Communications
Canada

REPORT ON THE

CANADIAN MISSION TO EUROPE

ON

DISTANCE LEARNING AND COMPUTER-BASED TRAINING

June 17 to 27, 1991

by

Thérèse Rivest and Keith Chang
Department of Communications, Canada

in collaboration with
Mission Participants

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EXECUTIVE SUMMARY

A Canadian mission to Europe on distance learning and computer-based training took place in June 1991. Representatives from fifteen Canadian private firms and public institutions which formed the mission met with a wide range of European organizations engaged in the research, development and application of telecommunications and information technologies for education and training. In addition to exchanging information on the latest technological developments in the field, on government policy and views on future trends, the mission explored areas for possible collaboration on research, development and business ventures.

The mission visited computer manufacturers, software developers, telecommunications carriers, training institutions, universities and research organizations in five countries. It also met with officials of the two European Community Programs DELTA (Development of European Learning through Technological Advance) and COMETT (Community Program for Education and Training in Technology), and those of SATURN, the European Open Learning Network.

The DELTA Program was of special interest to the Canadian mission for a number of reasons. The Program encourages R&D on many kinds of learning systems including the use of advanced telecommunications networks to establish an open learning environment in Europe. The DELTA vision is based on pan-European networks which will link users and suppliers, create new markets and make it possible to deliver new learning applications to users. Another reason for Canada's interest is that DELTA supports and encourages the development of computer-based and multimedia tools and applications for training.

Through the DELTA and COMETT initiatives, the Commission of the European Communities has assumed a strong leadership role in, and made an equally strong commitment to the development of distance learning and computer-based training. The initiatives have yielded tangible results as are evident during the mission. They bring together the key players in learning - distance educators, multimedia hardware and software developers, telecommunications carriers and industrial users - from across Europe to work together on large-scale, technologically and strategically important projects in a concerted fashion. The European telecommunication carriers are also playing a major role in advancing distance and computer-based learning technologies. The European PTT Open Learning Service (EPOS) project aims to bring about an open learning environment and to provide opportunities for innovation in learning technologies, courseware and services.

The mission confirmed the respective strengths of Canada and Europe in distance learning and computer-based training. These strengths complement each other well. There is little doubt that much can be gained from closer cooperation.

To build on the goodwill and momentum generated, a number of follow-up actions are recommended:

1) Over the coming year, the Department of Communications, Canada (DOC) and the officials of the Commission of the European Communities (EC) should pursue return missions from Europe to Canada and a joint workshop which will bring together experts from Canada and Europe to further develop applications for key projects.

2) At the private sector level, the mission identified opportunities for collaborative R&D and joint business ventures which will be actively pursued by the participants. Softwords Research International of B.C., for example, is working with Open University U.K. on a project that will use Canadian software as part of an interactive Pan-European satellite network for distance learning.

3) At the policy level, the mission members recommend that distance learning and computer-based training be recognized as strategic areas of national importance in Canada and that appropriate policies and programs, accompanied with necessary resources, be devised for their development.

4) The mission members also recommend that Canadian firms, researchers and distance educators meet among themselves to find ways to collaborate better, and to provide advice to the government on appropriate policies and programs to advance distance learning and computer-based training in Canada. DOC could benefit from the advice of such meetings.

5) Finally, it was agreed that key players should examine the strategic role that telecommunications networks could play in Canada in establishing stronger domestic markets for these fields. Key players would be federal and provincial governments, carriers, hardware and software firms, courseware producers, service providers, and organizations representing educators, trainers and industry users.

I. INTRODUCTION

Education and training are of strategic importance if a country is to be competitive and prosper in today's global economy. To meet the challenges of providing education and training to its population scattered over a large expanse of remote and rural areas, Canada has had to be innovative. It has a long record of applying telecommunications and information technologies to meet its many and varied requirements in training and education, and has accumulated some notable achievements.

The merits and importance of advanced technologies in education and training have also been recognized by the European Communities. As part of its Framework Programme for Research and Technology Development, the Commission of the European Communities (EC) has devoted a significant amount of resources and efforts to promoting the development and application of advanced technologies for learning through such programs as DELTA (Development of European Learning through Technological Advance) and COMETT (Community Program for Education and Training in Technology).

Over the past years, there have been a number of informal contacts between Canada and the EC in the area of learning technologies. These include, for example, participation of Canadian researchers in the EC's DELTA workshops, and visits to the DELTA Program Office by Canadian officials. In 1989, a DELTA delegation also visited Canada and held discussions with several Canadian institutions involved in distance learning. Following a series of discussions between Directorate General XIII: Telecommunications, Information Industries and Innovation of the European Communities and the Department of Communications, Canada (DOC), it was agreed that both sides could benefit through closer cooperation. A Canadian mission to Europe was considered to be a useful follow-on step which would permit a more extensive exchange of information, sharing of experiences and discussion of possibilities of joint R&D undertakings. A survey of Canadian companies and institutions in the field also revealed a strong interest in such a mission.

The Canadian Mission to Europe on Distance Education and Computer-Based Training was therefore organized. It took place over a ten day period from June 17 to 27, 1991. The mission was jointly sponsored by the Department of Communications (DOC), and External Affairs and International Trade Canada (EAITC) and the participating firms and agencies.

This report provides a record of the mission. Following a brief review of its organization, it summarizes the meetings, visits and discussions that took place, and identifies the results obtained. It concludes with a number of recommendations.

II. PURPOSE OF THE MISSION

The mission had as its objective to promote cooperation between Canadian and European companies and agencies in the area of distance learning and computer-based training.

