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ABSTRACT

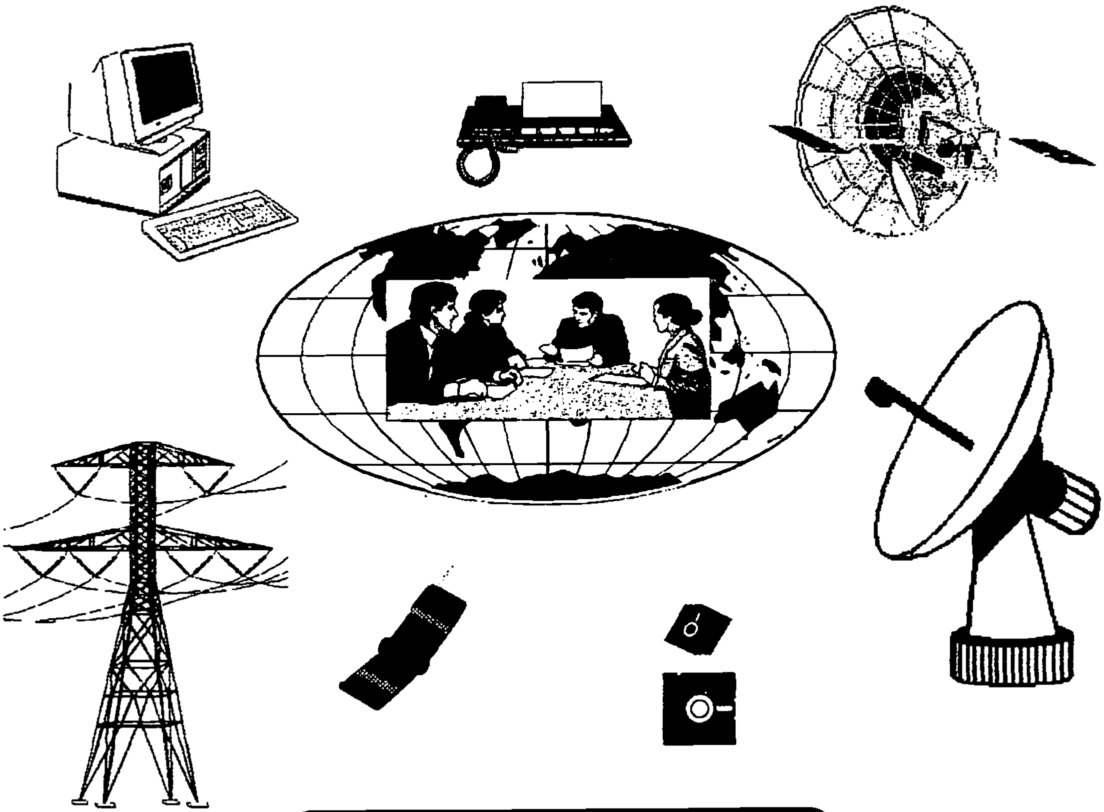
This report describes a meeting of 31 experts who deliberated on the various aspects of new technologies of training (NTT) and their applications in education and training with reference to Asia-Pacific contexts. Chapter 1 describes the rationale, objectives, inaugural session, meeting agenda, and closing session. Chapter 2 summarizes the country presentations. Chapter 3 highlights global trends. Chapter 4 focuses on industries' perspective on NTT. Chapter 5 presents the two working groups' project proposals for a recommendation on how technical and vocational education and training in Asia-Pacific countries could be strengthened with the support of NTT. Guidelines for the introduction and implementation of NTT are also provided. Appendixes include the following: schedule; "Welcome Remarks" (C. K. Basu); "Opening Remarks" (M. A. Qureshi); "Message" (Richard Szal); "Inaugural Address" (William G. Padolina); "Closing Remarks" (M. A. Qureshi); "Closing Remarks" (Franco Campagna); and "Valedictory Address" (Erlinda Pefianco). The following presentations are also appended: "VOCTECH's [Regional Centre for Vocational and Technical Education] Policy on Vocational and Technical Education Development in SEAMEO [Southeast Asian Ministers of Education Organisation] Member Countries" (Bernardo F. Adiviso); "The Directions of New Technology of Training in the UP (University of the Philippines) Open University" (Celia T. Adriano); "The Thai Educational System and the Ministry of Education (MOE)" (Sa-nguan Boonpiyathud); "NTT for Technical and Vocational Education: Trends and Needs" (Priscilla Cabanatan); "Expert Meeting on New Technologies in Technical and Vocational Education" (Franco Campagnal); "The Selection and Use of New Technologies for Technical and Vocational Training in Developing Countries" (L. F. Pau); "Issues in Assessing

the Comparative Advantages of NTT in Terms of Cost-Effective Training and Vocational Education" (Betty Collis); "Telecommunication Supporting Distance Learning" (Anna Stahmer); "Trends in Training Technologies" (Albert Herremans); "NTT: Definitions and Current Experiences" (Paolo Cellini); "Training Technology and Telematics Round Tables (T3-RT)" and "CD-I [Compact Disk-Interactive] as Educational Tool for Developing Countries" (Willem Bulthuis); "NTT in Temasek Polytechnic" (Lim Kin Chew); "Advanced Systems in Education for Vocational and Technical Training," "World Leader in Educational Technology," and "Advanced Technological Systems in Education for a Market-Oriented Vocational and Technical Training" (Alessandro Gava); "Education Reform in Papua New Guinea" (Stewart Hall); "NTT for Technical and Vocational Education in Japan" (Akemi Kawafuchi); "Use of New Technologies for Technical and Vocational Education in Korea" (Byong-Sun Kwak); "Education: Catching Up on Technology" (Jose D. Lacson); "Trends in Computer Assisted Learning" (M. Radhakrishna); "New Training Technology for Technical Vocational Education" (Brian Stanford); "Status of Technical Vocational Education and Use of NTT in Pakistan" (S. Irshad Hussain Tirmazi); "Excellence in Technology Training through Partnership" (Chris Wong); and "Vocational Education and Training for the 21st Century: 'Strengthening the Knowledge and Information Base of VOCTECH'" and "Needs of International Cooperation for Developing T/LRs [Teaching/Learning Resources] Using Computer" (Jiro Yoshio). A "Directory of Experts" and "Profile of Sponsors" concludes the Appendices. (YLB)

International Expert Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 3 to 7 July 1995



FINAL REPORT

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Manila, Philippines

Views expressed in this report are those of the participants and authors and not necessarily of UNESCO, ILO or CPSC.

In preparing this final report special acknowledgment is made to CPSC staff members, particularly Prof **MMR SIDDIQI**, CPSC Faculty Consultant, for drafting the report and Ms **CHRISTINE ORQUIOLA**, Mrs **CHARITO FLORES** and Mr **GERARDO CASAS** for the editing, design, production and printing of this final report.

Foreword

A tripartite collaboration among UNESCO-ILO-CPSC culminated in holding an International Expert Group Meeting on *New Technologies of Training for Technical and Vocational Education and Training* at Colombo Plan Staff College (CPSC) for Technician Education, Manila during 3 to 7 July 1995. Thirty-one experts coming from different parts of the world deliberated on the various aspects of new technologies and their applications in education and training with reference to Asia-Pacific contexts. The present report is a brief account of their deliberations.

I express my appreciation to UNESCO and ILO which were represented by Mr **M A QURESHI** and Mr **FRANCO CAMPAGNA** in the meeting. Messrs **ROLANDO TIBURTINI** and **QIAN TANG** of UNESCO Headquarters made extensive participation at the preparatory stage. I owe them my gratitude. I am indebted to Mr **BRIAN STANFORD**, Director, Adelaide Institute of TAFE, Australia for chairing the sessions. My special appreciation goes to the two rapporteurs and all experts who made immense contributions during this meeting.

I am thankful to the members of the Faculty and staff of CPSC for their support. I acknowledge the contributions made by Prof **MMR SIDDIQI** for synthesizing the deliberations and preparing the final document, and to Dr **GOBPORN INTRAKAMHAENG** for coordinating the various activities of the Meeting.

C K Basu

C K BASU (Dr)
Director, CPSC

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RECOMMENDATIONS OF THE EXPERT GROUP

1) Member countries of UNESCO, ILO and CPSC should formulate policies to encourage their respective technical and vocational educaiton institutions to introduce new technologies of training (NTT) to provide wider access to higher quality of TVET.

2) Member countries should take appropriate measures including flexible and distance learning approaches to train TVET teachers in the effective and economic use of NTTs. While going for NTTs, efforts should be made for maximizing the existing training technologies already developed.

3) Non-governmental organizations engaged in improving the quality and access of TVET may be encouraged to introduce NTT.

4) Private sector and computer manufacturers and other manufacturers of NTTs should provide support to member countries to introduce NTT for TVET, particularly in the developing countries of the Asia-Pacific region. They may support:

   -creation of NTT materials
   -dissemination of resources
   -support the spread of NTT

5) UNESCO, ILO and CPSC should continue to cooperate in organizing meetings and conferences on a yearly basis for the benefit of the member countries in the region. Steering committees for the purpose may be formed to coordinate the activities and evaluate the outcomes.

6) A regional teaching/learning resource center to promote NTT for TVET in the Asia-Pacific countries may be developed in CPSC with the support of UNESCO, ILO, JICA and other agencies.

7) UNESCO, ILO and CPSC should have access to Internet and E-mail and use it effectively for information dissemination and TVET staff development in the member countries.

8) The UNEVOC Regional Curriculum Clearinghouse and Database should also try to act as a repository and disseminator of curricula amd instructional materials for the national UNEVOC centres, CPSC, SEAMEO-VOCTECH and other TVE centers.

9) Member countries and international agencies should cooperate to undertake experiential researches on the utilization/effectiveness of selected NTT in TVE delivery.

10) UNESCO, ILO and CPSC may seek assistance from donor agencies including ADB, AusAID, CFTC, CIDA, DANIDA, GTZ, JICA, KOICA, SIDA, UNDP, World Bank to support the member countries' efforts to introduce and strengthen the effective and economic use of NTT for TVET.

11) The meeting endorsed the recommendations related to national and regional projects concerning the strengthening of TVET through NTTs. The outlines of the projects are given in Chapter 5 of this report.

CHAPTER 1

INTRODUCTION

1.0 BACKGROUND

Within the framework of sub-program 1.2.2. of the Approved Programme and Budget of UNESCO for 1994-95 biennium under UNESCO's International Project on Technical and Vocational Education (UNEVOC), UNESCO in cooperation with the ILO International Training Center, Turin and the Colombo Plan Staff College (CPSC) for Technician Education convened an international meeting of TVET experts, practitioners, and NTT manufacturers in the Asia Pacific region. CPSC hosted the meeting which was held from 3 -7 July 1995. The expert group meeting focused on problems and issues in improving the quality of TVET and assessed current trends in NTT that will provide the impetus for technological transformations in the area of technical and vocational education and training in keeping with the latest advances in technology. An earlier international meeting of experts from five continents which was conducted jointly by UNESCO and ILO at the ILO Training Center in Turin, Italy in 1993 provided background information for the meeting, particularly in the form of the publication emanating from it entitled *New Training Technologies*

2.0 RATIONALE

The last two decades have witnessed the rising of various emerging technologies which have been adapted in education and training with varying degrees of success. Some of these new technologies of training (NTT) have received widespread acclaim and were used to a large scale in teaching and learning situations for technical and vocational education and training. Many of these technologies are also context-sensitive in the sense that they are specifically suited for some situations while others have universal appeal. The period of two decades also witnessed gradual integration of computer, video and communication technologies while each of these technologies independently are also very powerful.

Most of these technologies have the potential to provide learning experiences which were inconceivable earlier to an individual student or a group of students or a remote student. These technologies have become very important today when we face a number of challenges such as providing education to an increasing number of students, providing education and training in fast changing technologies where adequately qualified teachers are not available, providing continuing education facilities to an ever-increasing work force, providing quality education in a cost-effective manner, reaching a large number of dispersed populations who would like to work in their own free time, improving the effectiveness of instructional systems, etc. It is not that NTT will provide solutions for every problem faced by the educationists but these technologies have the capability to considerably improve the situation when used judiciously.

In order to use the NTT for TVET, the teachers will need special professional development to handle NTT effectively. Planners, donor agencies, and industries and manufacturers also need orientation about the needs and benfits of NTT. Hence, there arises a need for the experts, practitioners, manufacturers of NTT and educational materials publishers to meet and assess the potentials of NTT and the way they can be used to improve the efficiency and effectiveness of the instructional systems/processes.

3.0 OBJECTIVES

The objectives of the meeting were to:

3.1 assess the current status of NTT and the level of preparedness of the member countries to adapt the same;
3.2 examine the global trends in NTT in relation to the state-of-the-art in the Asia-Pacific region;
3.3 exchange experiences of experts and professionals in the use of NTT;
3.4 discuss critical issues in the adaption of NTT in developing countries;
3.5 formulate recommendations for effective and efficient use of NTT in the context of the region; and
3.6 discuss and finalize a draft proposal for regional/national projects on NTT.

4.0 INAUGURAL SESSION

The session started with the CPSC Director Dr **C K BASU** welcoming the participants. He briefly mentioned the work of CPSC in the development of TVET in the region and the role in transfer of technology from developed to developing countries. He also described the conference as unique - where senior administrators, academicians, industry representatives, NGOs and international agencies working in the areas of TVET would be deliberating on the promotion and use of NTT for the development of TVET systems in the Asia Pacific region.

Mr **M A QURESHI**, Program Specialist of UNESCO PROAP, mentioned the initiatives and programs being undertaken by the UNEVOC project, particularly in the Asia Pacific region. One of these was the first NTT experts group meeting held at the ILO Interntional Training Center in Turin, Italy in 1993. It provided the opportunity to benefit from lifelong learning, and extend the outreach and cost effectiveness of TVET in the region. UNESCO wishes to produce a guideline document to be prepared for the region to introduce and implement NTT.

Mr **KRISHNAN NATARAJAN**, Deputy Director of ILO Manila, welcomed the participants and spoke about the support of ILO for the project and for the development of vocational.education in the Asia Pacific region.

Dr **WILLIAM G PADOLINA**, Secretary of the Philippine Department of Science and Technology, delivered the inaugural address. He emphasized that industrial development is dependent upon training technologies, competitiveness, skilled labor and work ethics. He spoke of his country's vision towards Philippines 2000, and the need to train high-caliber technicians in order to achieve it. Secretary Padolina further suggested that partnerships between government, industry and private sector/NGOs will be essential to bring about change. He emphasized the need for baseline information on the effects of technological change in the production systems in the formulation or re-direction of thrusts in skills development. The Science Secretary pointed out that present education must stress on learning to learn and the innovativeness in TVET so as to provide the technology edge to industry and society. Secretary Padolina added, *"Amidst the challenges and opportunities we face today, we need to be more innovative in planning and designing our technical and vocational education programs to maintain our competitive edge in the global economy."*

The full text of all the above addresses may be seen in rhe appendix.

Prof **MMR SIDDIQI** and Dr **GOBPORN INTRAKAMHAENG**, CPSC Faculty Members proposed a vote of thanks to the chief guest and the experts at the end of the inaugural session.

5.0 MEETING AGENDA

At the beginning of the technical part of the meeting, the following agenda was adopted:

5.1 Opening of the meeting
5.2 Election of the bureau
5.3 Discussion on the background of the meeting and Report of the First Expert Meeting on NTT at the ILO International Training Center, Turin in 1994
5.4 Discussion of the objectives, working schedules and expected outcomes of the meeting
5.5 Presentation of country reports on the use and effectiveness of NTT with special reference to TVET
5.6 Global trends in NTT and the state-of-the-art in NTT in the Asia-Pacific region
5.7 Role of private sector and industries in promiting NTT for TVET
5.8 Group work on problems and issues in NTT with special reference to developing countries in Asia and the Pacific
5.9 Regional and global cooperation for effective and economic use of NTT for TVET
5.10 Development of a framework of a Regional Project on NTT for further strengthening national capacities for effective and economic use of NTT for TVET
5.11 Recommendations and preparation of the report
5.12 Closing session

6.0 ELECTION OF BUREAU

The expert group elected the bureau for the conference with Mr **BRIAN STANFORD** of the Adelaide Institute of TAFE, Australia, as Chairman. Professor **AKEMI KAWAFUCHI** of the National Institute of Multimedia Education, Japan and Dr **KWAK BYUNG-SUN** of the Korea Educational Development Institute, Korea were the Vice-Chairpersons. Prof **M RADHAKRISHNA** of Technical Teachers Training Institute, Chandigarh, India and Ms **PRISCILLA CABANATAN** of SEAMEO-INNOTECH were rapporteurs for the meeting.

7.0 STEERING COMMITTEE

A Steering Committee composed of the members of the Bureau and representatives of UNESCO, ILO Turin Center and CPSC facilitated the conduct of the meeting.

8.0 EVALUATION

In accordance with the CPSC practice to evaluate all programmes, this Expert Group Meeting was evaluated on its various aspects by the experts themselves through a structured questionnaire on a five-point scale. The average rating was very close to *most satisfactory* and the overall rating is above the midway between *very good* and *excellent*. The verbal impressions expressed by all were very appreciative of CPSC's arrangements.

The summary statement of the evaluation may be seen in the appendix.

9.0 CLOSING SESSION

The Closing Session of the NTT meeting was held on Friday morning, 7 July.

The draft report and recommendations that were drawn up in the course of the meeting were presented by the Chairman Mr **BRIAN STANFORD** and reviewed by the expert group. The comments, suggestions and revisions made by the members of the group were duly noted and are incorporated in this final report.

Mr **M A QURESHI** of UNESCO in his closing remarks spoke of the initiatives being implemented under the UNESCO-UNEVOC project. He also mentioned that through this meeting, guidelines have been produced for introducing new training technologies in national systems and the launching of national and regional projects in cooperation with bilateral and multilateral funding sources and the private sector for the improvement of access and quality of our TVE systems. For his part, Mr **FRANCO CAMPAGNA** of ILO commended the work that had been done by all, especially by the CPSC Director and staff to come up with the draft report on time, enabling the expert group to read it in an efficient and effective manner. He expressed hope for a third NTT meeting to be organized during which the outcome of the recommendations made at this meeting would be assessed and evaluated.

Dr **C K BASU**, CPSC Director introduced the guest speaker Dr **ERLINDA C PEFIANCO**, Undersecretary of the Department of Education, Culture and Sports, Philippines. He described to the group her wide background in education, and her strong supportive role in the management of CPSC.

The valedictory address was given by Dr Pefianco, representing the Education Secretary. She recognized the outcomes and conclusions of the expert group meeting. She shared some of the experiences of the Philippines in the light of reforms that are taking place in the country's educational system. One of these, she mentioned, was the creation of the Technical Education Skills Development Authority (TESDA), which will supervise TVET. The undersecretary also discussed the government's thrust on human resource development, and the emphasis it is giving to technical and vocational education and training. She said that because of the current administration's policy on liberalization and modernization, it fully supports programs and activities such as industry cooperation in TVE and new technologies for TVE. She thanked the experts and the CPSC Director and staff for the successful completion of the meeting.

The closing remarks and vote of thanks was given by Dr Basu. He acknowledged the support of everyone for the success of the meeting, and expressed optimism that it was only the beginning and not the end. The CPSC Director especially thanked UNESCO for its technical and financial support and ILO for playing a vital role in the meeting. He specifically mentioned the following for their help in organizing the meeting: Mr Tiburtini and Mr Qureshi of UNESCO, Mr Campagna of ILO Turin Center, the members of the Bureau and all the experts, and the CPSC coordinators Prof **MMR SIDDIQI** and Dr **GOBPORN INTRAKAMHAENG**. He also thanked the CPSC staff for their sincere and dedicated service to make this important meeting a resounding success. Plaques and tokens of appreciation were distributed to the guests and certificates of participation to the experts.

CHAPTER 2

USE OF NEW TECHNOLOGIES OF TRAINING IN ASIA PACIFIC COUNTRIES

1. 0 SYNOPSIS

The academic works of the meeting started with the presentation of country perspectives with special reference to NTT. The presentations were followed by discussions on the various issues raised. The following salient features emerged:

- The status of NTT in the Asia Pacific countries reflects a wide range of variations among the countries. The countries like Australia, Japan, Korea, Hongkong and Singapore can be placed in one side of the continuum, and countries like Pakistan, Bangladesh, and PNG are at the other end. The available technology for TVET in Japan, Hongkong, Singapore and Korea are: broadcasting - TV/radio, satellites, CATV; interactive TV and package media - CD-ROM, CD-1, Video CD, Photo CD. The common feature found in the development of media technology is the rapid progress of digital technology, computer technology and materials technology and such technologies are integrated into multimedia technology. To other side, the use of NTT is minimal.

- In all countries, TVET systems contributed largely to the human resources development. The uses of NTT in the TVET systems enhanced the key aspects of access and quality. A well-knit program of gradual introduction of NTT consistent with the technological development of a country will strengthen the TVET systems which in turn will make similar contributions to the human resources development.

Abstracts of presentation of country perspectives are given below country by country.

The country papers in full text are given in appendix.

Australia

Developments in the use of technology for vocational education and training are occuring withion a broader context of structural and economic reform. With an emphasis on increased accessibility, improved quality, the importance of lifelong learning, ensuring social justice, greater industry involvement and effective use of available resources, Australia's vocational education and training sector is actively developing a number of initiatives to effectively utilize technology.

With the convergence of telecommunications and computing the opportunity arises to develop a full interactive information and service mode for educational delivery. Accepting that recent developments mean that we are no longer confined by "time" and " location" the opportunity arises to devise new technologies for creating and sharing knowledges.

Using Adelaide Institute of TAFE as a case study , examplese were presented of videoconferencing, audioconferencing, computer managed learning and the use of broadcast television.

However, we must resist any tendency to examine the use of technology in isolation. While appreciating the pedagogical implications associated with the "newer" technologies are complex we must move forward accepting that, to date, research data has not yet shown us a clear path forward.

Japan

With the social progress towards the information society and the multimedia society, various types of media technology came into active use in technical and vocational education. The media available for education can be classified roughly into three types: broadcasting media (TV/radio broadcasting, satellites, CATV), telecommunication media (telephone, facsimile, electric mail, video conferencing, audio conferencing, computer conferencing, video on demand, interactive TV) and package media (CD-ROM, CD-I, Video CD, Photo CD). The common feature found in the development of media technology is the rapid progress of digital technology, computer technology and materials technology, and such technologies are integrated into multimedia technology.

The latest media has been expanding its media functions such as wide area service, openness, networking, multiplicity, accumulability, two-way communication, individuality. From the educational viewpoint, the rapid progress of media technology has brought the same functions as mentioned above into education. Multimedia is constructing new types of educational concepts such as virtual university, combined with network technology.

At present, the ability to foresee rapid technological changes, to perform effective research and development and to conduct original, unique and skillful research is an important requirement to engineers in Japan. Thus, a new framework is necessary in technical and vocational education with an emphasis on the long term vision.

Singapore

This paper describes the entire IT infrastructure set-up for Temasek Polytechnic of Singapore. It identifies the various IT areas that will be made available to all staff and students of Temasek Polytechnic in this permanent Tampines campus.

The main IT areas that are focused on are windows-based PC software "client server" technology, network approach, ATM infrastructure, Internet and World-Wide Web services and multimedia-capable applications. The author believes that these are the necessary IT areas which can increase the effectiveness of technical and vocational training. The gist of this paper is that once the IT infrastructure is established, other computer-based education and training systems can be built on top of the high-speed data network. For this to happen, Temasek Polytechnic is going for the Asynchronous Transfer Mode(ATM)-capable network. This network will allow a bandwidth of up to 155 Mbps.

However, user acceptance and training in these new IT areas are just as important. Continual and regular end-user training courses are planned for staff and students.

Hong Kong

The Industrial Centre was established to provide industrial tarining to students. The qual.ity of the training has been well received by the industry. In the recent years, more and more enterprises of Hongkong move the majority part of their manufacturing operations to China and keep in Hongkong only the high value added operations such as marketing and product development. Consequently, young engineers are having less and less workplaces to receive their industrial training. Under such circumstances, the IC's role in industrial training is going to be even more vital than it has been in the past. Only through the coherent partnership with the industry, the IC can sustain sufficient resource to strive for its mission, ie. providing high quality industrial training to meet the needs of the industry and the society.

The paper describes how and what new technologies are brought in the centre for professional industrial training for budding and practising technologists in Hongkong as well as this region. The Learning Factory Concept, being an integration of business, management and technology, has been well recognized, supported by industry and substantiated with donations close to HK $ 70M in kind over the last two years, boosting the total asset of the centre to HK $120M. The Centre has become an international model being considered/followed in 20 cities over 4 continents.

Korea

As Korean society has rapidly transformed towards an information society, a limited training with fixed set of skills is no longer enough for technical-vocational education. In a world where data increase rapidly, schools have to prepare students to access and use information effectively. In this connection, two approaches were adopted, one was hardware approach and the other one software approach. For hardware, the Korean government has provided computers to schools as a long term plan. In software side, the Korean government supported projects of computer-aided instruction. KEDI has played a leading role in doing researches and producing software programs.

Now Korea is moving towards a society of networked multimedia environment where life-long learning beyond schooling is possible. Constructing an information superhighway becomes a national goal and multimedia approaches are explored in many ways.

In this context, some implications are drawn: First, as Korean society is moving into a networked information society, new technologies with focus on information technologies should be included as a core point of technical-vocational education program. Second, as the infrastructure of information society is developed, software engineering should be addressed. Third, schools are supported to equip modern facilities, and pre- and in-service teacher training in new technologies should be well-designed and practiced. Fourth, the educational system should be restructured in a way that technical-vocational education fosters the diversity and flexibility of programs thereby meeting the ever-changing skill requirements of the world of work.

Philippines

Three points stressed in setting up of an open and distance learning system are: 1) courseware; 2) organizational support, 3) student support.

The courseware design follows a systematic approach of development. Emphasis was given on the importance of identifying educational problems, before the delivery technology are set-up. Courseware being the heart of any open and distance learning should be designed integrating the skills of the subject matter expert, the instructional designer, media specialist and editor. The components of an instructional module was presented.

Organizational support plays the role of a manager. From the conceptual stage of a program to the last record of a student, the organizational system is behind every step. Much of the activities in this system could fall within the area of management.

Students who are not in the classroom have needs which should be met to sustain motivation. The study center and tutors are the first line of defense in keeping the learner motivated. Prepackaged courseware can become cold and distant, but through the tutor learning is situated and contextualized. A sample on how to use people in the community as tutors was discussed.

An important consideration raised from the presentation was the adaptation of the concept in vocational and technical education. What cooperative efforts should be established, through the leadership of CPSC, in supporting member countries in setting up this option? What specific guidelines should be in placed to deliver quality and cost effective education to the greater number of people?

There are questions the providers of educational opportunities should answer, but today the seed was planted, the rest of the action should follow with equal vigor and firmness that the leadership in CPSC has provided in organizing this meeting.

Thailand

I. The distance education program has been designed for those who are working in industries or companies and cannot attend the formal instruction college as full-time students. "Certificate in Vocational Education (3 years) " which use Dual Vocational Training too in modern teaching aid and may use the following :

1. Learning packages for self-study (including teacher guide, learning guide, student workbook, assessment guide, video/audio tape, CAI, CD-ROM.)

2. Telephone line : FAX, INTERNET, Electronic Mail

3. Broadcsating : FM/AM and Television broadcasting 1-channel, Cable TV 2 channels.

4. Sattelite (Telecom Asia) 5 center stations are in technical college

II. Some other courses in Technician (Diploma course) and Bachelor degree (Industrial Education and Engineering) may use CAI, CD-ROM, CAD/CAM, FMS, CIM, CNC Machine, Electronic Mail.

India

Section 1 traced the developments in computer systems from mainframes to PCs to powerful stand-alone systems and networking. The courseware developments were scanned from tutorial, drill and practice, simulations through adaptive techniques, simulation laboratories, intelligent simulations, use of generic tools such as N P, spreadsheets, databases and special purpose tools like logo and MALAN, laboratory interfaces, expert systems and ICAI, ITS, Multimedia, Hyper Graphics, Virtual reality, and use of Internet.

Section 2 emphasized that interactive features must be used to make CAL more effective. The issue of group interaction may be addressed using three different approaches - design of CAL software to promote group interaction, use of networks to promote intragroup interaction and design of student activities that interface CAL with external world/activities.

Section 3 on emerging trends brought out the following aspects:

- The role of class net, LAN and WAN in education were discussed along with the need to provide proper educational orientation.

- The generic simulation software which is driven by expert system or knowledge base and provides an output is likely to be the future of simulations. The fast changing technologies create a situation where knowledge is dispersed over different persons spread over large space. Since there is no time to consolidate the knowledge, Internet services and the knowledge acquisition methods used by professionals will become increasingly popular.

Since CAL and other courseware materials production is expensive, approaches like clipmedia, databases may become popular.

ITS has crossed the laboratory experimentation stage and bold initiatives are required to exploit this. Good Authoring systems are to be developed to support ITS.

Digital libraries will play an important role in the future education.

The representation methods and access methods for digital libraries are to be formulated.

The courseware will become more flexible in applications, functionality and in structure.

The unlimited potential of CAL can be tapped if we recognize the problems and solve them with the cooperation of all the countries.

Pakistan

Allama Iqbal Open University (AIOU) has been involved in distance education through correspondence courses using print media. The university is offering a wide range of courses in general education starting from secondary school certificate level to masters degree level as well as teacher training courses. The University is also using television and radio media as well, as part of its delivery system. The university has study centers with tutors all over the country for tutorials and practical work. The range of technical and vocational courses being offered at present is, however, rather limited being confined to few computer software and elementary level vocational courses. University also offers vocational courses for neo-literates using charts and audio-cassettes combination.

The situation is expected to improve further. Recently a new television channel PTV-2 has been started basically for AIOU and other educational programs. Lack of expertise and financial constraints remain the major hurdles in the way of expanding use of NTTs further by AIOU.

Under the new Technical Education Project computer technology y is being introduced in few more places and the computer labs at NITE (previously NTTTC) are being strengthened. This would also help promote use of computers in teaching/learning process. The NITE, has already embarked up on this, though in a very humble way and is offering short courses for Polytechnic Teachers in the use of computers in teaching/learning process.

Further more with the opening of telecommunications sector to the private sector and change of Telephones and Telegraphs Dept. as PTC, the facilities are expanding fast and with the availability of infrastructures, the use of NTTs employing telephone media will also improve.

Papua New Guinea

The utilization of NTT in the development of both technical and vocational education in PNG, assuming that the appropriate cost benefit analyses are carried out, may allow PNG to "leapfrog" in these two systems rather than by slowly investing in more traditional and increasingly obsolete strategies.

Some potential applications of NTT in the PNG setting are:

1. Distance Learning for teacher training and selected vocational programs using print and radio materials;

2. Individual Learning programs for technologies and skill areas for remote communities;

3. Pre-packaged upgradable video/CD-Rom based materials for technologies which are undergoing rapid technological change and require constant upgrading of curriculum;

4. Use of simulators for design and fabrication systems to provide high quality training without having to purchase expensive industrial standard equipment (i.e. for machining, metal cutting, mining, timber);

5. Use of PC based NTT's in urban technical colleges to ensure the quality and consistency of teacher presentations and the consistency of curriculum delivery and student evaluation;

6. Application of LAN and/or WAN approaches to the urban technical colleges, with a longer term plan to extend these networks to more remote sites. This would allow more effective communication across the curriculum for teachers and would also improve management of the system;

7. Creating a network link in PNG to provide access through internet and the World Wide Web to programs and resources available in UNEVOC Centres and other databases.

Bangladesh

Based on the findings of research studies and such other reports, a number of policy decisions have been taken. The most significant outcome of one of the decisions has been the restructuring of secondary education. A new stream of secondary school certificate - vocational (SSC, VOC) and higher secondary certificate , business and management (HSC, BM) has also been started from 1995. Based on the findings of these studies, the curriculum of technician programs have been revised in 1993-94. The revised technician curriculum in computer technology incorporates learning by using computer. The other technicians curriculum include computer use. The SSC (VOC), HSC (VOC) and HSC(BM) have subjects on computer learning and uses.

Within the present economy and level of technology in operation in the industrial and service sectors, the Bangladesh Technical Education Board (BTEB) has the program to strengthen NTT in the TVET in addition to making full use of traditional approach of instructional delivery. In 1995 the BTEB has created a research cell for further strengthening its research activities. Promotion of research in the use of NTT will be taken as one of the activities of the research cell for the development of NTT programs in the TVET.

CHAPTER 3

GLOBAL TRENDS IN THE USE OF NEW TECHNOLOGIES OF TRAINING FOR TECHNICAL AND VOCATIONAL EDUCATION

1.0 NEW GLOBAL ORDER AND MAJOR IMPLICATIONS

The socio-politico-economic order of the world has undergone unprecedented dramatic changes during the last few years. The downfall of centralized economies, the global enthusiasm for privatization and market economy, the impact of organizations like GATT, the formation of economic blocs like EEC, trade wars between developed nations, new concepts of human development, tremendous awareness to protection of environment and similar other events have implications for all nations in all fields including TVET. The trend towards a global village with a single global economy will put pressures on all countries to redesign the education and training systems in order to produce a world-class adaptive workforce. Tomorrow's world will witness more of open learning and flexible delivery allowing for the wide range of learning environments to cater to the differences in the learning styles, learning materials and needs, and variation in the learning opportunities. The issues of accessibility, quality and cost will give daunting challenges to all educational systems, including TVET. The disadvantaged majority of students who for any reason miss the route to higher education, will have to be given contextual education and training through a mixed mode of open learning, distance education and flexible delivery.

1.1 Open Learning

Open learning and distance education will have a greater role by seeking to remove the barriers to higher and continuing education which students may experience by way of geographical isolation, inability to take leave from work, family obligations, disability or financial constraints. With the barriers of space and time transcended, open learning systems will meet the growing demands of all including professionals. The distance education mode will use the whole range of NTTs to reach the clientele.

1.2 Flexible Delivery

Flexible delivery is characterized by:

- flexibility in terms of entry, program components, modes of learning and points of exit
- learner control and choice regarding the content, sequence, time, place and method of learning
- appropriate learning support systems
- application of new learning technologies where appropriate
- access to information on courses and services
- flexible assessment process

2.0 GENERAL TRENDS

2.1. Technologies are becoming more powerful and smarter, and the machines are becoming smaller and smaller, as evidenced by the emergence of powerful laptop computers.

2.2. Information has become more voluminous, portable and flexible. The trend of computers having large memory systems will continue.

2.3 Electronic delivery systems have multiplied, especially because of developments in telecommunications. Internet will be one of the major learning resources and technologies. Internet will witness much higher speed data transfers. ISDN will be used extensively and thus create opportunities for powerful learning environments, whether we are at home or in the office.

2.4 The volumes of data on Internet and the number of users on Internet will increase many fold. This will need information superhighways and the second generation Internet access and navigation tools.

2.5 In the world which is likely to be dominated by learning through Internet, browsing through information and hypermedia, the student will require new learning skills, and education research has to work out the methods of learning valid for these situations.

2.6 Classroom boundaries have expanded. Learning can now take place at home, in the workplace, and even while traveling. Virtual classroom and virtual university will be the trends of the future.

2.7 Hardware and software have become more powerful, making complex and intelligent simulations possible.

2.8 "Edutainment" combining education and entertainment will be popular.

2.9 The role of the teacher is changing to that of being a guide and a facilitator of the learning process. The teaching skills required by the teacher will change greatly in the future information society.

2.10 Learners are becoming more actively involved in their own learning. Interactive learning materials have made it possible for the learner to proceed according to his own pace and interest.

2.11 The fast-changing technologies will make knowledge dispersed over a large number of individuals, spread over the whole world. The knowledge will be available to teachers, researchers, personnel from industry and society. The knowledge in various disciplines will be fragmented, and since the disciplines are fast-changing, there will be no time to consolidate the subject. This will also result in non-availability of conventional instructional material. As a result the style of learning of professionals will be adopted by formal and non-formal sectors also.

2.12 The video-based education will acquire much greater importance.

2.13 The new technologies for training will promote cooperative production of instructional materials.

2.14 The boundaries between learner and teacher will be different with each one contributing in the network some information on the other.

2.15 The hard and fixed format courseware will change to the soft and flexible format courseware to cater to the needs of different groups and different levels of students.

2.16 Video and computer conferencing will be used extensively and will become one of the major methods of acquiring knowledge.

2.17 Multimedia instructional delivery systems will be used by the educational system to reach its students. These will include video and radio broadcasts, telephone and fax, interactive video classrooms, computer-based teaching, learning through digital libraries, CD-I and other associated technologies.

2.18 Whatever be the delivery systems and technologies used, the learning environment and the equipment will be greatly simplified and often will be a single instrument as multimedia computer.

2.19 Group interaction will be through interaction of groups who may not meet at all and yet they would be interacting very closely.

3.0 SPECIFIC TRENDS

Developments in training technologies have undergone immense changes over the years. In the decade of the nineties alone, such developments have been phenomenal. For education and training, the most rapid and significant changes have been in computer systems and telecommunications. As far as applications to TVET are concerned, trends in computer systems have been more relevant, particularly in cognitive areas and in simulations for skills development.

Technology trends as gleaned from current publications and reports of on-going projects in educational and training institutions include CD ROM, interactive video disc, digital audio, digital images and video, local and wide area networks, telecommunications, teleconferencing, CD-I, electronic mail, and of course the Internet and the information superhighway. The list is by no means comprehensive. State-of-the-art developments such as speech and handwriting recognition or machine vision systems, and facial recognition research have been reported.

Computer systems have evolved from mainframes to PCs to powerful stand-alone systems and networking. The courseware developments have ranged from tutorial, drill and practice, simulations through adaptive techniques, simulation laboratories, intelligent simulations, use of generic tools such as W P, spreadsheets, databases and special purpose tools like LOGO and MATLAN, laboratory interfaces, expert systems and ICAI, ITS, Multimedia, Hyper Graphics and virtual reality.

The generic simulation software which is driven by an expert system or knowledge base and providing a graphic output and is likely to be the future of simulations. The fast changing technologies create a situation where knowledge is dispersed over different persons spread over large space. Since there is no time to consolidate the knowledge and to provide it in the educational system for fast changing technologies, Internet services and the knowledge acquisition methods used by professionals will become increasingly popular. Digital libraries will play an important role in the future.

4.0 CONCERNS

The changes brought about by the new training technologies have raised some concerns.

Although computer-assisted learning has its acknowledged benefits, the development of good courseware has not been easy. More features need to be incorporated into learning materials such as interaction, intergroup, intragroup, and interfacing CAL with student activity. Courseware will need to become more flexible in applications, functionality and in structure.

The changing role of teachers will require that they be trained in the use of the new training technologies. This is necessary to assure the efficient use of the tools in the teaching-learning process.

The new training technologies can be very effective tools for achieving desired learning outcomes. Their potentials can be tapped to the maximum if problems are recognized and solved through collaborative efforts through sharing and partnership among the coutries and institutions in the region.

CHAPTER 4

INDUSTRIES' PERSPECTIVE ON NEW TECHNOLOGIES OF TRAINING

1.0 INTRODUCTION

For balanced development, production and utilization of NTT, experts from industries engaged in developing and producing NTT were also invited to present their experience and expert opinion on the design, use and effectiveness of NTT. Mr Alessandro Gava, Chief Engineer, Electronica, Veneta, Italy and Mr Barry Crist, Manager, Education Development, Apple Computer, California, USA presented their views on necessity, design, development and effective use of NTT for learning in technical and vocational education institutions and for continuing education in industry including distance learning mode.

Number of research studies conducted by ACOT (Apple Classrooms of Tomorrow) demonstrates the powerful uses of new technologies in teaching and learning. Students collaborate, create media rich compositions and use simulations while teachers refine their approaches to teaching - learning and professional development.

2.0 INDUSTRY-INSTITUTE PARTNERSHIP FOR INNOVATION IN EDUCATION

During last decade industry/business have been helping and entering educational institutions as partners in restructuring and renewing education to bring about fundamental education change. Industry became active partners in conducting educational research instead of simply funding the research studies. This brought about considerable benefits both to industry and educational institutions. Industrial centre at the Hongkong Polytechnic University was established as a educational factory for multi-disciplinary integrated learning using NTT and is carrying excellent education and training programmes with the active support from industry.

Many institutions are being established with the partnership of industry without the government support. Use of NTT is most essential for such partnership institutions for quality of training. New technologies of teaching and training started bearing fruits as a result of active partnership. Teachers and students involved in NTT became national experts in teaching-learning experiments with NTT. Perceptions about technology's role shifted from a pre-occupation with "computer literacy" to the use of "multiple technologies" as powerful learning tools. The important notion that people learn effectively by constructing knowledge actively through challenging hands-on activities gained importance. Students and teachers need different kinds of technology for different purposes (learning and teaching). Notebook computers that students carry and multi-media computers capable of desktop publishing and simulations will play a large role in future classrooms. Teachers, if left on their own, tend to incorporate NTT into their existing practices and styles very slowly and may take long time to bring about desired educational changes. Presence of intensive technology environment alone may not be enough and industry's active involvement is necessary to facilitate the introduction of NTT to bring about educational change faster. Transforming classrooms into stimulating learning environments requires a fundamental change in the culture of the educational institution. The teacher's role changes from delivering information to facilitating student's learning.

The teacher as learner is key to creating a new culture in the classroom. Teachers, like students, learn when they have on the spot access to help, models to learn from, other teachers to observe and be observed by, colleagues to share and discuss ideas with, as well as more opportunities to learn outside the classroom. The industry's involvement makes it possible to share their experiences and to offer opportunities to interact directly with teachers on NTT in the classroom environment and thus make teaching-learning a challenging and rewarding experience.

3.0 CONDITIONS FOR SUCCESSFUL INDUSTRY-INSTITUTE PARTNERSHIP

Due to dramatically different background of industry and education personnel, there can be some tensions and mistrusts between the partners of NTT. This may affect smooth functioning of partnership for use of NTT in bringing about educational change.

The biggest challenge for industry/business involvement in education concerns trust creating a balance between the interests of both parties. Educators are often distrustful of industry's involvement because they assume industry's real agenda is limited to selling a product and industry is perceived as caring more about its product than about the teachers and students. Such a distrust cannot result in an effective partnership. This kind of endeavor requires a much deeper understanding of how both sides operate their intentions and abilities. Partnership must be based on shared goals. The relations are to be developed on trust, long-term commitment and active co-operation for success. The basis for the success of partnership are:

- Shared goals and commitment from all levels and the commitment must be reaffirmed frequently;
- The business/industry must demonstrate that self interest does not override the goals of the partnership;
- The education partner must provide the conditions needed to nurture the experimental setting and openness to apply the lessons learned from past;

- Partnership created to improve teaching-learning requires extra time, intensive professional involvement and development for teacher whether or not new technology is involved;

- Innovations must match with existing organizational structures and any intervention should consider the educational institute as a whole;

- Flexibility is the key for teachers to work together, to change schedules to experiment, and for all sides of the partnership to learn and adapt continuously;

- Clear lines of communications are critical. Business/industry partners must understand that relationships and communication among different levels in educational systems are very different than in business/industry, and it must be ensured that teachers do not receive contradictory messages.

To ensure that a small experimental effort has implications beyond the classroom walls, all parties must understand who needs what kind of information in what form. Extra ordinary effort will be necessary on the part of local educators and policy makers, industry/business partners, and researchers to observe, translate, and communicate important lessons in on-going manner for the concept of research and development to take hold in the education system.

4.0 RESEARCH IN APPLICATION OF NEW TECHNOLOGY OF TRAINING

Number of studies have been conducted by industries in design, development and utilization of NTT and some of the important ones are given here.

4.1 *Constant Access to Technology*

Studies indicate that constant access to NTT influences the frequency, form and substance of teacher's collegial interaction. The teachers already enjoying collegial interactions are able to implement new technologies and instructional strategies more quickly. The adoption of innovation and the creation of a collaborative environment are complementary conditions for the educational change. With time, teacher's interactions moved from informal, infrequent exchanges to structured technical assistance to formalized team teaching.

Technology clearly has the potential to vastly transform relationships between teachers and students. Availability of technology alone is not enough for the change to occur. Educational institutions have demonstrated an unyielding resistance to change and those reforms which fit in the existing organizational structure and practices are easy for adoption.

4.2 *Teacher Isolation*

The effective use of technology in classrooms is often a slow process marked by a variety of obstacles and one of the key obstacles is - "Teacher Isolation", a condition common in many institutions. Introduction of NTT by some teachers in isolation in the institution may not succeed, and that the change will not occur simply by giving teachers the latest technological tools. Teachers must be provided with ongoing support which is available only if the larger system, in which they are working, changes as well. The reduction of teacher isolation is an important part of that change. Adoption of innovation and creation of a collaborative environment are complementary conditions for change.

Opportunities for interaction with colleagues play an important role for a successful work environment. In many institutions, the opportunities for interactions are limited and communication tends to be informal and infrequent.

Innovations can be extremely difficult to institutionalize because homeostatic forces in institutions are more powerful than innovative forces. Teachers may also resist change if the innovations come from policy makers or non teaching experts without considering the constraints. Serious commitment to innovation occurs only after teachers see that it really does assist them in teaching their students. This type of change occurs over a long period of time with sustained efforts. Apart from time factor, there should exist a supportive organizational environment and institutional sharing in motivating teachers towards the adoption of innovations and finally to team teaching. Team teaching led to cross disciplinary instructions benefiting the students and teachers. Changes occur faster if innovations and collegial interactions happen simultaneously.

4.3 *Students Involvement In T/L Activity With Use Of NTT*

Availability of technology to learners made changes in kind of text the learners interact with and the kinds of interactions learners have with the text. It has been found that the use of computers and NTT gets highly influenced by the existing social relationship among the teachers and students in the classrooms. Collaboration helps people produce innovative technology together, which no single person could produce by working alone. Students collaboration in the classroom will be influenced by the design of tools. Use of multiple technologies in the classroom allows each student to play several roles. Students can produce story show using slides with combination of text, images, and sound. These story shows are extensions of the usual reading and writing activities with new multiple roles of students in such shows.

Studies in schools indicate that by the use of NTT in classrooms by teachers, the students can share the teaching roles quite satisfactorily if the collaborative social environment exists in the classroom. The teacher can act as guide-director and supporter in the whole teaching-learning process. This provides teachers an opportunity to experiment on T/L with NTT. Significant change is possible with NTT but it requires time, patience, high level of commitment and sustained support from various corners.

4.4 *Influence Of High Computer Access On Students' Thinking, Learning, And Interactions*

Studies indicate that students provided with high access to computers made them more cooperative in sharing ideas, joint problem solving, helping each other, and more interactive. Students developed many abilities such as:

- Dynamic exploration and effective representation of information;
- Experimentation and problem solving;
- Social awareness and confidence;
- Effective communication;
- Independence;
- Expertness and collaboration;
- Use of computers;
- A positive orientation to the future.

Multimedia technologies contributed to major shifts in how students represented and integrated their ideas. Computers improved their confidence in writing and facing new problems. Students included graphics in their documents and improved their writing.

National Institute of Multimedia Education, Japan is conducting number of studies on - effective use of multimedia, Distance Education System by satellite communication, High speed Multimedia Educational Network Systems, Support System for the Development of Electronic Media Teaching Materials etc. NTT is going to play a very vital role in all future Educational Systems for TVET. Many developed and developing countries are working on effective application of NTT in TVET.

5.0 SPECIAL FEATURES OF MULTIMEDIA NTT PACKAGES

With the invent of NTT, many education industries are being established for designing, developing and producing multimedia packages and education systems based on NTT. These educational systems are comprising of both hardware and software. Electronica Veneta is one such education industry producing NTT based Multimedia packages and education systems in different areas of TVET. These packages/systems include multimedia presentations, graphic simulations, video pages etc for theoretical explanations, guidance for practical exercises etc. As another example, the Organization for Educational Resources and Technological Training (ORT) has been in technical, creative and comprehensive education for a long time. They develop, among others, high-tech educational systems, produce hardware, software and courseware. Like many non-government organizations utilizing NTTs in continuing education in many countries of the world, Philippine Academy for Continuing Education (PACER) developed many NTT based T/L packages for TVET programmes in their society.

The use of NTT has made it possible to produce the whole course into well structured specific micro level modules for training. These modules can be used for training and quick learning according to specific needs on a highly flexible pattern. These programmes can be carried out on computers to teach/train/learn theoretical or experimental or practical courses. The main components of any NTT based educational system are:

- Individual control unit for interaction of learner with computer system;
- Experiment module to cover an educational programme;
- Personal computers for use by the students/teachers;
- Software for individual study, simulation and data processing.

The configuration includes number of individual work stations for students and one for teacher. All these work stations are usually networked in order to enable the teacher to control and guide all the educational activity.

These NTT based educational systems are very useful in extending and providing continuing education facilities under different conditions and modes of learning. With these NTT based packages, it is possible to implement quite efficiently both theoretical and practical courses with the help of computerized systems. The main characteristics of these NTT based packages and educational systems are:

- Group learning;

- Individual learning for theoretical study and practical exercises controlled by computerized systems;

- Theoretical and practical computer managed learning;

- Modularity - adaptation to different training requirements
  - upgrading;

- Use of industrial type components, devices and circuits

  - variation of the circuits parameters controlled by computer to promote an inductive learning;

- Faults simulation and trouble shooting techniques;

- Continuous control of students' work;

- "Real time" control of the learning level achieved by the student/learner;

- Comprehensive courseware supports

  - Printed materials
  - Pre Prepared exercises
  - Educational Software (Diskettes, CD ROMs etc)

The user can configurate the system according to the personal needs. This permits the layout of different laboratories from simple to more complex ones. The learning can be made with incremental complexity to suit the learning capabilities of the target group/learner.

6.0 FLEXIBILITY IN DELIVERY WITH NTTs

The greatest strength of NTT based packages/education systems is its flexibility in delivery and options for T/L strategies. Appropriate approach may be selected depending on the learners' requirements and availability of technology.

The flexible delivery system includes, among other things :

- learning at various locations

- learning using different resources and technologies

- opportunities for continuing education

- opportunities and access to NTTs

7.0 ADVANTAGES OF NTTs

The use and implementation of NTT as a collaborative efforts among educators, research organizers and industries/manufacturers will result in following main advantages:

- More project oriented work
- More group work and cooperative learning
- More individualized attention
- More inter-disciplinary activities
- More choices for learning strategies
- Reduction in lecturing
- Different philosophy of teaching
- Elimination of paper-pencil
- More efficient drill and practice
- More motivation for writing and learning process
- Cooperative planning with colleagues and team building
- More ways of information gathering
- Introduction of student portfolios
- Less structured classrooms and more independent students
- Faster lesson preparation and revision on computer
- More suited for continuing education with distance learning mode

CHAPTER 5

WORKING GROUP SESSIONS

1.0 FORMATION OF THE WORKING GROUPS

Two working groups were formed to focus discussion on (1) project proposals to strengthen national capacities for introducing NTT and (2) guidelines for introducing NTT in the developing countries in Asia-Pacific region. List of the members of the two groups are given below.

Group A (Project Proposals)

Kawafuchi, Akemi	Chairman
Cabanatan, Priscilla	Rapporteur
Adiviso, Bernardo	
Austriaco, Nicanor C	
Gorica, Nejat	
Guiang, Alcestis	
Hall, Stewart	
Kupferman, Avi	
Rafique, Abdur	
Siddiqi, MMR	
Yoshio, Jiro	
Wong, Chris HC	
Campagna, Franco (ILO)	
Qureshi, MA (UNESCO)	

Group B (Guidelines for Introducing NTT)

Kwak, Byong-Sun	Chairman
Radhakrishna, M	Rapporteur
Adriano, Celia	
Boonpiyathud, Sa-nguan	
Gahlot, P S	
Javed, Farida	
Lee, Young-Hwi	
Lim, Kin-Chew	
Punsri, Pichit	
Tirmazi, Irshad Hussain	
Betia, Rene	

Dr CK Basu and Mr Brian Stanford facilitated the deliberations of both the working groups.

The two working groups worked independently to produce their group reports. The deliberations in connection with project proposal are described below in this Section A and those related to guidelines for introducing NTT are treated in Section B. Reports of the two groups were further considered in a plenary session.

SECTION A

PROJECT PROPOSAL

The group A for project proposal met under the chairperson to formulate recommendation on how TVET in Asia-Pacific countries could be strengthened with the support of NTT. After a thorough discussions the group preferred to consider the project proposals at two levels:

- National level
- Regional level

National Project

Strengthening National Technical and Vocational Training Institutions with New Training Technologies

The working group discussed the draft project proposal prepared by Mr Campagna of ILO International Training Centre in Turin on the basis of the recommendations of the first expert meeting held in Turin in 1993. The draft project proposal was accepted with minor revisions and endorsed to the Regional UNEVOC Project in Asia and the Pacific for follow-up actions. UNEVOC will promote the proposal through its existing network. UNESCO and ILO will support UNEVOC Centres in adapting the draft project proposal to their national context and in submitting it to potential donors. However, before looking for new donors, the meeting recommended that ministries of education interested in implementing the national NTT project undertake all possible efforts in identifying existing/ on-going projects funded by the World Bank/ADB or under the CPSC in-country programmes and other funding agencies which could integrate the NTT project with minor adjustments. In addition the meeting also recommended to locate eventual resources available of the UNDP Programme for Technical Cooperation between Developing Countries (TCDC).

Regional Project

Regional Partnership Network to Support Technical and Vocational Education with New Training Technologies

After discussing the proposal for the national NTT project, the group was informed of the 1992 survey conducted by Prof. Jiro Yoshio of Tokyo Gakugei University in Japan. The major findings of the research indicated the shortage of teaching and learning materials and the need to upgrade teachers' competencies. The working group therefore decided to address this problem through a regional partnership project which would also include networking with NTT lead institutions established in national projects.

