational services, one must emphasise the complete systems view of learner, tutor and development environments.
10. Services, of whatever nature, must satisfy needs.

The identification of requirements along the lines given above had to be based on the economics of a developing market for educational technology. However these are as yet poorly understood and, by and large, not available.

Usability of the advanced learning technologies was another strategic and central issue that was identified. In order to enhance and prepare for the uptake of advanced learning technologies, existing and available technologies must be implemented and used. Through multiple experiments and real implementations the usability of the technologies should be investigated. In this way, the added value of an advanced, technologically supported open and distance learning approach can be properly investigated. At the same time demand for it can be both created and extended.

The defined requirements should be based upon the need for advanced learning technologies and systems related to different types of users, particularly those who were decision makers, and be strongly related to the usability of these technologies.

In relation to the financial and investment issues, it was agreed that work should be undertaken in the field of costs to demonstrate the cost-effectiveness of learning technology.

4.3. Technical Panels

The Requirements Board provided the definition of future requirements and options on an industrial strategy level. Three Technical Panels then were formed, in order to translate these requirements and options in specific areas or tasks for research and development stimulating a European market for open and distance learning technologies. Three perspectives were taken into account:

- available technological options or those which should be developed;
- implementation strategies and infrastructures;
- pedagogical validity, requirements and options.

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