More specifically, the mission aimed:

1) to familiarize Canadian and European organizations with each other's programs, projects and activities in the research, development and applications of technologies, products and services in distance learning and computer-based training;

2) to learn from each other's strengths and experiences, and to exchange views and ideas on future development in the field;

3) to identify subject areas of mutual interest and to explore possibilities for collaborative development and joint activities between Canadian and European companies and institutions.

III. CANADIAN PARTICIPANTS

Seventeen participants representing fifteen organizations from across Canada in the field of distance learning and computer-based training technologies took part in the mission. These included private sector firms, research institutes, universities, and provincial and federal government representatives. The participants possessed a broad range of expertise and experience in the field. Dr. Keith Chang, Director, International Cooperation, Technical Marketing and Economic Development, of DOC, headed the mission. Thérèse Rivest, Senior Policy Analyst, of the Telematics and New Media Branch of DOC, organized and managed the mission.

A list of the participants, including the organizations they represent, can be found in Annex 1.

IV. EUROPEAN ORGANIZATIONS VISITED

A total of sixteen (16) European organizations were visited during the mission. These included hardware manufacturers, software producers, telecommunications carriers (PTTs) and other service providers, universities and other training institutions, research institutes, as well as a pan-European association and the EC DELTA and COMETT Program Offices. A list of the European organizations visited or involved in discussions with the mission, and representatives who can be contacted, is given in Annex 2.

Owing to the full support and cooperation of the DELTA Program Office, and the assistance of the Canadian S&T counsellor at the Mission of Canada to the EC and other representatives at the Canadian embassies and consulates, the mission was very well received by all the European organizations.

V. ITINERARY AND PROGRAM

The mission visited sixteen sites in five cities, i.e. Eindhoven, Brussels, Paris, London and Milan, over the ten day period, with an average of two days in each city.

EAITC representatives and, on occasion, representatives of provincial government delegations (Ontario, Quebec, B.C.) abroad accompanied the mission at each of these sites.

VI. HIGHLIGHTS OF VISITS AND PROGRAMS

The visits and meetings typically involved a presentation by the European hosts of their organizations and the projects or activities they were undertaking pertaining to distance education and computer-based training, particularly as they relate to major European Community Programs such as DELTA and ESPRIT (European Strategic Program for R&D in Information Technology). They were usually followed by demonstrations of the projects, systems or services discussed. On our part, the mission members would describe, and sometimes demonstrate their projects, their respective organizations, and activities.

Multimedia technologies, software implementations for distance learning and computer-based training and telecommunications applications were three primary subjects of the discussions. A fiber optic based teleconferencing system (CAPTIVE), developed by University College London, the interactive multimedia workstation developed by Olivetti (near Milan) and the CD-I applications developed by Philips (in Eindhoven) were some examples of European achievements which generated a great deal of interest on the part of the Canadian delegation.

The mission members took turns preparing summaries of the discussions at each site. The following highlights are a synthesis of these summaries.

6.1 The European Community Programs

a) DELTA (Development of European Learning through Technological Advance).

Phase I of the DELTA Program launched in 1988 by the EC focused on new technology for training and involved expenditures in excess of 20 million ECUs. The overriding aim of DELTA is to prepare industry for the emergence of a common market for educational tools and services and to increase the efficiency of training through the use of new technology and communications. This first phase of the program ended in March 1991. Requests for Proposals for Phase II were issued in June of this year. Phase II will run until 1994 with a budget in the order of 54.5 million ECUs.

The DELTA Program was of special interest to the mission delegation for several reasons. DELTA encourages R&D on many kinds of learning systems including the use of telematics or telecommunications networks. It will facilitate the creation of a trans-European network which will allow people to learn when and wherever convenient. This infrastructure is key to the development of markets for new training products and services.

Another area of particular interest to the delegation is multimedia tools and applications for training, the development of which DELTA has strongly fostered. The combined use of telematics systems and multimedia tools for training will permit a reduction in training costs, as well as facilitating flexible and distance learning. It can also provide effective support to learners, trainers and course producers.

Full participation in the DELTA Program is limited to organizations from the member states of the EC. As with most EC research and development programs, the conditions of participation in DELTA require that all projects be trans-national in nature, that is, there must be a consortium of two or more performers from two or more EC member states; that funding be shared on a 50\50 basis; and that the performing consortium be led, preferably, by a private company. Organizations from countries outside the EC, however, may participate in a variety of ways, for example, a Canadian company, university or governmental institute could:

1) be sub-contracted by a DELTA consortium member to provide niche expertise. Funding would be provided 100% by the consortium member;

2) bring a complementary task to a project being performed by a DELTA consortium (as long as it is acceptable to all concerned). Funding of the Canadian participation would have to be covered 100% from the Canadian side;

3) undertake an extraordinary ad hoc shared activity. For example, once an agreement has been reached with a prospective European organization, the latter would seek funding assistance from the DELTA Program or other EC programs while the Canadian organization would turn to Canadian funding sources;

4) participate in joint information exchange workshops, symposia and selected DELTA bi-monthly project meetings.

b) COMETT (Community Program for Education and Training in Technology)

COMETT is a program under the European Community's Task Force on Human Resources, Education, Training and Youth. The program focuses on initial and continuing training in the field of advanced technology. It is a broad-based program that encourages partnering between universities and industry.

The COMETT and DELTA Programs complement one another. DELTA aims at the development of the network and technologies to be used for disseminating training. COMETT, on the other hand, is concerned with the specific content needs of users. The first phase of COMETT covered the period 1986 to 1989. Phase II runs from 1990 to 1994 and has an allocated budget of 200 million ECUs.