The proposals for the national and regional projects are presented in the following pages.

Proposal
for a
National Project

STRENGTHENING NATIONAL TECHNICAL AND VOCATIONAL TRAINING INSTITUTIONS WITH NEW TRAINING TECHNOLOGIES

CONTENTS

1 Summary
2 Background and justification
3 Beneficiaries and parties involved
4 General aim of the project
5 Specific objectives
6 Project outputs
6.1 Trained national NTT expert team
6.2 NTT tool-kit
6.3 Electronic Information Support (EIS)
7 Activities
8 Assumptions
9 Factors ensuring sustainability
10 Institutional arrangements
11 Inputs
11.1 Government's input
11.2 Donor's input

Annex 1 Project implementation schedule
Annex 2 Budget of donor contribution

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1. Summary

Technical and Vocational Education (TVE) systems in Asia do not yet make use of the full potential of New Training Technologies combined with modern, cost-effective group and individual learning methods. The large mass of out-of-school learners have no access to just-in-time vocational training opportunities which meet their needs. Vocational training institutions should be able to also offer flexible/ open and distance learning schemes supported by appropriate training technology.

This project aims at strengthening the capacity of ministries and institutions concerned with TVE

- to improve the decision-making process in terms of cost-effective investments in training technologies;

- to improve the quality of learning and to provide an increased access to TVE.

To fulfil this aim, the project will assist a national NTT lead agency (UNEVOC Center) for the duration of one year in developing its capacity to provide professional guidance, consultant services and training in the field of NTT-assisted training delivery. When the donor-supported project comes to an end, the national NTT lead agency (UNEVOC Center) will continue to operate on a self-sustainable basis by selling its services to various target groups:

- needs analysis, feasibility studies, project proposals for national policy and decision-makers as well as for international funding institutions;

- demonstration sessions, exhibits and training for directors of training institutions, curriculum developers and trainers;

- on-line information and advice to practitioners.

The NTT lead agency (UNEVOC Center) will have a trained multidisciplinary team of NTT experts, training professionals and economists. In support of the team, the project will develop a NTT tool-kit which will include information materials and demos for decision-makers.

Another tool-kit will provide instruments for cost analysis, technical specifications, roster of experts and suppliers, etc. for training managers and NTT professionals.

The project will also establish an Electronic Information Support (EIS) which provides on-line, just-in-time information to its users.

National NTT lead agencies (UNEVOC Center) in more than one country will cooperate and share the development of the NTT tool-kit and the Electronic Information Support.

UNESCO, the ILO International Training Centre and the Colombo Plan Staff College will provide technical assistance to the project with the support of a donor.

2. Background and Justification

The international expert meetings on New Training Technologies held in Turin in December 1993 and in Manila in July 1995 analysed the training/learning problems in relation with the use of New Training Technologies in various regions of the world and in particular in the Asia and Pacific Region.

One of the major problems to be addressed is the ever increasing gap between the skills required by a rapid evolving economy/industry and the competencies provided by the educational and training system. There is a great need for training and retraining of teachers and for providing attractive opportunities for out-of-school learning. The population to be trained is geographically very dispersed, in some countries difficult to reach. There is a lack of infrastructure (equipment, facilities) and where it does exist, access is often difficult or facilities are underutilized (e.g., equipment locked, no access for out-of-school learners).

Decisions about investments and the use of NTT are being taken by decision-makers who, in most cases, have little experience in this field of continuous and rapid evolution. Instead of analysing true needs of the curriculum and various alternatives of training delivery methods in consultation with concerned trainers, investment decisions related to NTT are often taken top down, sometimes to satisfy ambitions, sometimes donor-driven and often based on foreign consultants' advice without in-depth knowledge of the local context..

On the other hand, decisions in equipping or rehabilitating technical and vocational schools as well as Universities, are taken without examining the full potential of NTT combined with new training methods.

Formal technical and vocational education systems are inadequate to serve the large mass of out-of-school learners because of their lack of flexibility to offer open and distance learning systems supported by NTT. Several studies, including those undertaken by the World Bank related to the use, costs and sustainability of educational technologies, indicate that the potential of NTT together with modern training delivery solutions could greatly improve the access and cost-effectiveness of learning. Yet, this potential remains to be fully understood and appreciated by policy makers and planners, training managers and trainers.

3. Beneficiaries and Parties Involved

To improve the potential of effective technology transfer linked with modern delivery methods there is a great need for information and training at various levels: teachers, directors of training institutions, curriculum developers, decision-makers and investment planners of ministries (e.g. Departments of Education and Labour), publishers of educational materials, suppliers of educational hard and software, project officers of donors and international financing institutions. Good decision-making related to investments and the use of NTT at the national level requires strengthening national capacity in this field.

The project aims to achieve this by supporting a team of NTT specialists and trainers (direct recipients of the project) of a leading national training institution, be it an advanced teachers' training institute in technical and vocational education (TVE) or the educational technology department of a reputed university, or a specialized consultancy enterprise.

4. General Aim of the Project

In the long run, the project should create the following impact:

- an improved decision-making process in terms of cost-effective investments in New Training Technologies of ministries and non-governmental training institutions concerned with technical and vocational education and training;

- an increased access of students/trainees to technical and vocational education and training in formal and non-formal education as well as for out-of-school learners and learners at the workplace;

- an improvement of the quality of the group and individual learning process within training institutions or via distance learning supported by effective training technologies and training delivery methods;

- a general awareness of suppliers of NTT and publishers of training courseware, of market opportunities which correspond to real domestic needs.

5. Specific Objectives

The project aims to strengthen a national pilot institution's capacity to provide the following services:

- professional consultants' and experts' services to national policy and decision-makers, including the preparation of feasibility studies and project proposals concerning investments in training technologies;
- provision of up-to-date information and statistical data related to the use and requirements of NTT to government, development aid partners, international financing institutions, producers and publishers of NTT hard and software;
- analysis of teachers' needs in developing cost-effective programmes and methods supported by NTT;
- offer just-in-time on-line professional advice and support to teachers/trainers of schools and enterprises;
- organize exhibits and demonstration sessions, possibly in collaboration with national training authorities, telecommunication companies, suppliers of training technologies, and publishers of courseware;
- training of technical and vocational teachers in the appropriate use of NTT combined with effective individual, group and distance training methods.

6. Project Outputs

6.1 *Trained national NTT expert team*

A multidisciplinary team of experts of the selected national leading institution will be trained to perform the services described under "SPECIFIC OBJECTIVES".

The team will include methodologists trained in various delivery methods for group and individual learning, including open/flexible/distance learning. It will also include technology experts trained in all available training technologies, including telecommunication-based technologies. The team will also include an economist trained in preparing investment studies, cost-benefit analysis and economic models at macro or institutional level.

6.2 *NTT tool-kit*

The project will produce a NTT tool-kit and make it available to national decision and policy makers of ministries concerned with technical and vocational education and training, directors of public and private TVE institutions and trainers.

Tool-kits may contain different types of information according to target groups:

Decision and policy makers will be provided with:

- short demonstrations of success stories, interviews of other ministers having successfully implemented changes (print, videoclip/disc);
- economic and developmental spin-offs (print, disc);
- opportunities of field visits, exhibitions, senior level seminars (e.g., EDI/WB seminars);
- budget/cost models (print or disc).

Directors of training institutions will have access to:

- short demonstrations of success stories (print, videoclip/disc);
- opportunities for study tours, field visits, exhibitions and staff development courses;
- budget/cost models (print, video);
- baseline information containing databases on peers with similar interests, NTT professionals and consultants, NTT equipment and prices, rosters of suppliers, etc. (computer networks or CD-ROM).

NTT professionals and chief trainers will be provided with:

- descriptions and technical specifications of currently available NTT (print, CD-ROM, computer databases);
- capital and operational costs of NTT (computer cost models);
- methods and framework supporting the decision-making process such as tools for the analysis of a specific training environment and the impact of alternative technology solutions (print, computer programme);
- cost calculation models and matrix for selecting appropriate technologies for specific training situations (print, computer programme);
- baseline information indicating access to peers, professionals, experts, NTT databases, roster of suppliers (computer networks or CD-ROM).

6.3 *Electronic Information Support (EIS)*

One of the outputs of the project will be to establish an on-line information system capable to provide "just-in-time" support to professionals. This system will be user-driven and will utilize existing networks such as INTERNET, BITNET, etc. to provide the following support:

- up-to-date information on new trends, technologies from manufacturers and publishers of NTT hard and software, etc.;
- examples of courseware, applications, etc.;
- names and addresses of specialists by categories, E-mail, computer conferencing menus, etc.;
- tools for decision support, project planning, etc.;
- calendar of NTT exhibits and conferences, staff training opportunities and professional attachments, etc.

7. Activities

The selection of the national lead agency (UNEVOC Center) will be made on the basis of the following criteria:

- its demonstrated leadership and recognition by other ministries, public and private sector training institutions in taking up the role of national leading institution in NTT;

- its capability to provide an organizational framework, infrastructure, the financial resources not covered by the donor contribution and, most important, the human resources required to build up a national multidisciplinary team of experts.

Once the national lead agency (UNEVOC Center) has been identified and selected for the project, it will undertake the following activities according to a detailed project implementation plan and schedule to be drawn up and updated every six months by the national project coordinator:

7.1 Appointment of the members of the project team.

7.2 Selection of progressive partner institutions in industrialized countries, and consultants to support the project.

7.3 Procurement of NTT hard and software.

7.4 Training of members of the project team.

7.5 Development of NTT tool-kit.

7.6 Development of the Electronic Information Support (EIS); establishment of network with progressive training institutions, suppliers, publishers, NTT professionals, etc.

7.7 Preparation of a strategy and plan for marketing and promoting the sales of services by the national NTT lead agency (UNEVOC Center).

7.8 Launch of information and publicity campaigns for the sale of services.

7.9 Start of the service operations of the national NTT lead agency (UNEVOC Center) according to the project implementation plan and budget:

- analyse present situation of the country in terms of needs and opportunities to introduce new delivery methods with the support of NTT. The survey should include the formal and non-formal TVE sector as well as the trainers' needs in industry and of out-of-school learners. Set up a database with collected information and statistics;
- set up a permanent NTT show and demo laboratory at the national lead agency (UNEVOC Center) with the collaboration of NTT hard and software manufacturers and the national telecommunication company;
- organize five one-week exhibitions and demo sessions in other parts of the country;
- organize information sessions for decision- and policy-makers;
- undertake feasibility studies and provide policy advice to ministries and planners of investment projects which include training technologies;
- support ministries and training organizations of the public and private sector with expert assistance in formulating and implementing projects which include innovative delivery schemes supported by NTT;
- organize courses for curriculum developers in the design of programmes supported by technology;
- organize teachers' training courses in appropriate delivery methods and use of NTT.

8. Assumptions

Here are described some factors that are important for the success of the project, but which lie outside the control of the project management.

8.1 Ministries and training agencies concerned with TVE both in the public and private sector recognize and accept the national lead agency (UNEVOC Center) in NTT and buy its services rather than hiring foreign consultants.

8.2 Bilateral donors, multilateral aid agencies and international financing institutions such as the World Bank and the Asian Development Bank use the expertise of the national NTT lead agency (UNEVOC Center) in preparing feasibility studies and project proposals requiring investments in training technologies in the country.

8.3 Legislative measures allow the national NTT lead agency (UNEVOC Center) to sell its services and to use the income for updating its equipment and know-how of its experts.

9. Factors Ensuring Sustainability

The project aims to provide an initial donor support of one year duration to the national NTT lead agency (UNEVOC Center) enabling it to launch its activities which, in turn, will enable the agency to operate on a self-sustained basis.

The lead agency will charge for its services on a cost basis in order to create sufficient income for always keeping up-to-date its NTT demo laboratory and allowing its experts to follow refresher courses abroad, to visit international exhibitions, to attend international conferences, and to pay visits to NTT manufacturers and publishers, etc.

The Electronic Information Support (EIS) must be designed to be able to operate on a basis of mutual convenience of all its users and providers of technology.

10. Institutional Arrangements

The **project** will be implemented by the national NTT lead agency (UNEVOC Center) with the technical support of UNESCO, the International Training Centre of the ILO, and the Colombo Plan Staff College.

The **NTT lead agency** of one country will also network with NTT lead agencies of other countries. Lead agencies of more than one country will cooperate and share the development of the NTT tool-kit and the Electronic Information Support (EIS). National NTT lead agencies will make staff exchange arrangements with progressive training institutions. Within the country, the national NTT lead agency will make institutional arrangements with ministries concerned with TVE, teachers' training centres, technology suppliers, publishers of educational materials, and telecommunication companies.

The **University of Twente**, Holland, will assist in the development of the EIS. **DIGITAL Equipment CTE** in Sophia Antinopolis, France, will contribute with the development of a CD-ROM of demo courseware for the tool-kit. The **ILO International Training Centre** will be responsible for the training of the multidisciplinary teams of lead agencies. The **Colombo Plan Staff College** will provide for in-the-region training and fellowship placements of lead agency staff and trainers from Asian countries.

The **project** will seek the cooperation of producers of technology hard and software, including telecommunication companies.

The **project director** will represent the NTT lead agency in national advisory boards for technical and vocational education and training.

11. Inputs

11.1 Government's input

(a) <u>Professional Staff</u>

The multidisciplinary team of the national NTT lead agency should include the following members:

- 1 national project director with experience in policy formulation and educational investments planning;
- 1 teacher with a degree in educational science and experience in technical and vocational teachers' training;
- 1 training technology professional with a degree in telecommunication science;
- 1 training technology professional with a degree in computer science;
- 1 economist with experience in economy of education.

All professional staff must be fluent in English, necessary pre-requisite for training abroad.

(b) Engineers

1 computer laboratory engineer with experience in computer maintenance and repair;
1 audiovisual engineer with experience in video and audio equipment operation.

(c) Premises and equipment

The national NTT lead agency should be selected also on the basis of its existing facilities and teaching technology, such as computer laboratory, video studio, etc. The project will complement the existing equipment with advanced computer-based multimedia and telecommunication equipment.

(d) Operational budget

The lead agency must have a budget for operating the services and laboratories with the necessary professional technical and administrative support staff.

11.2 Donor's input

(a) International consultants (including mission costs) US$ 58,000

Four w/m of various consultants in:
- open/distance learning systems management
- NTT laboratory design and operations
- consultancy services development
- follow-up mission.

(b) National consultants US$ 10,000

Six w/m of various consultants in:
- courseware development
- telecommunications
- organizational development
- NTT products specialists.

(c) Subcontracts US$300,000 (*)

For the development of high technology items of the NTT tool-kit and software and for the development of the EIS system.

(d) Equipment US$ 75,000

For completing existing laboratories with high technology NTT equipment.

(e) Training (fellowships) US$ 67,000 (*)

Training of all five members of the multidisciplinary team in Europe and USA and the engineers in the country.

(f) Miscellaneous operations US$ 20,000

Financial support for organizing NTT exhibits, for launching promotional campaigns and services of the national NTT lead agency, and for organizing the first training of trainers course at the NTT lead agency.

Total US$530,000 (*)

(*) The cost of these items and total project costs are only indicative, and may be considerably reduced if national NTT lead agencies in more than one country share development costs and the cost of training the multidisciplinary teams.

UNESCO/UNEVOC | International Training Center of the ILO | CPSC

Proposal
for a
Regional Project

REGIONAL PARTNERSHIP NETWORK TO SUPPORT TECHNICAL AND VOCATIONAL EDUCATION WITH NEW TRAINING TECHNOLOGIES

Outline of Regional Project: REGIONAL PARTNERSHIP NETWORK TO

SUPPORT TECHNICAL AND VOCATIONAL EDUCATION WITH NEW TRAINING TECHNOLOGIES

1. Background and Justification

CPSC survey of 1992 which highlighted the need of :

a) providing TVE teachers with modern teaching materials including NTTs; and
b) upgrading teachers' competencies especially in using NTTs.

2. General Aim of the Project

To improve TVE in the participating countries

3. Specific Objectives

a) To improve access to new and emerging technologies as teaching and learning resources.
b) To upgrade teacher competencies in TVE in the use of NTT.

4. Participants

CPSC (as the coordinating institution)

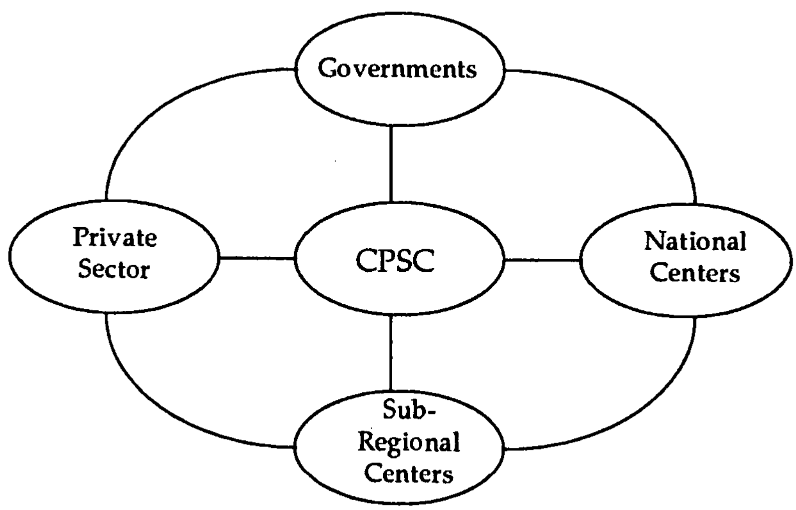
regional institutions

subregional institutions

national NTT lead institutions

private sector industry and training institutions

A schematic diagram of the regional project is given below:



5. Project Outputs

Trained key personnel in preparing NTT oriented teaching / learning resources.

Trained teacher trainers in NTT for new and emerging technologies.

Exemplary teaching learning resources, curricula, courseware, methods developed.

Established standard formats to enable the sharing of t/l resources.

Established network for sharing of t/l resources.

Operational program for the training of trainers .

(Principal Activities to be designed in accordance with expected outputs.)

6. Implementation Strategy

Setting up of a steering group for project management and monitoring.

Designating a coordinating institution (CPSC).

Formation of partnership network which includes private sector, industry, training institutions, international agencies, aid partners, etc.

Establishment of network structure including the definition of the roles of participating organizations and plan for resource sharing.

Setting a framework of agreement among network partners.

7. Inputs

Expertise

NTT equipment

Training programs for network operators, trainer of trainers, curriculum developers, etc.

SECTION B

GUIDELINES FOR THE INTRODUCTION AND IMPLEMENTATION OF NTT

1.0 INTRODUCTION

1.1 Rationale

New Technologies of Training (NTT) are powerful educational & training support. They offer cost-effective solutions and solutions to intangible problems. Since technology is for the improvement of the performance of the individual or the system, NTTs aim at providing effective and efficient training systems. These technologies offer the advantages when used under certain predefined conditions, and under those conditions they would give optimum results. This guideline document identifies such follow-up activities which are required to make the introduction of NTT a success.

NTT has global implications. Since these technologies are used extensively in business, entertainment and communications and since there is a globalization of trade & industry it is essential that the introduction of NTT must be considered as a responsibility of both global and national communities.

The economic prosperity of the countries depends upon the performance of TVET systems. Since NTT have great influence on TVET system, NTT must be adopted as a main teaching mode in TVET. Further, NTT must find a place within the curriculum of the TVET, as NTT provides necessary introduction to the other technologies being used around us.

1.2 Purpose of the document :

The guidelines are intended for use of educational planners and help them in the functions of:

- selecting suitable NTT training system for the region/country/institute,
- identifying the infrastructure to be developed and preparing plans to develop it,
- operationalizing the planned educational system.

The guidelines provide a methodology to analyze problems of education system and finding solutions through the use of NTT. The guidelines provide a broad framework, which may be modified to suit local conditions.

1.3 Objectives:

The guidelines aim at providing information and skills necessary to select, plan, and implement NTT in TVET. Specifically the guidelines will help in planning for the introduction of NTT.

2.0 GUIDELINES

Since the guidelines pertain to activities to be undertaken under different phases of a NTT project, the guidelines have been divided into 4 subsections. They are :

- **planning stage** which includes need analysis & system study
- **development stage** which includes human resource, infrastructure, & software development
- **implementation stage** where, the NTT is actually used in the TVET system
- **evaluation stage** where the NTT and the processes are evaluated for the purpose of improvements and evaluation of the impact i.e. efficiency & effectiveness of the project.

2.1 Planning Stage:

This stage will include activities such as need analysis, analysis of the present state of infrastructure and resources, formulation of goals, strategies and action plans for introducing, implementing and evaluating NTTs using standard techniques of systems analysis and design.

At this stage one of critical actions to be taken is the identification and selection of the technologies which are needed to be introduced in TVET. Technologies maybe identified and selected with the environmental context in mind.

2.1.1 Selection of the NTTs suitable for the environment:

The context of the society determines the technologies that are best suited for that context i.e. region, country and institution. The context may be defined in terms of parameters given below:

- Population

It is the target population. It may be the number of students enrolled in a college or the population of a country. The classification for population is as under:

Population < 15 million	-	Low (L)
15 million < poulation <100 million	-	Medium ((M)
population > 100 Million	-	High (H)

In the case of an educational institution the limits maybe below 1000, 3000 and above 3,000.

- Size

This is the size of the country or campus and is a measure of its spread. This determines the physical complexity of reaching every area. Often, the larger the country, the more funds are required to reach far away areas and probably higher level of technology is required.

Size < 250,000 sq km	-	small country (L)
250,000 sq km < size < 1.5M sq km	-	Medium sized country(M)
size > 1.5 M sq km	-	Large (H)

In the case of Institutions with

area < 5 Hectare	-	Small
5 < area < 15 Hectare	-	Medium (M)
Area > 15 Hectares	-	Large (H)

- Accessibility

It is the geographical accessibility of the region. Low accessibility means that it is difficult to reach the place, while high accessibility means that it is easy to reach the place. In the case of institutions also the same criteria may be applied. Generally, buildings which are closely connected can be considered as high accessible area. A campus with buildings spread over a large area may be considered as having medium access. Where a number of campus make up an institution, it may be considered as Low access.

- Communications Infrastructure

A country, where every village has access to telephone, fax, radio & television and Internet may be considered as having High communications infrastructure.

The absence of any one of these facilities may rank the country into Medium infrastructive group. The absence of two or more of these facilities may put the country into Low category.

In the case of Institutions also the same criteria may be followed. Instead of every village, we may refer to the Institution as a whole or to the sections/department, depending upon the size.

- Educational Infrastructure

The term refers specifically to the availability of teachers, curricula, buildings, instructional materials, well equipped laboratories.

The countries and institutions which use their own teachers, curriculum material and develop curricula and have adequate building are considered to have high infrastructure.

Countries and institutions which are deficient in one or two of the above components may be classified as having medium level of infrastructure.

Countries and institutions which are deficient in most of the above components may be considered as having low infrastructure.

- Financial Situation

The financial situation of a country or institution decides the capability to implement its plans and build up infrastructure. Using the standard economic measures, the status of the country may be defined as High to indicate better economic conditions and Low to indicate relatively poor economic conditions.

- Receptivity to NTT

Receptivity is a parameter which indicates whether innovations are accepted easily in the education system. High receptivity means that the NTT program will be accepted easily and low receptivity indicates that considerable efforts are needed to convince the system regarding the need to implement the project.

It also indicates the degree of difficulty one is likely to encounter in the implementation of these programmes.

- Age

Age is the average age-range of the target population of the system. Studies indicate that certain modes of learning and instructional media are not suitable for certain age groups. Since TVET system caters to a wide range of age groups, this is likely to influence the NTT selection.

The following classification may be useful.

Age	Level	Classification
14 - 18	Secondary school	Low (L)
19 - 25	College	Medium (M)
> 25	Continuing education groups, Research Students	High (H)

- Discipline of Study

The broad area or discipline of study also has considerable influence on the selection of NTT.

The disciplines which belong to the areas of Sciences, Engineering, Medicine, Agriculture and Performing Arts and which have laboratory work can be grouped and arbitrarily be classified as High. Areas like Economics, Business Management, Commercial Studies, Office Management, Hotel Management, Tourism, etc., may be grouped and classified as Medium. Areas such as Literature, Social Sciences, Educational Sciences may be grouped and classified as Low. The high & Low in this case define practical nature of the subject and is probably related also to the technological contents of the course.

- Language complexity

  In countries where multiple languages are used or where English is not understood, considerable problems are created in the implementation of NTT programmes. However, the situation where a single language is used and the language is well supported on computers & communications provides low complexity. Thus High, Medium & Low may be defined as under:

  - language complexity will be high (H) when many languages are used and the languages are not well supported by technologies

  - language complexity will be medium ((M) when two or three languages are used

  - language complexity is low (L) when single language is used or the medium of instruction is English

- Literacy

  The literacy parameter may not be significant for the target group ie TVET system.

- Other parameters may be added according to the needs.

The broad technologies which fall under NTT and which are relevant to TVET are classified under four classes namely, a) communication technology, b) video technology, c) computer technology, & d) others. The relevant technologies are given as under:

a. Communication Technology
   Radio
   Telephone
   Fax

b. Video Technology

   Broadcast TV
   Bidirectional TV (Interactive TV)
   Video films
   Video conferencing

c. Computer Technology

   CAL including multi media & networks
   ITS
   Computer conferencing
   Computer networks and Digital libraries

d. Other Technologies

   CD-I

It is important to note that the technologies listed are either new technologies or existing technologies used in a new way. In addition to these technologies, the other conventional technologies like print materials, laboratory equipment, projectors, the boards will continue to be used by the teachers in the education system.

A suggestive table of technologies and context parameters is provided in this chapter, without the values of the parameters. The table can be used to select appropriate technologies suitable for a country in the context of the parameters of a specific country.

An illustration of the application of the table through an example is also given. The desirable states of the parameter in terms of L, M, H for using telephone as a technology are listed. The current state of India is also described using the same parameters. Parameter comparison indicates that telephone system as NTT may not be suitable for Indian context.

2.1.2 Formulation of goals

A statement of goals and a description of outcome based objectives will be of great help in project formulation. This will help in keeping the main goal in focus while designing the activities.

2.1.3 Action plans

The action plans may be prepared on the format given below:

Activity Name	Starting Date	Finishing Date	Outcomes

In cases where the project is of sufficient complexity, the usual PERT & CPM techniques may be used.

2.1.4 Organizational structures

The project management is crucial to the success of the NTT project. Since NTT project involves various dimensions such as developing infrastructure, hardware & software resources, developing software, making use of the software in the educational environment of TVET, the organizational structure for project management is likely to be of multi-level structure and the suggested structure is given below:

- coordination committee which sets guidelines for the implementation, facilitates project success by providing necessary inputs and by removing
  bottlenecks, guides the project in implementation and interfaces with industry for collaborations and support.

- support structures such as Technical expert committee which provides technical guidance and support and is generally formed from professionals drawn from Academic and Industrial organizations.

- network structure such as Liaison committee which consists of members drawn from user groups and from industry. These members help smoother implementation of NTT project.

- operational structure such as teams or committees consisting of members of various groups working in the project. These committees will ensure that the goals are clear to all members, facilitate cooperation and smooth interfacing between the subcomponents, and monitor the project progress and suggest remedial measures, where required.

2.2 *Development stage*

The planning at this stage concentrates on the human resource development infrastructure and software development. The aspects which need attention are briefly discussed below.

2.2.1 Targets

The NTT project must identify the targets to be achieved. The targets may pertain to human resource development, infrastructure, software development and software utilization. The following format is suggested to workout the details.

Name of Technolology	Target			Distribution Needs (Qty)	Cost of Distribution	Funds	Funding Agency
	Activity	Quantity	Target Date				

2.2.2 Training Needs for HRD

Introduction of each of these technologies requires development of expertise in the areas of establishing/installing technologies and involving procurement of hardware and integrating the hardware; development of instructional resources; maintenance of the equipment and facilities; using the technologies and conducting research studies and monitoring.

The strategies suggested for the development of expertise are as under:

- Training programmes to be conducted by key organizations. These training programmes may cover different groups of people like policy makers, administrators, senior level personnel involved in implementation, and the technical persons involved in the hands on experience.

- Literature and kits to be provided to create awareness and expertise

- Support provided by identified key nodal agencies like CPSC through internet

- Peer group support through either joint working or through internet.

The format on which the training needs may be determined is suggested below

Target Group	Suggested Technologies	Aspects/Scope of Training	Duration	Quantity

The details of training programmes depend upon the initial level of participants and the nature of NTTs.

2.2.3 Infrastructure development & strategies

The development of infrastructure requires a variety of strategies. These include getting consultants, visits to other centers where such infrastructure exists, getting funds etc.

The following format is suggested for recording infrastructure needs.

Technology/ Facility	Materials/ Equipment	Cost	Funding Agency	Technical Assistance Sought

2.2.4 Software development and strategies

Most projects end up with the development of infrastructure and do not reach the stage of software development. Since software is what is required in the implementation of the NTT projects, great care is needed to plan the development of software. Software development is a difficult and time consuming job and often the software developers would like to retain their copyrights. The base materials from where the software is produced also may create copyright problems. Keeping all the above factors in view, the following avenues may be explored, in the order of priority, to procure/generate software.

1) Procure readily available, off shelf, software, meeting curricular needs.

2) Develop software collaborating with other groups. The collaboration will ensure greater chances of success for its use by a number of persons/organizations.

3) Participate in global collaboration for the development of software.

4) Start with simple techniques like clip-media, recording direct lectures on video and have gradual shift to more effective and more sophisticated formats.

5) Involve user groups and student groups around in the software development so that larger number of persons participate in the software development projects.

6) Concentrate on a curriculum related subjects pertaining to a discipline and develop adequate amount of software so that it attracts attention.

7) Seek private sector collaboration in either development or distribution.

2.3 *Implementation stage*

The implementation stage is to be planned very carefully and is crucial for the success of the project. The aspects of information dissemination regarding the products developed, actual dissemination of products, R & D required during implementation are to be thought over. The major problems & concerns that are likely to arise during implementation are to be taken care of.

2.3.1 Concerns

During the implementation of NTT, the organizations will face a number of problems. The anticipation of the main issues, concerns & problems and the preparedness to take necessary actions will greatly enhance the probability of success of the project and implementing agency. The list of concerns, action needed and the agency which has to take the action are to be prepared. The concerns may be thought over and grouped under the broad areas given below:

- Administration
- Financial
- Preparedness
- Technical
- Organization/management

2.3.2 Information dissemination

Information dissemination regarding the software development and products will reduce the chances of duplication in production and thus the wastage of efforts. A central agency like CPSC may take up the role of disseminating information on the developments. All the development agencies are expected to report their activities to the central agency. Using the Internet access, the information dissemination will be a fast and rewarding experience.

2.3.3 Dissemination of products

Policies need to be worked out for sharing of the products. The supply of the products through Internet from a central place like CPSC offers great advantage to all. Besides royalty/copyright fees, the other major expenditures are a media, instructional or and International postage. All this will be reduced to insignificant amount with the Internet mode of transfer.

However, it is essential to workout strategies to minimize or eliminate the royalty/copyright fees.

For this, the following mechanisms are suggested.

- Every package which is given to central repository will entitle the donor organization a certain number of free packages.

<u>alternately</u>

- Every donor organization gets a small royalty and the copyright will bewith the central repository like CPSC. CPSC will supply the materials to users at nominal cost.

2.3.4 R & D projects

Implementation of the NTT projects will involve some amount of R & D activity. It is advisable to undertake such activities in collaboration with other organizations as this will ensure the success of the projects. The Internet is an ideal choice for getting solutions on global basis. A suggested format is as under.

Project	Scheduled Start	Scheduled Finish	Importance in NTT Project	Collaboration	Cost	Outcome

2.3.5 Monitoring

Successful implementation of the project depends upon the close monitoring of the progress of the project. The purpose of the monitoring is essentially to provide mid-course correction in order to facilitate the successful completion of the project in scheduled time frame. The following format is suggested for the monitoring purpose.

Date of review	Activities & targets to be reviewed during the review period	Expected outcomes and progress of activities during the above period	Outcomes & actual progress of activities	Remarks or reasons for shorfall	Suggested corrective measures

2.4 *Evaluation stage*

Evaluation stage addresses to short term and long term impact and cost benefit ratio. At this stage we also attempt to evaluate the product and process. The standard evaluation instruments are to be designed.

3.0 CONCLUSION

The guidelines provided above may be used by organizations during the planning stage of the NTT projects. However, the guidelines are suggestive and may need modifications to suit specific needs of varying environmental conditions in which the projects are implemented. Attempt should be made to maximize the effective use of existing NTTs before early new technologies are introduced.

	TECHNOLOGIES	POPULATION	SIZE	ACCESSIBILITY	COMMUNICATION INFRASTRUCTURE	EDUCATIONAL INFRASTRUCTURE	FINANCIAL SITUATION	RECEPTIVITY	A G E	DISCIPLINE OF STUDY	LANGUAGE COMPLEXITY	LITERACY	OTHERS
I	**Conventional Technology**												
	Communication Technology												
	Telephone												
	Fax												
II	**Video Technology**												
	Broadcast												
	Bidirectional TV												
	Video Films												
	Conference												
III	**Computer Tech**												
	CAL (incl MM, & Networking)												
	ITS												
	Computer Conferencing												
	Computer Networks												
IV	**Others**												
	CD-1												

Table of Technologies & Context Parameters for NTTs

Example

The table with specific values of parameters for which **telephone** could be used as NTT is given below.

	TECHNOLOGIES	POPULATION	SIZE	ACCESSIBILITY	COMMUNICATION INFRASTRUCTURE	EDUCATIONAL INFRASTRUCTURE	FINANCIAL SITUATION	RECEPTIVITY	A G E	DISCIPLINE OF STUDY	LANGUAGE COMPLEXITY	LITERACY	OTHERS
I	**Conventional**												
	Communication Technology												
	Telephone	L-H	L-H	M-H	H	H	H	L-H	L-H	L-H	L	NA	NA

The Indian Context provides the following values for the parameters

. Population	H	. Comm Infrastructure	M	. Receptivity	L
. Size	H	. Educ'l Infrastructure	H	. Age	L
. Accessibility	H	. Financial Status	L-M	. Discipline of study	H
				. Language Complexity	L

A study of what is desirable in Indian situation indicates the factors communication infrastructure and financial situation are likely to create a problems. The problem is more critical with financial consideration. The factor communication infrastructure could also create problems, such as unreliability. Hence, the telephone based NTT may **not** be useful in the Indian context.

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MEETING SCHEDULE

APPENDIX A

MEETING SCHEDULE

Day 1 **03 July 1995**

8:00 am - 8:30 am **HOTEL DEPARTURE**: (Transport provided)

8:30 am - 9:00 am **ARRIVAL OF PARTICIPANTS**

9:00 am - 10:00 am **INAUGURAL SESSION**

Introduction to CPSC (Video Presentation)

Welcome Remarks and Opening Remarks

Dr C K Basu, Director, CPSC
Mr M A Qureshi, Representative, UNESCO
Mr Krishnan Natarajan, ILO Manila

Introduction of the Participants

Self Introduction

Introduction of Inaugural Speaker

Dr C K Basu
Director, CPSC

Inaugural Speech

Dr William G Padolina
Secretary
Dept of Science & Technology
Philippines

Introduction of Guests and Faculty Members

Prof MMR Siddiqi
CPSC Faculty Member /
Meeting Coordinator

Vote of Thanks

Dr G Intrakamhaeng
CPSC Faculty Member /
Meeting Coordinator

Commemorative Picture Taking

10:00 am - 10:30 am **Tea / Coffee Break**

MEETING SCHEDULE

Day 1 **03 July 1995**

10:30 am - 10:45 am	**ELECTION OF BUREAU** Facilitiators: Dr C K Basu Mr M A Qureshi
10:450 am - 11:00 am	**BRIEF ON THE BACKGROUND OF THE MEETING** Dr C K Basu & Mr M A Qureshi
11:00 am - 12:00 nn	**OBJECTIVES, WORKING SCHEDULE & EXPECTED OUTCOME** Discussion & on objectives, working schedules, expected outcomes Chairman Facilitators: Dr C K Basu Mr M A Qureshi
12:00 nn - 1:30 pm	**Lunch**

THEME : COUNTRY PERSPECTIVES

1:30 pm - 3:00 pm	Presentation of Country Perspectives on the use of NTT with special reference to TVET : Institutional / country experience Chairman Facilitators: Dr C K Basu Mr M A Qureshi Comments/Presentation from different experts
3:00 pm - 3:30 pm -	**Tea / Coffee Break**
3:30 pm - 5:00 pm -	**Continuation of COUNTRY PERSPECTIVES**

MEETING SCHEDULE

Day 2 04 July 1995

THEME : COUNTRY PERSPECTIVES

8:30 am - 10:00 am	Discussion of country perspectives on the use of NTT with special reference to TVET Chairman Facilitators: Dr C K Basu Mr M A Qureshi Mr Franco Campagna
10:00 am - 10:30 am	Tea / Coffee Break
10:30 am - 12:00 nn	BRIEF ON THE BACKGROUND OF THE MEETING Presentation of the report of the first expert group meeting 1994 and the proposed regional project on NTT. Mr Franco Campagna
12:00 nn - 1:30 pm	Lunch

THEME : GLOBAL TRENDS IN NTT & STATE OF ART IN NTT IN ASIA-PACIFIC REGION

1:30 pm - 3:00 pm	Tehcnologies of Distance and Flexible Education Mr Brian Standford Chairman
3:00 pm - 3:30 pm	TEA / COFFEE BREAK
3:30 pm - 5:00 pm	Trends in CAL Prof M Radhakrishna Ms Priscilla Cabanatan Chairman:

MEETING SCHEDULE

Day 3 05 July 1995

THEME : REGIONAL AND GLOBAL COOPERATION FOR EFFECTIVE AND ECONOMIC USE OF NTT FOR TVET

8:30 am - 10:00 am	**Needs of International Cooperation for Developing T/LR's Using Computers** **Prof Jiro Yoshio**
10:00 am - 10:30 am	**Tea / Coffee Break**

THEME : PERSPECTIVES OF PRIVATE SECTOR AND INDUSTRIES FOR NTT AND THEIR ROLE IN PROMOTING NTT FOR TVET

10:30 am - 12:00 am	**Current Computer Technology, Directions, and Necessary Skills to Compete in a Computer Literate Workforce** **Mr Barry Crist** **Chairman:**
12:00 nn - 1:30 pm	**Lunch**
1:30 am - 3:00 nn	**Advanced Technological Systems in Education for a Market-Oriented Vocational and Technical Training** **Mr Alessandro Gava** **Chairman:**
3:00 pm - 3:30 pm	**Tea / Coffee Break**
3:30 pm - 5:00 pm	**ROLE IN PROMOTING NTT FOR TVET** **Using Computers in Vocational Education and Software Sampling** **Mr Barry Crist** **Chairman:**

APPLE EXHIBITION AND COCKTAIL

MEETING SCHEDULE

Day 4 **06 July 1995**

GROUP WORK SESSIONS: **PROBLEMS & ISSUES IN NTT WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES IN ASIA AND THE PACIFIC**

8:30 am - 10:00 am	**Briefing Regarding Group Work and Formation of Groups & Groupwork** **Chairman:** **Facilitators:** **Dr C K Basu** **Mr Franco Campagna** **Mr M A Qureshi** **Group work:** **Group: 1) preparation of guide documents for implementing NTT.** **Group: 2) developing a frame work of a regional project on NTT for further strengthening national capacities for effective and economic use of NTT for TVET** **GROUP WORK**
10:00 am - 10:30 am	**Tea / Coffee Break**
10:30 am - 12:00 nn	**Continuation of GROUP WORK**
12:00 nn - 1:30 pm	**Lunch**
1:30 pm - 3:00 pm	**Continuation of GROUP WORK**
3:00 pm - 3:30 pm	**Tea / Coffee Break**
3:30 pm - 5:00 pm	**OPEN FORUM / DISCUSSION ON GROUP WORK** **(Guide Document, Regional Project, and Recommendations)** **Chairman**

MEETING SCHEDULE

Day 5 07 July 1995

8:30 am - 10:00 am	**PRESENTATION OF THE GROUP REPORT**	
		Group Work Representatives
10:00 am - 10:30 am	**Tea / Coffee Break**	

CLOSING SESSION

10:30 am - 12:00 nn	**Presentation of the Draft-report of the Meeting and Recommendations**	
	Discusssion and adoption.	
		Chairman
	Remarks	
		UNESCO: Mr M A Qureshi
		ILO: Mr Franco Campagna
	Valedictory Address	
		Dr Erlinda C Pefianco Undersecretary, Department of Education Culture and Sports Government of the Philippines
	Vote of Thanks	
		Dr C K Basu Director, CPSC
12:00 nn - 1:30 pm	**Brunch**	

BON VOYAGE!

WELCOME REMARKS

by Dr C K Basu
CPSC Director

Honorable Secretary, Department of Science and technology Dr **WILLIAM G PADOLINA**
ILO Deputy Director in the Philippines, Mr **KRISHNAN NATARAJAN**
UNESCO Representative from the regional Office in Bangkok, Mr **M A QURESHI**
Distinguished experts, guests and Faculty Members of CPSC,

It is indeed my honor and great pleasure to welcome you all on behalf of the Colombo Plan Staff College and on my own behalf to this International Expert Group Meeting on *New Technologies of Training for Technical and Vocational Education.* The Meeting is jointly organized by UNESCO, ILO and CPSC.

Fifty years ago last week, the UN Charter was signed. That was the beginning of a new era in human history. The UN symbolized the age-old dream of peace and international cooperation for progress. Forty-six years ago, the Colombo Plan was founded for social and economic development in the Asia-Pacific region.

During the last four to five decades, the world has changed almost beyond recognition. The Gulf War has ended, the Berlin Wall has fallen. Trade barriers are being removed slowly through the World Trade Organization (WTO). Most colonized countries in the world have become independent. The Asia Pacific economy is growing at a sustainable seven to eight percent a year.

Last Thursday, the commander of the Russian Mir space station shook hands with his counterpart aboard the US space shuttle when the two crafts engineered a historic link-up in orbit. All of us could see this spectacular scene through the television in our bedrooms.

These are the positive sides of the picture, yet there are so many contradictions in the world in which we live. Today, poverty remains a major concern in many countries. In absolute numbers, there are more illiterates today. The rate of unemployment is rising in most countries. Available skills are not matching the demand. People lack skills to utilize their full potentials. Workers are handicapped for not being able to update their skills. The environment is polluted. These contradictions and challenges need to be addressed.

Technical and vocational education can play a crucial role in developing human resources to face these challenges provided we take bold and imaginative steps today.

Over the last twenty-two years, CPSC with he support of the member countries have continuously and consistently followed the path of developing human resources for technology transfer in the Asia-Pacific region.

During the last two decades, we have witnessed unprecedented developments in computer technology, space technology and communication technology. Most Asian countries are experiencing the novelty of Internet, E-mail and satellite television and video outbursts. We have already started driving on the information superhighway. These technologies enable us to face a number of challenges in providing technical skills for increasing the number of technical and vocational education teachers and students. The technology provides opportunities for continuing education and training.

And most importantly, it could become more cost-effective and affordable for developing countries if we all work together with clear objectives and with a spirit of partnership.

In this Meeting we have:
1. experts from the academe
2. planners from Ministries of Education and human resource development in the member countries
3. manufacturers and industries producing new technologies of training
4. non-governmental organizations engaged in NTT, and also
5. donors and sponsors

This is just about a grand alliance to achieve the objectives we have set. UNESCO, ILO and CPSC have joined hands together in a spirit of partnership for the benefit of all the member countries in the region. In today's global village the essence of achieving goals is through effective partnership and meaningful cooperation and teamwork.

I thank UNESCO and ILO for giving this responsibility to CPSC to organize this meeting. I thank the Government of the Republic of the Philippines, particularly its most dynamic Secretary of Science and technology, Dr Padolina, for providing all-out support to CPSC. We hope to have our own Internet soon to further strengthen this cooperative partnership. With your expert advice and hard work over the next five days, I look forward to very useful outputs from the Meeting. I wish you all a very pleasant stay in Manila.

Mabuhay!

APPENDIX B-2

Opening Remarks
by Mr M A QURESHI
Programme Specialist, UNESCO PROAP

Dr **WILLIAM PADOLINA**, Secretary, Department of Science and Technology; Mr **KRISHNAN NATARAJAN**, Deputy Director, ILO Manila; Dr **C K BASU**, Director, CPSC
Distinguished participants, resource persons, Faculty Members of CPSC
Ladies and gentlemen

It is indeed a great honor and a privilege for me to extend to you all a very warm welcome on behalf of UNESCO on this auspicious occasion of the opening of the International Expert Group Meeting on New Technologies of Training for TVE. Dr Padolina, we in UNESCO are extremely grateful to you for having found time in spite of your heavy preoccupations to be with us at the opening of this meeting and to enlighten us with your views on this subject. We regard this as your deep commitment to education and training and view your participation as a source of encouragement and guidance for all of us attending the meeting.

This workshop as we all know is being organized by UNESCO under its International Project on Technical and Vocational education generally known as UNEVOC in cooperation with the International Labor Organization and Colombo Plan Staff College for Technician Education in view of their significant interests, roles and professional contributions in this emerging area of importance in TVE. This project, UNEVOC, has been launched by UNESCO as of July 1992. The project is designed to create more effective working relationships between UNESCO and other UN specialized agencies, ILO, regional organizations, NGOs, public and private funding agencies and last but not the least, the private business community. The project basically contributes in promoting exchange of information and experience among the Member States in order to make TVE better articulated with national education systems. The overall aim of the project is network policy planning, teacher training and technical institutes, specialized institutes such as CPSC, SEAMEO VOCTECH and teachers, schools and students throughout the world in a bid to assist in reducing the gap between North and South in building human resources for development. UNEVOC is an example of new thinking pointing towards an involvement of the wide civil society in education and training.

In Asia and the Pacific region fifteen Member States are already cooperating effectively in the UNEVOC Project through their specialized institutions, expertise and resources. It is gratifying to note that the Asia Pacific region currently is leading all other regions in the implementation of UNEVOC programs, thanks to the generous support and contributions of the participating Member States and their specialized institutions and resources which are UNEVOC's greatest assets. The project in our region was launched in December 1993 from the launching pad of the Adelaide Institute of TAFE. This meeting laid the basis of cooperation between UNEVOC network institutions, determining the role of cooperating

UNEVOC centers, identifying national case studies to promote articulation between TVE and the world of work and proposing curricular projects to strengthen the infrastructures of TVE in the Member States.

It is indeed very reassuring that the region has completed and disseminated widely its experiences in the form of thirteen national case studies on the role and functions of TVE in national development in cooperation with the Royal Melbourne Institute of Technology (RMIT), Australia. In addition, national profiles of twenty-one Member states have been completed jointly with CPSC.

A regional framework with recommendations for the reform of TVE systems has also been prepared. An Exemplar Curriculum Manual for Entrepreneurial Skills in Small Business has been produced which has already been adapted by a number of Member States. A guide-book on TVE Curriculum development has also been compiled together with the examples of best practices available in the region. A regional curriculum clearinghouse has been established based on the combined resources of two specialized institutions in the region which is now actively engaged in providing electronic networking of UNEVOC centers based on available technologies to enable effective exchange of materials and documents..

This Meeting on New Training Technologies in TVE has its genesis in an earlier expert meeting on the subject organized by UNEVOC in cooperation with the ILO Turin Center in 1993. For us in the region it is time we concentrated on this subject in view of the spectacular achievements of the region as a whole which has started to show the signs in the decline of the absolute numbers of adult illiterates, which stood at approximately 900 million in the beginning of the 90s. As a result a number of Member States are already looking beyond basic education to areas like technological literacy and providing know-how and skills for people to cope with the rapidly increasing influence of technology in society. NTTs have the potential of contributing to a larger extent to the development of both the necessary attitudes and educational opportunities for life-long learning and extending the outreach of formal systems of education in a cost-effective manner.

This expert group will deliberate extensively on strategies of facilitating the transition of our systems of education through NTT to cope with emerging challenges of population growth, environmental degradation and ways of improving the quality of life and resolving the crisis in human values. This is a gigantic task. Given the splendid resources and expertise in the region we do hope we shall be able to come up with agreements on guidelines to be used by Member States for the purpose.

Mr Chairman, before I conclude, may I once again thank CPSC, ILO, the Government of the Philippines, the Philippine National Commission for UNESCO and our distinguished delegates and resource persons for cooperating with us and joining us in this stupendous task.

Thank you.

MESSAGE

by Mr Richard Szal
Director, ILO Manila Office

I wish to thank you for your invitation and for this rare opportunity to be with distinguished participants in the field of technical and vocational education this morning and to give the message in connection with the opening of the five-day activities of the UNESCO/ILO/CPSC International expert Group Meeting on New Technologies of Training for Technical and Vocational education.

I also wish to express our sincerest thanks and deep appreciation to the Colombo Plan Staff College (CPSC) for organizing this expert group meeting. This meeting has brought forward the collaboration of three institutions, namely: CPSC, UNESCO, ILO in particular the International Training Centre in Turin, Italy, together with member countries/institutions involved in Human Resources Development in the region.

We are aware of the role of the International Training Centre of ILO at Turin in Italy. The Centre has changed tremendously lately. But aside from the work of the Turin Centre with vast facilities, ILO's concern for technical and vocational education in the region in the past three decades is well known and continues to be promoted by our multi-disciplinary teams under our active partnership policy and by a program called APSDEP (Asian and Pacific Skill Development Program). In the Philippines, the Department of Labor and Employment's TESDA (the newly established Technical Education Skills development Authority) has played a vital role in convening the APSDEP Lead Institutions of the Asia Pacific Region for a programming meeting early this year in Manila.

The globalization of economy and liberalization of trade has ushered in a new era of technological innovation and training strategy. In a highly competitive global economy adopting new technology for training is the need of the day. Therefore, the organization of this group meeting on new technologies of training for technical and vocational training is very timely and most appropriate.

On behalf of the ILO, I wish you all a very enjoyable discussion an exchange of views and a successful meeting.

I thank you.

INAUGURAL ADDRESS

by Dr William G Padolina
Secretary, Department of Science and Technology
Philippines

Acknowledgment and greetings ...

It is my pleasure to speak before this distinguished gathering of experts and supporters of human resources development. This meeting is very timely as it gears to define objectives and strategies of viable human resource development programs, specifically in the area of technical and vocational education which many countries, including the Philippines, is harnessing for industrial development.

We, at the Department of Science and Technology, share in your belief that the human resource dimension is a critical factor in measuring any degree of national development. In the last half of the century, this dimension has risen to center stage as more governments look into their human resource base as the major capital stock for industrialization. As shown by the experiences of the tiger economies of Asia, industrialization necessarily calls for appropriate market-oriented policies and a strong emphasis on the development of skilled technical manpower and indigenous technological capabilities.

In this era of global competitiveness, the development of human resources is ultimately manifested in the emergence of a skilled labor force imbued with a genuine work ethic and an entrepreneurial class that can seize market opportunities and motivate its workers to reach new heights of productivity. This can only proceed if society invests in human capital and technology upgrading through education, on-the-job training, research and development activities, and adequate health and nutrition services.

In a world that is becoming more and more technological, it is critical to size up the implications of these technological. changes to the human resource base in terms of the nature, level and quality of skills required. These changes have significant impacts on the skills profile in the production sector. In recent years, there has been considerable restructuring of the production systems to increase efficiency and productivity. Automation has been introduced in many industries, along with more skill-intensive manufacturing processes. These changes will certainly demand higher skills and abilities in the workforce.

At this point, I would like to emphasize the need for baseline information on the effects of technological change in the production systems for this will be very useful in the formulation or re-direction of thrusts in skills development.

In the quest for quality technical and vocational education, it is important to strengthen the partnership between government and industry, between employers and unions, if we want to be highly competitive. We need to harness partnerships between government and the private sector to create a more conducive environment for skills development. Private sector participation in this endeavor is a must to effect a multi-skilled manpower base which can keep pace with the dynamically changing needs of the industries.

DOST adheres to the timeless principle of investing on the human workforce to effect development. The science and technology support to the PHILIPPINES 2000 program on people empowerment and global competitiveness includes the development of skills and inculcation of proper attitudes to attain empowerment and increased productivity.

In consonance with this, we consider the development and training of high caliber science and technology manpower as our greatest investment in enhancing the country's productivity level. We have laid down the blueprints for the development of the country's scientific and technological workforce.

Aside from the scholarships we offer in the secondary up to the post-graduate levels, we also support programs on technical and vocational education. We are continuously collaborating with the education department to upgrade technical and vocational schools nationwide, along areas wherein technology application will be utilized. We strongly recommend a dual program on school training and factory apprenticeship to create a more adaptive and flexible workforce for the production sector. This dual program will provide our workers with both the manual, adaptive skills and the more innovative thinking skills.

We also have established the DOST Technology Training Center or DTTC as a supplementary program for the development of highly skilled technical manpower. The Center designs and conducts trainings and seminars to strengthen the transfer of technologies.

People in the countryside now have more access to our trainings and technologies through the provincial science and technology centers established nationwide.

At present, the DTTC offer courses on metals engineering, foods, nuclear technology, meteorology, health, forest products utilization, ceramics, industrial technology, agriculture, and textile, among others.

Another notable contribution of the DOST is the establishment of the first Integrated Circuit Design Center in the country. The Center is now ready to serve manufacturers and researchers in the electronics industry to enhance their capabilities through training activities.

Amidst the challenges and opportunities we face today, we need to be more innovative in planning and designing our technical and vocational education programs to maintain our competitive edge in the global economy. This deserve no less than providing the appropriate policy and economic environment for skills development, including the streamlining of training delivery systems to make them more effective in catalyzing people empowerment. I hope that we will all equally share the challenge of improving quality, productivity and practice in skills development.

May you have a pleasant and productive meeting.

Thank you and good day.