Approved projects receive 50% funding from COMETT which must be matched by the applicant and the partners in the project. The process and the conditions are similar to those of the DELTA Program. At present, there are no formal exchanges with Canada except when expertise is called in to help with particular projects. The COMETT staff indicated that should Canadian companies and institutions wish to participate, they could join the partners on a project specific basis but Canadian costs would not be matched. They also suggested that any Canadian firm interested in a joint undertaking should contact the specific project managers directly.

The mission participants were also made aware that the partners to a project could take training materials from outside Europe including Canada and modify them to meet their particular needs.

The meetings with the DELTA and COMETT program managers were found by members to be highly valuable as they provided useful insights into the strategies, priorities and approaches of the EC in the application of technology to education and training. Both programs were considered to be critical in the EC's drive for European competitiveness in the world economy.

6.2 Pan-European Associations

a) SATURN (Europe's Open Learning Network)

SATURN is a Europe-wide association that brings together both universities and private businesses for the advancement of open learning. Both groups are almost equally represented, with each having 45% of the membership. Under the aegis of SATURN, researchers, manufacturers and users of learning technologies work together to carry out projects of mutual interest. It has as its main goal to create a better trained and qualified European workforce through the use of cost-effective, open learning methods and the promotion of new ideas on education and training. All but two of the organizations the delegation visited were members of SATURN. Two thirds of the staff are on loan from its member organizations.

The membership fee in SATURN is US $1800. It has an annual budget of $1.5 million U.S. (excluding salaries), which is used to support open learning projects. Projects are often financed in part by other Europe-wide training programs such as DELTA and COMETT.

One example of SATURN's initiatives is EXPOMETT, which provides for the establishment of "Learning Technology Centres" in seven European cities initially. Apple, IBM, Bull and Philips have provided systems to EXPOMETT as a means of showcasing their multimedia systems.

In the presentation, Mr. Nickolmann, president of SATURN, indicated that SATURN could provide assistance to Canadian organizations in finding European partners who would be interested in entering into collaborative R&D or joint ventures. The possibility for Canadian companies to showcase their products in the EXPOMETT centres was also discussed.

6.3 Computer Manufacturers

a) Philips Innovation Centre

The highlight of the visit to Philips in Eindhoven was the presentation and demonstration on CD-I, the interactive compact disk technology which Philips pioneered. Using digital techniques and operating in a real-time, interactive mode, CD-I is a very powerful technology for multimedia productions and is ideal for training.

During the visit, presentations were also given on Philips' participation in such EC Programs as DELTA and ESPRIT. The Canadian participants used the opportunity to demonstrate some of their products and discuss their areas of expertise.

Philips was very open to partnerships. We were told that this is their regular mode of doing business. Five areas were identified for potential cooperation during the discussion. These are:

1) DELTA Pilot Projects for CD-I, including the possibility of linking it to telecommunications networks, ISDN, etc. (of interest to Ontario Ministry of Culture and Communications, Ontario Training Corporation, IIS Technologies, and Télé-Université.)

2) Development of CD-I methodologies (instructional scenarios) and titles (instructional software). (of interest to Ontario Training Corporation, Motion Works International, Athabasca University and Open Learning Agency.)

3) Telecommunications/protocols. (of interest to IIS Technologies and Télé-Université.)

4) Authoring systems (keyboard design tools, asset management, project management). (Télé-Université, Alberta Research Council, Le Groupe Micro-Intel, Motion Works International, and CWARC expressed interest.)

5) Open Standard for Multimedia Optical Storage Environment (OSMOSE) Interest Group. OSMOSE is an international effort to stimulate the development of interactive multimedia applications on Compact Disk. (Alberta Research Council, Motion Works International, and CWARC indicated interest.)

The interested Canadian organizations were suggested to send a one page proposal to Philips for consideration.

b) IBM International Education Centre

The delegation visited the IBM International Education Centre in La Hulpe, near Brussels. The centre provides services to approximately 35,000 IBM employees and customers a year. The program for the Canadian mission included an overview of IBM Education Europe, a visit of the multimedia centre and a multimedia demonstration.

IBM allocates $1 billion annually to training and education, which illustrate the importance IBM attaches to its human resources development. The company is involved heavily in joint R&D projects in distance learning and computer-based training. It supports and participates in a number of EC programs including COMETT where it is a member of the Advisory Committee to Promote Distance Learning Technologies. IBM is also a partner in EUROPACE, an advanced continuing education programme developing learning techniques via satellite.

Two proposals were handed out to the members of the Canadian mission during the visit:

- The European Lifelong Learning Initiative (ELLI) which is an industry-driven initiative focussing on lifelong learning; and

- East-West Distance Education Project Proposal which aims at delivering training and education in the eastern countries via videotape and satellite.

Mr. Keith Davies, IBM Europe, indicated that he welcomes joint project proposals for these or other projects from Canada. Proposals could be channelled through Mr. Dan Osborne, IBM Canada in Toronto.

c) Bull Training Centre

Approximately 50,000 students are trained at Bull Training Centre, near Paris, each year. These include Bull customers, staff and sales personnel. Bull has 8 multinational and 24 national training centres. Distance training is used to train engineers. The company has developed a simulator for training in maintenance technologies which incorporates computer-based software on a file server, touch screen and video disk.

Bull is a participant in the EC Programs EUROPACE, DELTA, and SATURN. Several demonstrations were given to the Canadian mission. One was SERPOLET, an interactive course development system which combines such features as multimedia and hypertext. Another was CLIPPER, a strategic project which consists in renewing all databases and E mail software for Bull internal management.

Some mission participants found the SERPOLET project of particular interest and intend to follow-up.

d) Apple Computer U.K. Limited

Apple Computer U.K. draws 35% of its revenue from education markets. The company has formed a special education team which is now responsible for all Apple dealer training in Europe. The multimedia demonstrations during our visit included an application developed for training on the operational system AUX and an Apple products configuration guide to train dealers.

Apple U.K. also invited British software developers to participate in the discussions and demonstrate their products:

CHRONICLE - a sales tool to promote the use of multimedia training. The system integrates business objectives and corporate culture with computer-based training to create a workplace aid.

SURROGATE CONFERENCES - This desktop conference system is based on Apple's QuickTime technology which is expected to be released early in 1992.

RENAISSANCE PROJECT - a multimedia CD-ROM that allows users to explore Shakespeare's Twelfth Night.

Some members of the Canadian mission had an opportunity to demonstrate their products they had developed for Apple computers in Canada, which resulted in several immediate sales. The same companies are pursuing other opportunities through Apple U.K.

e) Olivetti

Olivetti makes 81% of its total sales in Europe and has 37% of the European market. The company is part of a new industry consortium sponsoring distance learning courses on technology starting in the Fall of 1991. Its R&D centre has projects for deaf children, psychology programs at Rome University, mathematical courses research at Turin University, anthropology museum projects and a multimedia laboratory for the Italian banks. The Olivetti laboratory located near Naples is testing a new generation of multimedia standards and PC applications in corporate training. The company is a major European multimedia PC developer and is supporting a number of EC projects operating under the mantle of the ESPRIT and DELTA Programs.

The projects featured during the Canadian visit were:

- The development of the FASTLINK network at the University of Cambridge;

- The PANDORA BOX multimedia (quad screen image processing) conferencing system;

- IM-AGE, an upgraded kit for Olivetti PCs. Users can create interactive multimedia applications with audio/video coming from analog sources such as laser-disk or VHS tape. The kit contains an authoring toolset, a media control library and MS windows 3.0. It will be available for the market in early 1992.

- MULTIWORKS - a multimedia integrated workstation capable of processing multiple media, such as motion video, audio, graphics and text, in a consistant manner. MULTIWORKS is an ESPRIT project.

Mr. Antonio Converti, director of the Olivetti Multimedia Laboratory, discussed the results of an INTECO study (1991) from the U.K. mentioning among other things that the PC market in Western Europe is expected to grow from 4.8 million in 1991 to 7.8 million in 1995. Multimedia applications are forecast to grow from 6% (290 000) to 28% (2,2M) during the same period, with major breakthroughs at point of sale and point of repair ranking first and second and training following in third place.

Mr. Converti announced that a new multimedia development was underway led by a consortium including in addition to Olivetti such companies as Microsoft, ATT, Tandy and Philips. The product which will be ready by the end of 1991 features CD-ROM management, audio and music synthesizer, animations, Windows 3.0, 286 to 486 PCs, and colour graphics. Currently 35 applications are being developed such as games, language, infotainment, and encyclopedia projects.

Olivetti is interested in working with Softwords Research International of B.C. on the latter's authoring system QUATRAIN which operates on both the DOS and UNIX systems. Our representative at the Canadian Consulate in Milan, Mr. Claude Fontaine, who accompanied us during the visit, reported that one or two other Canadian companies represented on the mission could benefit from exploring avenues with other possible Italian firms. This will be pursued later this year.

6.4 Telecommunications Carriers (PTTs) and other Service Providers

a) European PTT Open Learning Service - EPOS

The European PTT Open Learning Service (EPOS) project, supported in part by DELTA, is a collaborative undertaking between the European PTTs, including SIP (Italy), Deutsche Bundespost (Germany), Telefonica de Espana (Spain), Televerket (Sweden), Swiss PTT, PTT Nederland and France Telecom. Representatives of three members of EPOS, i.e. SIP, Deutsche Bundespost and Swiss PTT, gave presentations and demonstrations to the Canadian delegation in Milan.

The long term strategy of EPOS is to create infrastructures that support a pan-European service for distance learning and an open learning service which meets the educational and training needs of the European Communities. The first phase of EPOS, which ended in 1991, had as its goal to develop new applications of existing technologies within the telecommunications companies. The second phase runs from 1992 to 1995 and aims to:

- develop and introduce new and more advanced services based on ISDN and on a vast range of multimedia material, thereby allowing the user to access the system via all the most common operating systems available;

- set up national organizations for the commercialization and the diffusion of the service; and

- meet the special learning needs of particular people or social groups (disabled, handicapped, and older people) or particular regional, language or ethnic groups in the EC.

The multimedia open learning service, which will come on stream in 1993, will be based on a combination of a broadband telecommunications system, European communication satellites and a European video conferencing system. During the third phase, planned for the period from 1995 to 2000, applications of the most advanced products derived from DELTA research will be developed and the service extended to state education systems and the individual user.

Demonstrations were given by SIP on the FORTEL Telematic Teaching System and by Deutsche Bundespost on its training system FUNLINE.

The FORTEL project is based on a plan to combine distance education provided via telecommunications with computer-based training and computer-managed instruction. The system will include a Europe-wide database of computer-based courses available for downloading on individual PCs. The courses will be archived, converted into a database and provided to end users by FORTEL. Royalties will be paid to courseware developers. The hardware, systems and telecommunications (ISDN) links are specified in the design.