APPENDIX B-5

CLOSING REMARKS

by Mr M A Qureshi
Programme Specialist, UNESCO PROAP

Dr Pefianco, Undersecretary, DECS, Dr Basu, Director CPSC, My very dear friend Franco Campagna from ILO, distinguished colleagues, Faculty Members of CPSC, ladies and gentlemen,

It is indeed a great honor for me to welcome you to this valedictory session of the International Expert Group Meeting on New Training Technologies for Technical and Vocational Education on behalf of UNESCO which we have convened in cooperation with ILO and CPSC.

We in UNESCO are highly indebted to you, Dr Pefianco and we wish to express through you our gratitude to the government of the Philippines, the Philippine National Commission for UNESCO, in particular for facilitating the holding of this international expert group meeting at CPSC. For us your presence here this morning indicates to us your deep commitment to the cause of technical and vocational education, and for all of us, it's a lot encouragement in our work.

This meeting, Dr Pefianco, which UNESCO organized under its new international initiative, the International Project on Technical and Vocational Education more widely known as UNEVOC is considered by us at UNESCO as very important in the context of the diverse nature and magnitude of the problems of our region as a whole at the turn of the present century and the present millennium, as compared to other region of the world. In terms of the global scenario as we all know our region represents about two-thirds of the world's population. It has a largest reservoir of manpower anywhere in the world. If properly harvest, it would be our greatest asset. Unfortunately, however, we still house about three quarters of the total of number of adult illiterates in the world. The redeeming feature for us at the present moment is the fact that the absolute number of adults in the region has, beginning the 1990s, started to register a decline and the countries are already looking beyond basic education. Technical and vocational education and training is being assigned comparatively higher priority in view of its promise and potential of providing the countries the competitive edge and the cutting edge to increase national productivity and enable us all to participate effectively in the global markets, as very rightly pointed out by Brian Stanford.

Dr Pefianco, UNESCO under its project UNEVOC is striving to encourage participating UNEVOC centers, many of which are represented around the table, to network among themselves and exchange experiences, curricula and materials for the reform of their systems of technical and vocational education. Since its launching only two years ago, the project has made tremendous progress in promoting a professional dialogue among the centers and production of important documents such as exemplar curricula, a guidebook for technical and vocational education curriculum development and more recently, the establishment of a regional curriculum clearinghouse and documentation center networking through available technologies.

The strengthening of the technical and vocational education systems of our region, with the integration of the new training technologies is regarded by UNESCO and it partners ILO, CPSC, SEAMEO-VOCTECH and other such agencies working in the region, as extremely important, relevant and urgent for our region. The new training technologies provide us in our part of the world with both the potential and the challenge of extending the outreach of our systems in a cost-effective manner. This meeting, you will be very happy to know as my colleague and friend Brian Stanford has just briefed you, has produced guidelines for introducing new training technologies in national systems and launching national and regional projects in cooperation with bilateral and multilateral funding sources and the private sector for improving the access and quality of our systems of technical and vocational education.

Dr Pefianco, we expect in UNESCO, ILO and CPSC to continue to count on your continued support for these initiatives and on behalf of UNESCO, I thank you once again for your presence amongst us this morning, which a source of great encouragement for all of us.

Thank you very much.

CLOSING REMARKS

by Mr Franco Campagna
ILO Turin Center

Dr Pefianco, dear colleagues, distinguished participants,

We have conducted together a week of hard but extremely interesting work, the end-product being this report. It is the visible part of our common effort; its content reflects extensive debates, discussions as well as silent work behind the scenes. I would like to thank Dr Basu and his team for producing this draft report for us to read it before our departure.

However, let us sit back a moment and reflect on what is going to happen now, because the success of this meeting should be measured on the basis of the impact it will have in generating changes in the years to come.

We have quite a good geographical spread represented at this meeting and I assume that each one of us expects some impact of this meeting. We analysed problems and made suggestions. Ten recommendations were formulated, two project proposals (a national and a regional project) were worked out, and a guideline prepared: it is an enormous achievement!

What will our chores be from now on in implementing the recommendations, accomplishing the two projects, and using the guidelines? What will our role be in stimulating and diffusing, among our collaborators and other interested parties, the results of the work completed during this meeting? I am a man of action, therefore I believe in meetings and training sessions only if they are useful, realistic and likely to generate some kind of change or improvement, otherwise it would be a waste of time and efforts.

We all are the main actors in this meeting and it depends upon us to bring recommendations into life through the organizations which we represent (CPSC, UNESCO, ILO) and, most important, the ministries and organizations which **you** represent. However, ministries of education are not the only ones concerned with technical and vocational education: other ministries and organizations should also benefit from our initiatives. We also need to gain the support of the private sector. How can we get these other actors involved in generating the changes, in implementing the recommendations we made here?

We are going back to our offices, to our homes. Our daily work is waiting for us. The in-tray has piled up. The first concern is how to get rid of the in-tray. But then we should also devote some time to brief our collaborators on what has happened in this meeting, to raise their awareness, to invite them to participate in our task. All of us need to make an effort in implementing the recommendations and the proposed projects. What can and should we do? We have discussed it in our working group, but I believe it would be useful to mention it very briefly also to the other participants. To take actions for implementing the national projects, in this case UNEVOC projects, should be the responsibility of the ministries of education. You can help in acting as a catalyzer, in discussing the draft project with your colleagues within the ministries so that it suits exactly your local conditions, and then route it through the proper channels, through the national authorities which are responsible for coordinating technical assistance.

Another most important factor, as Dr Basu said earlier, is to identify whether the national project can fit into already existing investment and technical assistance programmes. Usually some of these programmes or projects are quite large and include important technical assistance components (such is the case, for instance, of some investment projects funded by the World Bank or the Asian Development Bank). I would therefore suggest to find out whether our project could be integrated into an already operational project, which sometime would require minor revisions to the project budget with the agreement of all parties concerned.

For the regional project proposal further development work would need to be done. The main ideas are reflected in the report of this meeting but now they must be given the format of a project document. The CPSC should take the lead in developing the project proposal with our support.

I want to conclude with my hope to be able to participate in the third NTT meeting which may be held in one, two or three years' time. The next meeting should be targeted to assess the outcome of the recommendations of this meeting and to evaluate the projects which were suggested and discussed during this week.

Thank you.

VALEDICTORY ADDRESS

by Dr Erlinda Pefianco
Undersecretary, Department of Education, Culture and Sports, Philippines

Thank you very much Dr Basu for the introduction.

I must rise because I feel I must give recognition to this very important forum. I must give recognition to the very distinguished members, international experts who have come to attend this forum. I must also give recognition to the outcomes and conclusions of your five-day conference, which from what I hear, was very successful indeed. But let me start however, by saying that we in the Philippines, if I may quote our own president, are not only just back in business in the heart of Asia, that was a year ago. But just a few days back when our president gave his report to our people, which is the informal state of the nation address, he said and I want to share this with you very proudly, that the best is yet to come. So we are back in the Philippines, we are back in business, and there is still more of the best in the Philippines that will come. This is very fortunate because now that the president has completed the first half of his administration, we have more or less resolved our problems on peace and order. Mindanao is still a problem but this is something we are facing, and I think will be resolved to the satisfaction of all parties. We have, as you know recovered, and while before we have a negative growth rate, we are on the right track, and we will surely emerge as the next miracle of Asia.

But that being said, the best side and this is what the president mentioned, will be that the now the Philippines is focusing on human resource development. The president did say that in the last half of his administration, we are going to make sure that our human capital is developed. And I mentioned this because the topic that you have chosen for your conference on the new technologies of training is exactly what we want to do in our country, similar perhaps to what you are also doing in your countries. I also mention that here, we have gone into a lot of structural changes. Our educational system has been restructured through legislation perhaps to focus more on particular mandates of the system. The Educational Commission headed by Senator Angara and some of our leaders in Congress came up with new agencies. For example now, what used to be the Department of Education, Culture and Sports has been divided into three agencies. At the apex, handling tertiary degree programs is the Commission on Higher Education. Below that which is the foundation, that handles primary and secondary education which is my department is the Department of Education, Culture and Sports. At the middle, and this is what the always president refers to as the most important level. So at the middle of that triangle is now technical and vocational education and training which is now being placed under the supervision of a new agency, which is called the Technical Education Skills Development Authority or what we call TESDA for short chaired by the Department of Labor and Employment Secretary so that we can have the correct link to industry and businesses and employers and labor unions, and co-chaired by the Secretary of Education, Culture and Sports so that there is now the clear articulation between the foundations of technical and vocational education, from the primary to the secondary, all the way to post-secondary education. This is where we are now. We are at the crossroads of something exciting happening in human development formation in the country. I also would like to share with you that we are anchoring all these reforms on two policies.

One is a policy of liberalization and the other is a policy of modernization. So when we speak of liberalization, for our friends for example from the private sector, we are saying you will be left on your own. You want to offer this kind of training and education, go ahead, provided you are able to respond to what industry needs. And we think that by so doing, there will be a better fit between what we graduate in our tech-voc schools and what our industry needs. Our industry people here in the Philippines are very active. They participate very closely even in the designing of our curriculum. We have what we call a DACUM project where the design of a curriculum in our tech-voc schools are drawn not only by people in the academe, but jointly with people in industry. So that will make sure that the course that is being offered will really tailor-fit what they need when our graduates go to their firms or to their factories. In fact, we also have a very good program with them, which we call Teacher-Industry Attachment program. As you know, people in the academe do not always have the benefit of exposure to the factories and to the job sites. So what we do, and this is very kindly offered by our friends in industry, is have our teachers in tech-voc schools during the summer months go to the factories and job sites, and there they are able to see, first-hand, what is really happening. Hopefully, they bring that back to their classrooms. Of course, once in a while we lose some of them to industry. But I think we have already been able to come up with some understanding that if they do not stop pirating our teachers, they'll never get good graduates. So I think that has now been pretty threshed out. I think that this is the same problem you probably have in your own countries, with the salaries of teachers being really much less than what they can get, given their qualification if they join industry.

The other policy framework is one of modernization. And again, here is where we look at the new technologies that are emerging. I will not go into what these are or what we're doing here, except to say that any approach, any new strategy that will help make sure that we improve the teaching of vocational education as well as its training is something that our government fully supports. And therefore we are now saying that we have to modernize. we have to equip our schools. We have to give our teachers the best kind of training that is possible. And that is why we are very active in participating in programs such as those offered by CPSC, because we think that this is the only way to go to make sure that our teachers' expertise and competence will really be up to date. So on the challenge of change that has been articulated in this conference, and I think that is a challenge that is facing all of us in all our countries, now that we are entering a global world, now that we are talking about global competitiveness, now that we are talking about everything that will make this world really an open world.

We also would like to say that it is very important that as we push development, the culture of our own people must never be sacrificed. And therefore, in the Philippines, while we talk about pushing science and technology, at the same time, we want to balance it with emphasis on humanities and the arts. There must still be somebody who will just be looking at the stars, enjoying the flowers, enjoying the view. Not only on science and technology, this is very important, the culture of our people must still remain. While we look at globalization, the question is, how about indiginization? And I'm sure this conference addresses it all.

In conclusion I would like to thank you for bringing the conference to the Philippines. I am sure that our country, government and people will be able to get a lot of inputs from the conclusions and recommendations, ten of which you mentioned was arrived at in this conference. I know that we will discuss all of the conclusions of this meeting with our own people at the Department, also at TESDA. Because like you, we want this conference to be something that does not end with the closing ceremonies here, but something that begins only as we close this program and as we go back to our own stations. I hope that you will go home and have fond memories of our country and people, and we hope that you will come again and have some conferences in our country. Thank you very much and *Mabuhay*!

APPENDIX C

PAPERS PRESENTED

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

VOCTECH'S POLICY ON VOCATIONAL AND TECHNICAL EDUCATION DEVELOPMENT IN SEAMEO MEMBER COUNTRIES

By: *Bernardo F Adiviso*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

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VOCTECH'S POLICY ON VOCATIONAL AND TECHNICAL EDUCATION DEVELOPMENT IN SEAMEO MEMBER COUNTRIES

Bernardo F. Adiviso
Deputy Director
SEAMEO VOCTECH

I. INTRODUCTION

The Regional Centre for Vocational and Technical Education (or VOCTECH) was established on 28 August 1990 with the signing of the Memorandum of Understanding between the Government of Brunei Darussalam, the host country, and the Southeast Asian Ministers of Education Organisation (SEAMEO). The establishment of VOCTECH was the result of a feasibility study conducted in 1988 which found that SEAMEO Member Countries[1] had common needs in vocational and technical education that were not sufficiently met by existing resources.

The Centre is one of the 12 regional centres which operates as a subordinate body of the SEAMEO with the power to carry out activities for the fulfillment of its mandates. The other centres which are mainly hosted by member-countries of the ASEAN have distinct purposes or **raison d'etre** such as educational innovation, higher education, archaeology and fine arts, science and mathematics, graduate education in agriculture, tropical medicine and English as a second language.

II. MISSION AND GOALS

The policy on developing the vocational and technical education (VTE) systems of the SEAMEO Region is clearly embodied in the mission and goal statements of VOCTECH.

A. Role Statement

The role of the Centre is to identify and help solve common problems within SEAMEO Member Countries in the field of vocational and technical education. To this end, the Centre has identified three main roles:

- to act as a catalyst and innovator;
- to serve as a clearinghouse; and
- to act as a resource centre.

In the pursuit of its roles, the Centre assumed three major functions, namely: staff development; research and development and management information systems development. Figure 1 illustrates the major roles of the Centre and the means of carrying them out through training programs, conferences and workshops, multi-sectoral fora, surveys and developmental projects, consulting service, formation of clearinghouses, referral service, and publications.

[1] SEAMEO was founded in 1965 as a regional inter-governmental as well as an international organisation. Its Member Countries include Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand and Vietnam.

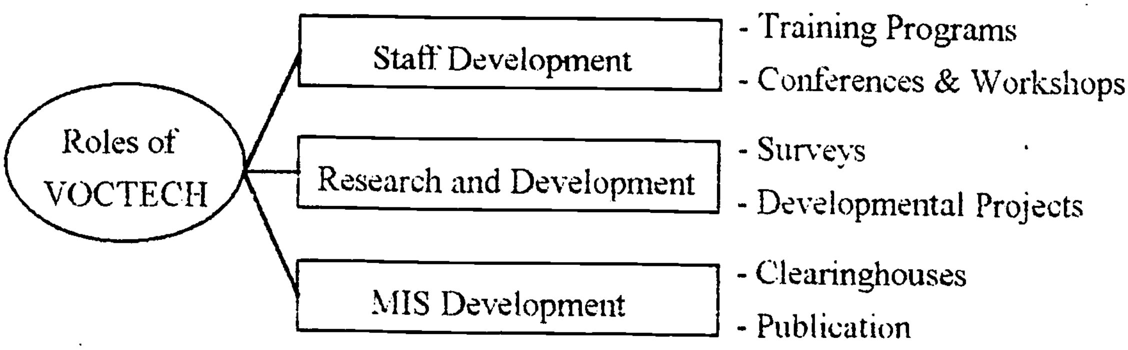

Figure 1 Roles of VOCTECH

B. Goals

Pursuant to its mission, the Centre established internal targets focusing on four strategic issues:

- Identification and selection of suitable participants to the staff development programs in order to guarantee success in helping to solve common problems of Member Countries;

- Provision of relevant, effective and useful programs for the improvement of vocational and technical education in order to contribute effectively in human resource development;

- Development and strengthening of the management capability of the Centre in order to respond quickly and effectively to the changing needs of Member Countries; and

- Ensuring of continued financial viability of the Centre.

III. POLICY STATEMENTS AND THRUST

A. Policy Statements

The Centre's commitment to developing the vocational and technical education systems of Member Countries is further strengthened by the following policy statements related to programs and services and program linkages:

1. Programs and Services

- VOCTECH will provide the education and training services as stated in its mandate and will allocate funds for the delivery of those services.

- VOCTECH will clearly articulate the profile of the candidate who is most likely to benefit from a particular training program.

- Each candidate will be consulted with respect to his/her training needs and interests and a training plan will be tailored to meet those needs, within the parameters of the program offered.

- Home institutions will be provided with a "Letter of Agreement" which will identify the training terms and obligations of the Home Institution, the Candidate, and VOCTECH.

- A directory of all VOCTECH graduates will be compiled, published and regularly updated and made available to alumni, future candidates, and participating and interested institutions.

- All VOCTECH programs and services will be evaluated by facilitators, participants, users, and where possible by external experts.

2. Program Linkages

- VOCTECH will build and maintain working relationships with a variety of vocational and technical education representatives from across all the participating SEAMEO countries.

- VOCTECH will be proactive in establishing program linkages with regional, national and international institutions, outside of the SEAMEO region.

- VOCTECH will develop a graduate tracking system and provide graduates with an alumni network system to remain current and develop new contacts in their vocational and technical fields.

B. Strategic Thrusts and Objectives

In addressing the long-term needs, the first Five-Year Development Plan (1994 - 1999) of VOCTECH focused on improving the vocational and technical education management capability of SEAMEO Member Countries. Consistent with this thrust, the specific objectives of the Plan are stated as follows:

1. Design and implement models of assessing staff development needs and innovative staff development programs and regional fora for the public and private sectors;

2. Institutionalise Research and Management Information Systems (MIS) as major tools in decision-making;

3. Produce and disseminate information and other resource materials which are particularly relevant to the thrust;

4. Establish and strengthen consultation and collaboration linkages with public and private sector organisations and institutions within and outside the SEAMEO Member Countries;

5. Improve resource capability through acquisition of physical facilities. solicitation of technical assistance, staff recruitment and engagement in income-generating activities to increase its services; and

6. Design monitoring and evaluation strategies for assessing institutional, national and regional impact and cost-effectiveness.

IV. THE USE OF NEW TECHNOLOGIES

A. Computers for Hands-on Training

The use of the new technologies of training (NTT) at the Centre is quite phenomenal. The acquisition of information technology (IT) facilities , i.e., personal computers, fax machine, PC compatible projectors, laser and color printers. VCRs, video camera, duplicating/sorting machines has been continuous since the formal start of training programs in the middle part of 1992. In addition, IT equipment with multi-media capability, which is a part of a technical assistance/grant, is scheduled for delivery this year or early next year. Essentially, the acquisition of NTT has to be done because almost all of the training courses held at the Centre require computer hands-on and MIS development. Totally, it is a part of the planned resource-capability building program of the Centre.

The Centre established a computer training laboratory with local area network (LAN) for the hands-on training of course participants from member and non-member countries. In addition, this facility becomes extremely useful to course participants in the preparation of their in-country/follow-up projects which is a standard requirement for course completion. Presently, the Centre is at a stage of establishing a regional network for VTE comprising mainly collaborating organisations/institutions from eight Member Countries. Such project will not only be mutually beneficial for information generation and decision-making purposes but useful for process simulation during course training.

B. Course Presentation

The use of NTT is significantly observed in the conduct of training courses at the Centre. Presentations of consultants, resource persons, staff and even course participants during course programs and conferences are done with the use of application softwares such as Microsoft Power Point 3 and 4 and Astound. This shift from the traditional style was encouraged in order to make the Centre up-to-date with the emerging technologies in human resource development and, more importantly, to introduce innovation which may improve training methodologies and strategies at the Centre in particular and in the SEAMEO Region in general.

C. A Plus Factor

There are good indications that encourage the use of NTT at the Centre as well as its exploitation for improving teaching-learning strategies in VTE in Member Countries. Firstly, the cost of procurement for IT equipment has gone down tremendously due to the reduction by the Brunei Government of import duties/tax from 25 per cent to nil. Another reason is the possible launching of a national network (BruNet) before the end of this year which would provide access of the Centre to the Information Highway- **the Internet**. This will not only make the use of NTT more operationally affordable but also helpful in acquiring needed information for course planning and designing.

V. CONCLUDING STATEMENT

The Centre is committed to keep abreast with the emerging technologies of training. As a training organisation, it is keen to adopt NTT in order to strengthen its capability and ensure its effectiveness as a regional institution for the improvement of vocational and technical education systems of the SEAMEO Region.

The Centre also declares its willingness to collaborate in future regional projects on NTT for vocational and technical education. The Centre believes in collaboration and this has been manifested in its keen interest of putting up a VTE Network in Member Countries including similar resource organisations.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

THE DIRECTIONS OF NEW TECHNOLOGY OF TRAINING IN THE UP (UNIVERSITY OF THE PHILIPPINES) OPEN UNIVERSITY

By: *Celia T Adriano*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

The Directions of New Technology of Training in the UP (University of the Philippines) Open University*

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Introduction

In yesterday's *Sunday Inquirer Magazine* (July 2, 1995), Ma. Ceres Doyo pointed out that, "This new 'campus' could yet be the 'biggest' one because it will be 'happening' all over the country." Considering the geographical structure of the Philippines, how could this be possible? Apparently, there is something that the University of the Philippines Open University is doing to reach out to the students who are not in the classroom. As a background information let me describe to you the situation in my country.

Need to establish an alternative access to higher education

Providing quality education to a growing population distributed in over 7,000 islands of the Philippine archipelago is a perennial challenge to the educational system of the country. It is an urgent need which must be addressed since human resources and knowledge will play strategic roles in the country's economic progress in the coming century. To help meet the challenge, the UP Open University (UPOU) was established on 23 February 1995. Through distance education, the UPOU seeks to remove the barriers to

* A country report delivered for the International Expert-Group Meeting on New Technologies of Training for Technical and Vocational Education, Manila, Philippines, 3 to 7 July 1995.

higher and continuing education which students may experience by way of geographical isolation, inability to take a leave from work, family obligations, disability or financial constraints.

With the barriers of space and time transcended, the UPOU is now in a position to meet initially the growing demands of our professionals for upgrading through distance learning.

Objectives of the UP Open University

The UPOU has the broad goal of providing wider access to quality higher education. In specific terms UPOU objectives are to:

- Provide opportunities for alternative access to quality higher education by offering baccalaureate and postbaccalaureate degree programs and non-formal courses by distance education.
- Develop a system of continuing education for sustaining professional growth and improving technical skills especially for those whose who can not leave their jobs or homes for full time studies; and
- Contribute towards upgrading the educational system of the country by developing, testing and utilizing innovative instructional materials and technology and sharing these with other colleges and universities through cooperative learning.

The current practice of distance learning in the UPOU

UP's distance education has been around since 1964. UP has initiated the first school-on-the-air program which provides practical tips to farmers. It was in 1984 when formal courses for science and math teachers were developed through the support of the Philippines' Department of Science and Technology. The Diploma in Science Teaching became the pioneering program in testing the water for a non-classroom based instruction. The first course offering was in 1988. Responses from those who underwent the training confirmed the need for a non-traditional delivery of instruction. Attuned to the demand for professionalizing our human resources, the university institutionalized the distance education program of UP in 1991, and in 1995 the Board of Regent formally established the UP's fifth campus, the UP Open University.

While technically the UPOU is yet in the infancy stage it has to date have launched the following degree and non-degree programs for various professionals:

- Diploma in Science Teaching
- Telemedicine
- Continuing Science Education via Television (CONSTEL)
- Master in Public Health
- Master in Social Work

The Diploma in Science Teaching (DST)

DST has graduated 142 graduates and now there are more than 250 students enrolled. Students enrolled in the program are served by nine study centers strategically distributed all over the country. Print is the main format of the course materials supplemented by tutorial sessions conducted in the nine study centers. In addition, summer residential classes for laboratory-focused courses are conducted.

Telemedicine

The project utilizes an interactive radio network to support the continuing medical education in undeserved rural communities. Audio "teleconferencing" using a Darone set linked to a telephone line is used. Regular and scheduled telemedicine sessions between Davao Medical Center in Mindanao and with the UP Manila's College of Public health has been established.

CONSTEL

The CONSTEL is being produced by the Department of Education, Culture and Sports (DECS), the University of the Philippines and the People's Television Network (PTV) in cooperation with the Department of Science and Technology, Philippine Normal University and the Foundation for Upgrading the Standard of Education (FUSE). Under the project, three telecourses of 40 lessons each (elementary science, chemistry and physics) will be produced and broadcast through the PTV network of stations as well as through video viewing centers in 200 divisional leader schools of the DECS and in the 15 regional science training centers.

Master in Public Health

Public health workers in the National Capital Region, Region 3 and 4 are the initial clients of this program which was launched last Friday June 30. The course materials are print-based and are supported by tutorials.

Master in Social Work

Like the public health worker, the social worker is tied to his/her job. The most appropriate approach for upgrading them is through distance learning. This program will be launched in Baguio on July 6, the same program will be launched in Davao on July 15. The course materials are print-based supported by tutorials.

In the development of the course materials, the problems of getting a conventionally trained professional to write in the distance learning mode was the biggest challenge. The UPOU conducted a massive training of our faculty members. From April 1994 to April 1995 a total of 17 Course Writing Workshops were conducted to about 450 participants in the four units of UP. In addition an incentive of 75% reduced teaching load plus a competitive honorarium was instituted to invite the faculty to write the courses they have been teaching in distance education mode. While not all faculty members who were trained became course writers right after the training, those who experienced designing materials for distance learning begun to rethink their own teaching style. Trained faculty members felt confident to write "user-friendly" materials.

In the beginning, we anticipated strong opposition from the professional schools but surprisingly, they were enthusiastic. The mediocre academics felt most threatened while the ones with unimpeachable stature responded with an open mind (Nemenzo, 1992). We have no illusion that focusing our effort to the technology of instruction will prepare us to the big things that are yet to happen in the UPOU. New technologies in training may yet be the partner in achieving the goal of providing wider access to quality higher education to our people.

Directions of new technologies of training

While the UPOU training materials are print-based, plans have been drawn to supplement print materials with multi-media. The first training of course writer on the multi-media to support the print materials was done in February 1995. Audio and video materials were developed. When fully operational, we plan that all our study centers will be equipped with the necessary hardware and software which students can avail of.

Preliminary meetings have been conducted with the UP Computer Science to design a software for course designers who will produce computer-assisted-instruction. The Doctor of Science Education Program has a plan of delivering the science and math courses via Philnet. Likewise communication and tutorial between students and tutors will be done through the net.

The Department of Science and Technology (DOST) is organizing a database in the sciences. UPOU faculty, researchers and students will be among the prime user of such information. Such environment will require certain hardware to access the DOST database.

UPOU works within the environment where the program it manages are develop by faculty members from the existing four UP autonomous units. Management therefore dictates a system where the UPOU is independent from the four UP units, yet dependent in its academic programs to the four autonomous units. With the four UP units based in seven out of the fourteen regions of the country, the physical distance must be compensated by a system where communication is fast, reliable and affordable. The initial link between UP Diliman and UP Los Baños via Philnet should be duplicated in UP Manila, and UP Visayas.

In our infancy we are experiencing sudden spurt of growing pains. Some are tolerable, but others are unimaginable in an academic environment. We are open to growth prescriptions, although we want to make sure that we are growing in the right direction.

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New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

THE THAI EDUCATION SYSTEM AND THE MINISTRY OF EDUCATION (MOE)

By: *Sa-nguan Boonpiyathud*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

THE THAI EDUCATION SYSTEM AND THE MINISTRY OF EDUCATION (MOE)

The education system currently in operation in Thailand provides six years of study at the primary level, three years at the lower secondary level, three years at the upper secondary level, and about four years at the tertiary level. Only six years of primary schooling are compulsory nowadays. Preschool and secondary education are, on the other hand, optional. However, basic education is in the process of expanding from 6 to 9 years (i.e. to lower secondary level) during 1992-1996, in accordance with the Seventh National Education Development Plans . The Ministry of Education (MOE) has this project as its first priority. The rationale and goals of the project are:

> The rapidly changing world has had such an unavoidable impact upon Thai society that rural-dominated society has been affected greatly (sic). The government's efforts in trying to turn Thailand into a newly industrialized country have meant that a section of the agricultural workforce is being transferred to the industrial and service sectors. Under such socio-economic circumstances, there is an urgent need for the ministry of education to adjust its goal and tasks accordingly.
>
> The main task of the Ministry of Education is to develop human resources so that they contribute favorably towards national development. Thus, the Ministry has a two-fold duty concerning its task in preparing the population for the country, firstly, to enter adulthood and secondly, as manpower. In other words, the appropriate workforce must be trained and prepared in line with the economic needs of the country, that is - basic education must equip children, youth and adults concerned with adequate skills which can be easily transferred from the agricultural to the industrial and service sectors or even to become self-employed.
>
> (MOE 1992:42-44)

ME is responsible for management the majority of educational facilities in Thailand: from preschool education to secondary and some post-secondary; for instance, teacher education, technical and vocational education. In addition, it also supervises private schools at all levels except at tertiary level.

Those who finish compulsory education may progress to secondary education by taking an entrance examination at the school of choice. To gain access to institutions of higher learning beyond secondary level, students must take an entrance examination in every case, except the open universities. It is worth noting that special education and non-formal education are also correspondingly arranged for every level of education.

Education for Occupation: A Priority of the Ministry of Education

Seeing the necessity to adapt the education system to development and labour needs of a newly industrialized country such as Thailand, vocational education and training has been given much more promotion than previously. Consequently, education for occupations has been determined as another major task for MOE which is aimed at:

> ..... providing individuals with adequate basic skills and knowledge which will enable them to rely on themselves in terms of work and daily living and to adapt to a new occupation, if need be, depending upon the workforce market which hinges upon the socio-economic circumstances of the country.
>
> One major require of basic education is that is has to contribute to the individual's opportunity for employment and the productivity of the nation. Therefore, attempts have been made by various departments within the Ministry to prepare graduates for gainful employment.
>
> (MOE 1992:48)

Thus, various educational levels have added and focused upon the importance of education for occupations. As mentioned in ME (1992:48-49), the concept of education for occupations has been highlighted in three main educational levels.

Primary Education

Learners will be provided with basic knowledge and skills. To be more specific, one of the 5 main areas of the learning experience at primary level is housework and basic occupational orientation. The aim is to foster habits for practical work and also establish a vocational foundation for the learners.

Secondary Education

The curriculum aims at promoting positive attitudes towards a career, enhancing personality development and work habits as well as providing opportunities to explore a wide range of career options. At upper secondary level (year 10-12), diverse alternatives are available for students who wish to continue on to higher education as well as those who will leave to enter employment. Consequently, careful balance is given to development of human potential and acquisition of skill for employment.

Vocational Education

Emphasis has been place on diversification of curricula in response to changing employment patterns in the country; on training of a skilled workforce particularly in areas with an immediate and projected increase in demand; and on linkages with industry and potential employers to provide concrete hands-on experience and an extension of services to rural areas.

Thai Vocational Education: Its System and Role

Students who have completed the lower level of secondary education (or year 9) and wish to continue studies may do so at upper secondary level (year 10-12) or at vocational/technical colleges or other specialized institutions as shown in table.

For the main vocation education provided by MOE, various types of specialized courses and training programs are offered and administered by the Department of Vocational Education (DOVE) and the Rajamangala Institute of Technology (RIT). There are many levels of study (i.e certificate to degree levels) programmed by them to suit the student's previous academic background as well as interests. One can also further pursue tertiary level studies at certain other vocational institutes attached to the Ministry of University Affairs.

Recently, another new project being developed jointly by the Department of General Education (DGE) and DOVE, is the project to establish a class for a vocational certificate at higher secondary school level. The curriculum will be adopted from DOVE, while the teaching-learning process will mostly be done in the schools of DGE. Some of the reasoning behind this undertaking is:

> to prepare as another option, for the larger number of prospective graduates from lower secondary schools within the next three years, resulting from the greater opportunity available for more students to enroll at the lower secondary level.
>
> (MOE 1992:49).

Department of Vocational Education (DOVE)

Ministry of Education, Thailand

DOVE is responsible for vocational education and training to meet the needs of the labor market and national economic growth according to the human resources production policy and the National Economic and Social Development Plan. Its area of responsibility embraces:

trade and industry

agriculture

home economics

commerce and business studies

arts and crafts

As DOVE is responsible for vocational institute throughout Thailand, colleges are able to tailor their programs to meet the needs of local communities. Programs are offered at the:

- vocational certificate level (three-year program),
- vocational diploma level (two-year program),
- technician diploma level (two-year program), and
- higher diploma level (two-year program).

In addition to these formal training programs, DOVE also offers:

- vocational skills training (one-year certificate programs), and
- a variety of short courses.

Certificate in Vocational Education

(Skill Level)

In Thai called Paw Waw Chaw, this three-year certificate program covers grades 10 to 12. Admission is open to grade 9 graduates, through competitive entrance examinations. Students may choose from the following programs: (for example)

Trade and Industry

Auto Mechanics
Metal Machine Shop
Electrical & Electronic Technology
Building & Construction Technology
Industrial Textile Technology
Tool and Die Making
Shipbuilding
Optics & Lens Techniques

Agriculture

Vegetable Crops
Agronomy
Pomology
Ornamental Plants
Poultry Husbandry
Small Animal Husbandry
Large Animal Husbandry
Fishery
Agriculture Mechanics
Agri-business
Agro-industry

Home Economics

General Home Economics
Food And Nutrition
Clothing and Dressmaking

Arts and Crafts

Fine Arts
Applied Arts
Leather Work
Handicrafts
Industrial Crafts
Photography

Commerce

Commerce
Tourism Industry
Public Relations
Press and Printing Business

Diploma in Vocational Education

(Technical Level)

In Thai called Paw Waw Saw, this two-year diploma program is open to graduates of the three-year certificate program in vocational education (Paw Waw Chaw). Applicant must pass a competitive entrance examination.

Diploma in Technician Education

(Technician Level)

In Thai called Paw Waw Thaw, this two-year diploma program is open to grade 12 graduates of academic or general programs, who have little or no technical background.

Higher Diploma in Technical Education

(Bachelor of Technology Equivalent)

In Thai called Paw Thaw Saw, this two-year diploma program is available through competitive entrance examination to students with a diploma in vocational education (Paw Waw Saw). Upon completion, students are awarded a Higher Diploma in Technical Education, equivalent to a Bachelor Degree in Technology.

Certificate of Vocational Education

(One-year Program)

Polytechnic colleges offer one-year program for students who have successfully completed grade 9 and competitive entrance examinations.

Short-Course Program

(225-hour Program)

Short courses, approximately 225 hours in length, are offered by Polytechnic and Industrial and Community Education Colleges. Prerequisite is completion of primary education, and no entrance examination is required. A certificate is awarded to the student upon completion.

Dual Vocational Training (DVT) System

and

Distance Education Program

DOVE is ready to meet new challenges. With the mandate to improve existing programs to meet the demands of a rapidly changing economy, and to provide more opportunities to get access to technical and vocational education and training, linkage with the private sector, has become two of new DOVE's major tasks: Dual Vocational Training (DVT) System and Distance Education Program.

Dual Vocational Training

(supported by Thai-German Cooperation)

Background

Dual vocational training (DVT) is a system of vocational education for the youth based on the cooperation of vocational college and company according to the needs of the company.

In 1986 Thai government, represented by DOVE, and German government, represented by GTZ, started a pilot project at Ta-Luang Technical College to test DVT in the field of Industrial Mechanic Maintenance. In 1991 the encouraging results lead to a new Thai-German project for the implementation of DVT in other regions and various occupational fields.

Aims of DVT

To produce a sufficient number and quality of skilled workers in accordance with the demands of industry and companies.

To create a new system of vocational education in Thailand which offers students having finished M3-level a chance of vocational training.

Participants in DVT

'apprentice': student having finished M3-level and not younger than 15 years, who wants to become a skilled worker in a specific occupational field.

'company': this acting partner selects the apprentice, provides an opportunity for regular training and pays him/her a small monthly remuneration.

'college': this other acting partner is responsible for providing supplementary lessons and courses in theory and basic practical training in order to achieve the occupational profile and qualification.

'DVT-project': is in charge for coordination and provides support to both acting partners.

Principles of DVT

DVT is based on the cooperation of the two partners. they come together in joint committees to take decisions on the organisation of the training, the curricula and training items, evaluation and examinations, rules and regulations, etc.

Each joint committee is chaired by a representative of the partner 'company'.

All apprentice having successfully passed the final examination receive a certificate signed by the top organisations of the two DVT-partners.

The apprentice belongs to the personnel of the company and has to conceal the company's internal affairs.

The apprentice has the opportunity to go through the equivalent of compulsory military service during the DVT-training period.

Structure of DVT

Company and apprentice enter into contract on vocational training, which has also to be signed by the parents of the apprentice. This contract is accepted by the Department of Labour.

Generally, the duration of the whole training period is 3 years and the period of study at college is 1-2 days per week, but alteration are possible in order to particular conditions.

In the company, the apprentice is guided and observed by an experienced employee, nominated by the management as an instructor to the apprentice; at school he is taught by subject teachers.

The apprentice is obliged to report the daily results of study and training in a report book which has to be presented weekly to his instructor in the company and to his teacher at school for checking and approval.

The apprentice has to pass, besides assessments, an intermediate and a final examination, both consisting of a theoretical (oral and written) and a practical part. These examinations are scheduled, observed and evaluated by specific joint committee.

DVT Programs

Applicants may choose from the following DVT programs: (for example)

Trade and Industry

Auto Mechanics	Electrical Installation
Electronic Maintenance	Shipbuilding
Surveying Technology	Plastic Processing
Printing	Tool and Die Maker
Mould Maker	Optics and Lens Techniques

Commerce

Retailing Business

Home Economics

Hospitality

Arts and Crafts

Textile Technology

Agriculture

Fishery

The number of Apprentices in 1995 is 12,000 approximately.

Curriculum Structure

of the

Certificate in Vocational Education

1995

Retailing Business

The students who complete this Certificate in Vocational Education 1995 in Retailing Business (DVT) take courses in several subject groups not less than 114 credits as shown in the following structure:

1.	Basic Subjects	30	credits
2.	Vocational Subjects (not less than)	69	credits
	2.1 Basic Vocational Subjects (16 credits)		
	2.2 Specific Vocational Subject (17 credits)		
	2.3 Elective Vocational Subject (not less than 32 credits)		
	2.4 Training/Project/Vocational Project (4 credits)		
3.	Free Elective Subjects (not less than)	15	credits
4.	Activities (2 periods)	-	credits
	Total (not less than)	114	credits

Distance Education Program

for

Certificate in Vocational Education (3 years)

Thailand's efforts to become a newly industrialized country have resulted in an urgent need for personnel to fill places in the labour market. In other words, the appropriate workforce must be trained and prepared in line with the economic growth of the country, that is - educational system should equip or should be developed in accordance with these needs.

The distance education program has been designed for those who are working in industries or companies and cannot attend the formal instruction school/college as full-timed students. This program provides opportunities for them to further their study or upgrade their professional skills by themselves via learning/teaching aids provided by Dept. of Vocational Education.

Four courses will be available in second semester, 1995:

Trade and Industry

Auto mechanics

Electrical

Electronics

Commerce

Commerce

Curriculum Structure

of the

Certificate in Vocational Education

1995

Auto Mechanics (Distance Education)

The students who complete this Certificate in Vocational Education 1995 in Auto Mechanics (Distance Education) have to take courses in several subject groups not less than 110 credits as shown in the following structure:

1.	Basic Subjects	30	credits
2.	Vocational Subjects (not less than)	62	credits
	2.1 Basic Vocational Subjects (21 credits)		
	2.2 Specific Vocational Subject (16 credits)		
	2.3 Elective Vocational Subject (not less than 21 credits)		
	2.4 Training/Project/Vocational Project (4 credits)		
3.	Free Elective Subjects (not less than)	18	credits
4.	Activities	-	credits
	Total (not less than)	110	credits

The Use of New Technologies

for

Technical/Vocational Education and Training

in DOVE

The distance education program will focus on the utilisation of:

- **learning packages** for self-study (including teacher guide, learning guide, student workbook, assessment guide, video/audio tape, etc.)
- **satellite** and **television** broadcasting (channel 11)

Some other course in technical areas may use the following **computer softwares** for advanced technical training (e.g. in Mechatronics):

F.M.S. & C.I.M. Systems

Flexible Manufacturing System and Computer Integrated Manufacturing

D.A.D. & C.A.M.

Computer Aided Draughting and Computer Aided Manufacturing

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

NEW TRAINING TECHNOLOGIES FOR TECHNICAL AND VOCATIONAL EDUCATION : TRENDS AND NEEDS

By: *Priscilla Cabanatan*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

NEW TRAINING TECHNOLOGIES FOR TECHNICAL AND VOCATIONAL EDUCATION: TRENDS AND NEEDS

By:

Priscilla Cabanatan
INNOTECH-SEAMEO

NEW TRAINING TECHNOLOGIES FOR TECHNICAL AND VOCATIONAL EDUCATION: TRENDS AND NEEDS

The Trends

The world of technology is wide and is seemingly in a constant state of flux. To speak of trends in new training technologies (NTT) would therefore be to venture into uncertainty, because what is heralded as the technology of the moment could change sooner than expected. It is with this sobering thought in mind that this paper presents what have been considered as trends by technology gurus, conscious that these may simply be describing parts of the proverbial elephant, with the added possibility that the elephant might be a chameleon.

Some of the trends of the nineties, as decribed by various authors, are as follows:

Authors	Trends
Russell, Heinich and Molenda, in the book "Instructional Technology and the New Media" (1993)	1. Media have become smaller and smarter. 2. Information is more portable and flexible. 3. Electronic delivery systems have multiplied dramatically. 4. Bounderies of traditional classrooms have expanded.
A. Bates, in his paper "The Range of Modern Media in Education and Training" (1993)	1. Integration of computers, television and communications through digitization/compression techniques. 2. Reduced costs and more flexible uses/ applications of telecommunications. 3. Miniturization. 4. Increased portability. 5. Increased processing power of hardware and software.
A. Herremans, in his paper "New Training Technologies" (1995)	1. "Edutainment" 2. More and more powerfuld NTTs. 3. Improved standardization in audio and video formats. 4. Continued move from analogue to digital. 5. Change in role of teacher to that of bein guide/facilitator. 6. More active involvement of learners in their own learning.

As far as specific technologies are concerned, the following content of various publications are indicative of trends:

Publication	Trends
The book "New Technologies for Education" by Barron and Orwig (1993)	CD ROM, interactive videodisc, digital audio, digital images and video, hypermedia, local area networks, telecommunications, teleconferencing.
The journal "TechTrends" (January to May issues, 1995)	Internet, interactive videodiscs, intelligent systems, multimedia, learning networks, information highway.
The journal "Educational Technology" (March-April, 1995 issue)	Interactive learning environments, hypertext, multimedia, electronic mail, CD-I, intelligent systems.

The state of the art could be indicated from the topics of the section of the computer magazine "Byte" in its January to May, 1995 issues called "State of the Art" which are as follows:

1. Color management.
2. Pattern management:
   Speech and handwriting recognition or machine vision systems;
   Facial recognition research;
   Eyes, ears and brains on a chip;
   Statistical pattern analysis.
3. Agents and smart software
   Security and interoperability;
   Finding information.
4. Network security
   Barricading the Internet;
   Building a firewall.
5. Digital video
   Digital video to the desktop;
   Corporate video production on the PC.

The above trends are gleaned from publications of the western world. Do these trends apply to the Asia Pacific Region which is the concern of this meeting? The June 15, 1995 issue of the newsmagazine "Far East Economic Review" said that Asia too was going digital, reporting that Asians are taking to the PC in increasing numbers. Software in Chinese, Japanese and Korean have been developed. The business counterpart of the virtual classroom is described as virtual offices on the Internet. Yes, the global trends are present in the Asia Pacific Region. It is perhaps the extensiveness of that presence which would not be comparable to the western world.

The SEAMEO INNOTECH Experience in the Use of NTTs

SEAMEO INNOTECH is the Southeast Asian Ministers of Education Organization Regional Center for Educational Innovation and Technology. It aims to help member and non-member countries to identify and solve common or unique problems through innovation and technology. Its member countries are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam. The non-member countries it has served include Bangladesh, Iran, Myanmar, Nepal, Pakistan, Papua New Guinea and Tanzania. The activities of the Center focus on training, research and information.

The Center promotes and utilizes innovative technologies appropriate for various educational and training applications. More than 4,000 key educators have been trained in courses which use a variety of approaches, strategies and multiple media to maximize learning effectiveness. All courses include components which orient participants to the value of using technology in education and training. Courses which focus specifically on the design and production of various media, particularly print, video and multimedia systems are also conducted.

Among the specific NTTs which INNOTECH has used for in its training courses are multimedia, as courses have been conducted on the production of multimedia materials using Authorware; and computer conferencing over a wide area network, which has enriched training courses by providing real time interactions between Southeast Asian partipants at our Center and consultants in North America as they "talk" to each other via their keyboards and computer screens. An initial attempt at video conferencing within the Center has also been undertaken.

Video based learning packages have been produced for two research and development activities. One package, produced for Project LEAD (Learning for Effective Administrator Development) is intended for delivery toschool administrators using the distance education mode. The other package, produced for Project VideoTech, is intended for the pre-service and in-service training of teachers. Project CORE (Computers for Rural Education) explored the feasibility of using computers to improve the operations of a rural cooperative.

There are two major information technology activities of INNOTECH: Project REIN (Regional Educational Information Network) and its MIS (Management Information System). REIN facilitates information exchange among member countries through databases established from contributions of cooperating centers in the member countries. Two computerized full text databases have been created, one on educational policies and the other on developmental projects. The MIS has implemented its Program Management System which created internal databases on the Center's various activities and the details associated with the activities such as objectives, participants, resource persons, funding, and evaluation. The thrust of future activities is maximum utilization of the databases created.

Has INNOTECH's use of various technologies been relevant to its clientele? Formative and summative evaluations of its various activities indicate that they have indeed been relevant. The continued relevance is indicated by the results of a needs assessment which the Center conducted this year in connection with the formulation of its Fifth Five-Year Development Plan. In response to questionnaires sent to the member countries, the following technology oriented activities were indicated as their priorities:

For training, specific technology-related courses which the member countries felt they needed were: Educational Planning, Management, Innovation and Technology for Greater Learning Effectiveness; Computer Assisted Instruction for Curriculum Developers, Microcomputers for Educational Planning and Administration, Distance Education for Formal and Nonformal Education, Application of Information Technology for Educational Administration, Technologies for Creating Greater Learning Effectiveness, Interactive Video Learning Materials for Greater Learning Effectiveness, Application of Information Technology for Teachers, Development and Utilization of Multimedia Materials for the Classroom, and Information and Telematics in Education. The foregoing titles clearly indicate that Southeast Asian educators want to be part of this Information Age. This is further indicated by their having placed REIN as their priority for INNOTECH's information activities for the future.

INNOTECH's experience in the use of technologies, including new training and information technologies, indicate that effective use of such technologies must be premised on a number of factors such as:

1. Responsiveness to the needs of clientele.
2. Planning and preparations made for the implementation of the technologies.
3. Allocating time and resources (human and non-human) for sustaining the use of the technology.
4. Adequate training of all those who will be involved in implementing the technologies.
5. Formative and summative evaluations.

NTTs for Technical/Vocational Education and Training

Are the NTTs applicable to TVET? An excerpt from ERIC Digest (Information Series No. 276, 1984) says that "Interactive video is particularly useful in allowing students to test their skills through simulations." Many projects have been undertaken using NTTs for TVET, and these indicate that the answer is yes. Examples which may be cited are as follows:

Projects	Use of NTTs
Project to develop an interactive, computer-based optical videodisc delivering system for skill training of machine lathe operators, conducted by the Ontario Institute for Studies in Education in Canada (1984)	The project reported positive results of using the videodisc, based on achievement testing. The average pretest score was 41% and the average posttest score was 92%.
European projects on new information technologies and vocational training, as reported by Euro TechNet in April, 1986	New technologies of the skills to be developed were the content of all training conducted. NTTs were reported as having been used specifically for delivering content such as: "Modular Training Course in New Techniques in Office Skills and Accountancy Using Data Processing and Telematics" and "Interactive Videodisc in Skills Development."
Projects in Italy of CSEA, Telecom Italia, InstitutoTecnico Industriale Enrico Fermi, FINSIEL, ISFOL, ENAIP and SEVA; based on study visits made by participants of the training course on "Development and Application of New Training Technologies" conducted by the ILO International Training Center in Turin, Italy on May 29 - June 30, 1995.	Multimedia and telecommunications for classroom and distance learning.

Problems in Using NTTs

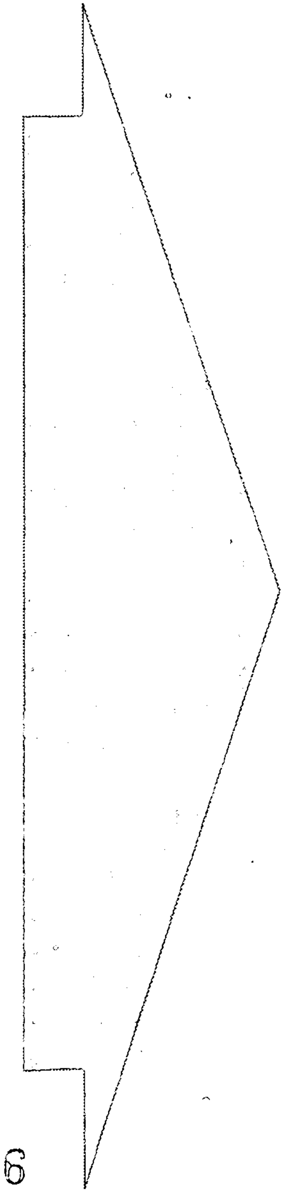
Although NTTs can be relevant and useful for TVET, it is not yet extensively used, especially in the Asia Pacific Region. This is particularly true of Southeast Asia, as indicated by the SEAMEO survey of the status of distance education in its member countries. There are many problems associated with the use of NTTs. This paper will cite three which have been particularly relevant to INNOTECH's experience:

1. The cost of acquiring the necessary hardware and software.
2. The need to develop courseware for the NTTs.
3. The need to train all those who will be involved in the undertaking.

Networking as a possible solution

Possible solutions to the above problems could be as numerous and varied as the institutions which encounter the problems. Pursuing solutions on an individual basis is feasible but costly. A more cost effective way would be to network among institutions engaged in similar tasks and encountering similar difficulties. The feasibility of networking among TVET institutions is discussed in the book "Change through Networking in Vocational Education" published by Kogan Page Limited (1993). This approach is being tried out by SEAMEO in the distance education activities of its various centers. It is not easy to get the process started, and mechanics of the cooperation have to be worked out in a true spirit of collaboration. It is however an option which can prove most rewarding if it succeeds, for all parties concerned.

The trends



Smaller and smarter media.

More portable and flexible information.

More electronic delivery systems.

Expansion of classroom bounderies.

More powerful hardware & software.

"Edutainment"

Changing role of teachers.

Active involvement of learners.

INNOTECH's use of technology in:

Training
- as content
- for enrichment of courses

Research
- Project LEAD & Project VideoTech
- Project CORE

Information
- REIN
- MIS

There is a wide range of available NTTs.

These NTTs are relevant for education and training, including TVET, but are not widely used because of problems.

Networking will make it possible to maximize use & benefits derived from NTTs.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

VOCTECH'S POLICY ON VOCATIONAL AND TECHNICAL EDUCATION DEVELOPMENT IN SEAMEO MEMBER COUNTRIES

By: *Bernardo F Adiviso*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

Expert meeting on

NEW TRAINING TECHNOLOGIES

in technical and vocational education

Turin

6 - 10 December 1993

FINAL REPORT

Expert meeting on NEW TRAINING TECHNOLOGIES in technical and vocational education

REPORT

Turin, 6-10 December 1993

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INTRODUCTION

Information media and computer technology have progressively invaded our working world and our private life. Business and industry have adopted most of the today's available technologies; young people and children use audio-visual equipment and electronic games.

On the contrary, vocational education and technical training do not yet make full use of media and new technology. There are various reasons and justifications for this shortcoming, the most typical ones being:

- education budgets are too tight to afford substantial investments in new technologies;
- teachers are not trained to use them and fear that new technologies may replace them;
- decision-makers lack the necessary information which would enable them to assess the opportunity and cost-effectiveness of using new training technologies, and are therefore ill-equipped to make decisions concerning investments in technology.

These reasons have led UNESCO and the International Training Centre of the ILO to convene a meeting of experts which would analyse these problems and make suggestions to overcome them.

The meeting aimed therefore to define the type of information and guidance which may help training managers and teachers to make appropriate decisions in regard of the use of new training technologies adapted to their context, resources and constraints.

As a result of the expert meeting, the organizers intended to publish a "*Guideline for selecting and using New Training Technologies in Technical and Vocational Education*", but the discussions during the meeting indicated the limitations of publishing a guideline which would be quickly outdated as a consequence of rapid technological evolution. It was suggested instead, to adopt a more articulated approach, a continuous information and guidance programme on a self-sustainable basis for the benefit of its users.

PARTICIPANTS

The meeting was attended by 20 persons (including the organizers).

Great care was taken by the organizers to invite representatives from academic institutions, industry, as well as experts from developing countries. Despite the fact that the relatively limited number of participants is not fully representative of all parties concerned, nevertheless the meeting was attended by:

- one New Training Technology (NTT) expert from each major geographical region (Africa, Arab States, Asia, Europe, Latin America and North America);
- three NTT experts presented research experiences from academic training institutions in Canada, Germany and Holland;
- five NTT specialists contributed to the discussions with the know-how of leading multinational industries, producers of new training technology hard- and software.

The mix of participants enabled the meeting to reflect the points of view of educational researchers, manufacturers of training technologies and potential users of NTT, both in industrialized and developing countries.

The detailed list of participants is illustrated in Appendix 1.

PROGRAMME OF THE MEETING

The International Training Centre of the ILO hosted the five days meeting in its residential campus in Turin, Italy.

After a welcome lunch on Monday 6 December 1993, the meeting was officially opened by Mr R. Tiburtini, UNESCO, and Mr F. Campagna, ILO Turin Centre. Mr Tiburtini presented the UNESCO International Project on Technical and Vocational Education (UNEVOC) to which the work of the NTT expert meeting relates.