The FUNLINE System is based on PCs using MS-DOS, either stand-alone or on a LAN. It is a computer-based training course for the employees of the Bundespost which has been implemented at 20 sites inside Germany. The course contains extensive graphics, annotated graphical diagrams, and multimedia data; it is neither video nor audio. Bundespost believes that if users wear earphones, communication between classmates is destroyed, losing an important and necessary component in training. Privacy regulations prevent the tracking of individual student performance. Registration data is kept on student private diskettes which they remove when leaving their workstation. Aggregate data is collected and evaluated. Courses are delivered automatically on a central hotline. The demonstrator indicated that the most difficult task was to integrate computer-aided instruction to existing training programs.

The Swiss PTT is a partner in the EPOS project. The presentation on its activities was given by Furrer & Partner AG Company, who worked as a sub-contractor.

The EPOS project is a typical illustration of the benefits that firms may draw by working together particularly on a large high-risk project. This is one of the many advantages offered by the DELTA Program which impressed the members of the mission.

Some mission members felt that the FORTEL objectives might be difficult to achieve due to the complexity of the project and its ambitious goals. The Bundespost FUNLINE system, however, could be very attractive to the computer-based training market in Europe because of its simplicity and cost effectiveness.

Overall, the EPOS project offers potential business and cooperative R&D opportunities for some members of the mission. It was agreed that links with the EPOS project should be maintained and opportunities pursued.

b) France Telecom

The mission visited l'Ecole Nationale Supérieure des Télécommunications, commonly referred to as Telecom Paris, which is one of the schools of France Telecom University and a research arm of France Telecom. Telecom Paris is one of France's top graduate-level engineering institutes. Approximately 200 engineers graduate each year in electronics, communications and informatics.

Among the topics discussed during the Canadian visit were a possible Canada/France exchange program for researchers, the future involvement of France Telecom in DELTA and a demonstration of a software programme called "SAVANT", which is a computer assisted learning system to help engineers learn new concepts.

Researchers from Telecom Paris have already worked at CWARC on an exchange program. It would appear that there is still an interest in renewing and expanding this experience on the part of both organizations. Other Canadian research organizations in the mission have also indicated that they would be interested.

France Telecom will submit a major project to DELTA, Phase II, on distance learning. If the project is approved, there will be opportunities for smaller firms to join in developing parts of the undertaking.

c) British Telecom (BT)

British Telecom has a team of 57 people involved in designing and developing distance learning material used to train 250,000 employees and some customers. BT's policy is to use distance learning as a first mode of delivery because it provides consistent and cost effective solutions for a critical mass of users.

BT uses whatever medium is appropriate, ranging from "low tech" material such as print and audio cassette to CD-ROM interactive video and more recently satellite-based full motion video. The firm incorporates face-to-face activities with distance learning strategies which are referred to as "integrated learning". Four interactive video programs have been developed using the simulation model. Approximately 10% of BT's training budget is directed to distance learning strategies and the company is the largest customer of the U.K.'s Open University.

Since BT's training products are generic in design, the company releases some of its packages to distributors for marketing and sales. One of the Canadian firms on the mission expressed interest in distributing BT's packages in Canada and plans to follow up.

Individual contacts can be made directly to BT Canada, Mississauga, Ontario, (416) 602-0444.

d) Guildford Educational Services

Guildford Educational Services (GES) is a small U.K. government organization specializing in setting up databases of training courses. In the U.K., all training courses and work experience are being assessed and "qualified" at one of the four levels of National Vocational Qualification. The objective is to have all UK citizens' training and work experience classified in a generic way within the next five years. Each occupation has its own database of qualified open learning courses.

The first Training Directory developed under government contract by GES contains 25,000 public and private courses delivered in various modes, with the exception of open learning courses which are gathered in a specific database "Maris On Line". Distributors market the courses using CD-ROM, print documents, on-line services and Prestel services. The databases are now self-sustaining.

GES participates in the EC Program ROMEO whose objective is to develop databases of education and training courses in various languages on CD-ROM. The current phase of the Program aims at developing commercial applications of the databases and partners are welcome.

Only two Canadian organizations, Ontario Training Corporation and Open Learning Agency, visited GES because of their particular interest in training course databases. Both organizations expressed interest in following up on the work on common standards and terminology for databases done by GES and on the progress of the ROMEO project.

6.5 Universities and Research Institutions

a) Open University U.K.

Established in 1969, the Open University was the first institution to offer university-level distance education in the U.K. In just two decades, it has become Britain's largest single open teaching institution.

Within the Open University is the Centre for Information Technology and Education where 40 researchers are concerned with all aspects of the use of information technology in distance education. Subjects on which research is undertaken include conferencing, the use of satellites, social implications of information technology and the role of artificial intelligence techniques in education as well as studies of systems for cooperative learning.

The JANUS project (Joint Academic Network Using Satellite) in which the Open University participates within the DELTA Program is a prime example of the Open University's interest. JANUS is a feasibility study project exploring the possibility of using an interactive pan-European voice and data satellite network for distance learning.

Satellite transmission for distance education and training was identified as an area for collaboration between Canada and Europe. Softwords Research International of B.C. is working with Open University UK to include its software products as part of the JANUS project.

b) University College London

University College London (UCL) is a member of the federation of colleges of the University of London. UCL has 10,000 full-time students and is located in the heart of London. At this university, two interrelated projects were brought to the attention of the Canadian mission: the DELTA project on Collaborative Authoring, Production and Transmission Interactive Video for Education (CAPTIVE) and the London Interactive Video for Education Network (LIVENET).

The general objective of CAPTIVE is to explore a new model for the transmission of images in the field of distance health education. This model integrates an advanced fiber-optic network, LIVENET, that provides live interactive video for teaching within the University of London, via the Olympus Satellite. Both projects demonstrate UCL's interest in the application of advanced telecommunications to European learning.

CAPTIVE uses telecommunications to provide access to a video database and its associated image bank. It allows the image bank to be used as an aid to designers and producers in collaborative discussions between European partners. It includes direct broadcast satellite, ISDN, optical storage systems and large knowledge databases.

LIVENET is a fiber-optic based network established by the University of London to link its five largest schools, its Computer Centre and its Audio-Visual Centre. It is a focus for research in the area of communications technology, from the electronic engineering and computer software aspects to the human factors point of view. The network will serve as a test-bed for the next generation of communications systems. The University of London intends to extend LIVENET to other parts of the University, to other universities and academic institutions and, via compressed video links, to local industries and businesses. International links will also be possible via satellite services.

Mission members considered CAPTIVE/LIVENET to be an excellent example of the application of telecommunications and computer-based interactive technologies to training and education. The research, design, development, implementation and evaluation of the model will be particularly useful to the future of distance learning. The development of collaborative productions to be used on the system was an area identified where Canadian expertise could be exploited.

Other interactive technologies such as audio conferencing, video compression and electronic blackboards could be integrated into the system to enhance learning. Here again, there is room for some Canadian technologies to be successfully applied.

Some of the Canadian participants would favour strongly the development of a LIVENET-type network to link researchers in Canada. This idea is the subject of a recommendation later in this report.

The issue of intellectual property and copyright emerged as a concern during the discussions with UCL officials. Integrating original works, capturing and re-using video images, etc. raise a number of copyright questions that need to be addressed. Unfortunately, the time available for the visit did not allow for extensive discussion of this subject.

c) Free University of Brussels

The Free University of Brussels has 7,000 full time students on the campus with only 10% of them involved in computer sciences, maths and physics. The University has nevertheless a very active Artificial Intelligence Laboratory where the research in computer sciences is done. It is a policy of the University to help small businesses interested in developing new technologies for training. The visit of the Canadian mission to the University, therefore, included the demonstration of a number of software packages.

The LEGO-LOGO courseware demonstrated by the University is used as a tool to teach programming skills and mathematical concepts to young students. The software is technically based on an object-oriented programming language using HYPERCARD (MacIntosh) and a LOGO interpreter in Pascal. The computers are linked in a network to permit the exchange of data among the students. The University has involved a group of students in experimenting with a prototype package which has been very successful in teaching computer and mathematical sciences at a distance, although the programming of a new subject matter could be costly.

The University also demonstrated a Group Decision Support System (GDSS) package which is a tool to permit researchers to work together in an interactive way. This technology, which is already in use in some universities and enterprises, could find an interesting application in distance teaching.

SoftCore Creative Technology in collaboration with the Free University of Brussels has developed ARCHIS, a software which can be used by distance learning institutions to handle documents in various fields. The software is a multi-user solution which can be linked with Search Query Language (SQL) databases residing on host computers within other operating systems. CWARC, IIS Technologies and the Alberta Research Council plan to follow up on the ARCHIS project conducted by SoftCore Creative Technology.

Dr. Livin Bollaert, responsible for external relations at the Free University of Brussels, has expressed a great interest in collaborating with Canadian distance learning institutions and research centres.

d) DIDA.EL (Società per la Didattica con Elaboratore)

DIDA.EL, founded in 1982, is the major Italian company focussing on Knowledge Communication Technologies. The company has two main focuses:

- a R&D laboratory that deals mainly with knowledge-based systems in tutoring and training environments, and
- a production group which produces tools, methodologies and instructional packages for large companies.

DIDA.EL's areas of research include intelligent tutoring systems, environments for learning, on-line help systems for programming, planning, logic programming, information systems, neurocomputing (navigation of distributed databases). One focus of DIDA.EL's work is to conceptualize how to use the same knowledge base for a number of different purposes: teaching, information, problem solving.

The company has been involved in many EC Programs including ESPRIT and EUROTECNET and has participated in seven DELTA projects, including EPOS. As a subcontractor to SIP, they developed three systems: a tutoring system, a guidance system and a toolkit for intelligent courseware.

The research and development conducted at DIDA.EL is leading edge in terms of the application of artificial intelligence to the development of training tools and materials. There exists potential for exchange of personnel, if the DELTA Phase II projects are approved. The training applications developed for FIAT and IBM by DIDA·EL could also be of interest to Canadian firms and agencies.

6.6 France-Canada Seminar

The France-Canada Seminar was organized by the Canadian Embassy in Paris in response to expressions of interest by several universities and private sector research firms from various regions of France to meet members of the Canadian mission. Approximately 15 organizations ultimately participated in the seminar.

Two members of the Canadian mission, Dr. Jocelyne Picot, Director, Applications Division, Canadian Workplace Automation Research Centre, and Ms. Lucille Pacey, Vice-President, Open Learning Agency in British Columbia provided an overview of the Canadian experience and current involvement in distance learning and computer-based training. Dr. Patrick Chevalier, Director of the newly established Service d'enseignement à distance of the Conservatoire National des Arts et Métiers in Paris described what France is doing in these areas. The workshops held during the seminar provided individual participants from both the host country and Canada an opportunity to exchange information on their projects and products.

The Government of France, which was represented at the seminar, is favourably disposed to the idea of funding a return mission to Canada should there be sufficient interest on the part of French firms and organizations engaged in distance learning and computer-based training. Possibility for such mission will be explored in the coming year.