Mr Campagna and Mr J. Pujol, ILO Turin Centre, illustrated the Centre's New Training Technology courses conducted in Turin in 1992 and 1993 for Asian and Latin American training managers. These courses were organized on the basis of a Modular Training package developed by the Centre with the financing of the Commission of the European Community.

During three days, the core of the meeting included presentations of the state of the art and experiences in the use of New Training Technologies. Papers were presented by Mr F.L. PAU (Digital Equipment) Dr B. COLLIS (Twente University), Dr A. STAHMER ("The Technology Monitor"), Mr A. HERREMANS (IBM Europe), Mr P. CELLINI (INTECS Sistemi) and Mr W. BULTHUIS (Philips). A summary of each contribution is presented under the heading "PAPERS".

The quality of the contributions of these resource persons set the tune and the level of the subsequent plenary discussions and group work. The presentations included also a brief demonstrations of interactive Disk Technology (CD-I) developed by Philips.

After his presentation, Mr Bulthuis opened the plenary discussion which focused on building the participants' consensus around a common approach to the continuation of the work of the meeting. The work method suggested was based on a number of questions which the participants were asked to analyse and answer in a chronological order. Each question was dealt with in group work; the groups reported and discussed their findings in plenary sessions. The result of group work and plenary sessions are described later under the heading: "GROUP WORK".

On the last day, Friday 10 December 1993, the participants concluded their work by recommending a number of follow-up actions to be undertaken in order to launch a NTT guidance programme. These are summarized under the headings: "7. How will the guideline be presented" and "RECOMMENDATIONS AND FOLLOW-UP ACTIONS". The detailed week's work schedule is presented in Appendix 2.

PAPERS

(by order of presentation)

L.F. PAU	The selection and use of new technologies for technical and vocational training in developing countries
Betty COLLIS	Issues in assessing the comparative advantages of NTT's in terms of cost-effective training and vocational education
Anna STAHMER	Telecommunication supporting distance learning
Albert HERREMANS	Trends in training technologies
Paolo CELLINI	New technologies for training: definitions and current experiences
Willem BULTHUIS	Training technology and telematics round tables (3T-RT) CD-I as educational tool for developing countries

The selection and use of New Technologies for technical and vocational training in developing countries

presented by

Dr L.F. PAU

Technology Director

Digital Equipment CTE

Sophia Antinopolis Cedex

France

INTRODUCTION

This paper covered Digital's approach to assisting decision-makers in the appropriate selection and application of New Training Technologies (NTTs).

The overall purpose of Dr Pau's presentation was to describe some pragmatic approaches that simplify decision-making by reducing the potential complexity offered by the broad range of configuration options available.

Having briefly outlined Digital's current involvement in NTT within developing countries, Dr Pau continued by presenting some principles that must be kept in mind when selecting NTT solutions. He then described where NTT can be applied to increase the efficiency of the tutor and assist the student's learning. Some simple matrices were shown to offer a first screening of possible solutions by cost and likely level of acceptance by age of the student population. He then went on to describe how technology suppliers and integrators such as Digital can assist in the delivery of NTTs by pre-packaging typically useful configurations and then managing their implementation.

DIGITAL'S INVOLVEMENT IN NTTs WITHIN TECHNICAL AND VOCATIONAL EDUCATION

(See Transparency No. 1: "Digital and Educational Technologies").

Digital's experience in this field covers all areas listed on the transparency. This experience is derived from providing for the internal training needs of a multinational company operating within many diverse cultures, through involvement in NTT projects within both developing and developed countries, as well as through partnerships with other suppliers and educational institutions in a wide variety of external research programs.

Digital is also a supplier of software and hardware platforms used in NTT configurations that may range from low-cost Fax-based solutions to fully developed interactive distance learning systems employing information servers to give shared access to multimedia materials.

UNDERLYING PRINCIPLES

(See Transparency No. 2: "Principles of Solutions Offered and Delivered by Digital Equipment").

NTT solutions must strive to minimize the total costs involved in their purchase and operation. Too often decision-makers fail to view costs as a whole before they make their selection. A study of costs must include all of the following elements:- the costs to make or buy courseware, the costs of the tutor's time spent in learning about and applying the technology, the cost of the technology itself (including the running costs), the costs of the delivery mechanisms it may employ and the costs of providing and maintaining all associated facilities.

The need to maximize self-reliance is of particular importance where solutions must operate without ready access to a local support structure.

The implementation of NTTs must seek to maximize the motivation and thus the level of their acceptance not only amongst the student population but also amongst tutors and administrators. Student acceptance seems highest where the technology is applied in support of experiential learning, "learning by doing". The acceptance of the technology by all those whom it impacts is greatly assisted if the teacher is prepared to act as a champion for its use. Any implementation program must budget for sufficient teacher's time to be spent in getting fully acquainted and comfortable with the technology before it is applied.

Technology suppliers can also simplify the task of decision-makers by presenting them with roughly configured solutions as a series of packages. These packages may of course be modified but they will require less individual customization and avoid the need for expensive additional consultancy services. These packages should be designed around the principle of self-reliance.

APPLYING TECHNOLOGY

New Training Technologies can be applied to make more efficient use of a student's time. Within technical and vocational studies, a student typically allocates his or her time equally between three different forms of activity.

(See Transparency No. 3: "Trainee Time Allocation in Technical and Vocational Training").

A third of the time is spent in classroom-based knowledge acquisition. This knowledge is then applied to "Interact and Play" activities such as the use of kits or models to practise the assembly of mechanical parts. These activities often involve the use of kits to allow for practice in a safe environment prior to the final phase of "doing". This final phase in the skill acquisition leads to the student actually delivering a final product, and in so doing, uncovering further problems to carry back into the classroom for further knowledge acquisition.

Technology can be applied across all these activities if it is required to do so.

(See Transparency No. 4: "Tutor/Guide Training Time Allocation for Technical and Vocational Training").

A tutor's time allocation can be roughly divided into four equal parts.

A tutor's time starts with a study of abstract notions and pedagogic principles to give a general framework for the teaching activity. Next there follows a new element introduced by NTTs where the tutor needs to study how to install and apply the technology. This is an important addition to the tutor's activities since it is key to a successful implementation of NTT. It reflects the importance of the tutor as a vortex for stimulating the acceptance of NTT across the educational community.

The third element in the tutor's time allocation is "doing difficult tasks", or, expressed in another form, keeping one step ahead of the students. The final element is the time spent on writing training plans and preparing support materials.

As with students, NTT can be applied to all these elements if needed. However, it also requires that the tutor takes the time to understand the technology in use.

SELECTING TECHNOLOGY

An initial screening of those technologies which may be appropriate can be done based on cost and the likely level of acceptance by student age. These two aspects are presented on two graphs shown in Transparency No. 5 "Age/Technology Equation" and Transparency No. 6 "Cost-Technology Equation". Both these graphs offer rough guidelines for selecting a pragmatic solution. They reflect the major constraint operating in developing countries - available budget.

The Age/Technology equation shows the age at which different technologies tend to be accepted by the student population. Note for example how Fax offers a cheap distribution method that can be used for students of most ages. Items shown above the cost ceiling are those whose total costs tend in most cases to be prohibitively high for most developing countries.

One of the major factors determining this cost ceiling is the high cost of telecommunications within many developing countries. These costs which are proportionally much higher than in developed countries, are the chief obstacles to the adoption of distance learning programs. By distance learning we intend the interactive access to learning material available on information servers through shared or dedicated lines.

The Cost/Technology equation takes a closer look at the cost element by positioning each item according to its overall investment and operational costs. Investment costs are calculated per student. They include the total outlay in terms of acquiring the hardware and software as well as producing or buying courseware. The cost data shown here is only approximate but the intention is to reveal the total cost impact for each technology type. Cost trends for technology are downward. However this trend requires a corresponding fall in the charges made by the telecommunications carriers before distance learning becomes a commonly feasible option.

PACKAGING SOLUTIONS

In spite of the costs that constrain adoption of high technology solutions, there remains plenty of scope for the imaginative deployment of more modest solutions. Unfortunately for decision-makers, the choice of how best to configure these technologies is complicated. To assist decision-makers, Digital has adopted the approach of grouping together a set of technologies into a series of packages. Some examples of these packages are listed on Transparency No. 7 "Examples of Packaged Solutions". These packages offer configurations that have proved their value during actual projects.

The packages listed on the transparency are only examples and a full range of additional packages are also available. P1 was a package implemented by Digital in South East Asia for the distribution of didactic material and the collection of student responses. It was a low cost Fax-based solution for delivering material from a centralized administrative centre to a single Fax machine. Distribution of the material within the village was then done by hand, as was the collection of student responses. This was possible since distances were not a problem. The Fax was also used to transmit the student responses back to the administrative centre. Back at the centre, new technology in the form of OCR (Optical Character Recognition) was used to scan student responses directly into the database. The use of OCR saved countless hours of administrative effort. P2 is a package that allows for the quick production of kits for teaching mechanical assembly tasks. P3 is a package that illustrates the possibility of using one method for delivering the didactic material and yet another for relaying the student responses. In this example use is made of the existing TV broadcast framework for low-cost TELETEXT transmission. Student feedback is provided by a CB (Citizen's Band) radio installed in each classroom. Whilst a phone line could also be used, the operational costs of CB offered a much cheaper alternative. By the time we arrive at P5 we are talking about sophisticated high technology solutions.

One of the major reasons for presenting solutions in this packaged manner is to give decision-makers illustrations of combined delivery and distribution methods. They may then consider the various associated trade-offs. The mapping out of suitable delivery mechanisms is perhaps the most significant factor contributing to the difficulties in selecting NTT solutions.

DELIVERY PROCESS

(See Transparency No. 8: "Typical Consulting Task by Digital in Developing Countries").

Having assessed appropriate technologies and selected a particular package based on needs and budget, continuing care must then be taken over how the technology and associated training programs are to be introduced. Transparency No. 8 presents a typical consulting task for Digital covering this aspect in the context of both developed or developing countries. This engagement process is designed to maximize the successful application of technology in support of specific training needs.

The first step in the process is to identify these typical skills that need to be mastered within the target population. Then, taking into consideration the constraints imposed by budget and infrastructure requirements, a kit can be designed and guidelines for its use produced. The kit may be a mechanical kit or else a software-based kit distributed on floppy disk, CD-I or CD-ROM. From this stage and through the subsequent phases of integration and customization, all results are tested and feedback are used to guide further modifications.

DIGITAL AND EDUCATIONAL TECHNOLOGIES

SKILLS	- Many application areas (manufactuing, marketing, communications, besides technical areas)
	- Consulting
	- Systems integration and delivery
	- Training costing models
PLATFORMS	- Terminals
	- PC's
	- Workstations
	- Information servers and networks
SOFTWARE	- Video technology
	- Electronic mail, Conferences, Databases
	- Text processing
	- Telework
PROJECTS	- Computer based training
	- Authoring tools
	- Scheduling tools
	- Video conferencing
	- European projects (DELTA, T3RT)
PARTNERS	- External research
	- Educational institutions

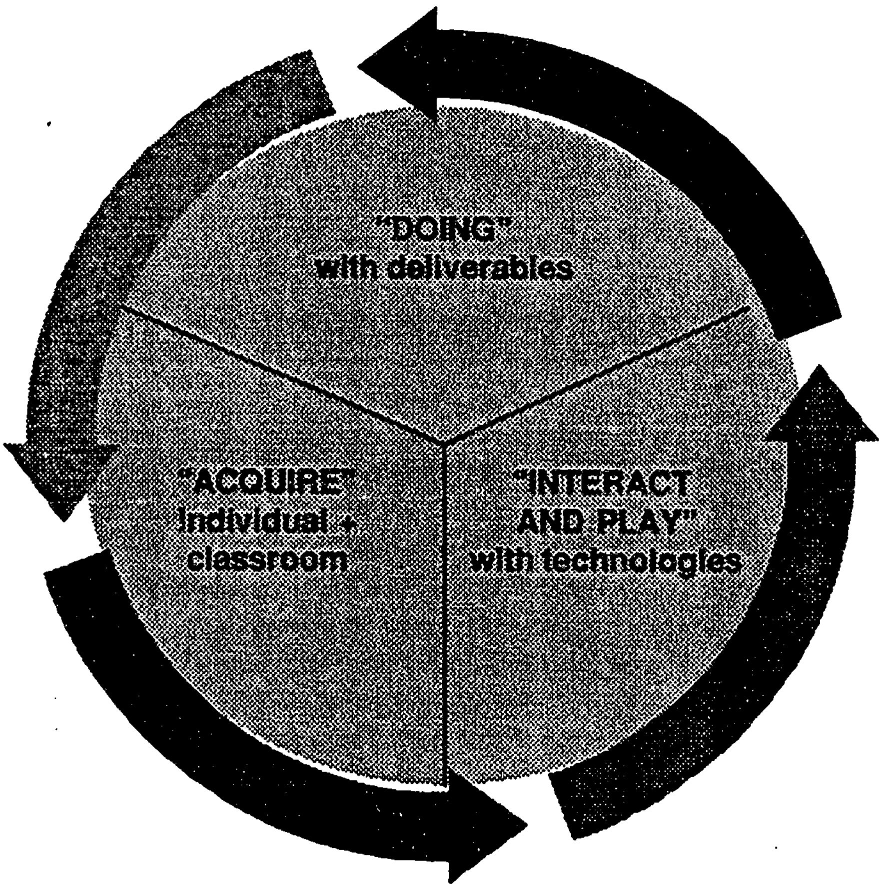
digital

PRINCIPLES OF SOLUTIONS OFFERED AND DELIVERED BY DIGITAL EQUIPMENT

- MINIMUM TOTAL COSTS (COURSEWARE + TUTORS + TECHNOLOGY + DELIVERY MECHANISMS + FACILITIES)
- MAXIMUM SELF-RELIANCE
- MAXIMUM MOTIVATION
- MAXIMUM SELF-PACED INTERACTION
- LEARNING-BY-DOING / IMPLEMENTING PEDAGOGY IN TECHNICAL & VOCATIONAL TRAINING
- TECHNOLOGICAL AIDS TO TUTORS / TEACHERS
- "PACKAGED" SOLUTIONS, MAXIMUM DEPLOYMENT, AND MINIMUM PAPER / STUDIES

digital

TRAINEE TIME ALLOCATION IN TECHNICAL & VOCATIONAL TRAINING



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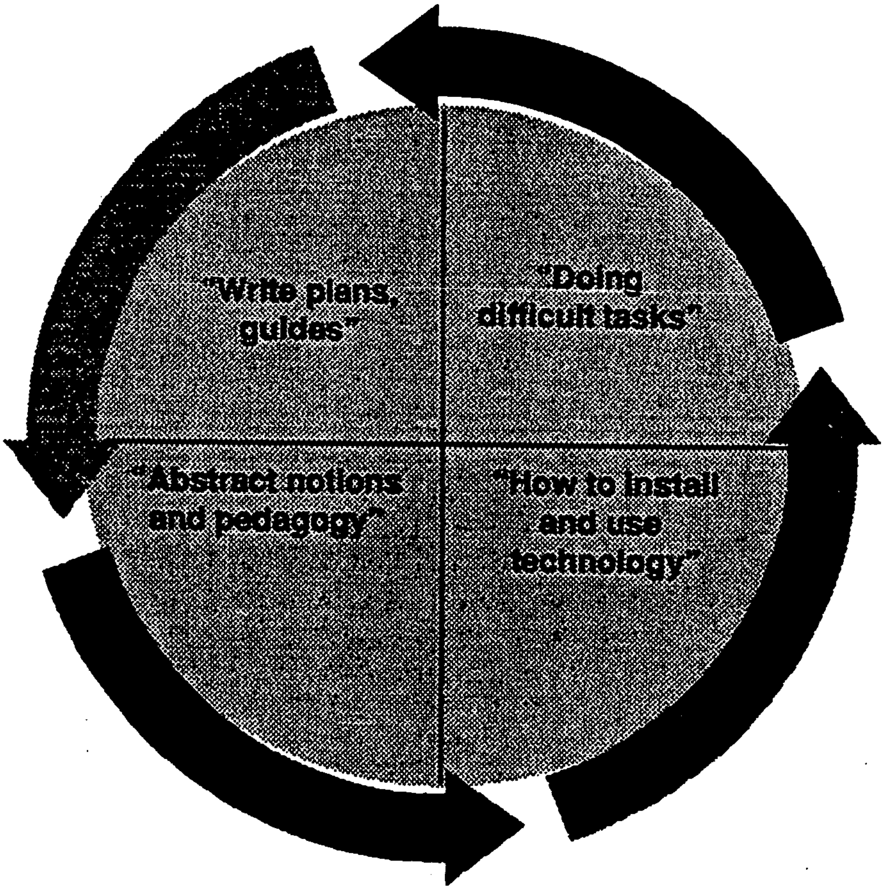
TUTOR / GUIDE TRAINING TIME ALLOCATION FOR TECHNICAL & VOCATIONAL TRAINING



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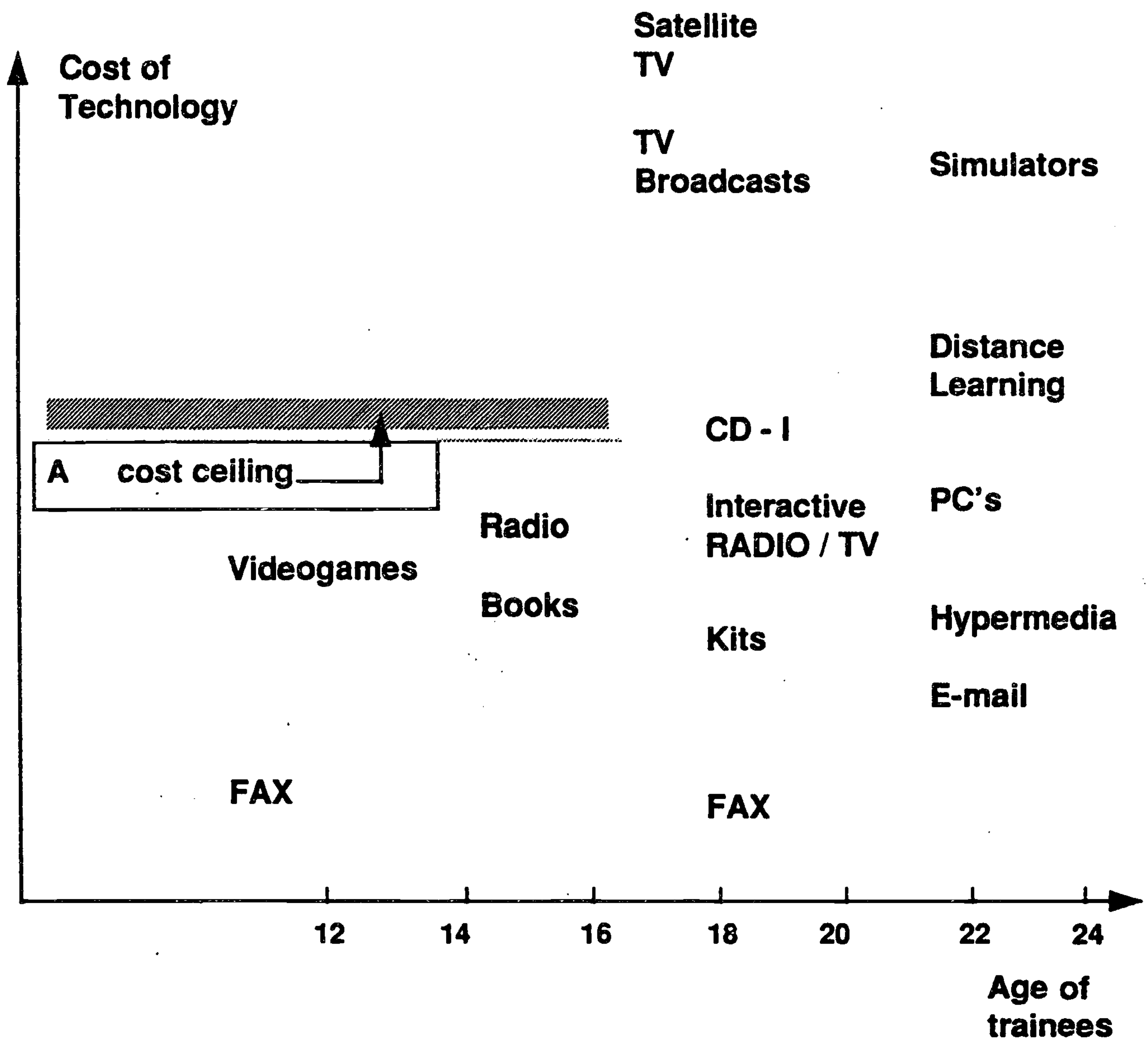
AGE-TECHNOLOGY EQUATION



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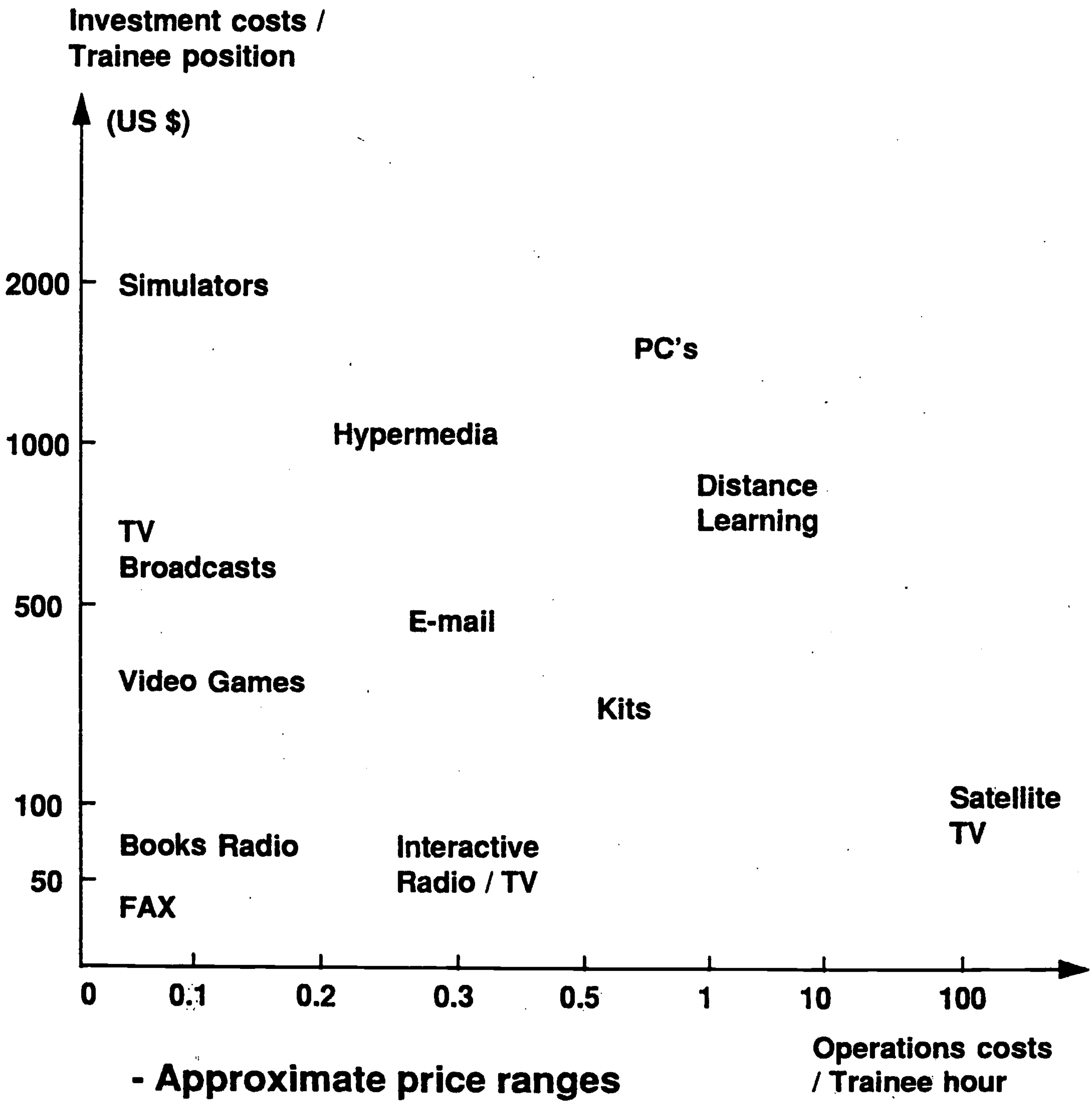
COST - TECHNOLOGY EQUATION



- Approximate price ranges

digital

EXAMPLES OF "PACKAGED SOLUTIONS"

P1	FAX Server (one per site) + Hand distribution + FAX back (with OCR at server)
P2	Fast turn-around plastic injection molding of kits, with possible controls
P3	Teletext via TV, and feedback via CB or phone
P4	PC + Terminals + LAN + e-mail
P5	Cooperative software on LAN + personal computer based authoring software on PC

digital

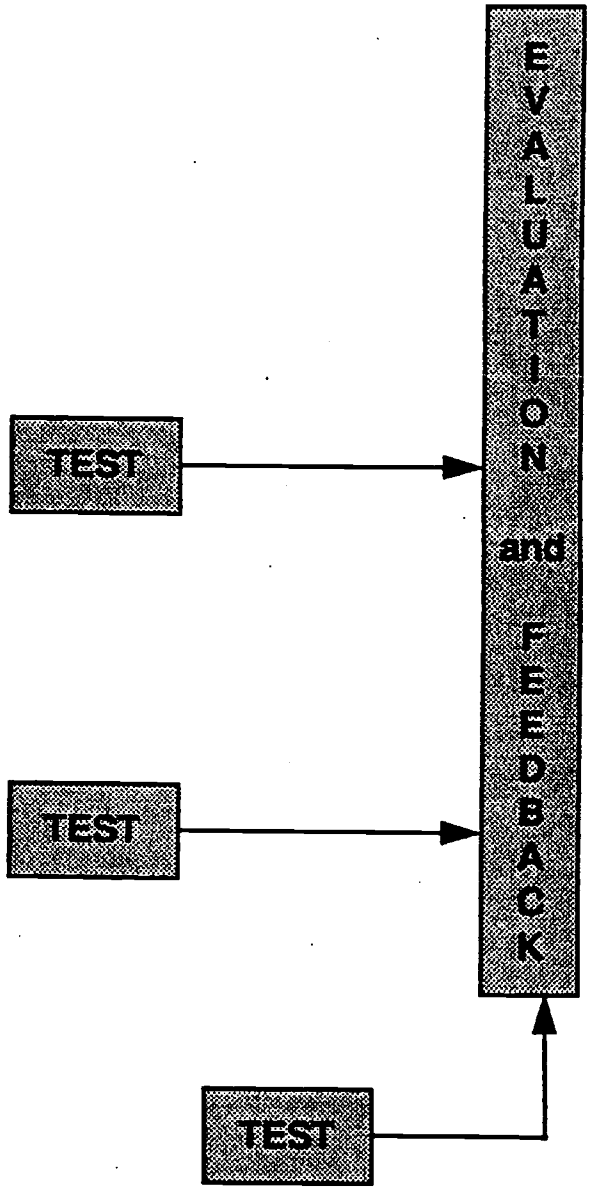
TYPICAL CONSULTING TASK BY DIGITAL IN DEVELOPING COUNTRY TRAINING

* Identify 5 typical repeatable skills to be acquired
* Total budget ceiling
* Local infrastructure

  * Specify design, deliver kits for "doing" a set of skills (shared with economic beneficiaries of training)
  * Generate learning-by-doing plan

    * Integrate or locate appropriate technologies
    * Install
    * Locate or design courseware

      * Customize
      * Complete trials
      * Distribute



digital

Issues in assessing the comparative advantages of NTTs in terms of cost-effective training and vocational education

presented by

Dr Betty COLLIS

Faculty of Educational Science and Technology

University of Twente

The Netherlands

PERSPECTIVES FOR DECISION-MAKING ABOUT NEW TRAINING TECHNOLOGIES

The task of the meeting is to evolve a plan for the development of "*Guidelines*" for better decision-making about New Training Technologies. However better decision-making is not a matter of following a linear procedure, but of having access to useful information and examples, and then, in a way specific to a training manager's own context, providing what sorts of help he or she needs to make a decision about the application of the example. "Help" can be in many forms, ranging from providing the decision-maker with more detailed information or with contact with a person who already has experience with a certain application of technology, to more formal kinds of support, such as detailed cost data and tools to calculate the projected costs of implementing a technology in one's context.

In the presentation, Dr Collis first highlighted some of the many different perspectives that can surround the decision-making process about technology use. She used a simple matrix (see below) to illustrate that decision-making about a particular NTT application can have many different results, depending on whether one is focusing on instructors, on institutional issues, on policy and strategy, or on the technology itself. Then she suggested the idea of a "performance-support environment" as a way to bring information and examples into the hands of decision-makers, to help them to better deal with the perspectives and constraints most relevant to them. This sort of support environment, called an "Electronic Performance Support System"(EPSS), is now becoming popular in many training settings and is the object of research activity at the University of Twente in the group of which Dr Collis is a member.

Technology Focus	**Human and Situation Focus**			
	Student/Training	**Instructor**	**Institution**	**Strategic**
Resources: - individually - in combination				
Organization of lesson				
Organization of course				
Delivery of training				
Support requirements				
Implementation constraints				

PERFORMANCE-SUPPORT ENVIRONMENT AND ITS ROLE IN TRAINING AND TRAINING MANAGEMENT: IMPLICATIONS FOR ILO/UNESCO NTT GUIDELINES

Introduction

The ILO International Training Centre in co-operation with UNESCO has launched an initiative whose overall goal is to increase the competence of national or regional decision-makers with regard to investments in NTTs as well as in their selection and use. In particular, this competence needs to be displayed in terms of increased effectiveness in assessing the comparative advantages and cost-effectiveness of NTTs. As a strategy for reaching this goal, ILO and UNESCO plan to stimulate the development of "*Guidelines for selecting and using NTTs in technical and vocational education*". An "expert meeting" is being held in Turin, 6 - 10 December 1993, to launch this Guideline initiative. The initial conception of the Guideline is that of a publication with a table of contents.

The purpose of this short paper is to suggest an alternative approach to the form and content of the *Guidelines*, based on a rapidly emerging trend in both training delivery and in training-management support. This trend is called "performance support" and the electronic environments that manage it are called "electronic performance support systems"(EPSS).

What are EPSSs?

Generally speaking, an EPSS is a computer "program" (something like "Windows") which allows the user to choose among different types of information and tools options through a single-user interface. The sorts of options available can include:

Information

- collection
- news-type
- specific to a certain task or situation, etc

Connection to: Human Resources

- names and adresses by categories
- ways to contact certain individuals or groups
- Communication support
  1 to 1 (mail)
  1 to many
  many to many (computer conference)
- etc...

Examples

- in text, sound, visuals, even video
- cross-linked to relevant "Information" or "Human resources"
- etc...

- **Tools**
  - for writing
  - for reports
  - for spreadsheet-type arrays or calculators
    - for decision-support
    - for project planning
  - etc...
  - (all use data from "Information", "Human Resources", "Examples", etc...)

- **Learning Resources**
  - tutorials
  - simulations, etc...
  - cross-linked to "information" "examples"

Some options are locally stored, others are available via network. Also, what is offered to the user among these resources can vary, depending on the needs and characteristics of the user. What appears on the computer screen can be downloaded, sent via a network link to a colleague, printed out, or stored on one's local disk for future reference. Within each category, many options and variations are possible.

What are the assumptions behind on EPSS?

Among the assumptions behind EPSS are the following key points:

- users' needs in terms of resources and support vary enormously;
- users need to streamline their searches for relevant information and support as much as possible (i.e. "one-stop-shopping") and to be able to find what they need, when they need it, from their workplaces ("just-in-time" support);
- users are sophisticated, and know their own constraints and context. What they need are examples, "success stories", relevant information and human contacts, and tools to help them handle this information and contact.

What might the *Guidelines* look like in EPSS form?

ILO operates as an international centre, to which regional/national centres and decision-makers refer. This interconnection now is in form of mail, fax, telephone, and human contacts, as well as exchange of printed materials and, occasionally, face-to-face exchange of examples and "success stories" (supported by overhead sheets and more printed materials) and sometimes short demonstrations of software or video products. Within the existing system, there could be a central EPSS in Turin and "associated EPSSs" in regional/national centres. What would the central EPSS offer, in relation to the general goal of increasing the competence of national and regional decision-makers in NTTs cost-effectiveness assessment and selection?

The Central EPSS

Running on a powerful multimedia computer, the following could be available in Turin:

Information

- → Pertinent ILO/UNESCO information, etc.
- → Selected background information on cost-effectiveness as a criterion for training decision-makers, etc.
- → Selected background information on different types of NTTs, ranging from glossary to pictures, detailed info, etc.

Human Resources

- → Cross-referenced names and pertinent information about addresses of "experts" decision-makers, etc. (with ability to send messages electronically or by fax direct by "clicking").

Examples

- → "Success stories" of NTT use in training
- → Photos and video clips of training settings with NTT in use
- → Examples of software, screen, display, video clips, etc.

Tools

- → Ways to electronically "cut and paste"
- → Ways to ask for more information
- → Spreadsheet and projection software, to assess financial implications of combinations of examples

The Central EPSS could be used for support and demonstration of the clients at Turin. In addition, representatives from around the world could contact the Central EPSS for particular combinations of ideas and information, which could be (a) printed out and mailed, (b) faxed or mailed directly, (c) "published" into a "*Personalized guideline*", targeted to a region.

Local EPSSs

Critical to this idea is the idea of Local EPSSs. Eventually, local regional/national offices could have "smaller" versions of the Central EPSS, so they would have the same tools, at least an overview of what is available in **Information, Human Resources** and **Examples** to the Central EPSS and among other local EPSSs. This requires a common format for data organization, which the Central EPSS would monitor.

Getting Started

Rich EPSS resources evolve over time and need someone with ongoing responsibility and interest to steer the evolution and develop a "supply-and-demand" situation among those who have relevant information or examples and those who want it. The ILO is well placed to provide this long-term guidance and leadership. To begin with, the focus could be on a particular aspect of training for which NTT decisions must be made, one that has international interest as well as local variation. An inventory would need to be made of different examples in this particular aspect (i.e., perhaps language training in English, or training of electronic technicians) where NTT is bringing broader range or better/faster/different aspects of training compared to traditional methods. Strategies for interlinking these examples, digitally storing their various aspects, finding out more detailed background information about them, etc., would evolve and be shown to target users for their reactions and suggestions. Strategic decisions could be identified relative to further development of the idea and its electronic environment. The University of Twente would be pleased to be involved in this design process.

Telecommunication supporting distance learning

presented by:

Dr Anna STAHMER

Director and Editor

"The Training Technology Monitor"

Toronto, Ontario

Canada

THE CONTEXT

The remarks in this presentation need to be seen in the context of trends and needs in vocational and technical education that characterize many of the industrialized countries.

Demographic trends show an ageing population. There are not enough young people to supply the new skills needed in the workplace. People who are working today have to learn the new skills. These, however, have work and family obligations and require access to more flexible training than young people without such obligations, would require. The competencies and skills required to carry out jobs in industry, commerce or services are changing quickly. A serious mismatch often exists of job openings and the skills of those seeking employment. Trainees are increasingly diverse in terms of their prior learning and experiences.

Lastly, the technology-infrastructure is well developed. Telephone penetration is high, cable TV services are widely available, so are computers. Athabasca University (Alberta, Canada) reports that 60% of its students owns a computer and that 80% have access to a computer.

THE USE OF TELECOMMUNICATIONS SERVICES FOR TRAINING - A SHORT REVIEW

In the delivery of training

In the corporate environment in Canada, around 22% of the major companies use some form of distance education: 25% use CBT and 15% use computer conferencing. Most of the roughly 200 community college campuses offer courses by distance education. Most of these courses, however, are print-based and a few use audioconferencing.

In course development and administration

Company training departments use technologies rather extensively for student administration and increasingly to support course development. In colleges, this type of use is less prevalent. A main reason is likely the lack of incentives to do so. Colleges, like universities, however, do use technologies and for example, over two thirds of them report that they access INTERNET or BIDNET services.

Illustrative Case Examples

- The Automotive Satellite Television Network distributes a regular set of TV programs to thousands of automotive dealerships and repair stations across North America. The service is distributed by satellite and subscribing businesses provide their own reception equipment on their own premises. The content of the sessions include sales, service and repair issues. Local group sessions are encouraged to follow some of the broadcasts to reinforce the learning process. Similar satellite network services exist for fire-fighters, policemen, hospitals and health services.
- The Mitchener Institute for Medical Technologists uses audioconference services to bring continuing education to medical technologists who work at hospitals, clinics and laboratories across Canada. Print materials and graphics are distributed by mail or fax. Often, groups of learners attend the sessions and discuss practical local applications afterwards.
- The Massachusetts Institute of Technology is networked for many learning resource and support functions for students as well as administration and faculty. The development of this network took about ten years at a cost of $100 million.

RELEVANCE OF TELECOMMUNICATIONS TO TECHNICAL AND VOCATIONAL TRAINING

Technical and vocational training requires the student to acquire knowledge and understanding, as well as skills. Opportunities for skills training need to be built into the design of telecommunications and distance education projects. Many successful examples exist.

TOPOLOGY OF TELECOMMUNICATION TECHNOLOGIES AND LEARNING MODELS

Main trends in telecommunications development, relevant to technical and vocational training are the increasing digitalization of the networks. This brings with it increasing ease of integrating computer-based services with telecommunications services. This, in turn, permits access to computer-based training packages from distant sites (equipped with a computer, modem, and telephone link). Further, very high capacity networks are under development in the US, Canada and Europe. These networks will allow vast amounts of data to be transmitted rapidly.

Distributed learning/teaching in real time (five principal technologies)

- Audioconferencing - voice only. This service uses loudspeakers and microphones at the participating sites. A conference "bridge" connects the sites by telephone lines. Bridging service can be leased from many telephone companies, or the equipment can be used to be operated by the user.

- Audioconferencing - with graphic support. In addition to the voice connection, this service also transmits graphic information, e.g. on an interactive electronic blackboard, or generated by computer images.

- Audioconferencing - with compressed video. Compressed video techniques permit the transmission of video images on telephone lines. Video input sources often permit the transmission of pictures of the participants as well as of graphics, text, etc. from an overhead camera.

- Desktop conferencing. Advanced technologies are beginning to appear on the market that integrate voice, graphic, computer and video services into service. These services require more bandwidth than the standard telephone lines. Many, but not all, are designed for desktop conferencing.

- Full-motion videoconferencing. Full-motion videoconferencing has two basic system configurations. One-way television offers one-way images, plus interaction by voice (often via audioconferencing) and data communications. Two-way televisions offers full duplicate services. One-way services link a large number of sites for training sessions, possibly up to 500 or so (the limitations are not technical, but rather pedagogical). Two-way services typically link 20 sites or less. Full-motion videoconferencing commonly uses satellite services as distribution technology. The use of fibre optics and other high capacity services is increasing as well.

Distributed learning/teaching in independent studies

- Distributed access to CBT and multimedia courseware. This service allows learners to access a learning package from the workplace, home or other place. Local area networks (LAN) that link terminals in the vicinity and wide-area networks (WAN), that link terminals at up to several hundred kilometers are the main distribution systems. Potentially, all computer-based courseware could be distributed by this method.

- Performance Support Services (PSS) are an advanced application of independent learning, allowing the learner to access training and new information as and when needed during the actual course of performing a job. For example, the software could alert the worker that additional information is necessary, or the learner can call up a training module when running into a problem. This applications is useful for trainees who work at computer-assisted jobs.

Other functions for telecommunications in distributed learning

- Database access - is increasingly used to update course content, and to get new ideas for course design.
- Computer conferencing - is often used in distance education to assist independent learners with peer group support, or to facilitate communications between such learners and instructors. Also, it is used in some training applications for group work among dispersed learners working on the same subject.
- Computer communications - within educational institutions and with their distributed learners is increasingly common to manage student records, transmit and review assignments, etc.
- Just-in-Time printing - is a new development in the applications of telecommunications and computing. Pilot projects are underway in which instructors have electronic access to a text book, to which they can make changes locally. This will permit them to integrate the textbook with their course curriculum and adjust it to local needs - prior to printing (locally) the number of copies required.

KEY DIFFERENCES: TECHNOLOGIES AND LEARNING TASKS

When selecting among the above technology options, it is important not to lose sight of very significant implications they have on the learning tasks and designs.

Real Time Learning	Independent Learning
Is a one-time event	Re-usable
Reaches many people at one time	Reaches many people over time
Course design and development can be handled by one content expert, with some training	Design and development are done in teams of content, instructional, graphic, computing, etc. experts
Can have low development costs	Typically high development costs
"Control" over the content rests with the faculty	Off-the-shelf materials need to be "localized".

CONCLUSIONS

Information and training technologies cannot be introduced cost-effectively into a training institution for distributed or independent learning, unless

- a business plan is developed that outlines the roles and the benefits of these technologies. Basically, the operation of the institution needs to be re-engineered. Lack of such re-engineering plan will merely add the costs of the new technology to the institution, without reaping its benefits;

- the business plan includes a skills review, a plan for the development of the existing human resources, and hiring criteria for new employees;

- strategies to give the learners the skills necessary to cope with a new learning system;

- the telecommunication infrastructure can provide the service without major problems. In many countries this may mean leasing fully dedicated and conditioned lines;

- access to sufficient funds can be available for the capital, operating and maintenance expenses that will be incurred. In many countries (including industrialized ones), the public sector does not have sufficient "new" funds available to finance and sustain such investments. "Re-orienting" existing funds is rarely an option, as a high percentage of these funds are tied to salary and facility costs. Options will need to be explored, including the development of some form of commercial relationship, or public utility arrangement. Such arrangement could make it attractive for private business to invest in the infrastructure and its operation, for a reasonable financial return (much like telephone companies).

Trends in Training Technologies

presented by:

Albert HERREMANS

IBM International Education Centre - IEC

La Hulpe

Belgium

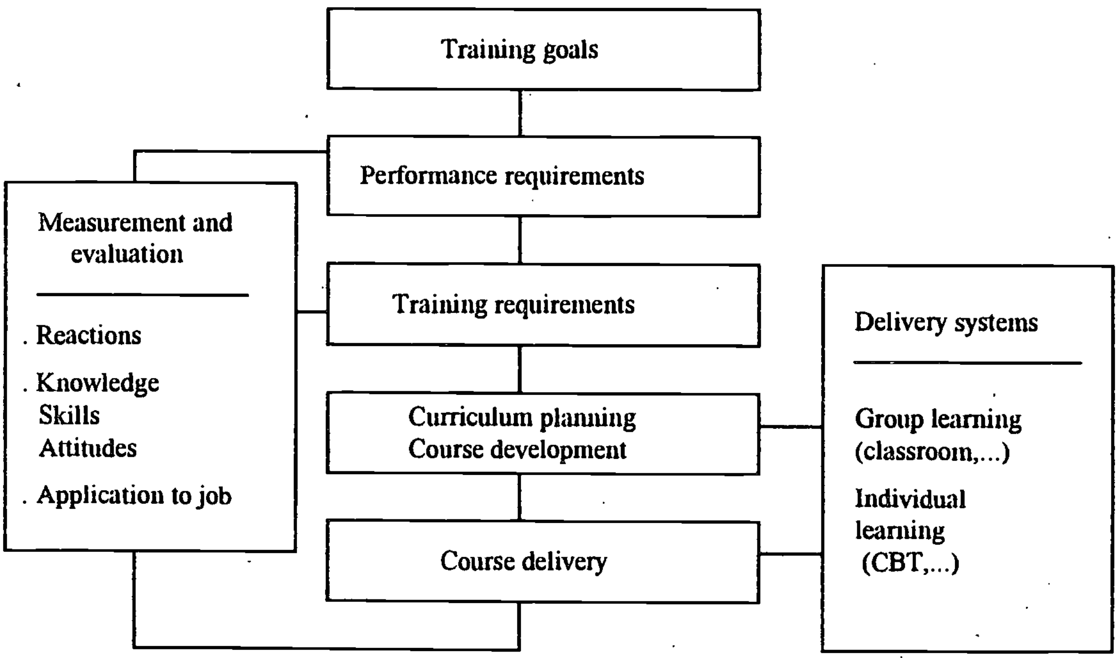
INTRODUCTION

The decision to use or not to use Training Technologies in a particular curriculum or course has to be taken at the design phase, as well as the selection of the technologies that will be used, when and how. Therefore, it is important to start the training process applying a strong methodology that will help to develop the most adequate courses with the most appropriate technologies.

The Systems' Approach To Education (SATE) has been developed by IBM Education for its own use (see figure below). Starting from the business needs and goals, one defines the skills (quantity and quality wise) needed to achieve them. By comparison with the current situation, the training needs can be determined precisely. It is then possible to design a curriculum and to decide the appropriate "delivery system", according to a series of criteria (costs, geographical spread and number of learners, etc...). At this level the decisions about technologies are made.

Once courses are operational, a three-level evaluation system provides the feedback to the trainers enabling them to improve their next decisions. For example an initial "hot reaction" from the learners gives a first feeling about the way the message went across, then a series of pre- and post-tests gives a more objective view of what has been really learned during the course. Finally an assessment of the learners' performance at the workplace shows how much he or she is putting into practice recently acquired knowledge.

A fourth evaluation level would ideally be related with the very first definition of needs and goals. However, it is very difficult to isolate the impact of training at that level. Whether or not the goals have been reached, is difficult to prove that this is due to training. In real life, many different factors may influence a situation either positively or negatively besides training...



This being said, when deciding which technologies to use, if any, the first question is why one should use technologies at all for training.

To improve the training quality:

- increase the retention rate;
- bring all learners to a common level of knowledge before the course starts;
- personalize the learning by meeting every learning style;
- simulate the reality at low cost and low risk of accidents;
- allow for a personal discovery rather than just the usual teaching/learning process).

To reduce the costs for course development, update and distribution:

- direct or indirect;
- re-utilization of existing educational material;
- joint development of courses;
- update and distribution.

Technologies may be used in different places. Classroom teaching can be improved by using some technologies as a presentation support, to evaluate the understanding (personal keypads) or have access to additional information (databases, encyclopaedia, ...). Distance learning can be seen in two different ways: live courses (kind of a virtual classroom, via satellite or terrestrial networks) or differed courses (the satellites or networks being used to transmit the material quickly, which will be looked at later on).

Computer-based training (CBT) has also evolved considerably during the last few years, thanks to the rapid evolution of the hardware, software, authoring systems and multimedia systems. It can now be used in PC laboratories, learning centres, at the workplace, at home and even in hotel bedrooms (where it is combined with the cable TV). CBT is also evolving thanks to "soft" technologies: hypertext or hypermedia have changed the paradigm from teaching by computer to learning by personal discovery and "navigation" in the subject matter. Artificial intelligence specialists work hard to get it applied to CBT to model the learner, giving each one a personalized learning path according to the learners previous knowledge and preferred learning style, etc...

A final word of caution about the implementation of training technologies: both teachers and learners have to be convinced that technologies represent a "plus" for them. It is sometimes necessary to convince them by making demonstrations of successful examples, invite them to workshops during which they will have some hands-on sessions and see how easy or difficult it is for them to use some technologies, and finally help them implement technologies progressively and with an adequate support.

New Technologies for training

Definitions and current experiences

presented by
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INTECS SISTEMI SpA
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Italy

INTRODUCTION

Scenario

In a modern information society, there is a new challenge in developing the necessary skills to manage, access, manipulate, learn, operate with information. The traditional educational system needs to be complemented by lifelong learning schemes which facilitate access to employment and/or re-training and skill-upgrading for those already employed. New technologies may help to respond where traditional learning system seems to be insufficient.

Historical background

Many technologies have been developed and some of them have been utilized for educational purposes during the last century.

The problem of how automatize the educational process is a difficult and demanding task, simply because human learning is very complex and requires an extremely sophisticated technology to perform the function of a good teacher. Furthermore a product that has educational value must be reasonably cheap in order to be affordable.

During the last two years there was a tendency to put on the market only a few but expensive products based on technology for learning. However, another tendency shows that prices are decreasing. For example, the price of a PC dropped from US$ 10,000 in 1982 to US$ 1,000 in 1992, with the quality of picture, the sound, and the processing capability increased. An interactive videodisk workstation cost in 1983 about US$ 15,000, nowadays the latest model costS about US$ 300.

These examples illustrate clearly the general trend of decreasing costs and increasing quality of training technology. This trend will make technology for educational purposes more accessible and affordable.

I would like to add that the educational exploitation of technologies is now possible thanks to their commercial success in other fields such as advertising and entertainment. In other words, we can say that the use of new technology is facilitated because it has been successful on markets other than education.

DEFINITIONS

In this paper I would like to introduce a systematic way of presenting technologies available up today in the educational field with some comments on their present utilization.

Some basic definitions will help in understanding the meaning of the following term used in this presentation:

COURSEWARE	Software developed specifically for educational purposes
ELECTRONIC PUBLISHING	Production/distribution of all types of information (text, sound, video) by means of any kind of digital recording/transmission technology
ELECTRONIC PUBLISHING ACTIVITIES	Everything that will be published and priced for a target user population on the market
FINAL USER	User of the training products (professional, clerk, student, consumer)
INDUSTRIAL APPLICATIONS	Everything that will be published for a large target population without a price or with only a political price tag
INDUSTRY	Companies that produce, commercialize or use information and training technology
INTERACTIVE TV	TV programs where the user is allowed to interact in real time
INTERACTIVITY	Individualization of the information access and learning process with real time contextual feedback from the system on learning achievement
MULTIMEDIA	Different communications languages (audio, video, text etc.) present at the same time and recorded/transmitted in digital format
ON-LINE PUBLISHING	Production/distribution of training materials on a magnetic (floppy) or an optical disk
PROGRAMS	Audio/video transmissions
PUBLISHING	Production/distribution of all types of information (text, sound, video) by means of any kind of recording/ transmission technology
SPECIFIC APPLICATIONS	Tailored training products for an industry
TECHNOLOGICAL PLATFORMS	Technologies of any type utilized to record/transmit information
TITLES/CATALOGUES	Catalogues, and data banks on publications/series of publications

THE GENERAL MODEL.

This analysis is exclusively dedicated to technologies that allow the user to interact with recorded/transmitted information in a digital format through a medium. It is the digital format that makes interactivity possible.

If the information is transmitted, we speak of Telecommunication Technology. If information is recorded/pre-recorded on a physical medium we speak of Disk Technology. It is possible to further subdivide each category of technology as follows:

TELECOMMUNICATIONS	DISK
ON LINE (Interactive Data):	**MAGNETIC**
Videotext	Floppy
Database	
Audiotext	**OPTICAL**
Interactive TV	PC-based ROM:
Cable TV	CD Rom
Telephone TV	Multimedia PC
Superhighways	TV-based ROM:
	CD-I
AERIAL	Others
Terrestrial	
Satellite	

TELECOMMUNICATION TECHNOLOGY

By On-line we mean every network dedicated to transport communication (telephone or specialized network). By Interactive Data it is possible to access and retrieve information through a central computer via a network.

Videotext

Videotext is based upon a normal telephone line plus a modem and a TV set. A user can retrieve information from a central database with a normal remote control. Interaction with the remote computer is limited by time response speed and by the multiple-choice approach. Mainly textual information can be accessed with limited graphics, no sound.

Typical applications are textual databases with constantly updated information intended for a large target population with limited information technology knowledge. MINITEL in France is a videotext with a dedicated low-cost monitor. It has millions of subscribers. Telephone directories and trains departure schedules are the most utilized services.

Experiences in training:		Videotext is a good telematic technology to access databases, or to download educational software on local PC's. The limitation of graphics, the low time response and the limited multichoice remote access to information makes it hardly suitable for educational purposes.
Publishing:		No major publisher is at the moment involved in Videotext courses catalogue; however, some training courses can be accessed and downloaded.
Industry:		After some trial experiences also industries decided to abandon videotext.
Schools:		With the exception of some document exchange and telesoftware experience, no country is utilizing this technology for education.
Research:		Research is based on multimedia Videotext and advanced graphics.
Technical/market requirements:		A videotext system needs a good telecommunication network, a host computer, specific system software, a large TV set installed at the user's place; a strong support of a public administration is also required (case of France).
Costs:	System:	A host computer, plus specific operative software is needed.
	Utilization:	To develop application is not complex nor expensive: it can be done via a normal TV set plus a keyboard or a PC.

Database

The large amount of information hosted in a central computer is accessible via telecommunication and retrievable through a PC. Information stored is normally of high value, and often contain bibliographic references of international interest. Today databases are oriented to textual information and organized in records/fields (every field can be accessed) or full text (every word is an access key). To retrieve information is quite complex and a special query language is needed.

Experiences in training:		Databases technology is suitable to training purposes, but today, text databases with complex query languages offer very limited possibilities for training highly skilled personnel. Telesoftware services have been experienced but access to bibliographic references remain the main training utilization; languages availability (main part of the information stored is in English), and query languages syntax do not facilitate a wide utilization.
Publishing:		Some technical reviews and publications are available, plus some educational software catalogues that can be downloaded. Some USA publishers have developed courseware specifically for on-line/remote access.
Industry:		Some European Telecommunication companies like SIP (Italy), Telecom (France), etc., have specialized courseware that can be utilized by distant company operators.
Schools:		This technology is not used for teaching company personnel and/or students. Some Universities are experimenting multimedia ISDN approach; however, a normal utilization among Universities is electronic mail, networking, data exchange.
Research:		Research programs are undertaken which study the possibility of multimedia databases, compression/ decompression and transmission of full-motion video on normal telephone lines, in order to offer complex multimedia courseware packages and other multimedia training services.
Technical/market requirements:		Very good telecommunication networks are required, preferably high digital technology which is associated with costly information sessions. A very developed PC user market, and modern telecommunication services are needed.
Costs:	Development	Development and production of courseware is quite expensive; the hardware required may be relatively simple, but a great deal of experience and a considerable amount of work is needed to produce good courseware.
	Utilization	This kind of courses need a PC plus telecommunication network. To the cost of a course should be added the telecommunication connection.