NEUROPE LAB, an international R&D Centre located in Eastern France near Geneva generated considerable interest on the part of members of the Canadian mission. The lab focuses on the development of technology and services to accelerate the process of learning and to support the management of knowledge as a fundamental corporate and community asset. The mandate of the Lab includes the bringing together of researchers from related fields internationally to work on joint projects. It is this latter possibility that was of particular interest to the Canadian participants.

The three research centres represented on the mission would be interested in establishing a telecommunication link with NEUROPE LAB. A proposal will be submitted to DOC and Vision 2000 for consideration.

6.7 Others

a) The Multimedia Event

Two members of the mission attended Multimedia 91 in London on June 25th. The exhibition consisted of 42 exhibitors, including a "Business Arena" and, in addition, an "Applications Gallery" demonstrating about 60 applications under the titles Education, Broadcast and Video, Publishing, Training, Creative Arts, Point of Sale/Information, and Presentations.

The exhibition emphasis was on applications rather than on products, in the following key areas: distance learning, business applications (especially presentations), education, point of sale and point of information, video production and the publishing industry. The most important area appears to be training and distance learning, where interactive video programs allow training to be delivered and accessed through the computer medium and used by employees at any time.

The exhibition featured presentations of software which had been previously demonstrated, for example, QuikTime. Several authoring systems were also shown on the PC, Amiga, MacIntosh, Philips, and SunMicrosystem workstation. A number of player systems (Sony, Pioneer) were also exhibited. It is clear that the industry is ready now for the smaller, full-range multimedia, multi-task workstation which embodies a number of image and data sources along with different presentation modes. It is also evident that the authorware and software packages which enable assembly, presentation and storage of these different information sources are coming of age.

It was possible to try out the train simulator, used for training train drivers (shown by HODOS), to get a closer look at the Renaissance Project presentation (Shakespeare's Twelfth Night) already seen at Apple U.K., and to see a number of interactive products. In fact, one well-established trend is that of "interactivity". The addition of sound and digitized video clips in a journal or news format is also popular, and it is evident that new products (e.g. QuikTime) are stealing the multimedia scene even before they have been beta-tested.

VII. SUMMARY OF THE RESULTS

The key findings of the mission can be summarized as follows:

1) Major organizations in Europe, with telecommunication companies (PTTs) as the vanguard, are playing an increasingly important role in distance learning. SIP (Italian PTT), France Telecom and Deutches Bundespost have themselves adopted distance learning and computer-based training recognizing that this is a cost effective means of meeting their own training needs. In doing this, they have at the same time created infrastructures that facilitate the expansion of European training markets and the further development of training products and services.

2) The EC R&D programs DELTA and COMETT are playing a pivotal role in advancing the distance learning and computer-based training technologies in Europe. They are an effective mechanism that links the various players with a stake in learning: distance educators, multimedia hardware/software developers, telecommunications carriers and industrial users. By contrast, Canada lacks such a mechanism and as a consequence, distance learning and computer-based training efforts tend to develop in an ad hoc and uncoordinated fashion.

3) In Canada, traditional distance training practices are well established. Learners, delivery technologies and course content remain the principal preoccupations of distance training practitioners. Multimedia and computer-based training development has not necessarily been associated with distance learning in Canada, with the result that the two groups of expertise are not linked institutionally or operationally. EC funding in Europe has helped designers and deliverers to experiment with projects in both of these expert areas at once, thus allowing both types of technologies and expertise to develop almost equally, and become linked.

4) The mission provided the Canadian participants with first hand knowledge about the European experience, and allowed new insights into the differences in European and Canadian contexts, approaches, opportunities and needs. Because significant R&D funding was offered to EC key players at a time when several new technological developments (often simply new combinations of old technologies) were happening, European private companies, universities, researchers, designers and practitioners were able to devote significant resources towards the realization of some tangible - though hard to achieve - objectives.

5) A significant difference between Canada and Europe can be seen in the relative depth of experience on distance learning. Canada has been involved quite extensively in distance learning for many years and well-established institutions dedicated to these activities have emerged over time. Examples in point are the Open Learning Agency in B.C., Athabasca University in Alberta and Télé-Université in Quebec. With the exception of the Open University in the United Kingdom, the Europeans, on the other hand, have entered this field only in recent years and their involvement has been through specific projects.

6) The development of a European Open Learning Environment cutting across national boundaries is a major objective of their overall workplan for the future. Since the large telecommunications companies will provide communication links in the realization of this objective, the issue of international standards becomes an important consideration in establishing a common platform which will be used to transmit courses. The issue of standards will also have to be addressed in Canada as distance learning increases its adoption of computer-based and multimedia technologies in its courses.

7) The discussions with the Europeans raised the question as to the acceptance of these new technologies by end users. This question was not addressed at length during the discussions, although it is clearly an important one in determining future market potential. This situation, however, is not unique to the European distance learning and computer-based training fields.

8) In Europe as well as in Canada, there is growing interest in the concept of Performance Support Systems. In many on-the-job training situations, it may be possible to replace traditional training technologies and methods with such systems to provide vital job information as needed, combining the most effective software solutions to offer learners just-in-time training using well-designed interfaces on desk-top multi-media environments. This appears to be an area which presents opportunities for joint Canada-Europe projects.

VIII. FEEDBACK ON MISSION BY MEMBERS

Following the return of the mission to Canada, many participants wrote to comment on the mission. Members generally agreed that the mission was well organized although some might have preferred to have had more time as a delegation to get to know one another and to exchange ideas before leaving Canada. The choice of sites visited in Europe and the quality of both European and Canadian participation were felt to be excellent. Members were impressed with the research and new technology applications in distance learning in Europe and saw considerable potential for future collaboration on some of the projects.