Audiotext

It offers the possibility of accessing a vocal remote database through a normal telephone.

Services are very limited and normally contain updated information such as jobs vacancies and entertainment. Some courses could be given (linguistic courses) but costs are very high in comparison with other media, and interaction capabilities are really limited.

Research:	Integration of audiotext capabilities with multimedia non-audio information seems to be an interesting perspective for this kind of services.

Interactive TV

With interactive TV we mean a program where the user is allowed not only to choose a broadcasted program but to:

(1) respond to some questions (telepolling/teleanswering);

(2) access a central library of electronic/audiovisual media from a vast catalogue (telemediateque);

(3) access and order services and objects from purchase catalogues (telepurchase);

(4) access and utilize already existing electronic services (services re-vehiculation).

Cable TV

Cable TV is very popular and accessible in USA, not as much in Europe. The new compression/decompression technique makes it possible to transmit much more information on a dedicated cable. Some research experiences are now in progress in the USA (Virginia, Florida) with some thousand of pre-selected users.

Telephone TV

In Europe some initiatives are taken in UK to begin utilizing the normal telephone line. VCR quality images after the decompression can be obtained on TV screen. No experiment at the moment is progressing in training.

Superhighways

This project for the moment concerns only the USA. However, starting next year also Europe (UK) wants to realize a very high capability network capable to transport everywhere any kind of data (audiovisual, text, data, telephone).

Aerial transmission

A lot of broadcasters use this kind of technology but it does not allow interaction with the end user. Other approaches have been researched. User choice recording during the program and later transmitted over a normal telephone line to a central database. Experiments have been conducted to teach French as foreign language in Africa with a limited multichoice approach. A digital signal is sent during the program and the reply is later transmitted on the telephone line.

Combined approach

Cable plus satellite aerial directly connected with telephone combined with aerial plus FM response system and a ISDN plus satellite and many other combinations are being experimented.

DISK TECHNOLOGY

All the disk technologies focus on the possibilities to distribute pre-recorded information accessible in a personalized way and/or to record information in a personalized way onto a physical medium. Magnetic: these technologies refer to PC-based applications and their name derives from the physical effect: the magnetic recording of information. Optical: Disk technologies based on laser recording/reading capabilities (optical effect) offer huge capability of storing information

Floppies

Floppies are very in most information technology industries. In fact, with millions of PCs all over the world, the floppy disk is a very simple mean to distribute software and information. The principal limitation is memory space: 1.4 Mbytes, at the moment, is a very limiting situation.

Experiences in training:	A lot of courseware has been developed for this medium with a multidisk approach in order to cope with limitation of space. Courses are normally text-based without multimedia languages in order to avoid space problems.
Publishing:	A lot of courseware is available on catalogue and distributed also in bookshops or news stands. Prices are normally quite cheap and the quality acceptable.
Industry:	Many large companies utilize PC-based training for every kind of skill development courses.
Schools:	Some public administration decided to introduce PC-based training in schools and universities but some problems have been encountered in teachers resisting to use technology. At University level, especially in scientific disciplines, less resistance was observed.

Technical market/requirements:		Low-cost PCs are needed, better if equipped to receive multimedia. Users should not be scared of using a PC which appears to be the most important challenge in the medium term.
Costs:	Development	From the hardware point of view the development of courseware does not require big investments. However, to develop a good courseware a lot of specialist-time is required.
	Utilization	The costs involved in the final utilization are: a low-cost PC plus off-the-shelf courseware.

PC-based ROM

It is disk that can be only **read** by the user. The CD-ROM is printed in a plant which produces also CD-audio. These technologies require a PC to access and retrieve information.

CD-ROM is designed to contain every kind of digital information and to communicate this information via a computer. More than 600 Mbytes (200,000 pages of text) can be stored in one CD ROM.

Experiences in training:		Since 1985, a lot of development work has been undertaken in exploiting the possibilities of this new medium. A great amount of courseware has been developed in every field. Main problems encountered: PC limitation in processing multimedia information and some reluctance from non computer-literate users.
Publishing:		More than 5,000 titles are available in the market with a lot of training courses. The number of publishers involved is increasing rapidly.
Industry:		Many large companies are utilizing this technology to train their employees, by developing courses and buying available titles.
Schools:		Some experiences in schools produced mixed responses, mainly due to teachers not being familiar with new technologies. No major and revolutionary projects are running at the moment.
Research:		New interface with the end user, audio-video information products, advanced authoring tools to diminish courseware development costs are the key areas.
Costs:	Development	To develop a multimedia courseware on a CD-ROM may cost some hundred thousand dollars not because of the hardware required but because of the development costs.
	Utilization	A PC plus a quite cheap CD-ROM allow to read CD-ROMs; titles' cost at the moment average US$ 100.

Multimedia PC

A Multimedia PC operate on standard MS-DOS or APPLE operating systems. It has the capability to manage audiovisual information in real time and to access information from on-line databases, TV programs, floppy disks, CD-ROM, and combine them together.

The complexity of the approach requests new software to combine information from various sources. Research is in progress.

CD-I

Compact Disk-interactive (CD-I) is a technology based on a TV set connected to a CD-I player. The user loads a disk and interacts with it trough a remote control. Simplicity of use is the main feature of this technology able to manage various kinds of audiovisual information in training. The use of CD-I does not require special skills such as the use of the CD-ROM and the computer. It is therefore well accepted by non computer literate students and teachers.

Publishing:		Philips is the major supporter of this technology and founded a publishing company which has about 200 titles ready. A lot of them are training/educational titles with particular regard to kids who can utilize this technology without keyboard.
Industry:		Some companies are developing applications for training and technical documentation.
Schools:		In Benelux tests are in progress to utilize this technology in classrooms.
Costs:	Development	To develop a CD-I courseware costs about one hundred thousand dollars in equipment and the same development cost as with CD-ROMs.
	Utilization	A player costs around 600 dollars and a disk around 40: of course a TV set is also required.

Others

Two other formats exist now in the USA: 3-DO and VIS.

The approach is very similar to CD-I with some marketing/technical differences. At the moment it is not possible to know their development and market potential.

Console

A lot of video-games operating with a low-cost computer are going to integrate CD technology; normally non-educational titles are available.

Optical WORM/Erasable

A disk can also be written directly by the end user, recording the information just once (WORM) or many time (erasable). These technologies are not fully standardized but in the near future they will be available at a reasonable cost. SONY Minidisk is the first typical example which offers the possibility to record sound and digital information.

CONCLUSIONS

New technologies will increasingly be of great help to consumer, students, teachers. They will offer a new way to access a large amount of information for learners. Within about ten years of studies and experiences multimedia interactive technology will be ready for the mass market where large quantities cut the costs, and where there will be an increased need for large quantities of readily accessible information at low cost.

Training technology and telematics Round Tables (T3-RT)

presented by

Willem BULTHUIS

Philips Consumer Electronics

Eindhoven

The Netherlands

1. INTRODUCTION

This is the summary of the presentation of Mr Willem BULTHUIS, Philips, on the European Training Technology and Telematics Round Table (T3RT), and especially on the experiences of this T3RT that might be of relevance to the development of a NTT Guidance Programme by ILO.

Besides acting as Chairman of the T3RT, Mr BULTHUIS is Manager, International Publishing Projects in the Multimedia Division of Philips Media.

2. PROFILE OF THE T3RT

In February 1992, the Training Technology and Telematics Round Table (T3RT) was founded by a group of 25 major European companies, with support from the Commission of the European Communities (CEC) under the DELTA programme. These companies consider human resources as a key to competitiveness and share a strong interest in improving the quality of training through the application of modern multimedia and telecommunication technologies.

The main goal of the T3RT is therefore to help its members, and European businesses in general, in exploiting the opportunities offered by technology to improve the quality of employee training. To realize this goal, the T3RT brings together representatives of all market actors involved in this area: companies who use technology for training purposes, companies who make a living out of providing training to others, publishers, technology suppliers, and infrastructure operators. This involvement of all market actors is considered as one of the keys to success of such an initiative.

The current members of the T3RT are listed below. Organizations marked in **bold style** form the Steering Committee:

- Apple Europe
- Berlitz
- Bull
- **DBP Telekom**
- Digital Equipment
- EPOS Internat
- EUROSTEP
- Ford Motor Cy
- **FFT**
- Fundetec
- Futuremedia
- IBM Europe
- ICL/Peritas
- IEPRC
- Jutland Telephone
- **Klett Verlag**
- Lloyds Bank
- Nat. West Bank
- **Philips**
- **SATURN**
- Siemens/SIETEC
- Telefonica
- Thomson CSF
- UNI-C
- **VMC**

The T3RT develops both practical and strategic recommendations, aimed at users and providers as well at governments, notably the CEC. These recommendations are prepared by Working Groups, comprising the best expertise available among the Members. During 1993 Working Groups have been addressing the following issues:

- how to support the selection of Delivery Mechanisms for training material?
- how to handle Design Migration: porting training material to other technologies?
- how to develop true Learning Organizations, with technology embedded optimally?
- how to cope with the Market Aspects of a standard framework (CTA), i.e. how to assure market uptake?
- how to stimulate Publishers to enter the training technology market?
- what are the barriers and Priorities for Action to stimulate market uptake of training technology?

3. EXPERIENCES USEFUL FOR THE NTT GUIDANCE PROGRAMME

A selection of some T3RT experiences which might be useful input for the development of the NTT Guidance Programme is presented below:

- one of the keys to success of the T3RT might also be of great relevance to the NTT Guidance Programme: the involvement of all key factors in the market. Especially important are the developers and publishers of learning material, as well as the infrastructure operators. Without their support, NTT will not take off. In this context, of special interest might be the results of the Working Group "Stimulation of Publishers" which has been analysing what role Educational Publishers could play in the multimedia market and how they could be stimulated to enter this field;
- a similar statement can be made about the involvement of all factors within the user organization: in the context of this workshop all relevant bodies in the Regions. Just as the T3RT experiences in European companies, not only the decision-makers should be involved but also the people who finally have to take up NTT (local managers, teachers, etc.);
- a specific concern of the T3RT is the selection of the appropriate technologies for a specific training situation. The Working Group "Delivery Mechanisms" is studying this question in detail, not with the aim to recommend specific technologies but to come up with a method and framework supporting the decision-making process. The approach is to start from the analysis of a specific training environment and to define which characteristics are most important in this specific context. As a second step the alternative technologies can be evaluated, on the basis of a general description and matrix provided by the Working Group, to select the most appropriate ones for the specific situation. It is believed that in practice often a combination of two or three technologies might provide the optimal solution.

This approach is illustrated in the matrix below.

The matrix may be used as a checklist, primarily for oneself. It provides a practical frame for completing it the way he or she likes.

characteristics	broadcast	PSDN	ISDN	B-ISDN	LAN/ WAN	CD/tape	paper
topology							
availability							
management							
costs							
content							
learning material							
human comms							
security							
reliability							
acceptance							

An overview of the characteristics which should be considered in the selection of appropriate delivery technologies for a specific situation is presented below:

TOPOLOGY

number of locations
number of learners
learners per site
type of location
(support needed)

CONTENT

multimedia
interactivity
volume
portability

RELIABILITY

maturity of standard
technical stability
technical flexibility

COSTS

upfront, infrastructure
upfront, per terminal
operational, fixed
variable per provider
variable per user

COMMUNICATION

1-way, real time
1-way, asynchronous
2-way, real time
2-way, asynchronous

AVAILABILITY

geographic spread
crossborder
at centres
at homes

MATERIAL

courses available
courses expected
range of material
number of sources
production costs
production time

ACCEPTANCE

familiarity
ease of installation
ease of operation
ease of use

MANAGEMENT

administration
creditation
billing
payment
booking
wait time

SECURITY

of infrastructure
of content
of learner data

In order to resolve specific training problems, one should enquiry about availability of technology, management issues, costs issues, availability of learning material, whether human communications are necessary or not, etc...

The use of the matrix may help discovering the strengths and weaknesses of each of these delivery mechanisms (broadcasting, telephone lines, ...). If there is a problem, technology might not be the only answer to it; one has to go through every single specific issue related with the problem. At the end of this procedure, one should be able to produce the best instruments to help people to make their own decisions.

After having found the strengths and weaknesses of these technologies, one will need to choose a combination of one or two technologies.

4. SUGGESTIONS FOR THE EXPERT MEETING

The following questions were submitted for discussion at the NTT Expert Meeting in relation to the *Guidelines* to be developed:

Key Questions:

- why guidelines?
- what are the target audiences?
- what are their decision processes?
- what information is needed?
- how will the guidelines be used?
- how should they be structured?
- how should they be presented?
- how to develop the guidelines?

Why NTT?

- what are the current training problems?
- what are the circumstances?
- what constraints does this pose?
- which problems could be (partly) solved by NTTs?
- which NTT's are useful for solving these problems?

How NTT?

- how to deploy NTT's successfully?
  - acceptance issues
  - organizational issues
  - infrastructural issues
  - learning material & support issues
  - pedagogical issues
  - financial issues
  - legal issues
  - technical issues

Training Problems

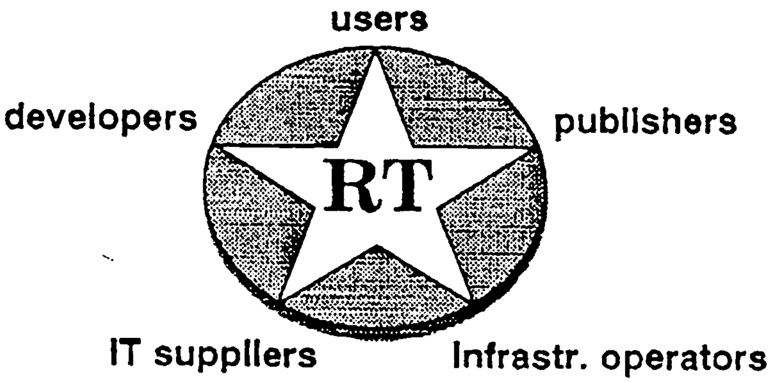
- affordability
- accessibility (spread)
- speed of skills development
- lack of teachers
- lack of learning skills
- lack of learning material
- lack of infrastructure

Constraints

- low upfront investments
- low operational costs
- fast implementation
- independence of infrastructures
- robustness
- ease of operation
- easy entrance (limited prerequisites)

The following pages illustrates the transparencies used by Mr Bulthuis in his presentation.

T3RT Members



Members

- Apple Europe
- Berlitz
- Bull
- DBP Telekom
- Digital Equipment
- EPOS International
- EUROSTEP
- Ford Motor Company
- FFT
- Fundetec
- Futuremedia
- IBM Europe
- ICL/Peritas
- IEPRC
- Klett Verlag
- Lloyds Bank
- Nat. Westminster Bank
- PHILIPS
- SATURN
- Siemens/SIETEC
- Telefonica de Espana
- Thomson CSF
- UNI-C
- VMC

T3RT Goals

- to bring together European providers and users of training technology
- to consider strategic issues, produce recommendations, and disseminate these
- to stimulate demand and makret uptake of existing and emerging training technology
- to stimulate cooperation between R&D and implementation projects
- to advise European bodies such as the CEC on technology application programmes and European industry policies

3

Transparency No. 4

Working Groups

DBP	• delivery mechanisms
Lloyds	• design migration
IBM	• learning organisations
Bull	• technology for trainers
IEPRC	• copyright issues
VMC	• market aspects of CTA
Klett	• stimulation of publishers
Philips	• priorities for future actions

- market sector awareness creation
- success stories

4

T3 RT

Multimedia for Training

?

- instructional paradigms
- organisational implications
- technology choices
- infrastructure issues
- development problems
- political & legal aspects
- investments & risks

5

T3 RT

D.I.Y. Approach (wrong)

X

- long studies
- trial-and-error
- re-inventing wheels
- unrecovered costs

→ frustrations
→ lack of confidence

6

Collaborative Approach

- exchange experiences
- share expertise
- share resources
- gather power

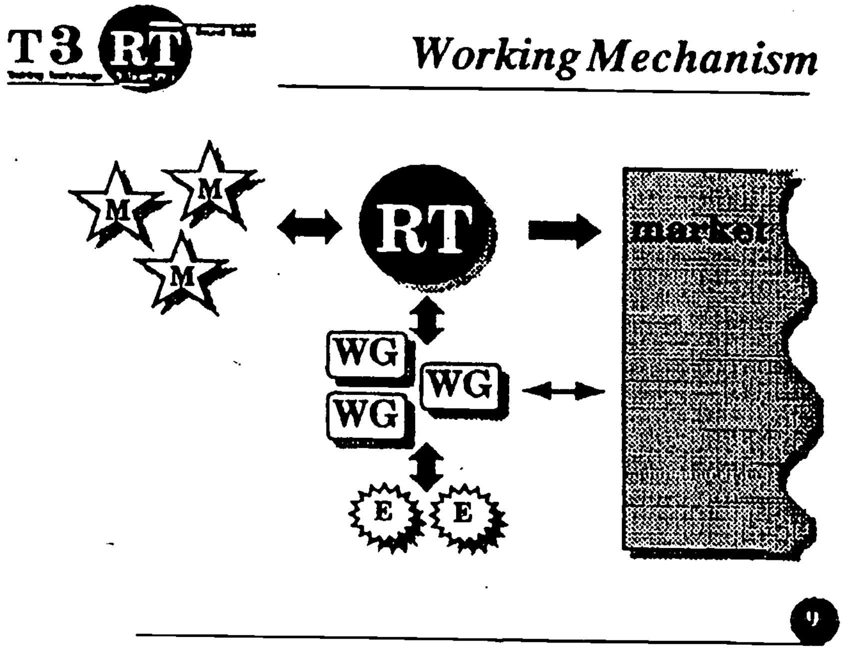
➨ reduced risks & costs
➨ better & quicker results

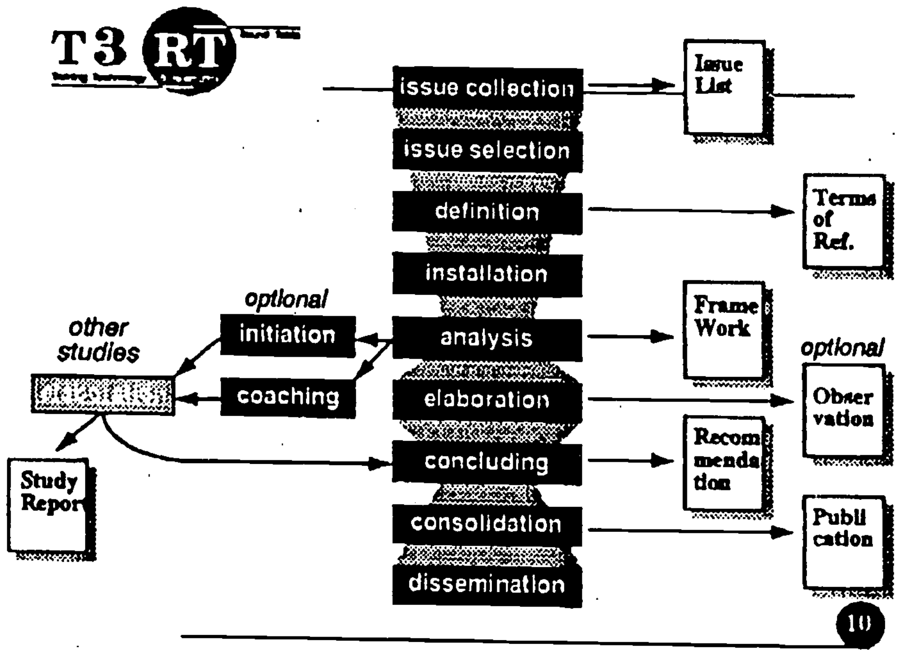
7

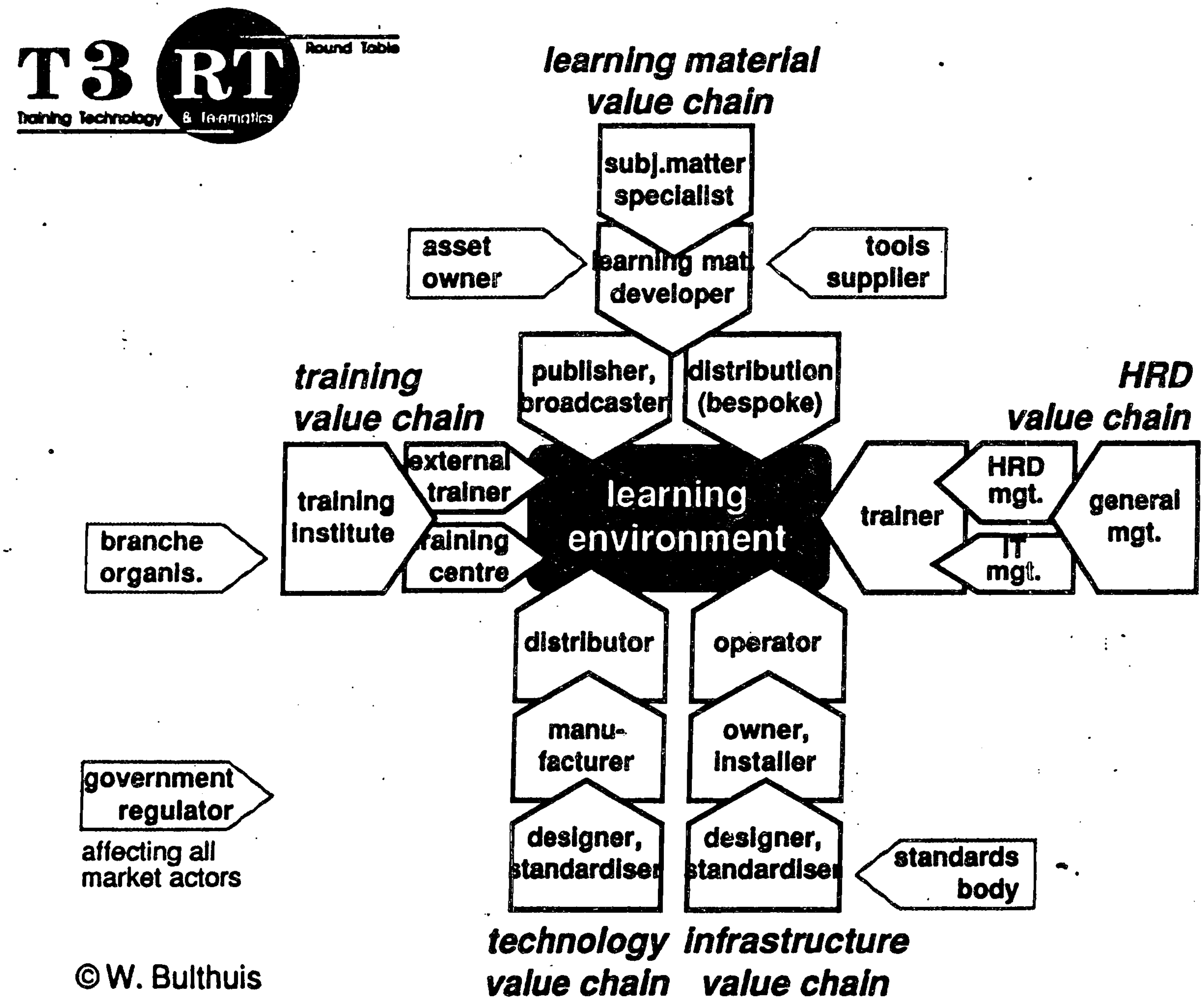
How to Collaborate

- don't focus at specific technologies
- don't focus at content
- address manageable issues
- 2 levels: management and experts
- sufficient critical mass
- CEC support

8


T3 RT
Working Mechanism
M
M
M
RT
market
WG
WG
WG
E
E
9


T3 RT
issue collection
issue selection
definition
installation
analysis
elaboration
concluding
consolidation
dissemination
Issue List
Terms of Ref.
Frame Work
optional
Observation
Recommendation
Publication
optional
initiation
coaching
other studies
Study Repor
10


T3 RT
Training Technology & Telematics
Round Table
learning material value chain
subj.matter specialist
learning mat. developer
asset owner
tools supplier
publisher, broadcaster
distribution (bespoke)
training value chain
HRD value chain
external trainer
training centre
training institute
branche organis.
learning environment
trainer
HRD mgt.
IT mgt.
general mgt.
distributor
operator
manu-facturer
owner, installer
designer, standardiser
designer, standardiser
standards body
government regulator
affecting all market actors
technology value chain
infrastructure value chain

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CD-I as educational tool for developing countries

presented by

Willem BULTHUIS

Philips Consumer Electronics

Eindhoven

The Netherlands

INTRODUCTION

During the NTT Expert Meeting, Mr Willem BULTHUIS from Philips gave a demonstration of CD-I as an educational tool for developing countries. The demo gave an idea of the opportunities offered by consumer products like CD-I to education in areas where money, technical infrastructures and teaching skills are scarce.

The purpose of the demo was to give an example of what is possible today with really low cost technology which is very easy to install and operate. It also illustrated the importance of publishers' involvement in an initiative as the NTT Guidance Programme.

THE TECHNOLOGY AND THE STANDARD

CD-I stands for "Compact Disk Interactive" and is a low-cost machine that can play multimedia versions of the well-known audio CD. While a CD-audio player is connected to a hi-fi set, CD-I is connected to a normal TV set (portable players with built-in colour screens and loudspeakers are also available). CD-I makes it possible to play ordinary audio CDs, video CDs containing complete movies (at better quality than VHS) and interactive multimedia CDs according to the CD-I standard.

The CD-I standard has been developed jointly by the major electronics companies (PHILIPS, SONY, MATSUSHITA) and endorsed by many other hardware companies, since then as a major entertainment platform for the future. Moreover, the standard is taken up by many publishers, movie companies and specialized multimedia developers, including companies specialized in courseware development.

CD-I disks are being developed by hundreds of companies around the world today, so that development skills are well available, also for training titles.

THE ADVANTAGES FOR EDUCATION IN DEVELOPING COUNTRIES

During the demo and the discussion, many advantages of a technology like CD-I for education in developing countries were raised. Besides being an accepted world standard for delivering truly interactive multimedia applications, the low costs of the equipment and distribution of courseware is a key advantage. The only requirements for a learning station are the CD-I player (well below US$ 1,000 including video, below US$ 500 without video), an ordinary TV set and power. No experts are needed for installation or operation, as the system is designed for consumer use.

Also the distribution of courseware on CD is very low cost (cheaper than on video tape), and facilitated by the fact that multiple (spoken) languages can be on one disk. The development costs can be substantial, but this is true for any good-quality multimedia learning material. CD-I learning material is being developed already by many companies, primarily for in-house use but also for publishing. Current educational titles on the market cover languages, management, medical, maintenance, technical training, etc...

Another key factor is that the CD-I medium is future-proof: extensions are planned (like addition of modem functions, interactive TV, etc...) but there will always be upwards compatibility (as consumers demand this). For this reason and because a small CD is much easier to handle than a large videodisk, many companies (such as the CHRYSLER Car Company) are converting their entire videodisk training library to CD-I.

GROUP WORK

Based on the approach suggested by Mr Willem BULTHUIS, the meeting decided to proceed step by step analysing a set of questions. Each question was discussed in groups which presented their conclusions in plenary sessions. Here is a summary of this work.

1. WHY GUIDELINES AT ALL?

Are guidances needed to get decisions at all, or to improve decisions being taken?

How can we move from offerings made to countries by consultants, manufacturers, etc.. to a demand-driven approach?

Considering that decisions about investments and the use of NTTs are being taken by decision-makers who in most cases have little experience in this field of continuous and rapid evolution, the meeting felt that it is necessary to provide such decision-makers with updated and unbiased guidance.

The discussion during the meeting aimed therefore to better define who should receive what kind of information and guidance, and how this should be organized. In order to reach this objective, the meeting discussed and adjusted the proposed agenda, structuring the discussions to reflect a logical sequence of posing questions and finding their answers through group work.

2. WHAT ARE THE TRAINING/LEARNING PROBLEMS IN THE DEVELOPING COUNTRIES?

In **RUSSIA**, there is a lack of training institutions; existing ones have old-fashioned approaches and methods; there is an absence of needs' assessment; instructors do not have the necessary skills to teach new topics with new tools, and there is a lack of motivation on the learners' side to get trained.

The absence of government plans creates gaps, which brings foreign trade suppliers into the market; the private sector is able to pay for training. There is also a lack of priority for the training areas where skills are needed (e.g. energy). One has to start, but cannot do everything at the same time nor from the very beginning, because of lack of human resources, money, lower-level skills who can "fix things"; the initial training has to go outside the central cities, and be spread throughout the country.

In **SOUTH-EAST ASIA** and **LATIN AMERICA** problems occur because of the insufficient level of proficiency in the subject matter and in the common language of instruction (English).

Training towards the market needs is inadequate and does not keep pace with the changes in industry. The basic education, and also the basic skills, are insufficient. No evaluation and follow-up mechanisms are in place. There is a need for training the trainers, who are not at the right quality level. Both teachers and learners have to change their attitude *vis-à-vis* NTTs.

The population to be trained is geographically very dispersed, therefore difficult to reach. There is a lack of infrastructure (equipment facilities) and insufficient access to limited equipment because of its cost (equipment is locked, difficult to access); technical information is generally not translated into the national languages. Time for training is too short. Hardware and software which are needed can not always be imported because of limitations of quotas in strong currencies.

In **AFRICA** and **ARAB STATES**, the high cost of training induces its scarce diffusion. The objectives of training are outdated and this creates a lag in the speed of skills development. Not enough teachers are available with the right skills.

Energy (power supply) and telecommunications (telephone, radio, TV) are not 100 per cent reliable (power cuts) and do not cover 100 per cent of the country territory (radio waves). This induces a need for physical distribution of learning tools and material. The ignorance of the training possibilities results in a lack of motivation. No career planning and no job descriptions exist. Cultural factors make it difficult to adapt the material from one country or region to another. The political instability and the lack of management do not help! There is a preventive education for subjects like war, drugs and AIDS.

3. WHAT ARE THE CONSTRAINTS AND REQUIREMENTS FOR NTT SOLUTIONS?

Particular benefits of NTTs are: flexibility (flexible content in terms of culture, languages can be created locally, curriculum), networking among people (linking desktops, libraries, colleagues and expertise), and creation of virtual classrooms (linking people at distance having the same learning needs and solutions needed).

Constraints are: they are "new institutions" for which there is no model yet, access to infrastructure (asynchronous telecommunications can work on low cost and quality lines), cost of communications (might be solved by educational rates, purchase in bulk of hours of telecommunications systems, adaptation of user rates by telecommunications providers for training) and limited reach/access (possible solutions are: combine broadcast with group work, target learning centres, create networks of centres).

Economies of scale can be achieved if one reviews the models of learner/teacher ratio, i.e. if one works in a way that several learners may follow at the same time the course delivered by a single teacher, even if this decreases the one-to-one contact between the teacher and every learner.

In **AFRICA**, electricity availability is unstable (use battery-powered equipment and/or power generators), telecommunications (radio waves do not cover the whole country; telephone lines are not feasible) are unreliable (think about physical distribution of educational material), decision-makers are uninformed and have wrong budget models (need for information and some lobbying), and trainers are not trained (need for trainers' training).

In **SOUTH-EAST ASIA**, there are large differences in infrastructures, skills, etc... (need for individualization of training), electricity is unreliable (need for battery-powered equipment and/or generators; also to focus on Training centres), money is missing (low-cost technologies may help), cultural differences are important (adaptation of training materials to local needs and translation into local languages), political leaders are unstable (need for sustainable strategy, assessment of infrastructures and potential use of NTTs), and teachers' quality is not high enough (need for trainers' training and support).

In **ARAB STATES**, the same problems as in the other regions; besides important unbalance in wealth among countries (richness is generally in reverse order of the number of inhabitants), the language to teach and learn technical subjects is generally English (no Arab terms for recent terminology in technical subject matters) which makes it necessary to have bilingual material (Arab + French or English), few technical books are available in Arab, good teachers are absorbed by the industry (use NTTs to upgrade teachers' skills).

4. WHAT IS THE TARGET AUDIENCE FOR THE *GUIDELINES*?

Which people/functions and organizations are involved in the decision process, related to the choice of NTTs for technical and vocational education?

In **SOUTH-EAST ASIA**, Secretaries (Ministers) of Education, Planning, Finance, Budget, Labour, Transportation and Communication, as well as the Under-Secretary for the Budget in the Ministry of Education; the chairmen of the Senate and of the Lower House; the SEAMEO council; the Directors of Technical and Vocational Education, and of the various Training Centres; the Prime Minister as well as the President or the King; Regional Directors of Education, the National Manpower and Youth Council; non governmental organizations (NGOs); the Chambers of Commerce and the Department of Trade and Industry.

In **LATIN AMERICA**, the Ministers of Education and of Labour; the State Education Secretaries (e.g. 27 for Brazil only); the Confederation of Industry (and its State Federations) and the Confederation of Commerce (and its State Federations); Training Centres: SENAI (for Industry), SENAC (for Commerce) and SENAR (for Rural Education); the Director of EMBRATEL (Brazilian telecommunications); Educational TV stations; Labour Unions; the training department of large enterprises; Universities (more for consultancy than for real decision).

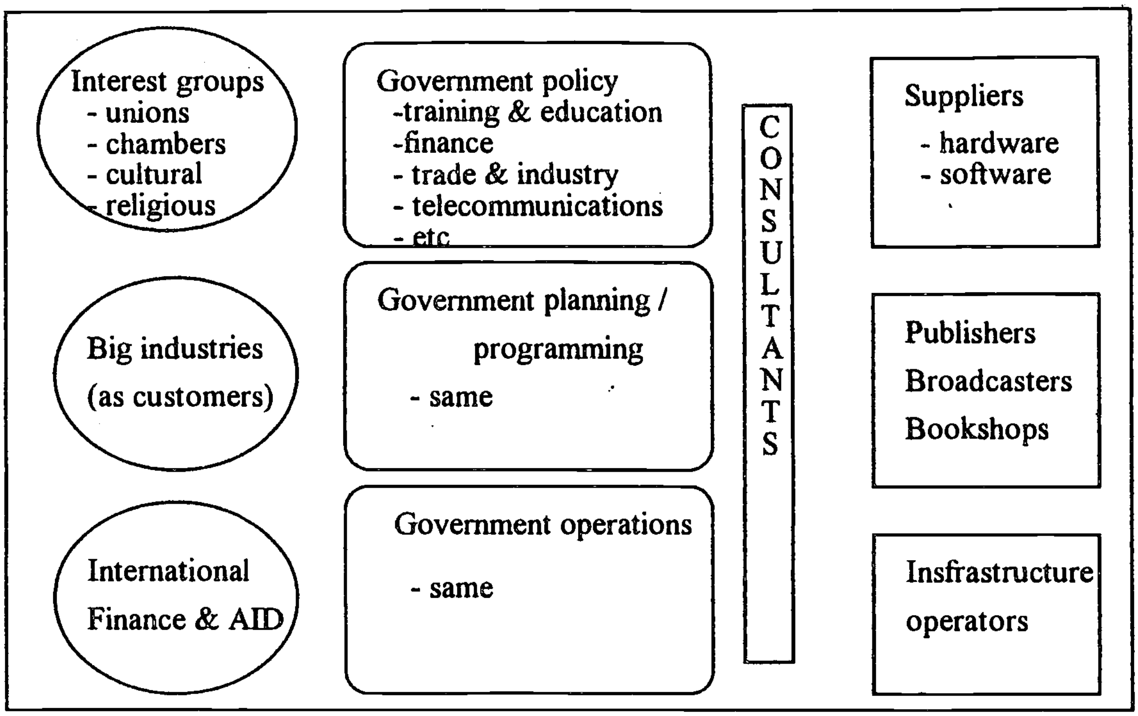
In **RUSSIA**, it varies according to the type of decision. Strategic decisions at the national level are taken by the Ministers of Labour and of Higher Education, and the Bureau of National Statistics. Decisions concerning investments in infrastructure, curriculum development in core areas, professional development and mass media course development are taken by the national Training Agency working in connection with the World Bank, the Ministry of Higher Education and Universities. As to the acquisition of hardware and software, there are guidelines from the Ministries: the equipment has to be approved, funds are provided by different government sources and the industry. Although foreign companies enter the market, Russian courseware at University level are not yet available for technical and vocational education. Methods used by trainers and the content of education are decided by the Ministry of Education, its Higher Education Division and re-training institutions (re-training is mandatory). There is a shortage of new trainers, because other jobs are better paid. The use of telecommunications is decided by the Academy of Science, the Ministry of Higher Education, the Post and Telecommunications and the providers of electronic mail systems. Special rates are offered to training institutions and universities.

In **AFRICA** and **ARAB STATES**, the most important decision-makers are the Ministers of Education and of Finance, and publishers. Key Ministries are those of Post and Telecommunications, Education, Labour, Finance, Industry and Commerce, Defence. Other target organizations are educational institutions, schools and Universities, as well as Training Centres, broadcasting corporations, multinational corporations, financial institutions such as the World Bank, IDA, USAID, bilateral trade partners, multilateral partners (e.g. EEC), banks. Others target are bookshops and publishers, religious and cultural leaders, teachers, trade unions, local entrepreneurs.

This long enumeration of potential decision-makers made it necessary to summarize and cluster them into categories:

- Government is making decisions at three levels of hierarchy:
  - government authorities responsible for strategy and policy decisions;
  - directorates at ministerial level responsible for planning and programming public expenditures and allocations of human resources;
  - Universities and training institutions responsible for the operational aspects of education and training;
- interest groups, such as unions, chambers of commerce and industry, cultural and religious influential groups;
- big industries training departments, acting as customers for training programmes and technologies;
- development aid partners, such as international financial lending institutions and international and bilateral aid organizations providing technical assistance;
- consultants, offering their services for training programmes;
- suppliers of both hardware and software;
- publishers, broadcasters and bookshops;
- infrastructure operators (telecommunications, Radio and TV broadcasters, etc...).

The following table illustrates a clustering of categories of decision makers.



5. WHAT ARE THEIR DECISION PROCESSES?

Introduction

Decisions about New Training Technologies should be taken in the light of the country's social, economical, political and industrial context. It should include the analysis of training needs and of the target group and define educational objectives. Only then decisions as to which selection criteria should be used to apply NTTs can be taken.

The decision process may not be linear, nor standardized; it may involve information gathering, analytical work, consultations, preparation and selection of options, etc...

Group work results

The meeting felt that some kind of guidance is required, which should include models of systematic approaches. The outcome of the group work illustrates examples of a series of actions and their chronological order which could help decision-making.

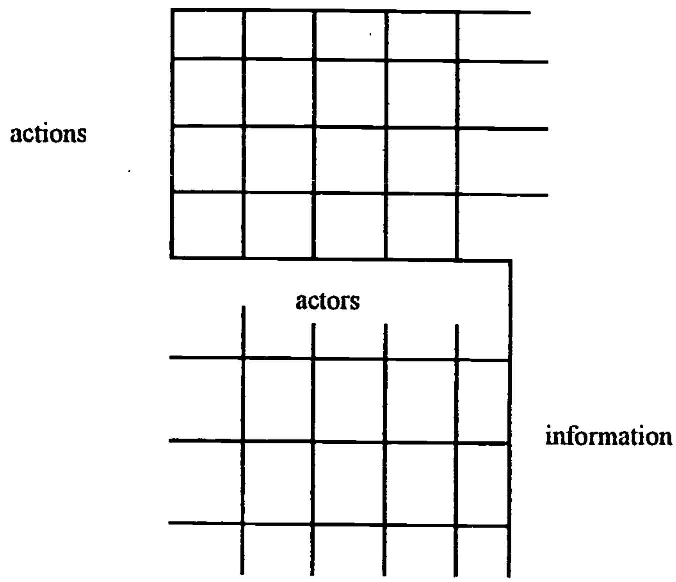
- Target groups have to be identified first: how many people do we have to train, starting from which skills level? What level of competency has to be achieved? How much are they geographically dispersed? What is the language of instruction?

- Next, the available resources have to be identified. How does the existing infrastructure look like (institutions, communications)? What are the available budgets and human resources?

- Then, one may list options likely to be able to solve the problem; analyse them in terms of costs, human resources, technology, institutional capacity, technical and pedagogical experience of trainers and time frame.

- Finally, one or two options may be selected in consultation with experts in educational technology. Organize pilot implementations and assess them on a longer-term basis, in order to finally be able to make recommendations to decision-makers.

This approach can benefit from the use of matrices like the one suggested in Dr COLLIS' paper or the one suggested by Mr BULTHUIS, which is in fact a 3 dimensional matrix relating the decision actions with decision actors and information needed.



6. WHAT INFORMATION DO DECISION-MAKERS NEED?

Referring to the categories of target audiences listed under 4. we can make an attempt to better inform every type of decision-maker at the level at which he or she has to decide. The meeting did that in two ways: the types of information needed and the level at which information has to be delivered to each cluster of decision-makers.

Information types

VIP people (Ministers) should receive information concerning available resources and the cost-effectiveness of NTTs in the form of macro-models. It may be provided on paper or computer data. They should also receive examples, analysis of spin-offs, information on how this was achieved. They should be invited to visit successful cases or shown a short video. Interviews of other Ministers having successfully implemented NTTs, reminding the problems they have to solve (lack of qualified teachers,..) and examples of success stories which may include interactive and distance learning.

Planners and Programme managers, (high level civil servants) have a more stable employment, they do not change for political reasons. They should receive information about micro-level economical advantages of NTTs. They should be invited on study tours with the possibility to spend some days to study successful experiences, attend demonstrations and short videos. A list of contacts and phone numbers (who does what in the field); checklists of available sources of additional information; updates about success stories; lists of sources for further training, especially at a distance, should be provided.

Training professionals should receive computer-based information: hypertext and/or hypermedia, examples on CD-ROMs, etc... provided they are equipped to use these tools.

Solution-providers could receive checklists, be in contact through computer networks (INTERNET, ERIC) on top of receiving paper-based information. They should be advised how to promote desktop text publishing (e.g. Mc GrawHill, IBM) and how to distribute technical information via networks (e.g. DEC-EDS).

Hardware manufacturers do not need to receive this type of information. However they might be interested to know the trend of the market potential in developing countries. Such information can in most cases be obtained by analysing available documentation and reports of national development and investment plans and of pipeline projects funded by international lending institutions.

Software producers should be made aware of the developing world issues in order to develop appropriate authoring systems: little high technology, necessity to translate and adapt courses to different languages and cultures, important need for technical and vocational courseware.

These different groups of decision-makers should receive data about the number of students to be trained, for what type and levels of skills, the number of hours needed to develop one hour of training, the price a student is able to pay for a course, the price companies are willing to pay to train their personnel. Information about country partners, universities and local entrepreneurs would also be useful to them.

Information levels

Information needed can be categorized in three levels: a) basic information which is necessary to take policy and strategic decisions, b) detailed information for those who plan and program, and c) specific information needed by those who decide at the operational level.

These three levels apply to a series of information about resources (human, material, financial, facilities and existing media), training needs (by sectors, regions, groups), hardware (CPU, storage, printers, maintenance, costs...), software (upgrading, system software, authoring systems, costs...) and courseware (existing courses that could be bought and used without new development). That information should reflect the state-of-the-art, trends, indications about return of investment and payoff. One might also give examples of successful and unsuccessful utilization of NTTs. Such information would have to be updated every six months.

Basic information should be distributed to those taking government policy decisions, interest groups (unions, chambers of commerce, cultural and religious groups) and infrastructure operators.

Detailed information are needed by those making government planning/programming decisions, publishers and broadcasters and big industries (as customers), to a certain extent.

Specific information is needed at the level of government operational decisions, international financial and aid institutions, hardware and software suppliers and big industries (as customers).

7. HOW WILL THE *GUIDELINES* BE PRESENTED?

How and in what form should information and guidance be available to governments and other decision-makers? One can think of various information supports in order to make them more attractive and adaptable to the resources available of decision makers and operators.

The idea has evolved during the meeting from the initial intention of developing a written NTT guideline and ended up with the idea of a fully-fledged "*NTT Guidance Programme*" in support of decision-makers.

The suggested programme aims to provide up-to-date unbiased information and professional guidance in various forms to public and private educational and training organizations, to producers of teaching software and to development aid organizations.

The four major components of the guidance programme

(a) Establishing in participating countries an institutional focal point in NTT, for example the department of New Technology of a leading national University.

The responsibility of such focal point is to collect and keep up-to-date information on NTT, and make it available together with advisory services and guidance to decision-makers and trainers. The same NTT focal point should also be able to provide information to bilateral and multilateral development aid organizations and to NTT hardware and software producers in regard to the market potential and demand of NTT in the country.

(b) Production and distribution to NTT focal points and decision-makers of an initial "*NTT Guidance Kit*" which includes printed guidelines, NTT demo courseware and a diskette or CD-ROM containing data of various types of information. The NTT Guidance Kit should provide guidance for target groups at various levels identified by participants of the NTT expert meeting in Turin.

(c) Setting up an Electronic Performance Support Service (EPSS) to provide NTT focal points with on-line information, computer conferencing and access to examples of NTT programmes, as suggested by Dr Collis.

(d) Training of NTT focal points in view of taking over new responsibilities as providers of information and guidance in NTT, and as trainers of trainers in the use of NTT; facilitating study visits for decision-makers to NTT sites of interest in other countries and training institutions.

Sustainability

The NTT Guidance Programme should operate on a sustainable basis. The launching of the programme will require a project which develops the four main components of the programme.

On completion of the project, the Programme should continue to operate on a self-financing basis. For example, national NTT focal points should generate income through advisory, consultancy and technical services which would enable them to pay the cost of information, for participation in meetings and visit to NTT exhibitions, and for a continuous updating of NTT hardware and software at the workplace.

The programme caters for a wide partnership which should involve research institutions, manufacturers of NTT hardware and software, publishers, professional associations and, of course, national NTT focal points. The partnership should be conceived in such a way as to enable each member to benefit from the existence of the NTT guidance network.

RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The participants of the NTT expert meeting showed a great interest in the outcome of the various group work and debates during the week.

A wealth of suggestions and innovative thoughts brought together a number of ideas which are worth pursuing and turning into concrete actions. These actions are described under point 7 (above) and they should lead to the implementation of a "*NTT Guidance Programme*" and network.

The UNESCO and ILO Turin Centre representatives closed the meeting and stated that both organizations will jointly pursue the recommendations of the expert meeting and develop a project proposal for launching the "*NTT guidance programme*".

A resource person of the NTT expert meeting was entrusted the task of elaborating the outline of this programme on the basis of the recommendations of the meeting. The outline will serve as a basis for discussion and reference of a working group for the formulation of a project proposal to be submitted to funding agencies. Another NTT expert was given the task of writing a short publication on the current State of the Art of Educational Technology.

Almost all participants of the meeting expressed their interest in a partnership in the "*Guidance Programme*", namely: the University of Twente would be interested in the design and operation of the Electronic Performance Support Service; Digital showed an interest in producing a CD-ROM example demo courseware available in the world marked for the NTT information kit. The representative of the council of South East Asian Ministers of Education expressed interest to act as a sub-regional focal point in south-east Asia.

Raising the necessary funding of the "*NTT Guidance Programme*" with sponsors will be facilitated by presenting the proposal indicating the interest of important research institutions, industry, national and international organizations to join the information network as partners.

UNESCO

International
Training Centre
of the ILO
Turin

APPENDIX 1:
LIST OF PARTICIPANTS

Expert Meeting on New Training Technologies in Technical and Vocational Training

Turin, 6-10 December 1993

Participants in the Expert Meeting on

NEW TRAINING TECHNOLOGIES

Turin, 6-10 December 1993

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Turin, 3 December 1993

UNESCO

International
Training Centre
of the ILO
Turin

APPENDIX 2: PROGRAMME OF THE MEETING

Expert Meeting on New Training Technologies in Technical and Vocational Training

Turin, 6-10 December 1993

MONDAY 6 DECEMBER	*MORNING*		Resource Person
	Participants' arrival and registration		
	12.00 - 13.45	Opening buffet - lunch at the restaurant of the Centre	
	AFTERNOON		
	14.00 - 14.30	Briefing on Turin Centre's HRD activities	F. Campagna J. Pujol
	14.30 - 15.15	Presentation of objectives, methodology and workprogramme * Plenary discussion	F. Campagna R. Tiburtini
	15.15 - 15.30	Coffee break	
	15.30 - 16.15	"New Technologies in Technical and Vocational Education" (TVE) * Presentation and brief discussion	F.L. Pau Digital
	16.15 - 17.15	"Issues in assessing the comparative advantages of NTT's in terms of cost-effective learning" * Presentation and brief discussion	B. Collis Twente University

All meals including breakfast will be in the Restaurant of the Centre from Monday to Friday unless otherwise noted.

TUESDAY

7

DECEMBER

MORNING

8.30 - 9 .45	"Telecommunication supporting distance learning" * Presentation, video and plenary discussion	A. Stahmer Publisher "The Technology Monitor" Toronto
9.45 - 10.00	Coffee break	
10.00 - 11.15	"Training technologies" * Presentation and plenary discussion	A. Herrmans IBM Europe Bruxelles
11.15 - 12.15	Visit to laboratories	

AFTERNOON

13.45 - 14.45	Demo of CD-I's:	W. Bulthuis P. Cellini
14.45 - 15.45	"New Technologies for Training", Status of the Art * Presentation and plenary discussion	
15.45 - 16.00	Coffee break	
16.00 - 17.15	Group work: "Issues and problems related to the applications of NTT in developing countries"	

WEDNESDAY

8

DECEMBER

MORNING

8.30 - 10.00	Presentation of Tuesday's groupwork	A. Stahmer A.Herremans
10.00 - 10.15	Coffee break	
10.15 - 12.15	* Presentation and discussion "Training Technology and Telematics Round Tables (3T RT), experiences of an influencial platform of users and suppliers of NTT's. Suggestions for guidelines	W. Bulthuis Philips Eindhoven

AFTERNOON

14.00 - 15.15	* Group work: "What is the decision making process and required actions related to NTT's?"
15.15 - 15.30	Coffee break
15.30 - 16.00	* Presentation and discussion of group work
16.00 - 16.45	* Group work: "What persons (functions), which organisations are involved in decision making related to NTT's?"
16.45 - 17.15	* Presentation and discussion of group work

THURSDAY

9

DECEMBER

MORNING

8.30 - 9.00 * Presentation: A. Stahmer

Synopsis of Wednesday's group work on: "What persons, organizations are involved in decision making related to NTT's?
Presentation of Cluster diagram

9.00 - 10.00 * Group work:
"What information and guidelines should be available to cluster groups?"

10.00 - 10.30 Coffee break

10.30 - 12.00 * Presentation and discussion of group work

AFTERNOON

14.00 - 15.30 * Group work:

Group 1: "How and in what form should info/guidance be made available to Government?"

Group 2: "How and in what form should info/guidance be provided to NTT manufacturers and publishers"?

15.30 -15.45 Coffee Break

15.45 - 17.15 * Presentation and discussion of group work

Dinner outside: 19:30 departure by bus from the Reception to the Valentino Castle

FRIDAY

10

DECEMBER

MORNING

8.30 - 9.45	* Plenary discussion and proposal on NTT info/guidance kit	F. Campagna R. Tiburtini
9.45 - 10.00	Coffee break	
10.00 - 12.00	* Recommendations on follow up actions for the development, production and dissemination of NTT info kits.	
12.30	FAREWELL LUNCH	

AFTERNOON

* Departure of participants

* Finalising the report of the meeting by the rapporteurs.

APPENDIX 3

PAPERS DISTRIBUTED

Bacsich P., Mason R., Rawlings A. et al. EADTU, The Netherlands	• *Telematic networks for open and distance learning in the tertiary sector. CCAM Study*
Bates A.W. The Open Learning Agency	• *The range of modern media in education and training: a world-wide overview,* 1993 • *Educational aspects of the telecommunications revolution*
Carrascal M.J., Pau L.F., L. Reiner	• *Knowledge and information transfer in agriculture using hypermedia. A system review*
Cellini P. Rome	• *New technologies for training. State-of-the-art,* 1993
CNR - Olivetti University La Sapienza, Rome	• *GOLEM - Newsletter of technology and Education Institute of Psychology,* 1993
Collis B. Faculty of Educational Science and technology, University of Twente The Netherlands	• *Issues in assessing the comparative advantage of NTTs in terms of cost-effective training and vocational education,* 1993 • *Performance supported and its role in training and training management implications for ILO/UNESCO NTT guidelines,* 1993
European Association of Distance Teaching Universities	• *CCAM - Investigation on Telematic Networks for Tertiary Education,* Vol. 1 and 2
France H., Ricciardi Rigault C. NATO Grenoble	• *Collaborative distance learning and computer conferencing,* paper presented to the NATO Capstone Advanced Research Workshop in Advanced Educational technology, 1993
Herremans A. IBM Europe	• *Training technologies,* 1993
ILO Turin Centre	• *New Training Technology - Modular series,* 1991
North-South Institute Ottawa, 1989	• *Telecommunications and development. A call from the Third World*

Paquette G., Bergeron G., Bourdeau J.	• *The virtual classroom revisited. An architecture for integrating information technology in distance education and training*, 1993
Pau L.F. Digital Equipment Europe	• *WAN+LAN for distance education* • *Evaluation of the common training architecture (CTA) based on case studies* • *Knowledge assets concepts and techniques for CTA and training applications* • *Training solutions using new technologies esp. in developing countries* • *Analysis of delivery technologies for corporate training*
Stahmer A. Toronto	• *Technologies for Workplace Training in Canada: Uses, Costs and New Partnerships*, 1993 • *Satellite technologies and services; implications for international distance education*, 1987 • *Creating an economic and policy environment for the use of multimedia in training and education* • *Uses of technologies for training in Canadian business and industry.* Final report, 1991 • *Report from a Canada/EC workshop on: Interactive and Group Learning Using Communications Networks*, 1993
Stahmer A., Bourdeau J., Zuckernick A.	• *Technologies and lifelong learning*, 1992
Stahmer A., Bryan I.	• *From books to satellites. A review of technologies for distance education*, 1988 • *Seminar on Using Technologies for Education and Training*, April 1988
Stahmer A., Green L. Publishers Toronto	• *Analysing costs/benefits of training technologies*, 1993
Stahmer A., Mehler A., Green L.	• *Educators guide to satellite communications*, 1989
Stahmer A., Naswil Idris CIDA/AMIC Singapore	• *Developments in Telecommunication Technology for Distance Education with Particular Reference to Developing Countries*, Seminar on Training needs in the use of media for distance education in Asia, 1987
Stahmer A., Zuckernick A., Spronk B. Toronto	• *Appraisal and design guidelines for distance education projects*, 1989

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

NEW TECHNOLOGIES OF TRAINING IN TEMASEK POLYTECHNIC

By: *Chew, Kin Lim*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

New Technologies of Training in Temasek Polytechnic

Lim Kin Chew
Manager / Academic Computing

3 - 7 July 1995

Introduction of Speaker

- Manager/Academic Computing, Computer & Information Systems Department
- Involved with the setup of the Diploma in Information Technology course
- Involved with the setup of the 1st LANs in TP
- Responsible for in-house IT training for all staff in TP
- Helped to set up the Internet link and World Wide Web server for TP
- Now promoting wider use of IT in education

Contents of Presentation

1. Employing the New Technologies

2. Promoting the use by staff

3. Implications for others

Employing the New Technologies

1.1 Windows-based PC software

1.2 "Client-Server"Technology

1.3 Networked approach

1.4 ATM infrastructure

1.5 Internet and World-Wide Web

1.6 Multimedia-capable applications

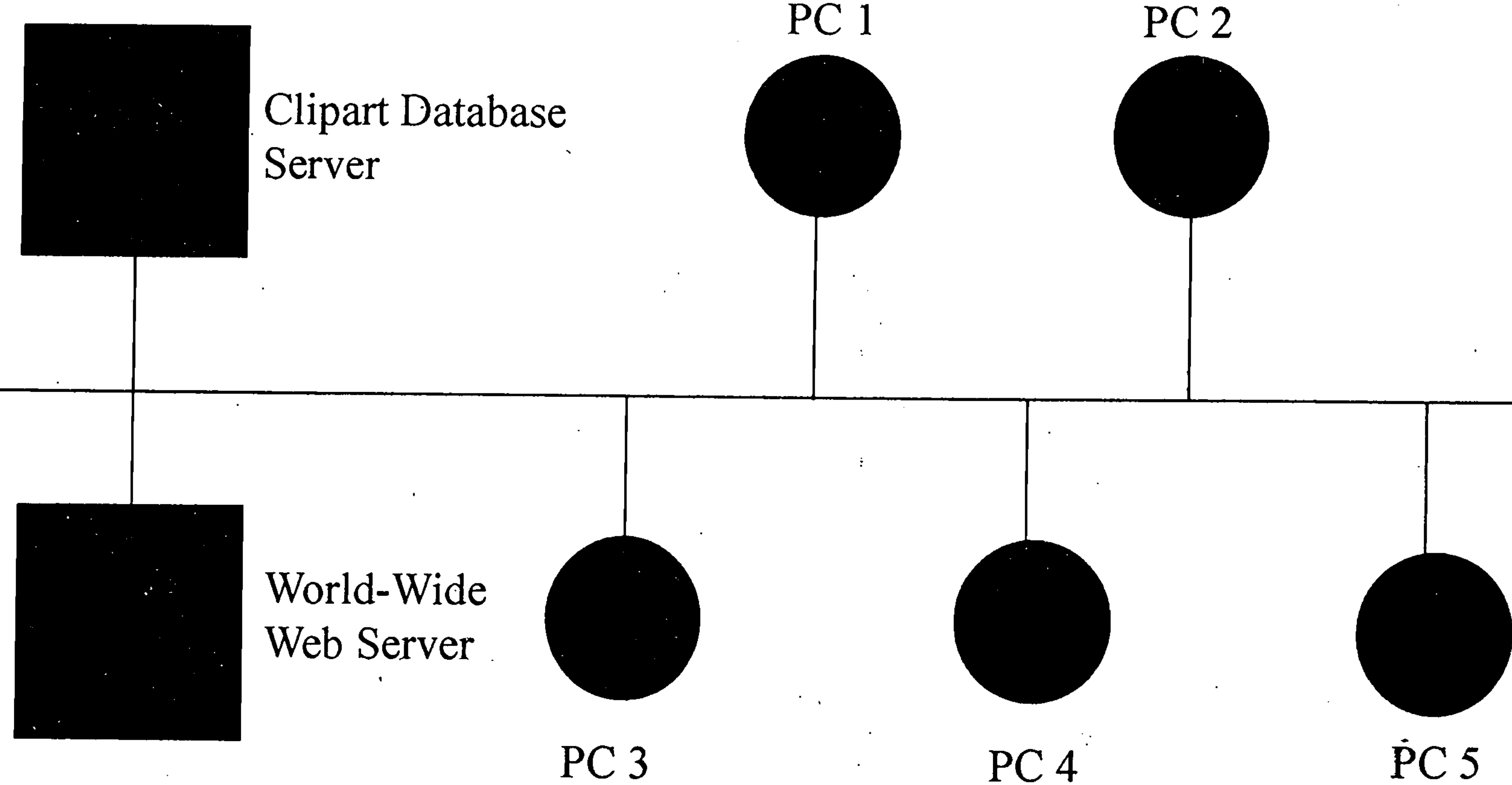
1.1 Windows-based PC software

- Stadardised PC setup
- "Plug-and-Play" environment
- Move towards complete Windows-based software
- Very selective in choice of PC software
- Provides regular in-house IT training
- Constant updating of software
- Proper software management

1.2 "Client-Server" Technology

- Corporate decision
- Fast setup of application servers
- Schools can address their specific training needs
- Most cost-effective solution
- Requires coordination and management

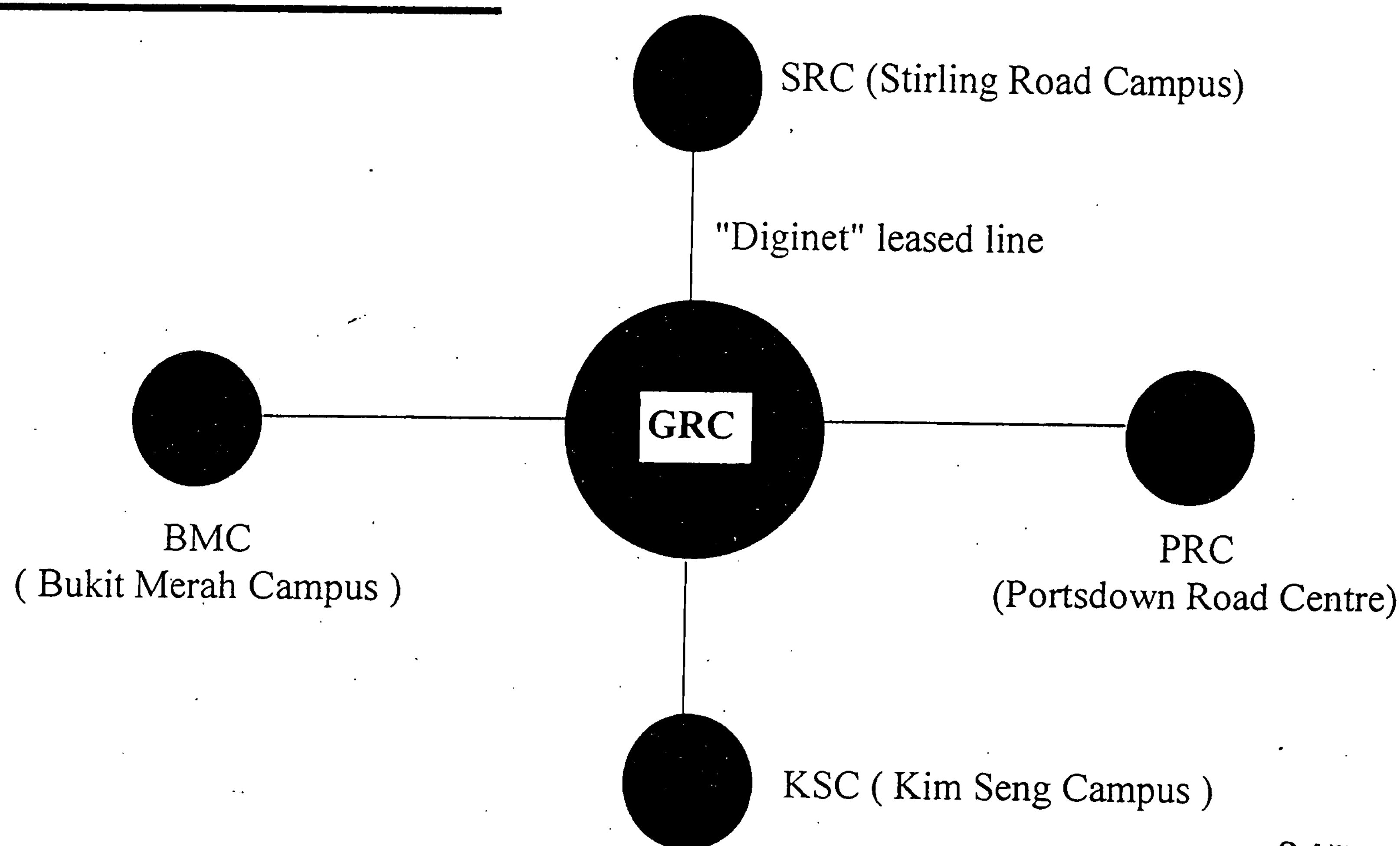
"Client-Server" Example



1.3 Networked Approach

- Emphasis on fast human communication
- All staff PCs are networked
- Email is our culture
- Staff: PC = 1:1
- Networked software rather than standalone
- Regular feedback from users
- Adopts industry standards for network connectivity

Current Network



Networked Polytechnic

- 5 campuses all linked to the GRC

- Use leased lines to link up the 5 campuses

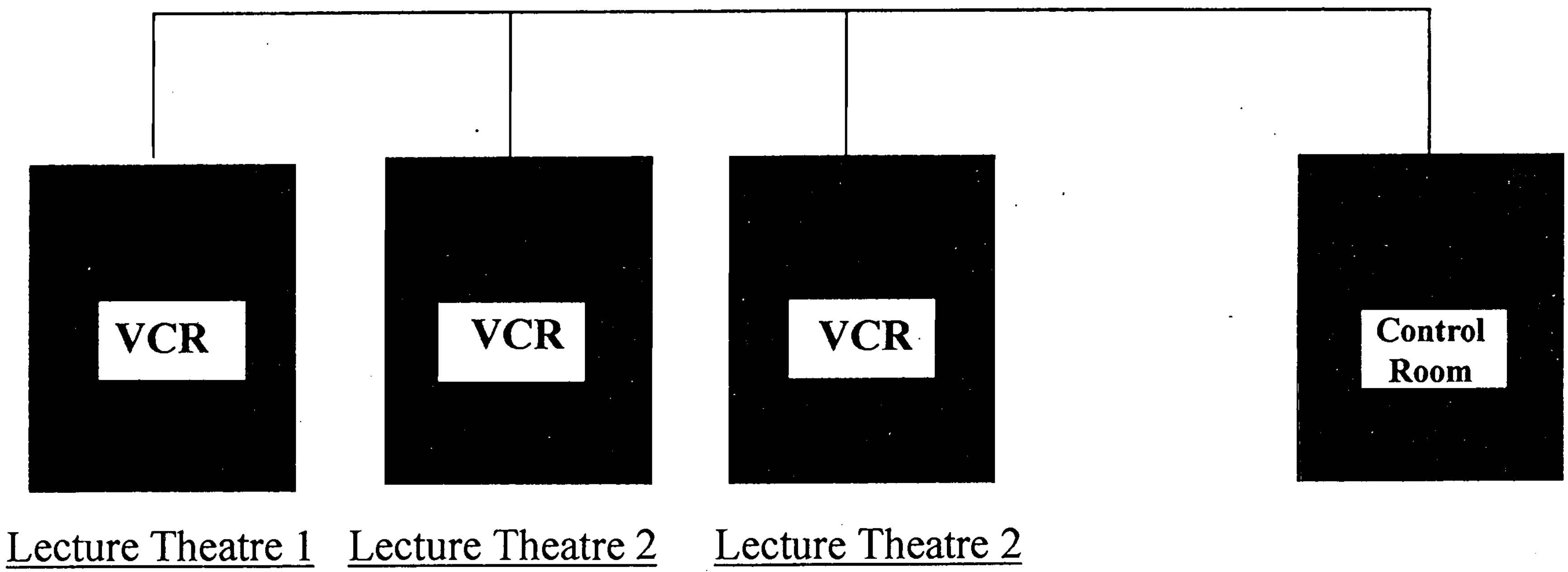
- Many applications are now available online
  Egs: Exam System, Library's OPAC

- Distributed applications for Schools
  Schools manage own IT resources
  Schools employ own Technicians
  Schools decide the use of software for own use

The Virtual Polytechnic

- Video-On-Demand Services
- Lecture-On-Demand Services
- Virtual Lecture Theatre Concept
- Video Commander System
- CD-ROM Arrays

The Video Commander System



- Centralised playback and control of all video tapes
- Better management of video services
- Needs cooperation and proper administration

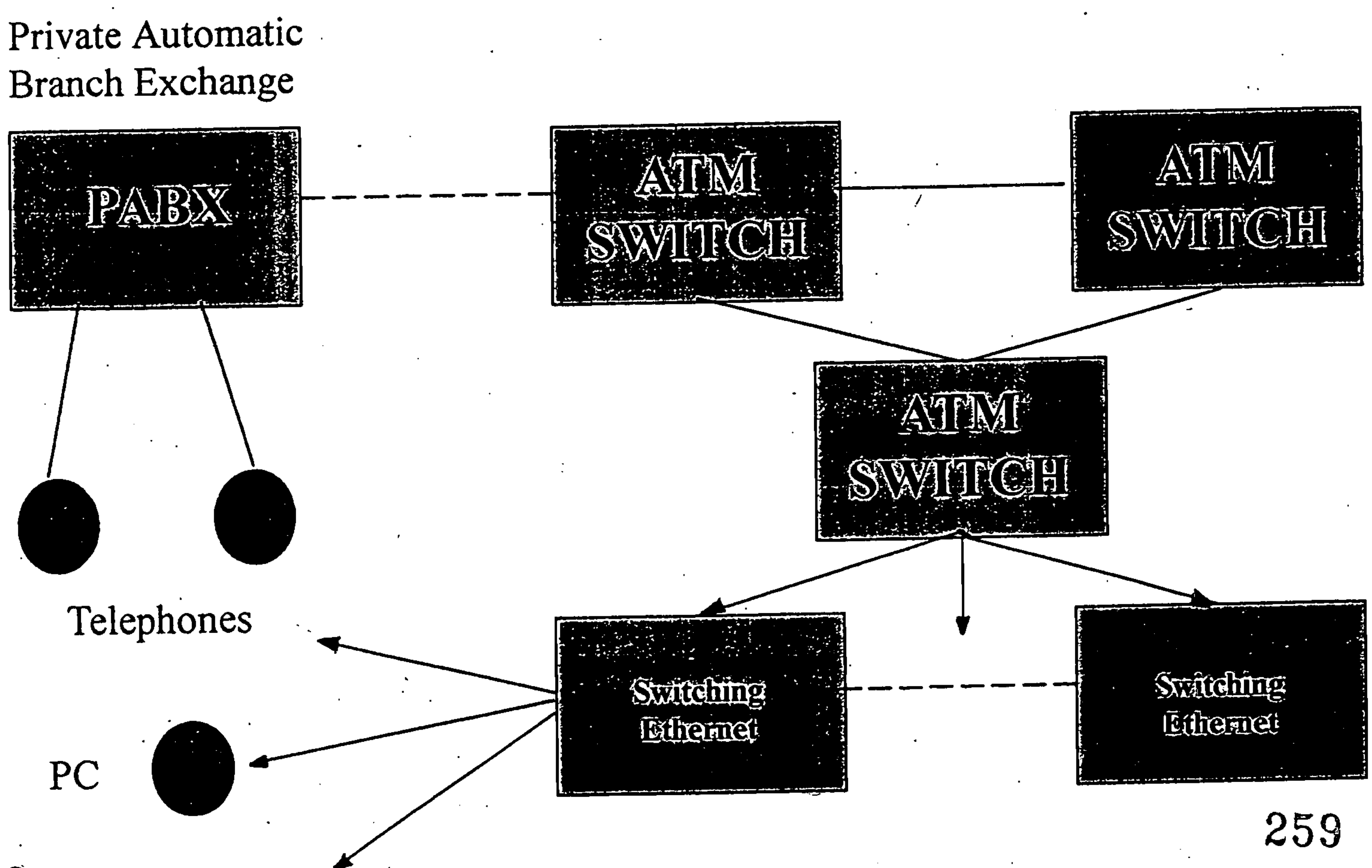
The Library

- Online Public Access Catalogue (OPAC)
- Online Reservation & Renewal of books
- Widespread use of Internet & WWW
- Directories of WWW sites for Schools
- Multimedia repository databases
- Computerised Library System (Dynix)

1.4 ATM Network

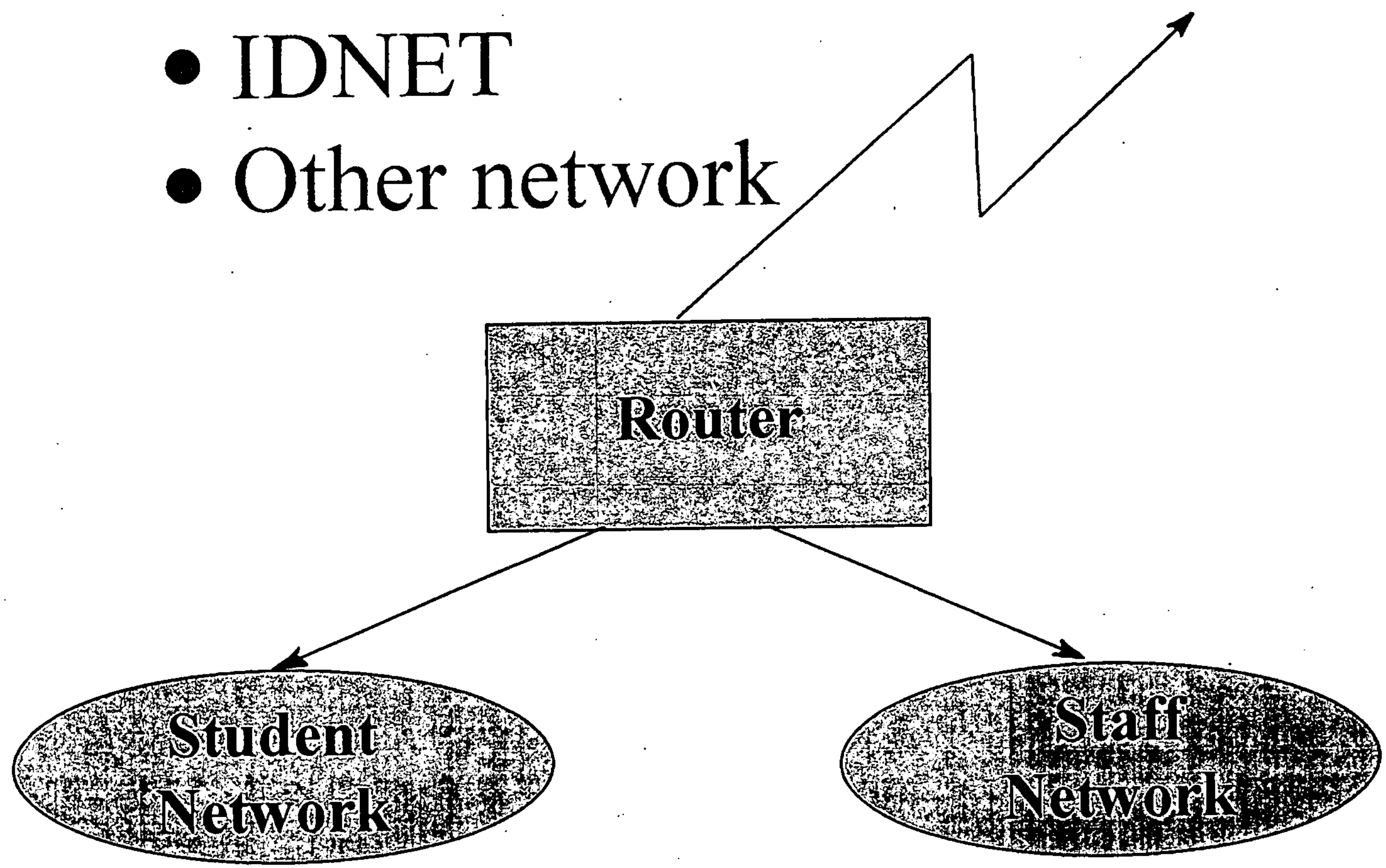
- ATM - Asynchronous Transfer Mode
- Support voice, imaging and multimedia applications
- High bandwidth,high performance network
- Infrastructure that supports the grouping of mobile staff users

New Network Configuration

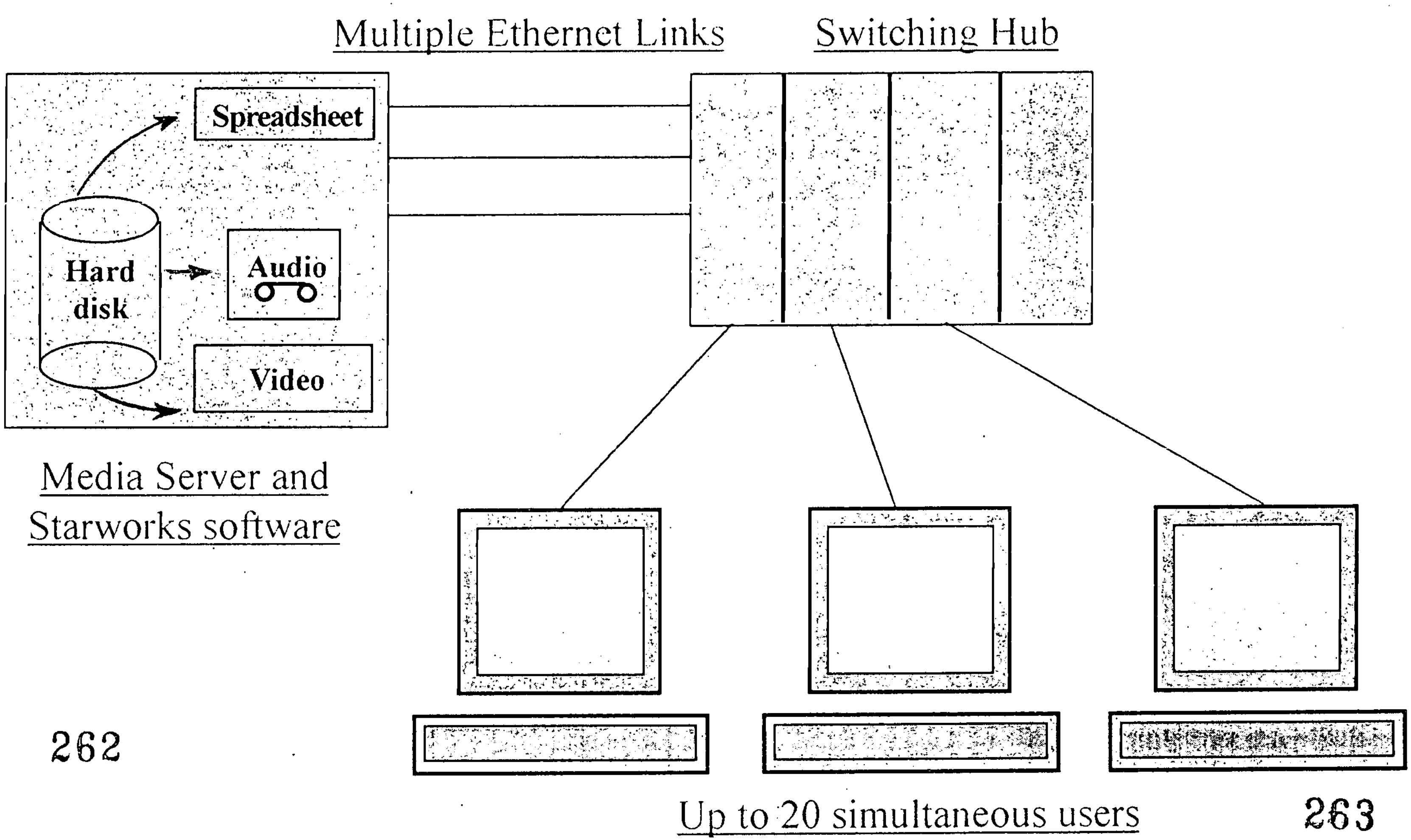


Network Connection for Staff and students

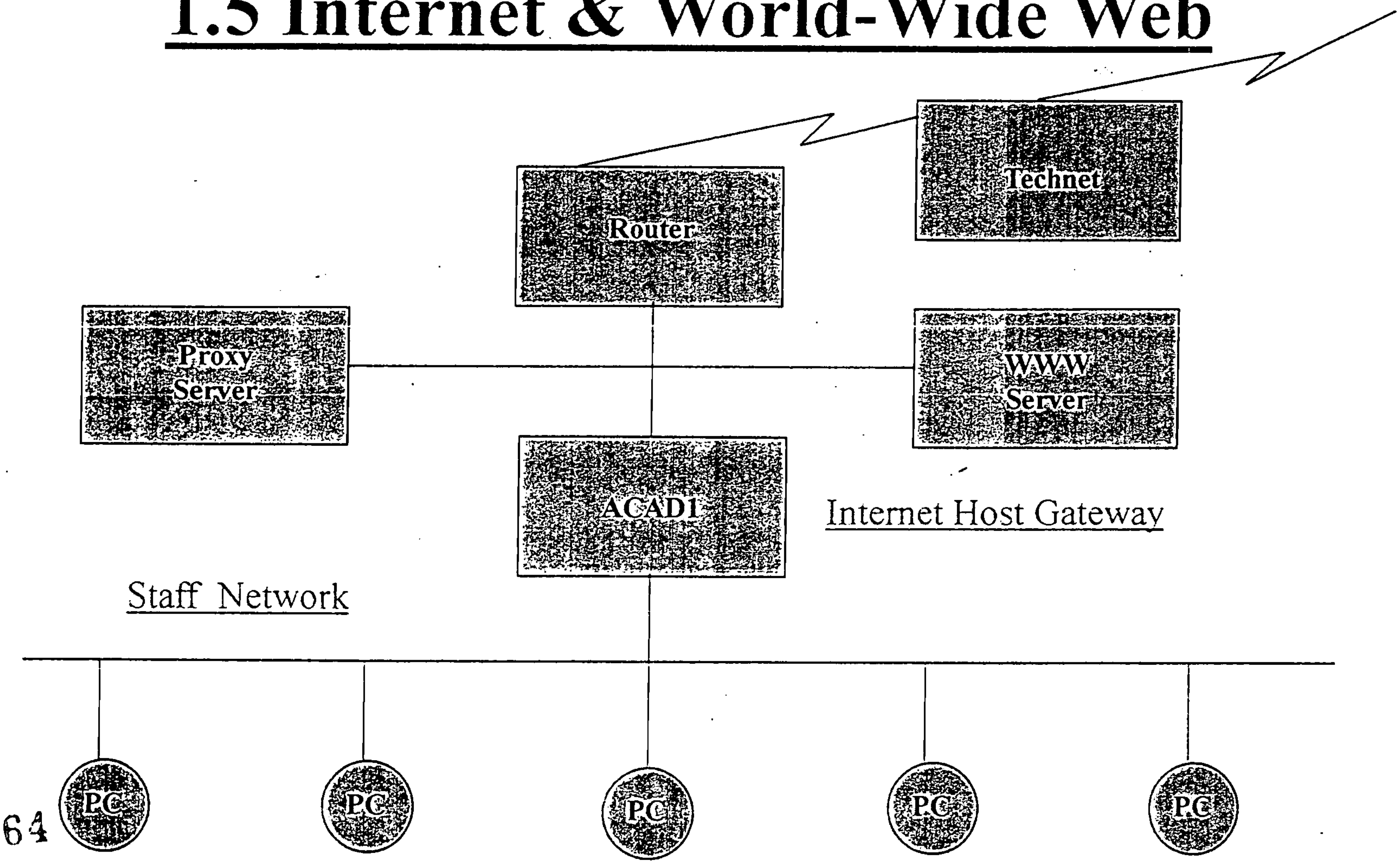
- Internet
- IDNET
- Other network



Multimedia Videoserver in a network environment



1.5 Internet & World-Wide Web



264

265

1.6 Multimedia-capable Applications

- Courseware Development
- Lecture Presentation
- Students' Projects
- Service Kiosks
- Campus Guides

2. Promoting the Use by Staff

- 2.1 Senior Management's endorsement and support
- 2.2 Competent middle-level managers to implement IT programmes
- 2.3 Regular introduction of new training courses for staff

IT Training for Staff

Two level of training :

General skills

Specialised skills

General skills: Examples:

Basic IT, Windows, Wordprocessing,

Spreadsheet

Specialised skills: Examples:

PowerPoint for lectures

MM ToolBook for multimedia coursewares,

Authoring using HTML

3. Implications for Others

3.1 Need a long-term vision
3.2 Specify goals and objectives
3.3 Constant innovation
3.4 Mindset of lifelong learning & relearning
3.5 Learn from mistakes
3.6 Dare to try out new things
3.7 Corporate culture of quality training & work

EDUCATIONAL USES OF WORLD-WIDE WEB

Introduction

The whole world is now caught in the fever of Internet. It seems everyone is talking about the Internet and how easy it is to get onto the World-Wide Web. Just what is the Internet and the World-Wide Web? The Internet is an INTERnetwork of NETworks. It started off as an advanced research project by the U.S Department of Defence. The World-Wide Web (commonly referred to as WWW, W3 or simply the Web) is a relatively new Internet service. It was introduced some time in 1991. However, it only became very popular when the Windows-based browser called Mosaic was introduced in late 1993. Since then there has been rapid development in this new technology. Of particular interest to Temasek Polytechnic are the educational uses of the World-Wide Web.

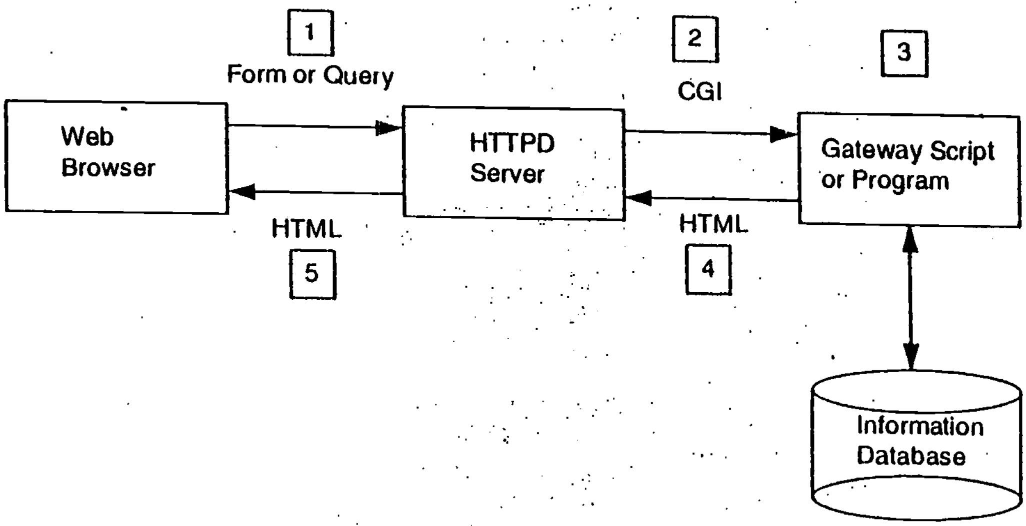
Two Approaches

Basically, there can be two major approaches in the educational uses of the World-Wide Web:

1) The first approach makes use of the hypermedia nature and the distance delivery capabilities of the the Web technology. In this approach, the teacher can exploit the educationally attractive features of the Web - the distributed concept of Web servers (this means that the Web servers can be located anywhere in the Internet world); the multimedia documents; the hypertext/hypermedia capability and the WWW networked basis which allows for distance learning. One small area which many Web users might not be aware of is that lecture materials can be easily prepared using the HTML (HyperText Markup Language). Imagine how convenient it is to have all your lecture materials stored centrally on a Web server! The teacher can then go to any lecture theatre and retrieve the lecture materials via the PC.

However, there are certain difficulties facing the teacher who wishes to develop educational coursewares with interaction for the students. The use of fill-out forms in the Web is limited by the difficulty in writing the CGI (Common Gateway Interface) programs. Another difficulty is that the HTTP (HyperText Transport Protocol) is a stateless connection. This means that there is no direct relationship of any kind between two consecutive requests to the same server, even if the queries come from the same user. The server treats every request it receives independently from any other request it received in the past or that it will receive in the future. For a good educational courseware, the teacher might want the system to keep a history of the the student's performances, both before and after a certain lesson. The good news is that work is going on in this area.

Hopefully, in future we can expect to see interactive Web coursewares which can monitor the progress of the learner.



Concept of the CGI (Common Gateway Interface)

2) The second approach makes use of the Web technology on an organised structure of hypertext links. This approach is very useful to the casual browser who surfs the Internet and who knows many Web sites. Such an approach is more suitable for the "discovery" type of education. A teacher, for example, can set assignments for the students to create their own documents to tie up information collected in a more constructive way. For example, an assignment can be set on, say, the effect of waste, refuse and rubbish on the environment. The student can then use all the available Web tools, such as the search engines, to hunt for the relevant information. He/she would then need to create the simple Web page and insert all the links on that page. Explanatory texts can be written with materials culled from electronic journals and online magazines. Graphic pictures on the environment can also be inserted. In the end, this project will turn out to be very satisfying to both the student and the teacher as well. In fact, with an Internet link, the student can literally does all his/her work on the PC at home!

Issues

Although it is educationally appropriate to allow students access to the Internet and the WWW, we need to ensure that the students do not have access to pornographic materials. It is possible to block off such undesirable sites but the long-term goal should be more on educating the students rather than having more and more policing measures.

The second issue has to do with the costs and consequences of long-distance accesses to Web sites. Accessing materials from Web sites far away may take a long time and also hogs the bandwidth. This issue becomes even more important especially when the Technet Unit is being privatised.

Conclusion

The World-Wide Web is certainly going to change the teacher and the student. There is always the possibility of ignoring this technology. However, I believe that if the Web technology is properly harnessed, everyone gains in the end. In addition, by designing the Web coursewares properly, we can build up a student-centred educational environment.

TEMASEK POLYTECHNIC

MISSION:

Welcome to Temasek Polytechnic's World Wide Web...

General Information About Temasek Polytechnic

- Inception of Temasek Polytechnic
- Mission and Goals
- Organisational Structure
- Temasek Polytechnic's Logo

Milestones (Historical Account of Yearly Main Events)

- Milestones in 1989
- Milestones in 1990
- Milestones in 1991
- Milestones in 1992
- Milestones in 1993
- Milestones in 1994

Course Information

- School of Business
- School of Design
- School of Engineering
- School of Information Technology and Applied Science

Administration

- Administrative Departments & Divisions

Publications

- INTEMPO
- Newsletters
- Press Releases
- Temasek Journal

Services from Temasek Polytechnic

- Information on LINUX
- Pottery Works of Mr. Iskandar Jalil
- Internet & WWW Talk for the Media
- Dr. Peter J. R. Creamer's Home Page & Research & Technology Division

Things on the Internet

Short Directory of World Wide Web Sites
Innovative Internet Applications in Libraries
Singapore's InfoMAP
Singapore's Information Servers
Nanyang Technological University's Library
National Library
WWW Resources for School of Design - by Tan Lay Poh
Culture Cruise - Foreign Languages
Worcester Polytechnic Institute
George C. Gordon Library, Worcester Polytechnic Institute
Edupage - Information on use of IT
Search Engines in World Wide Web
Lin Hsin Hsin Art Museum
Collins New Digital Dictionary
Ghost Rider Leisure Page
Cyberspace Hospital
Kandang Kerbau Hospital
National Skin Centre
New Rider's Official WWW Yellow Pages
Asia One - Singapore Press Holdings' WWW Page
Business Times
Mobilis - The Mobile Computing Lifestyle Magazine

Information on Macintosh

MacHTTPD Home Page
Searchable Macintosh Shareware Catalogue
Macintosh Internet Resources
Web66 Guides for MacHTTPD

School of Engineering

Engineering Project Show '95

Multimedia in the Web

Sound and Video Clippings

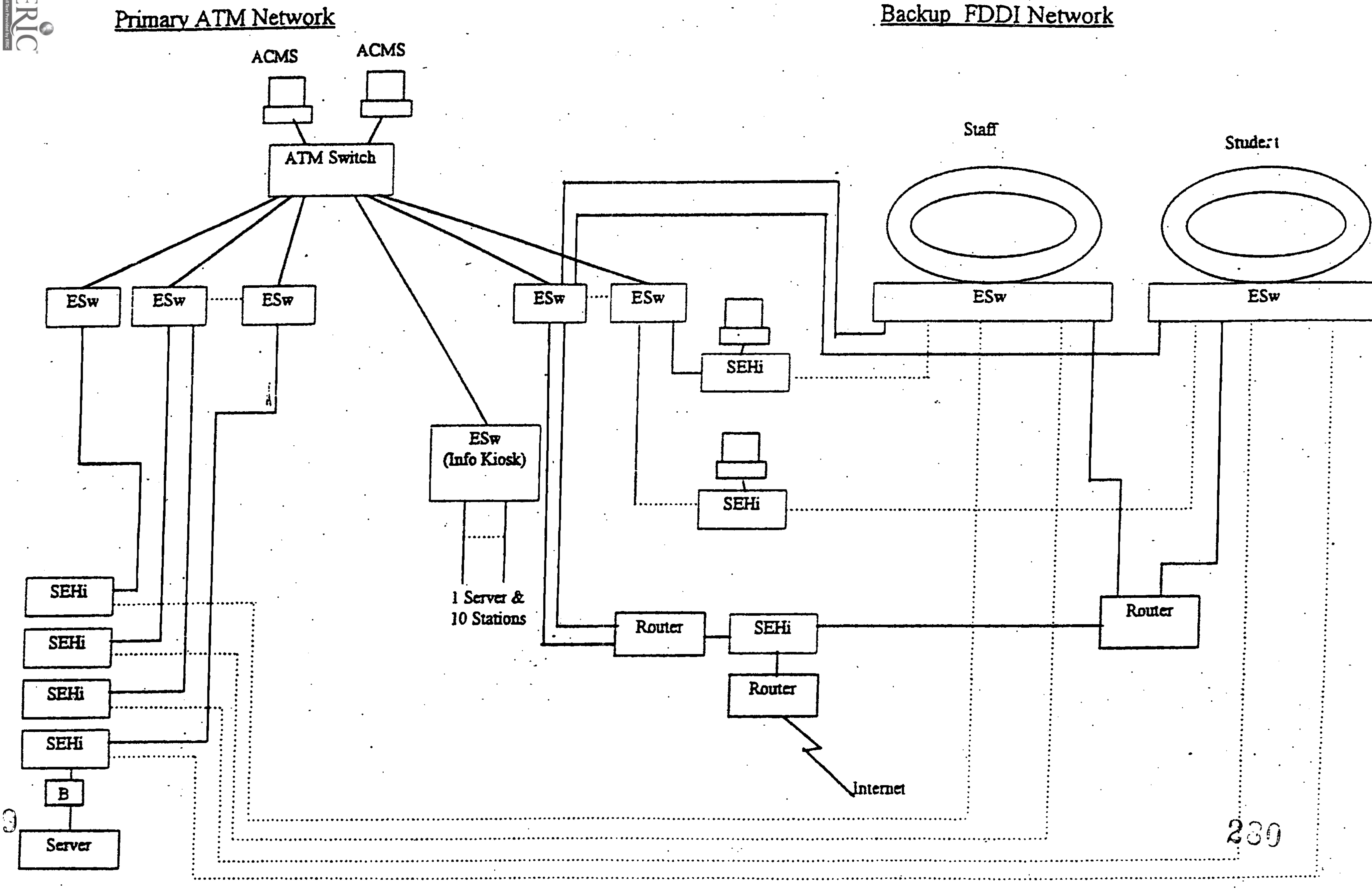
Model of Tampines Campus

Model of Temasek Polytechnic's Campus at Tampines

Feedback Form

Please give us your feedback about this Web Server.

This World Wide Web Server is maintained by Lim Kin Chew. You can contact him at <kinchew@tp.ac.sg>.
The information provided here was last updated on 18 June 95.



Primary ATM Network
Backup FDDI Network
ACMS
ACMS
ATM Switch
Staff
ESw
ESw
ESw
ESw
ESw
ESw
ESw
ESw
(Info Kiosk)
SEHi
SEHi
1 Server &
10 Stations
SEHi
SEHi
SEHi
SEHi
SEHi
Router
Router
Router
Internet
B
Server

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

ADVANCED SYSTEMS IN EDUCATION FOR VOCATIONAL AND TECHNICAL TRAINING

By: *Alessandro Gava*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

ADVANCED SYSTEMS IN EDUCATION FOR VOCATIONAL AND TECHNICAL TRAINING

Why Educational Systems for V & TT?

- Theoretical/Practical Approach
  helps better and faster learning

- Modern technology is converted into clear concepts

For Which Areas?

- "Conventional" : Mechanics; Electrical; Electronics; Automation; Analog Communications; Refrigeration; etc.

- "Emerging" : CAD/CAM; Computer Integrated Manufacturing (CIM); Computer Integrated Building (CIB); Digital Communications; Data Communications & Telematics; Computer Networks; Automotive; Biomedical Electronics; Ecology; etc.

Some Features

- Group Learning
- Individual Learning
- Modularity

  - Adaptation to different training requirements
  - Up-grading

- Courseware Supports

  - Printed material
  - Prepared exercises
  - Educational software (Diskettes, CD-ROMs)

- Theoretical-practical computer managed learning

- "Industrial" - Type systems

Inputs for Manufacturers

- Institutions
- Customers, users
- Industrial world

Catalogues for Education
Elettronica Veneta & IN.EL.

• Electronics, Instrumentation and Process Control	catalogue no. 20
• Telecommunications	catalogue no. 21
• Multimedia Audiovisual Systems	catalogue no. 22
• Electrical Engineering	catalogue no. 23
• Industrial Chemistry	catalogue no. 24
• Process Control	catalogue no. 25
• Automation Technologies	catalogue no. 26
• Educational Systems for: Heating Refrigeration - Air Conditioning Domestic Water Supply	catalogue no. 27
• Agro-industry	catalogue no. 28
• Modular laboratory for plant physiology, agricultural chemistry and biotechnology applications	catalogue no. 29
• Modular greenhouse with computerized automation	catalogue no. 30
• Biotechnology laboratory for plant tissue propagation	catalogue nc 31
• Mechanics: CAD, CAM, CNC, FMS, CIM	catalogue no. 32
• Automotive Technology	catalogue no. 33
• Biomedical Electronics	catalogue no. 34
• Interactive Practical Electronic System	catalogue no. 35
• Ecology	catalogue no. 36
• Experimental Chemistry Laboratory	catalogue no. 37
• "HIGH TECH" Military Laboratory	dedicated catalogue
• Domestic Electrical Equipment Technician	catalogue no. 38
• Hydronics	catalogue no. 39
• Educational CIB®	catalogue no. 40
• Industrial Automation in Education	catalogue no. 41
• Laboratory for alternative energies	catalogue no. 42

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

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WORLD LEADER IN EDUCATIONAL TECHNOLOGY

By: *Alessandro Gava*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

ElettronicaVeneta & IN.EL. S.P.A.

- ITALY -

COMPANY'S PROFILE

ELETTRONICA VENETA & IN.EL. S.p.A. incorporated in 1963.

Company's capital: It. L. 4,600,000,000= paid up.

President & Managing Director:	**Mr. Antonio Romano**
Export Sales Manager:	**Mr. Leonardo Gardin**
Administration Manager:	**Mr. Gianni Mion**
Production Manager:	**Mr. Luigi Rorato**

Main offices and factories:
- Motta di Livenza (Treviso), Via Postumia, 16

Branch for after-sales service:
- Rome, Via Leopoldo Serra, 32

ELETTRONICA VENETA & IN.EL. S.p.A. is the world's biggest Company in the educational field.

ElettronicaVeneta & INEL

A) Industrial Production:

Turn-key laboratories and workshops (excluding building constructions) for the following technical fields:

- Electronics, Instrumentation and Process Control
- Telecommunications
- Interactive Practical Electronics
- Electrical Engineering
- Industrial Chemistry
- Process Control
- Automation Technologies
- Educational Systems for: Heating, - Refrigeration - Air-Conditioning - Domestic Water Supply
- Multimedia Systems
- Mechanics: CAD, CAM, CNC, FMS-CIM
- Automotive Technology
- Biomedical Electronics
- Agro-Industry
- Laboratory for plant physiology
- Agricultural chemistry and biotechnology applications
- Greenhouse with computerized automation
- Biotechnology laboratory
- Ecology
- High Tech for military training
- Experimental Chemistry Laboratory
- Educational softwares

for UNIVERSITIES, TECHNICAL INSTITUTES, VOCATIONAL INSTITUTES, VOCATIONAL TRAINING CENTERS, MILITARY SCHOOLS.

B) Technical assistance for education:

1) Feasibility studies for technical and vocational education.

2) Design and lay-out of laboratories and workshops with complete list of educational equipment.

3) Installation of laboratories and workshops.

4) Up-dating courses for trainees only for laboratories and workshops supplied. The training courses are carried out in Italian, French, English or Spanish and may be carried out at our permises or at Customer's site.

ElettronicaVeneta & INEL

THE STRUCTURE

***THE STRUCTURE** of the firm is organized into 5 manager's offices and 9 main departments:*

- *Finance / administration and personnel*
- *Marketing and public relations*
- *Home market*
- *Foreign market*
- *Research and development*
- *Cooperation: integrated open-end and training projects*
- *Production departments of:*
  - ★ *Electronics, instrumentation and process control*
  - ★ *Telecommunications*
  - ★ *Multimedia audiovisual system*
  - ★ *Electrical engineering*
  - ★ *Industrial chemistry*
  - ★ *Automation technologies*
  - ★ *Educational systems for: heating - refrigeration - air conditioning domestic water supply*
  - ★ *Agro-industry*
  - ★ *Mechanics and Autotronics*
  - ★ *Biomedical electronics and experimental constructions*
- *Services for production*
  - ★ *sales*
  - ★ *job order management*
  - ★ *quality control*
  - ★ *Technical assistance and maintenance*
- *EDP center*
- *Operating office in Rome*

THE PERSONNEL of the firm is the main resource of the Company. Therefore, particular attention is given to the personnel offering a constant training activity aimed to improve the knowledge and the professional level of each member.

The philosophy of Elettronica Veneta & IN.EL. has always looked for the satisfaction of its employees, because the spirit of collaboration and the proudness to belong to a firm are values which encourage the welfare at best. The great advantage of belonging to a leading factory in education lies in sharing more and more advanced professional experiences, of very high level and matching the other factories of the field at international level.

RESEARCH AND DEVELOPMENT. Our factory is a continuously growing universe. It develops its activity looking for the future and, in order to match the competition of the market, it devotes a large part of its resources to the study of how to satisfy the Customer's expectations at best. This set of activities is called research and development, and is addressed partly to the constant improvement of the productive processes, partly to the research, the "invention" of new products and this has been achieved in 30 years.

For this reason, we have called our territory "Educational Valley".

The company lies in an area of 52,000 sq m of which 20,000 are covered.

THE PRODUCTS of Elettronica Veneta & IN.EL. come from industrial experiences transferred into education. At the moment the products included in our catalogue are 1,100.

Each scientific department is directed by an engineering staff which designs, manufactures, tests and installs a top quality product at the user's premises: **The products ELETTRONICA VENETA & IN.EL. are characterized by a careful qualitative analysis which involves all phases of development and realization in the TOTAL QUALITY CONTROL Laboratory.**

THE AGENTS, 20 in Italy and 46 in the foreign countries, are the business collaborators of the firm.

Their training is not only commercial but also technical and educational so that they can be good collaborators for the school, too, in that they can understand its needs, programmes and educational fields, they can supply the after--sale technical assistance and also the starting-up and maintenance of the equipment (hardware-driven).

THE FINAL CUSTOMERS of our company are Universities, the Technical and Technological Schools, Professional Vocational Schools, Public and Private training bodies and the companies, for a total of 4,630 customers.

We deeply and sincerely thank our customers who put their trust on us for the last 30 years.

THE REGULAR SUPPLIER of the firm are 1,480.

The raw materials and the components are top quality and all must sustain a "qualitative test" carried out by the "quality" department of the firm.

THE PRESS. Our computerized mailing list includes 17,500 names. Our products have often been mentioned in specialized magazines. The magazine "FORTUNE' (June 1988) considered invention as the winning weapon on the market of the 90ies: "FORTUNE" has analysed examples of the 100 most creative companies in Italy, among which there is our company, mentioned among the "innovators".

The magazine "UOMO MANAGER" (July 1989) has dedicated the cover and a long article to us.

The authoritative magazine "ESPANSIONE" (January 1991) has listed us among the 31 leading companies in avant-guarde production techniques which aimed at specialist corners of the market and have been successful by thinking on a large scale.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

ADVANCED TECHNOLOGICAL SYSTEMS IN EDUCATION FOR A MARKET-ORIENTED VOCATIONAL AND TECHNICAL TRAINING

By: *Alessandro Gava*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

VOCATIONAL - TECHNICAL AND TECHNOLOGICAL TRAINING:

The education scheme may be divided into two macro-sectors:

1) **vocational training for workers: aimed at training skilled workers in the fields of industry, services and agriculture**

2) **training of intermediate technicians, for prospective executives in the fields of agriculture and services.**

As far as the vocational, technical and technological training for industry workers is concerned, in addition to a common group of disciplines, such as Mother tongue literature - a foreign language - fundamentals of civil law - geography - mathematics, some specific subjects are provided for: electrical engineering; electronics; telecommunications; chemistry and environmental studies; mechanics; heating, refrigeration and domestic water supply systems; building techniques; car electronics (or autotronics); automation etc.
Both for the common subjects and for the specific subjects the knowledge level varies according to the study level, e.g. vocational training for specialised workers and vocational training for intermediate technicians.

As for the area of services, besides the common subjects, such as Mother tongue literature - a foreign language - fundamentals of civil law - geography - mathematics, the system includes some specific subjects related to the field of commerce, marketing, health care, administration, business computer science, tourism, etc.
Both for the common subjects and for the specific subjects the knowledge level varies according to the study level.

As regards the agriculture field, besides the common subjects, such as Mother tongue literature - a foreign language - fundamentals of civil law - geography - mathematics, the system provides for some specific subjects: techniques concerning analysis laboratories, farming machinery, biotechnologies, agroindustry. This last specialisation varies from one region to another, according to the farming products in each area.
Both for the common subjects and for the specific subjects the knowledge level varies according to the study level.

The common guidelines for the technical and technological subjects dealt with in the different study levels must meet the needs of the industry field, including industrial equipment maintenance.

Therefore, the educational approach followed for each course and for each related specialisation, must comply with the technology used in the domain of industry, thanks to a theoretical, experimental and practical training.

This means that educational equipment should be manufactured with industrial components - the same material used in industry - so that the study and the use of this equipment should provide students with satisfactory attainments to start them off on their future jobs.

The most advanced European schools prefer interactive educational systems, i.e. computer-assisted educational equipment working with specific software. Such systems can be used either for collective lessons in the classroom including experiments with the equipment or for the study that each student carries out individually.

This interactive system is already widespread in Italy and in the European Countries and is mostly used in the fields of electronics, telecommunications, autotronics (car electronics), biomedical equipment, etc.
It allows to train students in the use of P.C's in the different technological fields and in technical data control. This way students are actively involved in theory and experimentation, as they are obliged to interact with electronic equipment.
All educational equipment should be supplied with textbooks and with software packages if necessary.

Elettronica Veneta & IN.EL. is the only company in the world which has developed the technological software needed in the various educational fields. Moreover, it has created the "Autotronics" field, that is automobile electronic systems in education.
In point of fact, car-manufacturing firms dramatically increased the use of electronic systems in cars and are still developing the electronic devices designed for better car control and safety. Such systems enable the driver to detect any possible failure which might occur .
Consequently, the vocational and technical training administered in the field of car maintenance has made great strides.

Another field to which we wish to draw your attention is Biomedical electronics.
The Biomedical electronics field consists in the training of maintenance technicians for biomedical equipment used in hospitals or in consulting rooms.
As a matter of fact, in many countries there is a shortage of technicians with an adequate background to handle biomedical equipment maintenance.

Automation is also undergoing an ever-increasing development, especially in the fields of pneumatics, electropneumatics and oil-hydraulics, of which it is important to know the basic principles and the most significant applications for industrial automation.

Industry workers may be grouped into three large categories:

1) skilled workers
2) intermediate workers
3) engineers

These three categories are obviously involved with manufacturing and have no grounding in administration, marketing and panning, as this is a separate sector.

Elettronica Veneta & IN.EL. worked out an educational system covering 20 different fields which have a common strategic goal:
the training of factory workers and maintenance technicians at all levels.