IX. FOLLOW-UPS

A number of follow-up actions has been identified, with some described in Section VI above and many more noted by individual mission members. Individual mission participants will no doubt pursue opportunities they have identified for their respective organizations. Collectively and from a DOC perspective, we would suggest the following follow-up actions:

1) a follow-up meeting of the mission participants be held to review collectively the findings, and the lessons learned;

2) missions from Europe on distance learning and computer-based training. One immediate possibility is a mission from France as proposed by the participants at the France/Canada Seminar held in Paris during the mission;

3) a joint Canada/EC Workshop on distance learning and computer-based training;

4) facilitating the realization of joint projects as identified by mission participants.

X. CONCLUSION AND RECOMMENDATIONS

It would not be excessive to say that the mission more than fully accomplished its objectives. As a result of the mission, the Canadian participants had a comprehensive and in-depth understanding of the approach, priorities and direction that the Europeans take in distance learning and computer-based training, which are valuable for our own work. The Europeans had a better appreciation of the Canadian strengths. Promising opportunities for collaborative R&D and for business alliances were identified, with some arrangements worked out on the spot.

While marketing was not a primary objective of the mission, a number of mission members identified market opportunities, with on-the-spot sales.

A number of other Canadian delegates indicated a readiness to exchange research staff with European organizations to develop new products or applications of existing technologies. Several large European organizations currently developing proposals for DELTA, Phase II, have invited Canadian firms to join with them if their proposals are accepted by the EC.

A good deal of goodwill was generated between Canadians and Europeans involved in the mission, which is invaluable for furthering cooperation of firms and institutions in Canada and Europe.

The mission has served to bring to the fore a number of fundamental issues concerning Canadian involvement in distance learning and computer-based training at both the domestic and international levels. It has sharpened the focus on the important role that telecommunications and information technologies could play in human resources development, in the form of distance learning and computer-based training. The need for a long-term strategy and concerted plan of action is evident. In this connection, the mission members would make the following recommendations:

1) Distance learning and computer-based training be recognized as strategic areas of national importance and that appropriate policies and programs, accompanied with necessary resources, be devised for their development;

2) Closer cooperation among Canadian organizations engaged in distance learning and computer-based training be encouraged through such mechanisms as:

   - the formation of R&D consortia to undertake joint projects supported by government programs such as the Strategic Technologies Program (STP) and the Industrial Research Assistance Program (IRAP);

   - the creation of a dedicated high-speed network to facilitate communications and cooperation among R&D centres in the field;

   - Canadian firms, researchers and distance educators should meet regularly to discuss possibilities for closer collaboration, and to provide advice to government on appropriate policies and programs for the advancement of distance learning and computer-based training in Canada. DOC could benefit from the advice of such meetings;

   - Vision 2000, a consortium of major Canadian telecommunications manufacturers, should acquaint itself with developments in Europe on distance learning and computer-based training, particularly the European Open Learning Service (EPOS) sponsored by the large telecommunication companies, and consider possibilities for collaboration.

3) Canada should examine the strategic role that telecommunications networks could play in establishing stronger domestic markets for distance learning and computer-based training. In this respect, key players would be federal and provincial governments, carriers, hardware and software firms, courseware producers, service providers, and organizations representing educators, trainers and industry users.

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Annex 1/Annexe 1

June 14/juin 1991

CANADIAN MISSION TO EUROPE ON DISTANCE LEARNING AND COMPUTER-BASED TRAINING

MISSION CANADIENNE EN EUROPE SUR L'ENSEIGNEMENT A DISTANCE ET LA FORMATION ASSISTÉE PAR ORDINATEUR

June 17 to 27/ du 17 au 27 juin 1991

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GLOSSARY/GLOSSAIRE

COMETT	Community Program for Education and Training in Technology Programme Communautaire Européen pour la coopération Université-Entreprise dans le domaine de la formation aux technologies
DELTA	Development of European Learning through Technological Advance Développement de l'apprentissage en Europe par l'emploi des technologies avancées
SATURN	The European Open Learning Network Le réseau européen d'apprentissage flexible
DOC *MDC*	Department of Communications, Canada Ministère des Communications, Canada
EPOS	The European PTT Open Learning Service Le service d'apprentissage flexible des sociétés de télécommunications européennes
PTT	European Telecommunications Companies Les sociétés de télécommunications européennes
EC *CE*	Commission of the European Communities La Commission des Communautés Européennes
EAITC *AECEC*	External Affairs and International Trade Canada Ministère des Affaires extérieures et Commerce extérieur Canada
CAPTIVE	Collaborative Authoring, Production and Transmission Interactive Video
EXPOMETT	Learning Technology Centres Centres de technologies de l'apprentissage
CD-I	Compact disk interactive Disque compact interactif
CD-ROM	Compact disk read-only memory Disque compact-ROM
OSMOSE	Open Standard for Multimedia Optical Storage Environment
ISDN *RNIS*	Integrated Services Digital Network Réseau numérique à intégration des services
EUROPACE	European Program of Advanced Continuing Education

ESPRIT	European Strategic Programme for Research and Development in Information Technologies Programme stratégique européen de recherche et de développement dans le domaine des technologies de l'information
JANUS	Joint Academic Network Using Satellite
LIVENET	London Interactive Video for Education Network
EUROTECNET	Community Action Program in the Field of Vocational Training and Technological Change Programme d'Action Communautaire dans le domaine de la formation professionnelle et le changement technologique