This is why our equipment are suitable for the three study levels stated in points 1), 2) and 3). The respective textbooks and software will be used according to teaching needs and to the attainments to be acquired at the three levels, with the added advantage of using the same equipment.
To set a clear example, let us say that skilled workers, intermediate technicians and engineers will all use a PC, but the level of use is different, even though it is always the same tool.
This is the way the educational products we manufacture are designed.
And this is the reason why our products sell in Europe, in the States and in Developing Countries.

We would like to cooperate with the consultants (ILO, UNESCO, CPSC and NGOs Authorities) incharged of drawing up curricula for vocational and technical training projects; additionally, we could provide technical assistance for teacher training and updating, in the frame of the a/m projects implementation.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

EDUCATION REFORM IN PAPUA NEW GUINEA

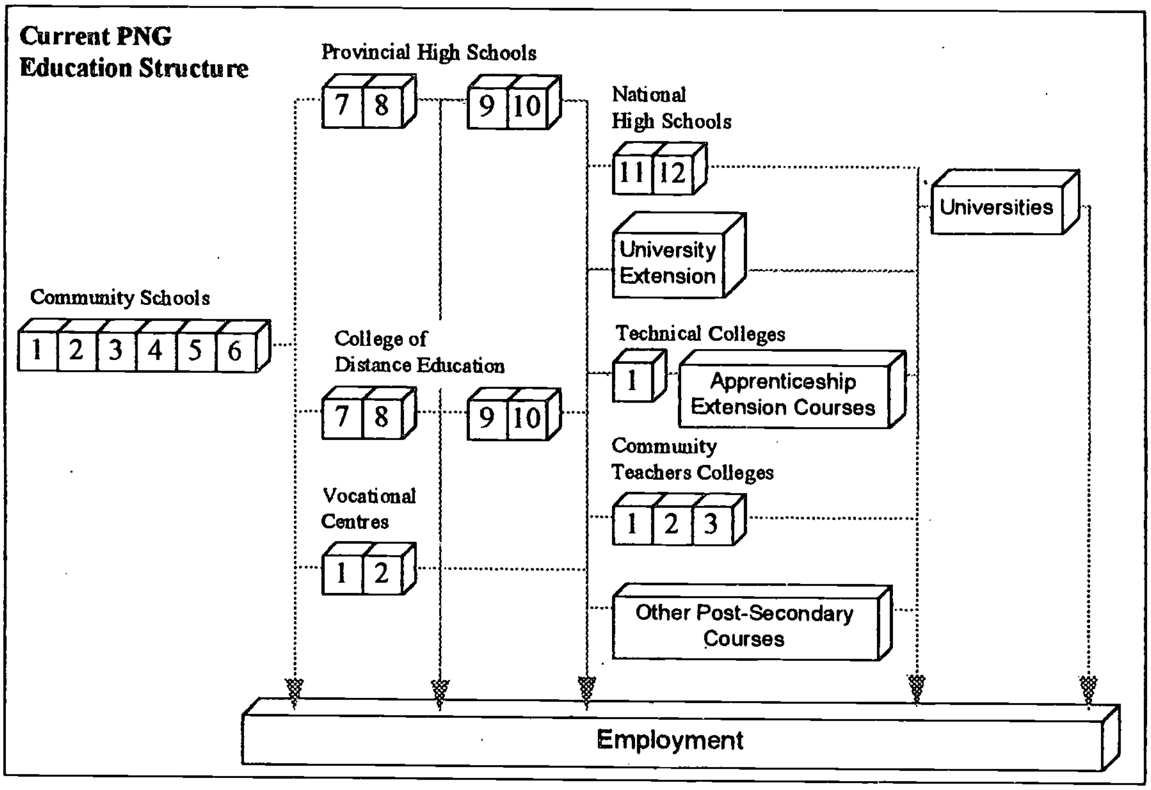
By: *Stewart Hall*

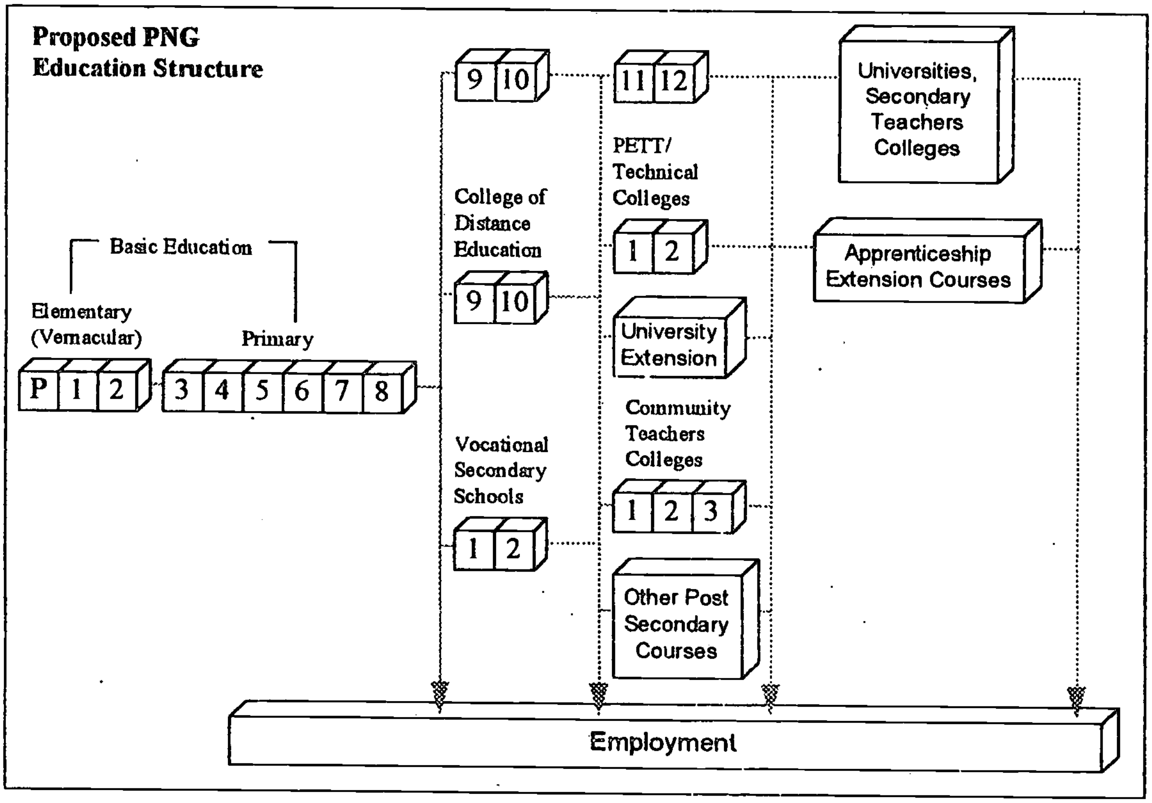
organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines


Current PNG
Education Structure
Provincial High Schools
7 8
9 10
National
High Schools
11 12
Universities
University
Extension
Community Schools
1 2 3 4 5 6
College of
Distance Education
7 8
9 10
Technical Colleges
1
Apprenticeship
Extension Courses
Community
Teachers Colleges
1 2 3
Vocational
Centres
1 2
Other Post-Secondary
Courses
Employment


Proposed PNG
Education Structure
9 10
11 12
Universities,
Secondary
Teachers
Colleges
PETT/
Technical
Colleges
College of
Distance
Education
Basic Education
1 2
Apprenticeship
Extension Courses
Elementary
(Vernacular)
Primary
9 10
University
Extension
P 1 2
3 4 5 6 7 8
Community
Teachers
Colleges
Vocational
Secondary
Schools
1 2 3
1 2
Other Post
Secondary
Courses
Employment

A. Vocational Education

Introduction

The Education Reform Strategy in Papua New Guinea calls for the strengthening of vocational education, particularly at the secondary level, by raising the status of vocational education to the level of secondary schools.

The challenges for the GoPNG in reforming vocational education include:

- the reduction of the disparities in the quality and accessibility of vocational education, particularly for women;
- the development of curriculum that is relevant to the wide variation of communities served by vocational education;
- the development of a credible relationship between vocational education and employment, including self employment;
- the creation of a positive perception of vocational education in the community at large;
- the upgrading of existing vocational teachers and the training of sufficient new teachers to support the revised objectives of vocational; education
- the upgrading of facilities and equipment for vocational education to meet consistent basic quality standards that may be set for the system.

Present Position

Vocational education in Papua New Guinea is delivered through 114 registered Vocational Centres (VC) in the 19 provinces and the national capitol district of PNG. There are additional permitted VCs that are privately funded and operated for which data are not readily available. The VCs vary greatly in size. The largest Centre enrols 477 students, while the smallest has 10.

Vocational Centre teacher salaries in approved centres are met by the DOE. In addition, DOE provides some support for maintenance on a grant basis. Provincial governments vary widely in their support for vocational education, with some provinces providing subsidies for student boarding costs, while other provinces provide little or no financial support for VCs.

Students who complete Grade 6 now enter VCs where they remain for up to three years. The curriculum is thought to be mostly practical with academic content limited to CODE courses in a few centres.

There are currently a total of 11,212 students enrolled in registered VCs in the country. Of these, 3,224 (29.6%) are female.

Female students generally follow a home economics program for three years that emphasises home making skills. In some VCs these skills are applied in micro enterprise ventures that are income producing for the centre, such as the provision of catering services to outside agencies. The intent of these ventures is to raise money for the centre's operating budget while providing on the job training for the students.

Male students follow a trade curriculum that covers such trade subjects as automotive, metal fitting/fabrication, agriculture, woodworking, electrical and plumbing. These trade programs generally include a third year work experience which, like the courses for female students, combines fund raising activity for the centre with on the job training for the students.

There are 631 teachers in the VCs and 210 (33%) of these are female. There are 170 male teachers in VCs who are untrained, although they may have appropriate skills in their area of trade specialization.

There are substantial qualitative variations across the VCs in terms of curriculum, equipment, facilities, capability and training of teachers, initiative and enterprise of centre managers and support and encouragement of provincial governments. These variations suggest that there is no "system" of vocational education in PNG.

Reform Policy

The Reform agenda calls for the development of a system of vocational secondary schools (VSS). Existing VCs will be upgraded to the equivalent of Grades 9 and 10. Over the period of the reform implementation, the VSSs will be adapted to accept around one quarter of Grade 8 leavers. They will continue to support Grade 6 leavers until 2004.

Curriculum adjustments will be made to make the VSS program more community based, with an emphasis on entrepreneurial skills and self employment. In addition, the curriculum in the VSS will be changed to include academic subjects in English and mathematics that are appropriate to the trade subjects being taken. The curriculum mix is likely to be 75% practical subjects and 25% academic subjects for the majority of students in VSSs.

Emphasis will be placed on increasing female participation in VSSs.

Reform Projections

The number of student places in vocational education is expected to rise from 11,212 in 1994 to 12,471 in 2004. There will be a reduction in the demand for vocational teachers and an increase in the demand for junior secondary academic teachers as the Grade 6 leavers entering the system are replaced by Grade 8 leavers. It is expected that nearly one fifth of Grade 6 leavers will be accommodated in the vocational secondary schools until 2001. It is anticipated that the progression rate from Grade 6 to Grade 7 will be 94%, eliminating the need for a program for Grade 6 leavers by 2004.

From 1994, approximately one quarter of Grade 8 leavers will be accommodated in the vocational secondary schools, with the enrolment increasing steadily with the growth in the number of Grade 8 leavers.

Resource Implications

Creating a system of secondary level vocational schools from the existing vocational centres will require significant investment in facilities and equipment to bring the existing centres up to an acceptable functional level.

There is a need to train the 170 untrained teachers as quickly as possible, as well as to train the 120 new junior secondary teachers who will enter the teaching service during the period of the reform implementation.

As DOE is extremely short staffed in this area, two additional staff will be required to coordinate the overall implementation of the reform in vocational secondary schools.

Potential Constraints

Responsibility for the vocational education system falls between DOE and the provincial governments. Essentially, this means that no agency accepts responsibility for leadership of the system and it languishes in many provinces. It will be extremely difficult to plan, develop and manage the proposed secondary vocational system as long as the structural issues remain unresolved.

Financial support for VSSs, outside of the teacher salaries provided by DOE, is very limited. Most provinces have few resources to offer. The attitude of the community at large towards vocational education has been negative, since those completing vocational centre programs have not been readily employable and they have not been able to continue their education. Unless better linkages to community enterprises are created and access is provided to further education for those with appropriate skills, vocational secondary education will not be supported by the community.

Options for Implementation

Preferred Options are to:

- develop the capability of the 114 existing vocational institutions in accordance with the reform agenda strategy;
- expand the concept of government /NGO partnerships with private sector organizations such as the Don Bosco Technical Schools at the national and provincial levels;
- create a new management structure for vocational secondary education at the national level;
- emphasise relevant local skills in the vocational secondary curriculum to create

opportunities for employment in the local community;

- develop a training program for VSS Managers combining small business management with school administration skills to ensure that the income generating programs in the VSSs make maximum contributions to the operating expenses of the schools.

B. Technical Education

Introduction

The Education Reform Strategy in Papua New Guinea calls for the adaptation of existing technical education institutions so that they can play a more effective role in meeting the future human resource development needs as those are addressed by the subsector.
The challenges for the GoPNG in reforming technical education include:

- the more efficient use of existing teaching positions;
- the development of curriculum that is more relevant to the needs of the productive sectors of the Papua New Guinea economy;
- the rationalization of programs, facilities and equipment to ensure a cost effective approach to the delivery of courses;
- the upgrading of facilities and equipment to properly support the curriculum;
- the development of more effective coordination and management systems to ensure that there is no unnecessary duplication of programs and services; and
- the increased accessibility of all technical education courses to women.

Present Position

Technical education in PNG is delivered through six institutions. Four levels of courses are offered:

- Pre-Employment Technical Training (PETT) courses are offered in 24 trade or skill areas. The duration of PETT course ranges from 30 to 40 weeks of full time study. Entry requirements call for either Grade 10 or 12 completion, with appropriate grades in mathematics, English and science. A certificate is issued at the end of one year and is required for entry into apprenticeship.
- Apprenticeship or extension courses in 24 trades are offered on an 8 week block release each year for three years.
- Technician certificate courses are offered in mechanical, electrical and civil

engineering, catering and hotel administration, science and technology and business studies. The courses are offered in three 20 week blocks over 2, 3 or 4 years depending on the program.

- Part-time or short courses are offered to commercial and industrial organizations and to the community. Based on available 1993 and 1994 data, all of the part time enrolments are in business studies courses. There are no part time enrolments in technical subjects. More than 70% of part time enrolees were female in 1993 and 85% are female in 1994.

It is estimated that there are 1800 places available in the technical education system. Applying a Full Time Equivalent (FTE) formula to 1994 apprenticeship and part time enrolments, it is estimated that there are currently 1,590 FTE students in the system. There are 176 teaching staff, for a student : teacher ratio of 8.6 to 1, across all technical college courses.

Of the 176 teachers in technical education, 48 or approximately one quarter are non-national contract staff. All national teachers are trained, while of the non-nationals, who are recruited primarily for their appropriate technical skills, 26 or 54% are not trained teachers. The Technical Education division of DOE provides training in basic teacher education skills for these non trained contract employees. Of the total number of teachers in the technical colleges, 19 or approximately 11% are female.

Reform Policy

The Reform agenda calls for the development of an appropriately trained work force based upon PNG's manpower needs. Graduates of the technical education system should have entry level skills as required by industry as well as being adequately prepared for self employment. New two year Technical Training Certificate (TTC) programs will be designed to relate more effectively to industry needs. Articulation with higher education institutions will be a requirement of the new technical college programs. All technical education courses will be equally accessible to male and female students based on a combination of academic and practical assessment.

Reform Projections

The number of student places required in technical education is projected to grow from 1,590 (FTE) to 4,196 (FTE) during the 10 year period of the reform implementation. Based on the preferred student teacher ratio of 15:1, 280 technical education teachers will be required by 2004. This represents an increase of 104 over the current number of teachers.

Resource Implications

The technical education system has the potential to absorb more students within its current stock of teachers by increasing the student teacher ratio to 15 to 1. Teachers in the technical colleges are significantly under utilized. No new teachers should be required until the year 1998, although adjustments may have to be made in current staffing to ensure coverage of all skill areas.

The major costs of the reform in this sector will come from the purchase of new equipment, the provision of new buildings, the refurbishment of existing facilities and the addition of 104 teachers to the recurrent salary costs of the system. Costing of the equipment and facilities requirements should take place within the framework of a rationalization of the system that reduces the number of institutions involved in technical education and groups programs together to maximize the use of equipment and workshop space. The Technical Education Division of DOE has proposed a plan to rationalize the system based on these principles. Summary costings in this paper are based on this plan.

Potential Constraints

- The lack of any reliable data on work force requirements for PNG makes it extremely difficult to determine appropriate targets for technical education.

- Linkages between technical education and private sector employers are not adequate and the development plans of business and industry do not play an important role in the technical education curriculum. This discourages partnerships which could more effectively train the workforce even in the absence of accurate aggregate national employment information.

- The administrative structure of technical education needs clarification. The CHE, which is under a separate ministry, is responsible for technician level education, while DOE oversees PETT/TTC, part time and extension (apprenticeship) courses. All of these activities use the same equipment, facilities and staff. The potential for communication problems and conflicting priorities is considerable.

Options for Implementation

Rationalization of the technical education system should be the highest priority, based on the following objectives:

- group programs to encourage the sharing of facilities and equipment;

- increase the student : teacher ratio in the system to 15 to 1 to make the system more cost effective;

- develop standard FTE student formulae to measure teacher utilization efficiencies in extension and part time programs;

- implement a plan to localize the technical education teacher service by 2004; and

- develop a plan to integrate the management, administrative and support services of technical colleges with non university tertiary institutions, such as nursing schools, where this is possible, to create more cost effective approaches to institutional management.

New Training Technologies: Their Potential Role in Vocational and Technical Education in PNG

The educational reform program that is being undertaken in Papua New Guinea focuses on the need to provide universal access to primary education in a challenging economic, geographic and social environment. The implications for Vocational and Technical Education in the reform agenda are substantial and will call for significant investment in new facilities, equipment, curriculum and teachers to ensure that TVET in PNG supports economic development, particularly in resource based industry.

The utilization of NTT in the development of both technical and vocational education in PNG, assuming that the appropriate cost benefit analyses are carried out, may allow PNG to move forward in these two systems more rapidly than by using more traditional strategies.

Some potential applications of NTT in the setting are:

- Distance Learning for teacher training, selected vocational programs with print and radio based materials.
- Individual Learning programs for technologies and skill areas with limited demand in remote communities.
- Pre-packaged video based materials for technologies such as automotive which are undergoing rapid technological change and require constant upgrading of curriculum.
- Use of simulators for design and fabrication systems to provide high quality training without having to purchase expensive industrial standard equipment. (i.e. for machining and metal cutting)
- Use of PC based NTT's in urban technical colleges to ensure the quality and consistency of teacher presentations and the consistency of curriculum delivery and student evaluation.
- Apply LAN and/or WAN approaches to the urban technical colleges, with a longer term plan to extend these networks to more remote sites. This would allow more effective communication across the curriculum for teachers and would also improve management of the system.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

NEW TECHNOLOGIES OF TRAINING FOR TECHNICAL AND VOCATIONAL EDUCATION IN JAPAN

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organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

New Technologies of Training for Technical and Vocational Education in Japan

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1. Ability requisite to engineers

There has been a tremendous growth of industry and diversification and advancement of technology in Japan in the 50 years since the end of World War II. Therefore, the abilities requisite to engineers have largely changed, and an entirely new framework is necessary in the technical and Vocational education.

The development of Japan's postwar economy can be broadly divided into three periods: the recovery period during which Japan built its economy back up to the prewar level, from the end of the war to the mid-1950's; the period of rapid economic growth, from the mid-fifties through the sixties; and the recent period of an economy with a stable rate of growth, from the early seventies.

In the period immediately following the war, Japan's economy was in a state of devastation. Japan absorbed the latest technology from the advanced industrial countries of America and Europe in order to restore the Japanese economy to its former prewar level. In addition to basic technological knowledge, engineers also needed sufficient linguistic ability to read and understand foreign documents.

1955 marked the end of the postwar reconstruction period and the beginning of the period of rapid economic growth. Japan's industry made the progress for rapid increases in productive power, improvements in labor productivity and labor conditions. Environmental pollution became a social problem in the mid-sixties. Engineers needed to have the ability to cope with the application of new technologies, environmental pollution, and other problems that were becoming increasingly relevant.

During the stable growth period, the demand grew for both diversification of business and originality. Engineers needed to have the ability and imagination to carry out original research and development.

At present, the ability to foresee rapid technological changes and to perform effective research and development is an important requirement; in addition to the ability to conduct original, unique, and skillful research. Thus, at present, a new framework is necessary in technical and vocational education with an emphasis on the long-term vision.

2. The vocational man-power development by enterprises

In Japan it is firmly established as common practice that enterprises employ new graduates all together on permanent basis rather than put the right man in the right place throughout the year. Also, Japanese enterprises have had the idea that themselves should provide their employees with necessary vocational ability. However, in the country, social and systematic system for vocational education was in poverty and its social environment has not been well-regulated.

The change of employee's constitution in the entire industries, the ratio of workers younger than 29 years declined from 45.0% to 32.4% between 1962 and 1992, meanwhile that of older than 50 years rose up from 11.3% to 21.5%. Also, the ratio of workers with long time service went up to 42.4% from 29.3%, and that of new male graduates increased to 26.3% from 12.7%. In the change of occupational constitution during the preceding period, the ratio of personnel engaged in special and technical work rose up to 12.0% from 6.6 %, and clerical and administrative workers went up to 23.8% from 17.9%. The above consequence accounts for the progress of aging, long time servicing, high education oriented and white-collar oriented of labor force.

While, the enterprises which intend to put emphasis on the department of sales/marketing and R&D in future occupy high ratio of 80% respectively, and their posture is inferred to try positively to keep up with strengthening marketing and technical innovation. Also, in connection with the change of classification for labor demand in future, "the weight of job required with high special knowledge and technology will rise up." is 52.9% or highest in the ratio, "The weight of job required with experienced skill and technique will rise up." is 49.9%, and "The weight of job required with broad knowledge and technique will go up." is 47.1% follow like that. Therefore, it is deemed that ability are demanded for "high special knowledge", "abundant experience" and "broad knowledge".

In order to train such talented people, the technical and vocational education will play important role as the activities of enterprises. The ratio of vocational training, enterprises conducted OFF-JT as the actual condition of vocational training, was 78.2%. As for the job classification of employees for OFF-JT, "specialists and engineers" 80.3%, "technicians, manufacturing/construction workers and laborers" were 82.3% and "administrative and supervising staff" 80.3%, and thus the ratio of people taking OFF-JT is very high. As for the purpose of the people attending the training, "The acquirement of fundamental knowledge and skill" was 43.3% or highest, "The improvement of special knowledge and skill" 41.6% or second. Most for the former were answered by new employees and most for the latter were by other than new employees. As for dissatisfactory point of vocational training, "The kinds of job training course are few" was 58.8%, "The level of contents is not satisfactory." 49.5%, "The period is too short or the number of times is less" 46.8%, and "People for the training are limited" 45.0%. Therefor, the various kinds of the technical and vocational education in high substantial quality and number are demanded.

3. Programs of the Ministry of Labor to Train Highly skilled Workers

As we witness the dramatic restructuring of our society wrought by rapid technological progress, a shift towards information orientation, and a large-scale aging of the population, it is becoming increasingly important to train competent workers who will be able to cope these societal changes through every stage of their professional careers. To respond to this need, the Ministry of Labor is developing the following programs to train workers with practical abilities and advanced knowledge.

- Institute of Vocational Training, which was established in 1961, is offering courses to train field engineers with advanced knowledge and skills.
-15 computer colleges around the nation are offering two-year courses to train information-processing engineers.
- Business Career System is an advanced educational system that will encourage white-collar employees to continue studying to further develop their job abilities.
- Educational center for top in-house engineers is providing knowledge on high technologies such as ME and newly developed materials.

- Local Software Centers in some communities are prepared for providing in-house workers with a comparable level of education to that received by system engineers.
- Media Staff Developing Centers are prepared for training telecommunication engineers in some communities.

4. Japan's Educational System for Technical and Vocational Education

Educational system of Japan is comprised fundamentally of 6 years of elementary school, 3 years of lower secondary school, 3 years of upper secondary school and 4 years of university. There are also junior colleges with 2-year curriculum, and technical colleges with a 5-year curriculum for lower secondary school graduates.

9 years of elementary school and lower secondary school is compulsory. However, the percentage of students who went on to upper secondary schools has levelled off at about 94% for both male and female students, the percentage of those who continuing on to junior college or university was 40.9%, and the percentage of university and college graduates entering postgraduate courses was 8.2%.

Technical colleges and specialized schools have become the core of the technical and vocational education provided. The first technical college was founded in 1962 in order to train engineers with advanced practical skills who would be able meet the demands and challenges presented by Japan's rapid scientific and technological progress. Technical colleges are higher educational institutions that provide five-years of consistent practical education to students who have completed a junior high school course. The curriculum can be modified to suit the students' individual abilities and preference. In 1993, there were a total of 62 technical colleges in Japan, with an entrance capacity 10,990.

The first special school was founded in 1976 as an institution to provide practical vocational education and training for special skills. The curriculum of special schools is designed to precisely and flexibly to meet the various educational needs prescribed by social change. In 1993, about 700,000 students were enrolled in special schools. The freshman class accounted for 15.6% of students graduating from upper secondary school that year in Japan.

School education has been the core of the technical and vocational education resources managed by the Ministry of Education. However, the rapid aging of the population and several other changes have made it necessary to afford learning opportunities to citizens at every stage of their lives, so the Ministry of Education has shifted some of the former administration's emphasis on school towards lifelong learning. Thus, higher educational institutions have positively accepted adults, and universities and the industrial world now jointly provide technical and vocationa education.

The Ministry of Education is considering the further promotion of refresh education in its administration of higher education in 1995. This program needs to promote the education of workers to enable them to master new types of knowledge and skills in universities and graduate schools, in order to help the workforce keep in pace with today's rapid technological innovation and changes in industrial structure. With the increasing number of special adult selection systems, nighttime graduate schools, and day-and-night course systems, a growing number of universities are accepting adults. The Ministry of Education is engaged in a number of measures for the promotion of adult education, including the facilitation of cooperation between universities and the industrial world, the provision of information on adult education, the improvement of the educational methods and curricula at universities, and experiments on adult education by satellite communications.

5. Current Media Technology in Japan

With the social progress toward the information society or the multimedia society, various types of media technology came into active use in technical and vocational education. However, as the progress of recent multimedia technology is too rapid, the phenomenon that "new technology becomes out of date in three years" is frequently observed. In such circumstances, it is difficult to grasp accurately the present status of the latest technology used for technical and vocational education. In this report, current media technology in Japan will be outlined.

Japan has a highly advanced communication infra-structure. In addition to traditional ways of communication, telecommunication facilities and equipment are widespread, including radio broadcasting, TV broadcasting, computer networks, telephone and facsimile. TV and video equipment are widely diffused across household.

The media available for education can be classified roughly into three types; broadcasting media, telecommunication media and package media.

The broadcasting media includes radio broadcasting (AM, FM), TV broadcasting (VHF, UHF), satellites (BS, CS) and CATV. The feature of this type of media is that the wide area service is available but it is highly restricted to one-way communication. Regarding the broadcasting media, the switchover to the multichannel system is being dealt with, by applying multiplexing technology, and, at the same time, high-quality intelligent transmission systems including Hi-Vision are being put into practical use, using digitizing technology. There is also a tendency toward two-way communication system such as two-way urban CATV.

Regarding the telecommunication media, the exchange of images has been becoming easy owing to the expansion of the use of ISDN as an information infrastructure, together with basic technology such as telephone, facsimile and electronic mail. In addition, the range of the use of communications satellites has been increasing, and they are being put into practical use. The construction of the advanced telecommunication network using optical fibers is being done aiming at completing the whole network covering all over the country by 2010, and it is required to reconstruct the educational environment according to the progress of the construction of the network. Experiments using such technology as VOD (Video on Demand), interactive TV, are also being carried out.

Regarding the package media, the environment for the use of CD-ROM, CD-I, Video CD, photo CD, etc. is becoming improved and enriched. The recording medium is being changed from the tape to the disk, and the use of the package media as teaching materials having a mass storage capacity and having random accessibility is expanding.

The common feature found in the development of the media technology is the rapid progress of digital technology, computer technology and materials technology. Such technology will be integrated into multimedia technology in future, and its function will be strengthened; in this case, the function of the broadcasting media and that of the communication media become similar to each other, and the boundary between these two types of media will become indefinite, and these functions will be used complementarily. Thus the latest media has been expanding its media functions such as wide area service, openness, networking, multiplicity, accumulability, two-way communication, individuality. Multimedia is also constructing new types of educational concepts such as the virtual university, combined with network technology.

From the educational viewpoint, the rapid progress of media technology has brought about the expansion of functions such as wide area service, openness, networking and multiplicity, and the appearance of the recording medium having a mass storage capacity has caused the remarkable increase of information which can be managed personally, and consequently, it is becoming easy to deal with the education on individual basis.

6. Information education in school education

Comparison of the information education in the primary school and secondary school education in our country with that in the advanced countries (USA, Australia, Holland, Germany) shows that the ratio of schools where computers are used in the education is smaller than that of the counterparts, and the information education is largely behind them though the computers introduced in the school education are much more sophisticated. The information and communication technology is the basis of the highly information society, and the information education in the primary school and secondary school education is important. The Ministry of Education and the Ministry of Home Affairs plan to increase the number of personal computers per school to 42 sets for each secondary school, and 22 sets for each primary school by additionally introducing 750,000 sets of personal computers to the primary schools and secondary schools in the coming six years. For bringing up the teachers to be engaged in the information education, system engineers in the computer manufacturers are employed as part time instructors and the system is prepared which authorizes the qualification of teachers in upper secondary schools who exclusively teach the information technology and the information processing for those who graduated from the upper secondary schools. They also plan to build libraries for the software for educational use where the teachers can try the educational software in order to activate the educational utilization of the software of the personal computers.

A project has already started which realizes the environment of the use of the network for pupils and students in primary schools and secondary schools. This project connects the primary schools and the secondary schools by the network with the Educational Software Development and Utilization Promotion Center as the core. Database of the center can be accessed, and the Internet can be connected through the network.

"On-line University Concept" project has started this year where the database of the lectures and the information on the studies are mutually used. Sixteen national and private universities participate in this project. This system connects each university by the network through the Internet by making use of the high speed network of 2.4Gbit.

7. Refresh Education Using Communications Satellite

Refresh education is educational system where the knowledge and skills necessary for various occupations are given to the people who are engaged in a occupation, by formal higher educational institutions such as universities, technical colleges and junior colleges. The measure of the Ministry of Education for the promotion of the refresh education was already described. In this part, the experiment of the refresh education using communications satellite as one of new technology will be outlined.

From the result of the survey of the needs for refresh education, which was made by the Ministry of Education, it was clarified that there were great needs for the basic engineering course (college level), the professional course (graduate course level) and the advanced technology course. Regarding the contents, the needs for programming (software), measurement/control, management/administration and machining were large. Regarding the trend of advanced technology, the needs for electrical/electronic communication, information (hardware), information (software) and the management were large. Based on the above-mentioned result, the course program in the form of a enlightening lecture meeting about science and technology was conducted in 1992. Then, in 1993, the course program in the form of a lecture about advanced technology was conducted, and in 1994, the course program in the form of a lecture about information engineering and computational engineering, each of which is one of the specific professional fields of technology, was conducted.

Regarding the systems which were used in this experiment, six national universities and about 350 enterprises which have a receiving equipment were connected with NIME making use of three communications satellites which can be used in Japan, and real-time lectures were given to engineers. About five thousand engineers and researchers of the universities and enterprises in all parts of the country participated in this experiment. The contents of lectures, the sounds and images were highly evaluated by them. The following are the subjects of lectures of each course program.

The 1st Program: November 5, 1992:
"The effect of opt-electronics on the public society",
"The expectation toward engineers of the new age".

The 2nd Program: January 19, 1993: (Lectures by a Nobel Prize winner)
"The ideal way of research and development: The difference of the way of thinking in research works between the U.S.A. and Japan",
"The creation aiming at the 21 century" .

The 3rd Program: December 1-3, 1993:
"Micro machine", "Micro machine and new robotics", "Virtual reality and tele-existence", "Advanced material and its reliability", "Evaluation of materials", "Intelligent materials science", "Superconducting electronics", "Semiconductor device and quantum mechanics", "Artificial organ and micro machine", "Organism and oxygen", "Flight and the way of swimming of living being", "Biotechnology", "Technology and society", "Urban environment and metabolism", "Intelligent information technology and human being".

The 4th Program: December 13-14, 1994:
"Invitation to the most advanced computer graphics", "The environment for the development of next-generation software", "Learning computer", "Invitation to computational linguistics", "Very high speed asynchronous computer", "Information security technology and its role".

This year, the investigation and the arrangement of "system technology at practical level", "the needs for lectures", "evaluation of the learning effect" are being carried out.

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USE OF NEW TECHNOLOGIES FOR TECHNICAL AND VOCATIONAL EDUCATION IN KOREA

By: *Byong-Sun Kwak*

organized by

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Manila, Philippines

Use of New Technologies for Technical and Vocational Education in Korea

by
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Use of New Technologies for Technical and Vocational Education in Korea

The major purposes of technical and vocational education are to help every learner choose a job according to his/her needs and interest, and to encourage the learner to keep taking vocational training courses in order to acquire up-to-date knowledge and skills. In accomplishing such purposes, some problems may occur. In order to solve the problems and to improve the quality of technical and vocational education, the whole government including the Ministry of Education, the Ministry of Labor, the Ministry of Commerce, the Ministry of Science and Technology and the Economic Planning Board have been devoting their efforts to the establishment of a new educational system.

1. Basic Directions for the Improvement of the Technical and Vocational Education

The labor market in Korea has experienced a serious gap between the demand and the supply of technical manpower since the middle of 1980s. Until recent years, technical and vocational education and training systems have not effectively responded to the quantitative and the qualitative demands from the industries (Ihm et al., 1993).

This problem may occur due to the uniformed curriculum, educaitonal contents unrelated to the demands of the field, insufficient educational facilities, lack of various educational programs, ineffective investment, insufficient cooperation between schools and industries, and weak administrative and financial support systems (Chang et al., 1993). These problems occur not only in schools for pre-service training but also in firms for in-service training. With such problems, institutions for technical and vocational education seem to be far from an open education system suitable to the needs of learners and the demands from industries.

Concerning these problems, the following issues need to be considered in order to solve the problems and thus to improve the quality of technical and vocational education (Chang et al, 1993; Park, 1993).

First, the educational system should exist as a part of a system for lifelong learning. This system should be open and flexible enough to satisfy the needs of every learner and of industries.

Second, the educational system should deal with the increasing complexity of work as the job maket changes according to the social change. As our society changes, the industrial structures change and the required knowledge and skills also change. Thus, technical and vocational education systems should foster the diversity and flexibility of educatioal programs and curricula to satisfy the everchanging skill requirements of industries.

Third, the educational system should be reorganized to provide learners with opportunities to acquire apprenticeship through real-life experiences. Such opportunities should also be provided to every learner regardess of their social economic status.

Overall, policies to improve vocational and technical education should be established to implement the principles of lifelong learning through the creation of open and flexible educational systems, offering training and vocational guidance.

The recently announced policy on educational reform also reflect such direction of technical and vocational education (The Presidential Commission on Education Reform, 1995). The policy emphasizes the importance of open education and lifelong education, and the need for constructing a circulating system for educational information.

In order to accomplish the policy and solve the problems in technical and vocational education, new technologies need to be adopted into educaitonal settings in order to provide everyone with opportunities for learning regardless of the time and space limitations.

2. Use of New Technologies in Technical and Vocational Education in Korea

1) Use of Computer-Assisted Instructional(CAI) Software

(1) Why CAI software needs to be used?

CAI software has been commonly used in educational settings. The advantages of using CAI software can be summarized as follows:

- active learning: CAI software provides learners with opportunities for interactive learning. Such learning allows learners to become active. It has been well known that learning occurs best through an one-to-one learner-teacher interaction. However, in a typical classroom situation where a teacher has to interact with a large number of learners, it is very difficult to retain the dynamics of learning. In this regard, CAI software has strong advantages.

- individualized instruction: CAI software provides learners with opportunities for individualized instruction. With traditional instruction, lectures are given to a large number of learners at the same time regardless of their individual differences. With CAI software, however, depending on learners' responses, different instructional branches can be made. Furthermore, some sophisticated programs can maintain the learner's learning history and use the information to tailor the instruction to the needs and the preferred style of that learner.
- simulated learning tools: Instructional uses of simulations through CAI software can provide safe and efficient learning environments in which learners can play with and explore various variables. For example, the learners can exercise machine operating procedures and learn the consequences in a safe manner. This type of learning tools are increasingly becoming a powerful technique to meet educational needs.
- learner control: CAI software with good quality allows learners to have control over learning pace, sequence, presentation of content and many other options, which are not possible in traditional courses. This learner control strategy may help learners become motivated in learning and thus become better learners.
- enhancement of higher-order cognitive skills: Currently the notion of problem-solving skills which can be applied to real situations is increasingly being addressed as important. In this vein, some computer activities can facilitate the development of higher-order cognitive skills. For example, when learners are engaged in problem-solving tasks using CAI software via a network, they can exchange ideas and discuss solutions to the given tasks, which can improve their thinking abilities.

Although the effective uses of CAI software depend on many factors such as an appropriate curriculum, teachers, learners, and so forth, it seems that CAI software has great potential to play a prominent role in instruction and learning. Incorporating CAI software into curriculum can save teachers' time by allowing them to interact more with their learners. In sum, intelligent uses of CAI software should be emphasized in order to improve the quality of education.

(2) How CAI Software is Used?

In Korea, the Ministry of Education has established a plan to strongly support the computer education in schools. According to the plan, at least 31 computers will be provided to every school in Korea by the end of 1995. 90 pieces of educational software have been and will be developed by Korean Educational Development Institute each year, and distributed to schools. According to the plan, 497 pieces of software have been developed by the end of 1994, and teachers are allowed to make copies of the software for free to use in their schools.

As a part of the governmental plan, 79 pieces of CAI software have been developed for the technical and vocational education by the end of 1994. The amount of software developed for each school level is as follows:

- Elementary School
  practical course (25 pieces)
- Middle School
  technical education/ home economics (3 pieces)
  technical education (15 pieces)
  home economics (4 pieces)
  industrial education (9 pieces)
- High School
  technical education (7 pieces)
  home economics (7 pieces)
  information industry (9 pieces)

Some instances of the software topics are the use of drawing instruments, the structure and the operating principles of personal computers, the structure and the functions of a gasoline engine, the design of a skirt, etc. Most of the software has been developed in order to provide learners with opportunities to acquire knowledge and skills related to computer literacy, and to enhance abilities to make or operate materials. Through the use of the software, learners may recognize the usefulness of computers.

In general, the development of CAI software for technical and vocational education aims at the following(Kwak et al., 1994):

- acquiring real-life experiences in a simated situation
- acquiring knowledge and skills needed in industries, and creatively using the knowledge and skills
- understanding the characteristics of jobs, and searching for jobs that satisfy learners' abilities and interest

·acquiring positive attitudes towards the labor
·understanding computers, and acquiring basic knowledge and skills needed for effective uses of computers.

2) Use of Hypermedia

(1) Why hypermedia needs to be used?

Much attention of educators has been focused on the use of hypermedia due to the unique characteristics of the media. The following is the special features of hypermedia:

·nonlinear access to information: Hypermedia challenge the sequential presentation of material, which has dominated our conventional way of learning. Traditional methods of instruction rely upon linear media such as textbooks and lectures. With such linear media, every learner should follow the same beginning-to-end path through the instructional material, prearranged by an author or by a teacher. In contrast, hypermedia are nonsequential; there is no single, fixed order in which learning materials are to be presented. Instead, there are multiple ways in which one can access the same information. In short, the advent of hypermedia makes nonlinear and multidimensional learning and instruction possible.

·a high-level of learner control: Another significant advantage of using hypermedia for education is that it offers a high-level of learner control. Hypermedia present several different options for a learner to explore instructional materials, and the learner can determine what to learn next and how to learn about it. Consequently, this advantage of learner control demands additional responsibilities on the part of a learner over his/her own learning.

·use of multimedia: Not only can the instructional material be presented nonlinearly, but the information presented to the learner can be delivered by multimedia. The same information can be presented in various forms such as graphics, sound, video images, text, etc., so that a learner can choose whatever media type suitable for his/her personal needs. Various kinds of media are brought together in this type of learning environment, making more and diverse information available. These multi-modal capabilities can hold learners' attention better and thus, improve the effects of learning. Besides, children who have difficulty processing abstract verbal information may benefit from more concrete visual and auditory information.

- active involvement in learning: The interactive nature of hypermedia demands the learner to be active. With the traditional instructional method which usually involves lectures by teachers, learners can stay as passive as they want to be. However, with hypermedia, learning can occur only when a learner dynamically interacts with the learning system; the learner becomes the initiator of his/her own learning rather than a passive recipient spoon-fed by the teacher.
- individualized instruction: Hypermedia allow learning to be more individualized. Not only do hypermedia allow learners to go through different pathes, but also they provide a rich context to foster multiple elaborations through its associative idea-linking potential. In other words, hypermedia support individual differences of the learners in terms of their abilities and preferred learning styles.
- flexible learning pathes: Finally, learning can become less formal. For example, learners can quit the study of a topic at any time and resume whenever they want to. There will be no penality for doing that. Besides, while studying a certain topic, the learner may become interested in another related topic and thus engage themselves in exploring the topic of interest. At any point, learners may come back to the original topic. The flexible, linking capabilities of hypermedia allow learners to freely jump from topic to topic.

(2) How hypermedia are used?

The implementation of hypermedia technology for learning and instruction will have many significant implications for education. In Korea, educators are enthusiastic about the adoption of this new technology.

For example, a hypermedia learning system is now being developed and will be implemented in the National Science Museum from the next year. The Korean Educational Development Institute has been developing a multimedia authoring tool, which will be distributed to teachers from the beginning of the next year.

3) Use of Multimedia Telecommunication Systems: Information Superhighway Infrastructure

(1) Why Intermation Superhighway Infrastructure needs to be constructed and used?

The Information Superhighway Infrastructure(ISI) is a representative use of telecommunication systems with multimedia. It can allow people to communicate with others through telecommunication systems, that deliver various types of information such as sound, text, graphics, animation, etc. through the use of multimedia. Once the ISI is constructed and available to public, everyone can easily get access to a huge amount of information at a very fast speed everytime and everywhere.

Also, as the ISI is constructed and used, industrial economy will be systematically reorganized for effective uses of information; economic activities are to be computerized and automatized, and new markets and industries will be created for multimedia-telecommunication services. In addition, people's lives will be changed for the effective uses of information through the use of distance education, distance medical examination and treatment, etc.

The special characteristics of the ISI can be summarized as follows:

- ·network: The ISI has a network feature, which organizes a large amount of information. The network system can send and receive sound, voice, graphics, animations, and other types of multimedia information at a very fast speed, and thus can activate communications among people.
- ·connectivity: The ISI connects important public institutions with industries, schools, home, libraries, hospitals, etc. in order to use fulll capabilities of the whole society.
- ·openness and flexibility: Every learner can easily send, add, use and receive information as he/she wants.
- ·accessibility: Regardeless of people's social economic status, handicap, location, etc., they can use the ISI at a very cheap cost.
- ·interoperability: The ISI consists of networks of networks. Thus, network-users can communicate with each other regardeless of which networks they are in.

(2) How Information Superhighway Infrastructure is constructed and used?

Our society has changed from the one emphasizing the role of industries to the one emphasizing the importance of information. In information society, information takes an important role, which affects the development of the economy and people's lives in a nation.

The government should set up a national policy and establish co-ordination mechanism for the effective acquirement, use, storage and reproduction of information and human resources. On this point, the Korean government has recently estabished a plan for the construction of the Information Superhighway Infrastructure(ISI) (Cheon, 1994). According to the plan, the construction of ISI will be completed by the end of 2015. It has been planed that 5 types of information networks are to be constructed, and one of them is the education and research network. For the construction of the education and research network, the following tasks need to be accomlished: construction of synthesized educational information networks, construction of long-distance eucational systems, development of educational multimedia software and databases, construction of academic information databases, and training for human resources. Especially, for technical and vocational education, the institution for continuing education will provide educational programs through a long-distance educational system. To accomplish the plan, some research is under going, and test-beds have been implemented.

The ISI will link government, public institutions, research institions, industries, schools and universities, etc., and share information stored in large databases. Until now, there has been little effective cooperative work done between industries and educational systems. As the result, technical and vocational education has not been able to meet the demands of industries. Also, within industries, the lack of investment for in-service training has caused serious problems for effective management of personnels and products. Considering these problems existed in technical and vocational education, careful attention needs to be paid to make links among schools, public training centers and in-plant training centers of firms for the better coordination of national training programs through the use of the ISI.

Through the networked organization among related institutions, distance-education and real-time instruction can be accomplished. Unique educational systems such as virtual schools, electronic libraries, home-schools can be also created. Thus, through the use of the ISI, effective utilization and management of in-service and pre-serve training can occur.

3. Implications

A major factor in the changes in technical and vocational education comes from the technological and social changes in the workplace. The followings are directions of these changes(OECD, 1994).

-- The new technologies tend to eliminate repetitive and routine jobs. One results seems to be a general up-skilling of jobs. Another results, about which some controversy continues, is a reduction in employment opportunities for young people.

-- There is a clear tendency towards more team-work. The man-machine relationship is being replaced by an interaction between teams and technical system. As a result, increased emphasis is put on social skills and communication to complement technical expertise.

-- Increasingly, employees are expected to perform a greater variety of tasks ranging from planning to evaluation. There is an increased emphasis in the more progressive entrprises on polyvalent skills, on the multi-function employee. On the other hand, changes in work organization are needed to provide more scope for the exercise of these professional skills.

-- The interval between training and work are becoming shorter. As a consequence the readiness for continuous learning and its cognitive and attitudinal correlates are considered more and more important

With these trends, a limited training with a fixed set of skills is no longer enough. The person will require not only higher order thinking skills but the capacity to adjust to and master new technical and social situations. This calls for a broadening and strengthening of the nature of technical and vocational education and has a particular impact on people currently at work and those preparing immediately for it.

In relation to this aspect, the use of new technologies such as multimedia technologies, information technologies, etc offers a new and hopeful approach. In a world where data increases rapidly, a major challenge for schools is to prepare students to access and use information effectively. Without higher-order thinking skills, they cannot synthesize large volumes of information into a structured knowledge. Multimedia technologies have great potential to help students master higher order thinking skills. Multimedia technologies with information network can realize the open learning environment for people as a life long process.

Several implications are drawn from the discussion above.

First, new technologies with focus on information technology should be included as a core part of technical-vacatioal education program. The nature of information and, the way of communicating and handling information, and the use of infomation technology to investigate should be taught as a learning element.

Second, multimedia aided learning programs in various types for technical-vocational education should be regorously developed and distributed.

Third, schools should be supported to transform into multimedia learning environment which bridge from its current role of augmenting data delivery in conventional instruction to instead fostering a new model of teaching/learning based learner's navigation and creation of knowledge webs.

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An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

EDUCATION : CATCHING UP ON TECHNOLOGY

By: *Jose D Lacson*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

EDUCATION: CATCHING UP ON TECHNOLOGY

Presented by Director General Jose D. Lacson
Technical Education and Skills Development Authority (TESDA)

1. Times have changed

Industrial society, it is said, is one wherein human resources, products and money predominated. An information society, on the other hand is one where information reigns supreme. In one generation, our generation, the transformation was so fast that entire concepts learned in childhood will have to be relearned so many times over to adjust to technologies updated as we zip along the information superhighway.

We grew up with the concept of war contextualized in World War I and II. We were dazzled with the high tech magic of the Gulf War live on television right in our bedrooms. After that electronic spectacle, the old war movies seemed like romantic movies with its attendant pain and hardship. Present day wars are attended by high technology. But have we heard of electronics and computers in the ROTC curriculum?

Mass production systems in the industrial revolution placed a worker in a pool of workers who adjusted to each other. Mass production now has one worker in a pool of impersonal robot arms and conveyors. The implications on the human worker in terms of productivity assessment, wages, timekeeping are tremendous as data is so immediate as the Personnel office is informed by the computers on an up to the minute basis.

In schools, the blackboard became whiteboard became electronic boards became TV monitors. The notebook was transformed to an electronic 4 kilo. carry on of the paper less society.

At home, the rural and urban, the young and the old race through channels with that remote control device. Some people see two different movies at the same time and still catch up with CNN and NBA in between.

Libraries and catalogues have changed drastically too with the cable and e-mail and the Internet. And one can hold a world-wide meeting via teleconferencing.

Against that backdrop, what does a trainor do?

2. Technology Supermarket

The school board goes to a technology supermarket and browse. They can browse and browse and browse and always get something new on the shelf. And browse and always fear obsolescence. There abounds consumer guides, product guides, glossy brochures, demos, infotech fairs.

The technology for training is limitless. The simplest issue to address is budget. The bigger considerations are learning models and the objectives of the educational environment.

1. **Traditional hierarchical learning**

In a transition generation such as this, administrator and trainors do not change as fast as technology. The early ones have been educated, in their more retentive and impressionist years on the hierarchical, procedural learning process.

2. **Analytical learning**

Often referred to as task analysis, this is why approach to learning is often admired but rarely practiced in TVET.

3. **Experiential learning**

This is premised on learning as inherent in a person and that learning comes through discovery from his experiences. This model advocates the structuring of the learners experiences.

Computers in education started in the mid 70's when hardware was expensive, software was not available and awareness was minimal. In the mid 80's, hardware became cheaper and educational software slowly emerged. Trainors were caught in the dilemma of change. The start of the 90's saw an explosion of high quality education software as a result of the emergence of more inexpensive and very powerful PC's for offices, schools and the homes. The students got excited and the administrators and trainors are faced with not much choice. Multi-media, distance conferencing, network access are here to stay. Did technology dictate the learning model of the future?

3. The Network is the Campus

You went to a campus that was yours and your classmates. Your classmates had faces and hearts and laughter. The pretty librarian helped you with the index file and the books on the shelves. You went from room to room guided by a regularly ringing bell.

What will the class reunion of the future be? We know of eternal friendships developed over the e-mail, more exciting than conventional pen-pals as responses are immediate. Will the class reunions be computer-aided, computer-based, computer managed or teleconferenced?

Expansion went from campus to university systems to consortia to networks. The buzzword is "We are on the Internet."

On the other hand, the class has shrunk from the big group of forty to the manageable sixteen to single, individual student. The course program has long ceased to be distributed-mimeographed-for-five-hundred students but rather printed out for individual students drawn from a network wide menu.

4. **The Competency Based Education (CBE)**

CBE is a systematic approach to learning in which the primary concern is to ensure the learner's learning and performance of knowledge and skills relevant to the chosen occupational goal. It is a highly personalized learning process in which an individual starts learning at a level of skill and knowledge based on present competency and progresses at own pace. It is very much learner-centered and focuses on one's strengths, needs and learning styles.

Under the system, the teacher's role dramatically shifts from the traditionally authoritarian source of knowledge to that of a learning process manager and resource person. The instructor provide direction to the learners, monitors their progress and verifies attainment of competencies through written evaluation of theoretical knowledge and demonstration of practical skills. The cited dual role of the teacher requires high competence in subject specialization and in administrative process of monitoring and managing learner progress.

In CBE, the teacher has a fixed schedule, and the learner have flexibility to focus the appropriate resource and assistance. The teacher is usually located on a learning resource center, workshop or laboratory and not stationed in a distance remote place. Traditional classroom lectures are replaced by instructional materials supported by individual or small group consultation or tutorials.

CBE trainees ought to posses enough maturity, motivation and determination to pursue their program independently. The process being new, transition from the traditional process to CBE may be facilitated by an orientation program and continued support from instructors, guidance counselors and advisors.

Implementation of CBE requires significant advance preparation and sincere commitment to change. It is important to give careful consideration to issues such as changing role of instructors, cost of developing programs and introduction of new administrative policies regarding admission, scheduling and fees. Everyone associated therefore with the new system implementation including policy makers, government officials and school administrators require a thorough understanding of the implication of introducing a non-traditional learning methodology like the CBE.

FACTS AND FIGURES

NMYC, the forerunner of today's TESDA conducted two studies:

a. A Regional Study on Curriculum, Training Materials for the Asian and Pacific Skill Development Programme of the International Labour Organization and;

b. The Survey on the Use of Computer Technology in TVET in the Philippines for the Senate Committee on Education.

The Regional study conducted in 1993, revealed that:

- Existing curricula were internally developed while training materials and teaching methods were adopted from international models.

- The quality of printed training materials outnumber the non-print ones. The most common materials, the training modules, are distributed in printed form.

- The conventional classroom method is still the most prevalent delivery mode.

- The most problems and difficulties are:

  - Lack of expertise
  - Lack of support facilities and equipment
  - Coping with technological changes
  - Lack of trade experts
  - Lack of reference materials
  - Low level of industry participation and support

The Respondents showed the following plans and emerging trends

- Promotion of the development of curriculum, training materials and training methods with direct industry participation;

- Focusing development on trade areas and in the level of standards set by industry;

- Establishment of the regional resource center and the promotion of networking;

- Devoting development activities to new trades and emerging technology where a country has comparative advantage;

- Industry directly engage in curriculum and training materials development for their own specific needs;

- Strengthening of staff capabilities; and

- Development of new training technology to facilitate efficient and effective conduct of training programs.

The national study on computer utilization in TVE conducted in August 1994, covered 385 sample TVE institutions with high enrollment sizes in 5 (five) fully electrified regions, it was learned that the introduction of computer technology has achieved the following:

1. Improved many traditional methods of teaching;
2. Adapted many information processing methods to education;
3. Adapted many teaching methods to the development of training materials;
4. Brought new and useful experiences to the classroom; and,
5. Improved communication, including conferences and co-ordination work.

Use of computer technologies in the Voc-Tech system, however, was not extensive. Courseware was not sufficiently utilized to meet the instructional needs of students in the five regions. Video and Replay technology was not fully exploited in the classroom. Use of Audio and Graphics in training and of telecommunications in the networking were likewise very limited.

On the other hand, the five regions showed a much higher level of accomplishment in the upgrading or training of teachers or trainors than in the use of coursewares, audio-video,. two respondent schools evaluated their coursewares. The evaluation suggested that some coursewares in present use in the classrooms are quite restrictive, allowing little room for follow-up action by teachers.

The areas suggested for pilot courseware development are automotive and motor vehicle repair, electronics and driving among others.

Problems associated with CBT/courseware development are four-fold: problem in hardware and software acquisition; repair and maintenance of equipment; training of teachers along new mode of instructing; and, the lack of guidelinesfor courseware development.

In the view of key informants of the study, the future of Voc-Tech education promises:

1. Wider uses of technology in the classroom;

2. Use of computer-assisted and computer-managed instruction or computer-based training. It was suggested that management of education and training and industry fully exploit the advantages of these technologies for improving education and instructing.

The informants predicted a significant change in technical education as a result of computer technology, considering that education authorities are increasingly becoming uncomfortable with traditional modes of instruction, more students are taking computer engineering and computer science courses, complaints are increasing on the quality of school graduates, as well as on the competence of teachers and the ability of schools to maintain quality faculty manpower, requests for computer equipment and computer-trained staff are increasing, and the national aspiration to attain high industrial status is being pursued more intensely.

The informants stressed the need for a plan to promote efforts towards adopting newer or alternative instructional methodology. This study recommends that this suggestion be threshed out in a forum where policy makers, educators, practitioners, and even computer equipment dealers are represented. Supporters of the plan should complement one another in the provision of funds and infrastructure and encourage the design of management system for wider acceptance of new instruction modes. Both respondents and informants also pointed out that the government should take the ion from agricultural sector to industrial and the urban infrastructure and encourage the design of management system for widening teachers of the new methodology or instruction, i.e. CBT.

Training pointed out that the government should take the ion from agricultural sector to industrial and the urban infrastructure and encourage the design of management system for wider development.

The core in rural informal training is the analysis of needs and the training component attendant to the needs. Training in rural community-based projects is always seen as integral part of a total development scenario rather than the end in itself, local participation therefore in project planning and delivery is a primary requisite.

Vocational training is usually associated with well-defined occupational categories and a standardized training in the rural informal setting, the informal nature of the labor markets has made it difficult to pinpoint skill requirements associated with identified-income generating activities. Training content therefore is not designed towards the concept of conventional occupational categories but rather a basic, wider skill cluster which will adopt to part-time and seasonal income-earning opportunities. Requirements can only be developed for individual project rather than applied to a series of projects in various locations with varying needs. Adaptation is more the role than replication.

Various training delivery systems are employed

1. Community Training Units (CTU)

   A CTU is located in a municipality where the local government and public or private organizations are willing to undertake community projects and more important where there are actual or potential opportunities for wage or self-employment. The CTU training makes use of any available structure in the community as a training venue, e.g. classroom, multi-purpose hall, barangay hall, vacant building. In this way, the CTU typify the semi-mobile type of training wherein when a particular community need for the CTU have been satisfied, the tools and materials and equipment can be transferred to another community that has exhibited the need for such. Trainors are aided by flipchart and actual objects and the local point out with pride - video programs.

2. The Mobile Units

   The original concept of the training van and, at one time, was replaced by the training box which are wooden and metal boxes containing small equipment, tools, printed materials, flipcharts. The boxes are packed for light courses as basic carpentry, food trades, small engine repair. The boxes are transported in hired jeepneys or pick-up trucks and unloaded and opened in a prescheduled community where there is a pronounced need. The boxes become the storage shelves after classes.

3. Distance Education

   In Central Visayas, a cadre of Community Training and Employment Coordinators (CTECs) were trained to guide and monitor enrollees in radio classes conducted from a central station in Cebu. The CTECs meet with the program coordinators and the trainor regularly to clarify issues and report on progress of the trainees. Radio classes are supplemented by predistributed printed materials. During broadcast for hands-on classes, enrollees gather in one common area where equipment, tools and visual materials are made available.

Let me summarize my points

1. The constantly changing technology dictates the educational reforms that will have to be undertaken to make students interested in learning and turn them out as relevant workers.

2. Technology has widened the playing field for TVET. This demands an open creative mind for administrators and TVET.

3. Visual information and its availability in the networks are potent tools for education. The networks have made educational resources limitless.

4. The students are excited to learn with computers. Trainors should be doubly excited to teach with computers.

5. There are creative ways of bringing non-formal education where the amenities for high technology does not exist.

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TRENDS IN COMPUTER ASSISTED LEARNING

By: *M Radhakrishna*

organized by

United Nations Educational, Scientific and Cultural Organization
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International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

Trends in Computer Assisted Learning

INTRODUCTION

CAL had its origins in around mid 60's. At that time computers were thought to be good replacement for programmed instruction implemented on simple teaching machines. Educationists believed that computers could offer a fairly complex branched instruction to cater to the needs of the students. In the initial stages, the text information on the computers was supplemented by flash cards carrying diagrams due to nonavailability of computer graphics. The CAL was implemented on main frames or large minis because of the large memory requirements. It used tutorial, drill & practice and simulation styles at this stage. The developments in graphic outputs and the advent of personal microcomputers during early 80's redeemed the lost faith in CAL & gave it a fresh lease of life. However most applications tended to be simple electronic page turners though the tutorial style and simulations have become more interesting due to the incorporation of graphics. At this stage new styles like explorations, tutor-tutee model were introduced. A major deviation from the initial philosophy of structured PI style of teaching occurred with the introduction of explorations and exploratory tools. Attempts were made to use existing generic packages like word processors, data bases, spreadsheets and graphic editors/presenters as tools in the CAL environment. Special purpose generic tools such as mathematical and graphic tools and programming environments like LOGO and microworlds were also developed to support the teaching & learning process.

Efforts were made to move away from predefined and narrow instructional systems during this period. Though the introduction of tools is one such approach other approaches such as adaptive drill & practice environment, adaptive tutoring environment, expert system based teaching environments were brought under the definition of CAL. Hypertext based instruction was one of the major innovations introduced in CAL. It provided a simple and natural method of learning with enormous potential. Simulations slowly grew into simulation laboratories and laboratory interfaces. The innovations such as computer based testing, computer based instructional management systems notably Keller's plan were added to the repertoire of CAL. The evolutionary changes to CAL were too many and required a more encompassing name for the whole activity. "Educational computing" was often used to describe all the above activities.

The developments pertaining to the field during 90's are remarkable. With the introduction of optical memories, fast processors, hardware digital compression techniques and fast internal buses the integration of video and computer technologies has been achieved. The present capabilities are adequate to capture video quality frames singly or in motion video form, store them either on hard disk or on CD ROM with JPEG or MPEG compression algorithms, and retrieve them at adequate speed for presentation to the student with or without computer generated overlays. The VL bus or PCI bus provided the necessary data transfer rates and the current fast and wide SCSI and fast IDE based hard disks and quad speed CD ROMs provided the necessary retrieval speeds to make the video presentation a reality. The Multimedia aspects are strengthened with DSP chip based 16 bit sound cards and with a variety of multimedia peripherals. With this came large databases of pictures, video clips, audio clips that could be readily integrated into CAL lessons. The multimedia developments gave the necessary impetus for the development of Virtual reality systems. Though the educational value of the virtual reality systems are yet to be explored there is sufficient reason for us to believe in its usefulness to provide support to conceptual understanding, psychomotor skills when interfaced/ used with laboratory environments and in the development of problem solving skills when used in exploratory environments.

The quest to emulate human teacher in CAL environments has lead to expert systems & Intelligent computer assisted instruction (ICAI) or Intelligent tutoring systems (ITS). Though historically the attempts to build such intelligent systems started during late 60,s and early 70's the developments in computer systems and artificial Intelligence have created the right situation to build meaningful ICAI systems.

The computer networking which has come of age with some type of standardisation in equipment, technology and practices provided adequate speed & facilities to be of use in educational system.

PROBLEMS & ISSUES

Electronic page turning

Over the years, CAL has gained strength in terms of graphics and presentation. The present courseware including the multimedia packages tend to fall in the category of electronic page turners. There is a need to pause and think about the ways in which we can develop higher order cognitive abilities if we need to utilise the full capabilities of computers. This issue is also closely related to the features supported by the authoring tools used to create rhe courseware. Most authoring tools, though expensive, provide merely glamorous & eye-catching presentations with colours, wipes, pictures and videos. However, the aspects pertaining to interaction and bi-directional dialogue are to be strengthened in the authoring systems and courseware.

Group interaction

CAL has been conceived and developed for selfstudy and single user environments. Modern microcomputer systems were also designed for single user to operate. However, the researches indicate that the group interaction is very important to learning and the courseware may be designed to promote this gorup interaction. The interaction may be two types - intergroup interaction ie the interaction between the students workingon the same computer and intragroup interaction ie the interaction between the groups. The group interaction also brings the issue of interface between CAL instruction and the rest of the educational environment. Considerable work was done in the areas of group learning or cooperative learning, situational learning and contractual learning. All these variations incorporate group learning in some form or the other. The issue of group interaction may be addressed using three different approaches - design of CAL software to promote group interaction, use of networks to promote intragroup interaction and design of student activities that interface CAL with external world/activities.

Interaction

The CAL systems generally support one way interaction such as the user selecting an option, responding with a single numeric/word answer, pointing out an object or dragging an object to the target position, etc. More complex interactions are required in the teaching/learning systems to build up the complex cognitive skills. In the absence of bi-directional interaction, sophisticated response analysis systems, use of modelling and exploratory tools, the CAL is likely to be reduced to the level of watching an interactive video. Since all the information and aswell all the enquirees from the student cannot be anticipated and incorporated in a pre-stored way, adaptive information generation techniques were developed. These techniques need further refinement.

Authoring systems

Most of the current authoring systems including those with multimedia support are targeted to advertising/ publicity market and the flashy presentations depend upon the user's choice. The educational authoring systems need to support much greater student interaction, support to wide variety of instructional strategies and variety of student activities. The authoring systems are far too expensive for purchase by most small schools. Further, the authoring systems need to be modular with facility to upgrade it functionally as & when desired, on similar lines to most CAD packages. This will enable the user to choose what is required at a given point of time and upgrade it as per the requirements.. Efforts are needed to develop a modern, modular, open ended authoring system which can grow with time and could be made available to schools at nominal cost.

Dispersal of Knowledge

With rapid technological changes and global market forces the knowledge is no more confined to universities and colleges. It is dispersed in the society and is available with a wide range of people located at different places.The fast changing technologies provide very little time to consolidate the existing knowledge into well defined structures.Thus ways and means are to be found to tap this dispersed knowledge and organize it so that the user can easily access it. The current wide area networks and Internet partially solve this problem. However the current facilities still fall short of the requirements in terms of the speed of the networks. It will not take long to choke up the current network with multimedia unless information superhighways come into existence at the earliest and information organization facilities are built up for the network users. On the other hand, from instructional point of view, we have a number of problems to be solved. One of the main problems we will increasingly face is "*wandering*" in the cyber space and picking up all the undesirable stuff. The second problem is more crucial and addresses to the issues of cognitive mapping of information in the mind of the student using the disjointed pieces of information. We do not have help of cognitive sciences at the stage to address this problem.

Case for global cooperation

Well made CAL material are expensive to produce. The conventional courseware requires a preparation time of about 150 to 300 hours for one hour of instruction. The time estimate includes time required for lesson design. Even when clip media data bases are used, the structured lessons require about 100 hours or so for one houe of instruction. This does not include the time spent on developing the clipmedia data bases and the time spent in overcoming the copyright laws. However, a possible approach is to build short unstructured teaching-learning resources which can be used by the teacher in a learning situation. Whichever way we go, i.e. build CAL lessons or develop unstructured teaching-learning resources, a global cooperation will be essential for using the technology at an affordable cost.

EMERGING TRENDS

Computer networking

Computer networks bring computers and consequentially the people together and allow them to share resources, ideas, knowledge and communicate among themselves. Since education implies all these activities, it must make sense that networking must contribute to the process of learning. Since one of our concerns while using CAL was fostering group interaction, the capabilities of networks may be exploited in CAL or in broader terms, in educational computing. We may visualise networks at three levels - class room networks, campus networks or LAN and wide area networks or WAN. The WAN includes INTERNET as well.

The class room networks, as the name suggests are to support the class room teaching. The teacher as classroom controller will have the final control over all the systems. This implies that the teacher will be in a position to disable all the systems, can monitor the work of all the students. The teacher should be in a position to send his/her screen to any or all the students. This includes passing messages. The teacher also must be able to send or facilitate sending messages , screens and program files among the students. Such a system will provide intragroup communication under the control of the teacher.

The next level of networks support campus wide communication and serve much broader functions apart from intragroup interaction. These networks support many functions such as mail between the faculty and students, between students, campus news, bulletin boards, accessing the software and courseware resources and accessing the electronic libraries. The simple email could be used for sending notices, posting assignments, receiving asignments etc. The LAN may also enable its members to access facilities like INTERNET. The bulletin boards provide a powerful facility for problem solving environments. The problems could range from a simple class room problem to a large crisis management problem. The provision of CD ROM libraries will help in optimising the use of resources. LAN will be of great value in the development projects. LAN can be modified to implement Video/ computer conferencing.

The next level is all too familiar WAN and access to full facilities of internet which includes remote computing, database access, meesage passing, accessing global bulletin boards, conducting video/ computer conferencing besides email. It offers all the advatages of LAN. In addition, it provides the platform from which we could access dispersed knowledge, share the ideas, problems, solutions with the peer groups. The issues of internet are brought out in different sections.

Simulation Laboratories

Simulations have been used for a long time in the educational environment. Though these were common in unversity education systems, they were not utilized to their full potential in the TVET system. The TVET system, due to its dependence on non-analytical and non-mathematical approaches, needs the support of simulation tools to provide an intuitive experience to the TVET students. The current computer systems with 32 and 64 bit processors are powerful enough to simulate real life situations and systems. The availability of good graphic interface to simulation software provides visibility to the simulations. The expert systems and knowledge bases provide the necessary support to build and run real life simulations very effectively. Efforts are also underway to build powerful generic modelling tools with the help of which the student will be able to simulate the environment of interest. Simulations are powerful means of communicating with the student and allowing the student to simulate the environment/system is much more powerful tool. Simulations and simultion tools form simulation laboratory environment where student explores his/her ideas. without the need for sophisticated equipment or complex programming. These will assume great importance in areas where the equipment is expensive and situations where fast changing technology does not permit adequate time for the design and development of laboratory equipment. The concept could be extended to include virtual laboratories.

Intelligent tutoring systems

As seen from the preceding discussion, conventional CAL is based on retrieval of stored information in response to either student response or question. The conventional CAL suffers from two main disadvantages. Firstly the stored information may not contain all the relevant information that is required for generating the response, especially when the students' query or response is unanticipated and secondly the bidirectional interaction may not be adequate for communicating the needs of the user. On the other hand the ITS emulates the teacher, in the teacher-student interaction. The student and the computer will be able to communicate in natural language in ITS without using the prestored sentences.

For the understanding of natural language, many AI approaches are being followed. It is pertinent to remember that the sentences used by the student are neither complete nor correct. The system must be able to deduce the meaning of thesentence from the fuzzy situations. Considerable success was achieved in this area and the knowledge is awaiting exploitation. When the queries are in voice form, the voice recognition technology will be useful. The current technolgy promises vocabularies of the order of 60,000 words with partial speaker independence. It is possible to train the voice recognition system to general accent of the user rather than to specific words spoken by the person.

The interaction and response of the teacher often depends upon the perception of the teacher about the student. The current state-of-the-art permits the computer to generate the state of knowledge or the domain model of the student. The researchers are exploring the techniques of resolution in case where more than one domain model exists and also the need to have cognitive models of the student. The student models form the basis for the generation of information required for the response from the computer. The student models in ITS will provide sufficient information to deduce the reasons for the incorrect responses of the student and thus providing the facility to individualise the instruction.

Since the computer is emulating the teacher, it is expected to be an expert of the domain knoledgeand thus is able to generate the answers to student questions. For this the computer needs to have the knowledge base pertaining to the relevant domain. The knowledge base has to contain different types of knowledge representation schemes or structures and current technology is adequate to represent most of the knowledge structures. However work is required to put the various knowledge structures into an unified structure. Further the computer needs to learn from its environment and update its knowledge base. The schemes for updating the knowledge through examples and explicit interaction exists. This means that an ITS system which starts with nminimal knowledge base will be able to acquire knowledge, as the interaction is pursued. The ITS uses its knowledge base, like human teacher to formulate its response and the natural language processor then puts the response in proper format for communication.

In the case of problem solving environments, which are common in TVET, the ITS provides the facility of generating problems & solve them or alternately accepts the problems given by the student & solves them. There are many ways in which it does this . One of the common techniques is to reduce the problem to its parametric form where the given quantities and goal stae are defined. After this the problem solver searches the solution space for the optimum solution. It should be able to backtrack and produce alternate solutions on demand as there is no unque solution to any problem. Some ITS systems permit the user to solve the problem onthe computer. The system keeps a watch on the student solution and steps in when the solution deviates from the correct solution by a predetermined limit.

A sophisticated authoring system is needed to support the ITS. Currently a few full sized ITS systems are in existance and reports indicate their successes in a variety of field conditions. ITS is designed to achieve higher order cognitive abilities.

Digital Libraries

Libraries have played an important role in research, teaching and learning. Computer based libraries or digital libraries, which are currently evolving, make use of the huge storage, cataloguing, indexing and fast information retrieval facilities of the computers. They provide the facility of browsing documents, books, journals; and down loading the required information on to a local computer or taking a hard copy of the desired document. These libraries may physically be distributed over a number of countries but can provide unified logical view to the user. The digital libraries will help the teachers and students by providing information, resources and tools that have previously been conceptually and physically not accessible. They also make the method of accessing and retrieval of information simpler and faster.

we may define a library as an organized set of resources, such as space, equipment, information media, furniture and human services. The media may encompass books, AV materials, CAL, multimedia, journals, manuals etc., The services may include help in locating resources, classifying, indexing, borrowing or lending, requisitioning, reserving and purchasing etc,. In all these, the libraries play responsive and proactive roles. The libraries also play the role of preserving and organizing resources that could serve the community over generations and bring people together in the knowledge space and facilitate their interaction.

The conventional libraries provide cost affective service through the sharing of resources. They have been directly and indirectly responsible for the teachers and researchers to develop or prepare these media. While these functions continue to exist, a new challenge is faced in areas of technology that are fast changing. In these areas no organised set of information or knowledge exists and the knowledge that is available is distributed over a large set of individuals dispersed over the globe. Further to complicate the scenario even the available knowledge is changing very fast making it difficult for it to be integrated and archived. The digital libraries attempt to face this problem.

Traditionally the libraries have been supporting both formal and informal education systems. The fast changing technologies have created a new dimension related to supporting the professional learning (23). Even though the professional learning is very similar to the self learning, it is much more specific, directed and built around personal books, subscription of journals, reports, technical literature, interaction through professional meetings or conferences and personal communications. Many of the data sets, computational tools and organization & access methods of digital libraries are developed to enhance this professional learning. The professional learning is characterized by continuous & incremental learning and is strongly linked to the performance at the job.

Digital libraries integrate the requirements pertaining to the three segments namely formal, informal and professional segments and break down the physical barriers between the resources. The learning styles and resources used by professionals become important for the teachers and students, who are the members of formal system, in view of the fast changing technologies. Further, the digital libraries tend to be universal, as the servers located at various places and provide seamless integrated set of resources.

The digital libraries perform many functions and operate in different environments, and their functions are discussed as under:

Books and journal circulation

The books & journals are expensive and beyond the reach of the common individual in the Asia-Pacific unless subsidized. Since the publishers and industry have vast amounts of information which they can make available through digital library system at very little cost. The costing could depend upon the service used such as browsing, down loading for browsing or taking a hard copy, etc. Thus the books and journals can be purchased in full or in part and the costs may depend upon the type of access the user wants. Virtually the problems such as availability of the book, availability of most recent edition will be a thing of the past.

Electronic journals

Though the concept of electronic journals has been in vogue over the past few years, they have not achieved as much of penetration as expected. The electronic journals are likely to extend information resources range of the students and teachers of TVET. Two common approaches are currently being used in accessing electronic journals. They are (1)either store the files in laTex or postscript or ASCII form on a file server and make them available through email or FTP access or (2) store documents in hypertext/ hypermedia format and allow on-line browsing. The main problems faced by the electronic publications are information retrieval support for complex graphics and formulae and the distribution speed and reliability. Access time problems may become dominant with more & more users and these problems are likely to be solved through information super highways and multiple servers.

Virtual classes and conferences

In this mode the information could be presented to students of a virtual class (or even a conventional class) by the teacher by providing list of references that are available in digital libraries. These papers or references form the basis for classroom (virtual or conventional) discussion. Use of BBS to post papers, adding comments to papers on BBS will be some of the learning strategies in these environments. The semi-anonymous student will be in a position to learn better and interact with the group better. The boarder between the classroom where structured threaded discussions or conversations take place and the libraries where browsing is done is likely to be blurred and two approaches are likely to be integrated.

New and interdisciplinary curriculum implementation

Inter disciplinary curricula like 'Earth system Science Community' (http://www.circles.org) links the students, teachers in schools and universities from a number of disciplines with the scientists and NASA test data. Using tools like Mosaic, FTP the students and teachers can access the data sets of NASA, discuss in the classroom, simulate scenarios and collaborate with scientists. Thus the digital libraries of reports, data, messages and student reports are likely to be of great help to the academic community, especially in the fast changing technologies & in highly interdisciplinary areas.

Hypermedia and CDROM libraries

A variety of materials are coming out based on Hypermedia. These cannot be encoded and made available in conventional formats. Most of these materials need networks for their delivery. The current CDROM libraries can be shared and used through computer networks and relevant files may be copied based on the authorization. The CDROM based digital libraries include a variety multimedia materials, clip media databases, information bases, news and a whole range of software. The present search techniques permit the activation of a subset of books in the library and the fuzzy searches could be confined to a particular book or a set of books. The access techniques may introduce extensive procedures for secure and legal usage as per the copyright laws.

Indexes and directories

The new digital libraries include bibliographic and catalog databases. These databases like OCLC, MEDLINE and NTIS contain millions of records or citations. The current techniques make the search process very simple for the user. However searches on large databases are likely to be difficult. Also the problem of searches on graphic databases is yet to be solved satisfactorily.

Search and display tools

Internet provides the largest and most ill organized library retrieval systems. Navigation and display tools such as Mosaic, allow users to browse www and display text and graphics. NAIS, Archie and Veronica help users to search specific directories (24). These index or navigation or directory tools are supplemented by structuring tools like www (25) and gopher (26). All these tools prove inadequate with larger databases and the second generation tools are in the process of coming up.

Issues in the use of digital libraries:

Better search techniques are needed and the information retrieval may become slow as more and more users start using the network. The digital libraries offer books and journals that are dynamic in nature where the reader may leave comments and notes for other readers. Large amounts of information may lead to 'electronic wandering' by the user and the teacher has to take the role of moderator to guide, evaluate, compare and assimilate materials. This is important as learning involves mapping of information in the brain and the effects of hypermedia or random acquisition techniques are not well understood. The digital library, with its spread of range is likely to create situations where students will increasingly challenge the 'authority of teacher's information'. The digital libraries are likely to produce more even-leveled students and schools. The copyright laws for distribution of the copyright materials is yet to be settled. Teachers need to be trained for using the unstructured and vast resources provided by the digital library. The student learning strategies need change as conventional note taking of multimedia materials may not be meaningful. Since the expertise is widely spreadout, the users tend to depend upon each other and require global cooperation.

CONCLUSION

While we incorporate changes in the hardware technologies such as optical memories, multi media, networks, virtual reality, etc. and use them, a number of issues crop up in regard to the CAL courseware development. We find that there is a shift from fixed & prestored, unifunctional and unimedial courseware to adaptive & generative, multi functional and multimedial courseware. The adaptive and generative courseware implies that a whole range of courseware users with different abilities and backgrounds are to be taken care instead of a specific group. The needs of networked environment and cooperative groups are to be taken into consideration. The multifunctionality implies that the courseware should take care of the needs of individual, group, learner directed, simulation oriented, etc. types of user classes. The multimedial makes use of the text, sound, graphics and video formats. The transition represents a change in paradigm- from 'hard' courseware to 'soft' courseware. We have to look at the design issues in the changed paradigm. Besides this, we have yet to explore how the current technologies of multimedia and networks are to be used for effective learning. The dominant themes of the future may be 'explorable worlds' and 'electronic books' which encompasses 'talking' and 'moving picture' books. The role of teachers in these environments is to be defined. The teachers and students are to be prepared to work in this new paradigm. The formats of electronic books are to be worked out between the two competing approaches - hypermedia and database approaches. The design and the structure of authoring systems are to be worked out. The problems of wandering in cyber space and picking up of undesirable cultural influences are to be addressed. There is a need to develop super interface to facilitate rapid searching and navigation in the vast information space. The possibility of working in virtual laboratories and virtual universities is a distinct possibility.

The introduction of new technologies of training offers us unlimited opportunities and at the same time throws up a number of challenges. Unless we address ourselves to these issues, the promises of the future cannot be realised.

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

NEW TRAINING TECHNOLOGY FOR TECHNICAL VOCATIONAL EDUCATION

By: *Brian Stanford*

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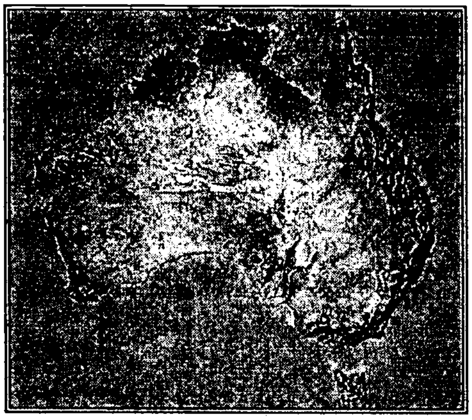
COUNTRY PAPER

AUSTRALIA



New Training Technologies for Technical-Vocational Education

3–7 July 1995

MANILA

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Biographical Details

Brian Stanford, Director of Adelaide Institute of TAFE, is a graduate of Adelaide (BA, Dip Ed) and Manchester (M Ed) Universities. He has over twenty years experience as a director within the State's training and further education system and is sought after as a conference speaker and presenter. For example, Brian was a keynote speaker at the 1st Global Conference on Lifelong Learning in Rome (1994); he has made presentations at several conventions of the American Association of Community Colleges (including an interactive videoconference presentation to the 75th Annual Convention (1995), and is a visiting specialist to the Colombo Plan Staff College (1994-1995). He regularly makes presentations to conferences and seminars including UNEVOC workshops (1993-1995); made a major presentation to the International Conference on Learning Beyond Schooling convened by OECD (1994) and has made major presentations at numerous other conferences and workshops, both within Australia and overseas.

He is a Fellow of the Australian College of Education and served as a Director of Australia's National Training Board between 1991 to 1995.. He has served as a member of the Commonwealth of Learning's Technical-Vocational Reference Group and is a member of the Advisory and Network Committees of the Open Learning Technology Corporation. He chairs the Learning Systems and Resources Executive Committee for the State's Department for Employment, Training and Further Education and has had a long involvement in consultancies and working parties concerned with State and national educational communications strategies, including membership of South Australia's VideoNet Steering Committee and EDA Media Project.

Brian Stanford's keen interest in international activities has involved him in projects and consultancies in Hong Kong, Malaysia, USA, New Zealand Indonesia, Fiji, Pakistan, Turkey, Philippines, Europe and the United Kingdom. In 1990, he was seconded to the United Kingdom's National Training Authority for 12 months, in 1993 he worked as a consultant to the Fiji National Training Council and is a visiting specialist to the Colombo Plan Staff College in Manila (Philippines).

Under his leadership the Adelaide Institute has developed an international profile. The institute has established collaborative arrangements with educational institutions in a number of countries, and pioneered a comprehensive range of delivery modes including open learning, computer managed learning, interactive compressed digital videoconferencing, interactive videodisc, and satellite and international communications networks.

Adelaide Institute is widely regarded as both an innovative and successful teaching organisation, and in 1993 was selected by UNESCO as one of Australia's two UNEVOC Centres of Excellence in the Asia-Pacific region. In December 1993, Brian Stanford hosted the inaugural Australian UNEVOC Conference at Adelaide Institute. In October 1994 a memorandum of understanding was signed with the Colombo Plan Staff College.

AUSTRALIA - ***where East meets West; a multi-cultural nation of European heritage located on the Asia Pacific rim***

LOCATION

Officially the 'Commonwealth of Australia', Australia is the only country that is also a continent. It ranks as the sixth largest country in the world and is the smallest continent. Because it is located entirely in the southern hemisphere it is often referred to as the "land down under".

Australia is composed of six states; New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania and two Territories: Northern Territory and Australian Capital Territory.

It covers a land area of 7 682 300 square kilometres, approximately 5 % of the world's land mass. It is almost the size of mainland United States of America (excluding Alaska) and is about 50 per cent greater than Europe (excluding the USSR).

Australia is the lowest, flattest and, apart from Antarctica, the driest of the continents. The continent can be divided into three parts - the Western Plateau, Central Lowlands and Eastern Highlands.

The Western Plateau occupies more than half of the continent, including all of Western Australia, nearly all of the Northern Territory and more than half of South Australia. Although most of this area is flat it does contain numerous ranges and some individual mountains, of which Uluru (Ayers Rock) is the best known.

The Central Lowlands comprises about one third of Australia. It is a broad corridor which stretches from north to south between the Western Plateau and the Eastern Highlands.

The Eastern Highlands is a belt of land 80-450 kilometres wide that follows the eastern seaboard and is characterised by the Great Dividing Range.

CLIMATE

Australia features a wide range of climatic zones, from the tropical forests of the north, the arid expanses of the interior, to the temperate regions of the south.

Widely known as the "Dry Continent" the land is relatively arid, with nearly 40% of the continent receiving less than 250mm of rainfall annually, and 70% receiving less than 500mm annually. The latter figure generally marks the limit below which most crops cannot be grown without irrigation.

Australia's rainfall pattern is strongly seasonal, with a winter regime in the south and a summer regime in the north. Much of Australia also experiences a high variability of rainfall.

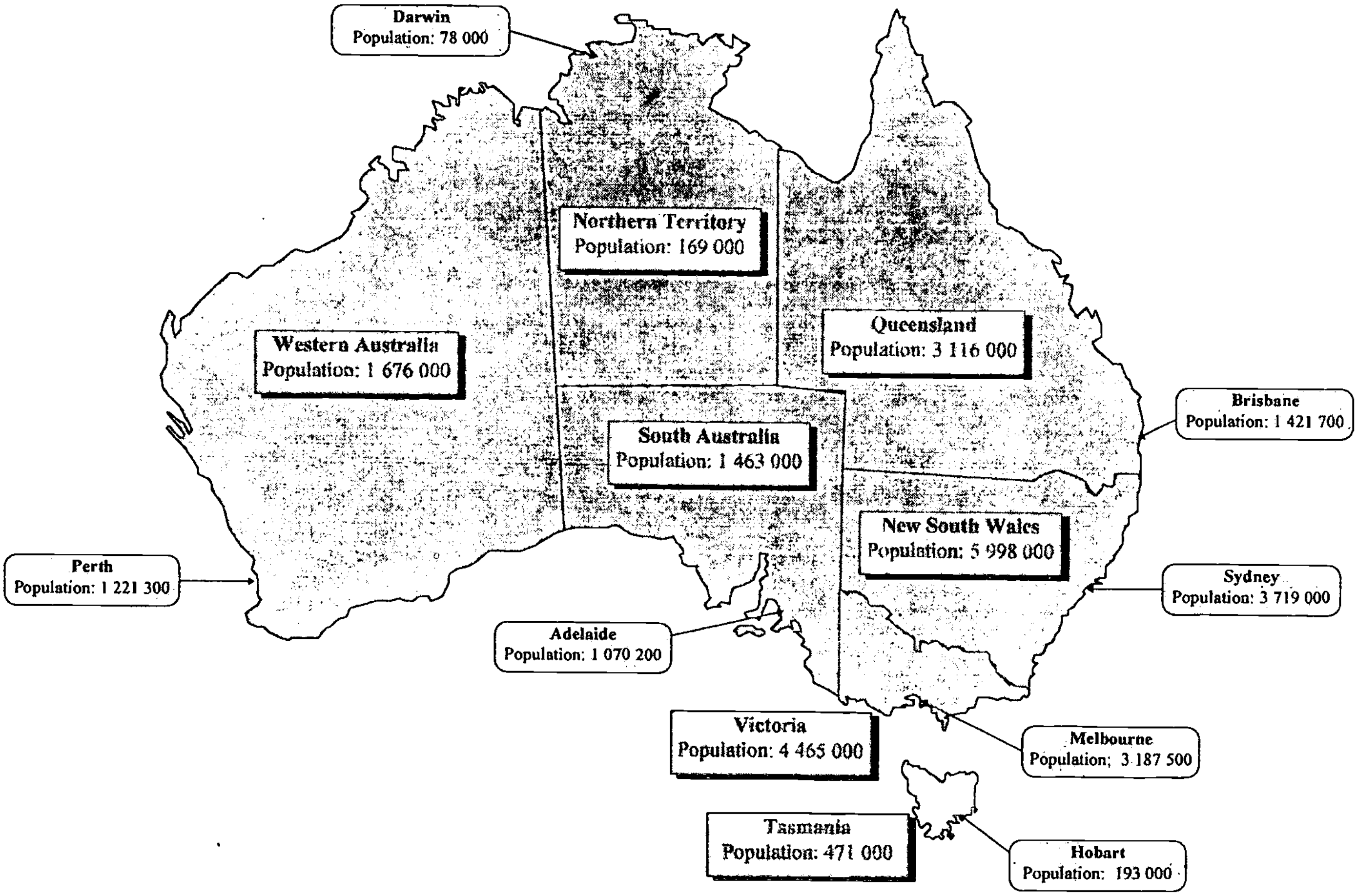
Population

The estimated resident population of Australia is 17 661 468 *(1995 Year Book)*

Most of the population is concentrated in two widely separated coastal regions. By far the larger of these lies in the south-east and east, stretching in an unbroken crescent from South Australia, through Victoria, Tasmania and New South Wales, to Queensland. The smaller of the two regions is in the south-west of Western Australia.

At the time of the 1991 Census 85.3% of the population lived in cities and towns. These cities include the federal capital, Canberra, and the State capitals. The populations of these major centres and the six States are shown below. By comparing the populations of the State capitals with the State populations depicted it is easy to see the proportion of urbanisation.

Canberra, with 298 000 people is smaller than all the State capitals with the exception of Hobart.



Composition of Population

The median age of the population at June 1993 was 33.0 years, which is an increase from the median age of 27.6 years in 1972. The increase in the median age reflects the fact that there are more people in the nation who are aged over 64, this category having increased by approximately 37% in the past twenty years. With a birth rate currently less than 1%, combined with the fact that people are living longer, it is expected that the median age of Australia's population will continue to increase.

Of the total population, there are more females than males (99.2 males for every 100 females). This is again contributed to by there being more females aged over 64 than there are males. In all other age categories the ratio is slightly in favour of males.

The 'workforce age' sector comprises 66.7% of the population, with children under 14 representing 21.7%.

Religion
The Australian Constitution forbids a state religion and guarantees religious freedom.

The Australian population is predominantly Christian, with the majority associating themselves with the two major groups, Catholic and Anglican (27.3% and 23.8% respectively at the 1991 Census).

The remainder of the Christian population (22.8%) is dispersed between several other groups (eg Uniting, Presbyterian, Orthodox), all of which comprise less than 5% of the population.

There has been a substantial increase in the proportion of persons of non-Christian religion residing in Australia since 1981, from 1.4% to 2.6%. At the 1991 Census 33% of the non-Christian religion persons were Muslim, 31% Buddhist and 17% Jew.

ECONOMY

The monetary unit is the Australian dollar.

Australia is relatively resource-rich country. Its mining industry was the fastest growing sector of the economy throughout the last decade to 1992-93. However, in general terms, Australia has now become a service economy, with the provision of services accounting for over 70% of Gross Domestic Product.

Industries
- Mining
Australia is the world's largest producer of bauxite (38% of world's product), diamonds (36%), and lead (16%).

About 31% of the world's low-cost uranium reserves are located in Australia. As Australia has no nuclear power stations, all uranium production is exported in the form of yellowcake.

Australia is the world's largest exporter of black coal, alumina, diamonds and zircon, and the second largest exporter of iron ore, low-cost uranium, lead and zinc. It is also the third largest exporter of gold.

Gold has become Australia's second biggest export earner after Coal. In 1992-93 it accounted for 7.1% of total exports, the main markets being Singapore, Japan, Hong Kong. Gold Production in Australia accounts for 11.1% of the estimated world production.

In the 1992-93 financial year exports of ores and minerals, minerals fuels (coal, coke etc) and metals such as gold amounted to 39% of Australia's total exports.

Agriculture

Wheat is the most important crop, others being oats, barley, grain sorghum, maize and rice.

A wide variety of fruit is grown, ranging from pineapples, mangoes and pawpaws in the tropics to pome, stone and berry fruits in the temperate regions. The most important are apples, oranges, bananas and grapes.

Cattle are raised in all States. Dairy cattle are restricted mainly to the southern and coastal districts. Beef cattle are concentrated in Queensland and New South Wales.

New South Wales occupies the premier position in sheep raising followed by Western Australia and Victoria. Poor market prices for wool since 1990 have had a marked impact on flock size and numbers have declined to 138 million in 1993, from a peak of 180 million in 1970.

Exports from the rural sector amounted to $17.079 million and comprised 22.8% of the total exports from Australia in 1992-93. The major items were meat, wool cereal grains and sugar.

Fishing

The Australian Fishing Zone covers an area 16% larger than Australia's land mass and is the third largest Fishing Zone in the world. However Australia's fish production is insignificant by world standards. This reflects the low productivity of the oceans rather than under-exploitation of its resources. Major commercial catches are prawns, abalone, rock lobster and tuna.

Sixty-nine percent of the total value of Australia's production is exported, Japan being the primary market (42%).

Manufacturing and Service Industries

Manufacturing and services are the fastest growing sector of the export market. Manufactured exports are growing at an average rate of 17.8% per annum and now constitute 29% of merchandise exports.

Tourism

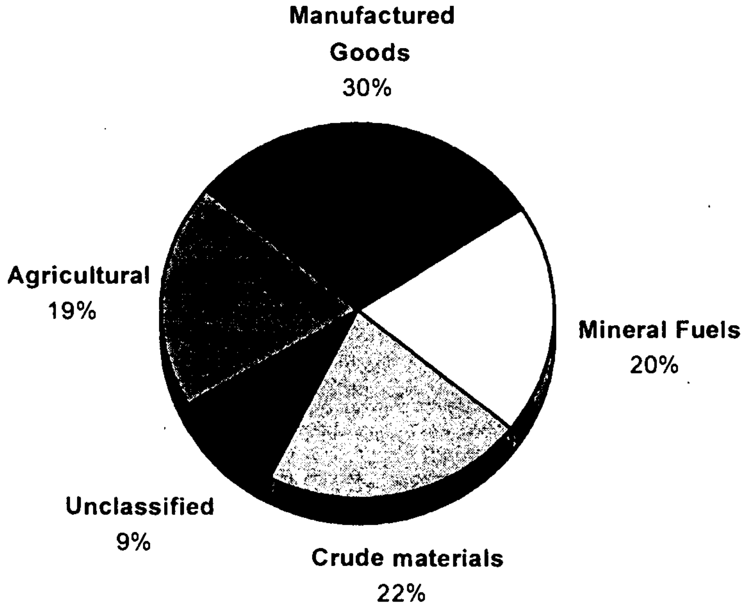
Tourism has experienced unprecedented growth and made a substantial contribution to Australia's economic development. It has matured into a prominent, sophisticated activity with potential to play a significant role in Australia's future prosperity

It is estimated that in 1991-92 tourism directly and indirectly contributed 5.5% of GDP, with international tourism earning $7.7 billion.

International visitors generally spend the majority of their time in New South Wales (presumably because Sydney is the capital of that State), closely followed by Queensland and Victoria. However, there is some variation to this pattern depending upon a tourist's country of residence. For example, most Japanese tourist spend most of their time in Queensland.

EXPORTS

All sectors of the economy are well represented, displaying a wide and varied trading base. The distribution of export commodities across the economy is illustrated in the accompanying chart.



Agricultural Products	Manufactured Goods	Mineral Fuels	Crude Materials	Unclassified
Live Animals Meat Fish Dairy Products Cereals (Wheat, Oats, Barley) Sugar Coffee, Tea Animal Fts Vegetable Oils	Iron and Steel Non-Ferrous Metals Wood and Paper Products Industrial Machinery Cars Pharmaceuticals Textile Yarn'Office Machines Telecommunications Electrical goods Beverages	Coal and Coke Petroleum Petroleum Products Natural Gas	Metal Ores Textile fibres Cork and Wood Paper Pulp Animal Hides and Furskins	Non-monetary Gold Gold Coin Not elsewhere classified

There are no export products that stand out from others to the extent that they dominate.

The best performer is Coal which occupies 12% of total exports. Others to perform well are Non-monetray Gold (5%), Beef (5%) and Iron Ore (5%).

Somewhat surprisingly, although it still provides an export income of over $2 million, wool comprises only 2% of Australia's export market. Earlier this century Australia was reputed to have been "carried on the sheep's back", a reference to the country's reliance on wool for the majority of its export income.

Overall there has been a 16% increase in the value of exports since 1990-91. There is, however, no one sector of the export market responsible for this increase. All areas are contributing evenly and thereby maintaining their share of Australia's export market

Japan is by far the the leading destination for Australian exports, with 25% of exports going to this country.

The next biggest customers are:

United States of America	7.65%
Socialist Republic of Vietnam	7.65%
Republic of Korea	6.15%
Singapore	5.86%
New Zealand	5.21%
Taiwan	4.15%
Hong Kong	4.02%
United Kingdom	3.71%
China	3.51%

On a regional basis countries in South East Asia account for 33% of exports and those in the Pacific Region 8%. Japan and Korea combined comprise 30% of Australia's export market. Europe's portion is 13% with the United Kingdom the largest single customer with nearly 4% of the total exports.

CONTEXT

It is a truism to say that many far-reaching changes occurred in Australian society during the 1980s. Paul Kelly in *The End of Certainty* (1992) claims our economic orientation became more outward looking as we aspired to become an efficient and confident nation in the Asia Pacific. Significant changes identified by Kelly include:

> *... the advance towards a multi-racial Australia, the demise of protection, the start of the long awaited assault on arbitration (a method of judicial determination in centralised wage fixation), a loss of confidence in State power and a turning away from government paternalism, a shift towards market power and deregulation to varying degrees, efforts to secure better enterprise productivity and workplace reform, a deeper sense of national self reliance, a reappraisal of welfare as a need not a right, and an emphasis on individual responsibility as well as individual entitlement.* (p15).

Within this context, vocational education and training began to come into prominence. OECD reports indicate that while in the 1960s and the early 1970s much attention had been paid to general education, by the 1980s

> *... providing all young people with relevant skills for changing and newly emerging jobs (and enabling them to participate in job creation) had become an urgent necessity in all (member) countries.*

Internationalisation, or globalisation, of the economy and the requirement for Australian industries and enterprises to become world competitive has led to major trends:

- a **restructuring economy** (more of Australia's GDP to be sold overseas as manufactured exports;
- **structural economic change** (favouring service industries);
- embracing **technological change**; and
- **enterprise restructuring.**

The Growing Importance of Skill Formation

The result is an emphasis on training, or more precisely skill formation, which includes, but is more comprehensive than, older concepts of training. Skill formation requires a qualitative shift in how training is defined, delivered and integrated into job design and work organisation. It means that the skills necessary to achieve competitive advantage will not be achieved by traditional approaches to training. Rather they are achieved in a range of ways:

- **integration of work and training** through pay rates and a career ladder based on skills acquisition;

- **lifelong learning and adaptation of the individual** to higher and varied job demands (through multiple entry and exit points and to and from training, eg through the recognition of prior learning);

- **integration of experiential and theoretical learning** (eg competency based training);

- **integration of vocational and general education.**

Thus education could no longer be thought of solely as a preparatory process for adult life, occurring in childhood and youth, and completed in either the compulsory years of schooling, at university, or through other initial training for work. There is also a growing acceptance that investment in education yields productivity growth.

The Importance of Recurrent Education

This, coupled with the pressures of rapidly changing technology, highlighted the importance of recurrent education throughout an individual's working life. Overall, work and society had become more complex. An individual's life was more likely now to include periods of retraining, unemployment, career changes and early retirement. Consequently the importance of lifelong learning, including the provision of a wide variety of education and training opportunities throughout life, and the acquisition of generic and foundation skills for learning, was gaining recognition.

There are also growing expectations in Australian society about how, when and where educational opportunities will be provided. It was becoming essential for most **young people** to undertake at least 12 years of formal education, and reports emphasised the need for more education and training opportunities for those in the 15-19 year age group to prepare them for the increasingly complex work and social environment.

Also, there was equal pressure on the **adult population** to continually upgrade or develop new skills to match the profile of a restructured workforce. Australians are increasingly expected to re-enter education and training at appropriate times during their working life to upgrade their skills and to facilitate career mobility. They want flexibility in the offerings so that their specific needs can be met through provisions in the workplace, their own home or traditional education and training institutions.

Ensuring Social Justice

An emphasis on **social justice** highlighted the many sectors in the community who had been disadvantaged in their opportunities to participate successfully in education and training. These included those who are physically, geographically, socially or culturally isolated. To increase participation, alternative approaches to traditional educational delivery needed to be available to meet their particular needs, to redress their disadvantage, and overcome the often ingrained aversion to learning and educational institutions.

During the 1980s it was recognised that the country was grossly underqualified in vocational education and training, that the training that did occur was all too often narrowly skills based, there was a lack of consistency of outcomes from State to State and also little portability of qualifications.

As early as 1965 the need to reform Australia's vocational education and training system had been recognised.

Skilled labour, in our view, is likely to be Australia's scarcest resource. Everything possible must be done to increase the supply of this resource and to make the most economical use of what is available. Improvements in the mobility of labour between both occupations and industries are required. Australia cannot afford to be conservative about this, and a co-operative attitude on the part of governments, unions, management and education authorities alike is essential. (Report of the Committee of Economic Enquiry, *Vernon Report,* Vol 1, 1965, p435).

It was to be another two decades before the impetus gained momentum with the release in 1987 of *Skills for Australia* and *Australia Reconstructed.*

These reports were two essential building blocks for the development of a new and revolutionary approach to vocational education and training within Australia.

Then, in 1989, the eight governments in Australia, along with peak employer and union bodies, agreed that **national reform** of vocational education and training was needed. Since that time the reforms have been national in scope, and involved government, trade unions, employer representatives, educationalists and students. There has been a developing national system and a number of bodies such as ACTRAC (Australian Committee on Training Curriculum) and NTB (National Training Board) established to give a lead and direction.

Central to the reforms has been the spread of **competency based training** based on national standards and today approximately 60% of the workforce is covered by nationally approved standards. Australian competency standards are rational in scope, industry focussed, broad based, and use a unified or common format.

It has been a time of far-reaching reform.

Many other reviews, enquiries, and reports followed. Influential reports include those of Finn (1991), identifying the urgent need to substantially increase the nation's skill base; Mayer (1992), advocating the need for generic competencies; and Carmichael (1992), recommending the implementation of the Australian Vocational Training System (AVTS).

In July 1992 ANTA (Australian National Training Authority) was established to provide the nucleus from which fundamental change is evolving. (The ANTA agreement is to be renegotiated later in 1995). Central to the reform is a move to a more open and competitive training market, increased level of resourcing to the Vocational Education and Training (VET) sector, and a closer interaction between industry and providers to ensure that the training system meets priorities.

ANTA is the major policy-formulating body and reports to a council composed of the State Ministers and the Federal Minister.

A major source of advice to ANTA comes from Industry Training Advisory Boards (ITABs). These are formally composed and funded boards which represent national industry groupings, and they advise ANTA on vocational training needs and strategies for the group of industries they represent.

There is a similar structure to ANTA at the State level. State legislation has established Vocational Education and Employment Training (VEET) boards. VEET boards take advice from State level ITABs and training providers. VEET boards also advise ANTA on State needs and priorities. VEET boards also oversee contracts governing indentured training (apprenticeships and traineeships).

The Structure of ANTA

In practice ANTA determines policy, the level of funding of States and advises VEET boards on the relative priority of industry sectors and the types of skills training required by industries. VEET boards interpret ANTA policies and advice in the State context and negotiate with ANTA a State Training Profile, on the basis of which ANTA funds VEET boards and VEET boards decide the funding of training providers. Reporting on outcomes works in reverse: the providers report to the VEET board and the VEET boards report to ANTA.

To receive ANTA funding providers must be registered with VEET boards and there is a set of prerequisites for registration. However, any individual or organisation can apply for registration and, once registered, can apply for funding. Providers fall into three groups.

Firstly, there is what could loosely be called State government provision through institutes of TAFE (Technical and Further Education). The State government structure varies from State to State. In some States institutes are statutory authorities, in other States they are units within a government department.

The second group of providers there are what are called `private providers'. These are privately owned businesses providing vocational education by either accessing ANTA funding or charging clients on a fee for service basis.

The third group of providers are large individual enterprises or groups of smaller enterprises within a common industry, whose core business is not education and training, but who wish to offer training to their employees.

DEET: Another Source of Funding

Such is the structure of ANTA. However, there is also a Federal Minister for Employment, Education and Training who presides over a large government Department of Employment Education and Training (DEET). DEET also provides funds for vocational education. Its aim is primarily to place the unemployed into employment and so its emphasis is mainly on entry level courses which are closely tied to short term labour market needs.

The funding of VET through ANTA and DEET only accounts for about 60% of expenditure on VET in Australia. The remainder, which is quite significant but often overlooked, comes through the investment of enterprises in training their own staff. There is increasing pressure from employees for such training, although privately funded, to be accredited, or to at least articulate with, accredited courses.

Coordinating the Diverse Funding and Management Bodies

Ministers accepted that implementing reforms had been the responsibility of many existing or specially created bodies. They decided that a **Standards and Curriculum Council** would be established within the ANTA structure to bring together the functions of the National Training Board, The Australian Committee for Training Curriculum, and the National Staff Development Committee.

The new council would also have responsibility for the Australian Qualifications Framework (AQF) in the VET sector and the national coordination of the National Framework for the Recognition of Training (NFROT).

At this time (March 1995) transition groups have been established to coordinate five key areas, namely:

- standards and best practice;
- recognition of training;
- structures;
- assessment; and
- user choice.

One of the first actions of ANTA was a review of the implementation of the National Reform Agenda. The consulting group's report *Successful Reform* recommended a single national training market facilitation agency.

ANTA's report *Proposals for a more effective implementation of training reforms* and *Towards a Skilled Australia: A national strategy for vocational education and training* were accepted by Ministers in September 1994.

The National Strategy for VET is the central element in the agreement between the Federal and State governments and provides the framework for ANTA policies.

The National Strategy comes in **three parts**:

- a statement of principles;
- a statement of goals; and
- a statement of strategies to achieve the goals.

There are **four principles**:

- to build a client-focussed culture;
- to promote opportunities for lifelong learning;
- to promote a national identify for VET; and
- to reward innovation and best practice.

There are **four goals**:

- to advance quality and responsiveness by promoting a coordinated diversity of providers;
- to improve the quality of provision;
- to improve accessibility to VET so that it becomes available to all Australians; and
- to increase efficiency.

Each of these **four goals** is accompanied by a set of strategies.

Goal 1: Coordinated Diversity of Providers
This goal is based on the premise that competition is the most effective way to improve services, contain costs and focus an organisation's interests away from itself towards its clients. Whereas prior to the reforms the State government provider of VET was by far the dominant provider, additional growth funding is now equally likely to be allocated to private providers or industry or enterprise providers.

The following strategies are aimed at achieving this goal:

- funding is allocated on a competitive tendering basis (to date this has only been applied to growth funding);
- funding for off-the-job training for apprentices and trainees goes to employers or employer organisations who choose, in consultation with employees, the provider of the training;
- all States and Territories are required to detail mechanisms in their training profiles by which their training market will be opened to increased competition;
- industry and private providers are encouraged to become registered and so be eligible for funding;
- in determining funding, priority is given to organisations which demonstrate service delivery strategies designed to meet the needs of the clients.

Goal 2: Enhanced Quality

Quality in all aspects of vocational education and training is a key objective of the National Strategy. Vocational education and training is to focus on best practice and quality assurance. Staff development and management improvement are priorities. Mechanisms are being established so that all aspects of training design and delivery—recognition of training, accreditation, curriculum, assessment and qualifications—are reviewed to ensure a quality service for clients.

Strategies to improve the quality of provision are:

- identification and adoption of best practice measures;
- adoption of quality assurance measures by providers;
- increased funding of national staff development projects in areas such as flexible delivery methodologies, a competency based approach to teaching, workplace leadership and student assessment, including workplace assessment (these projects result in learning materials which are distributed nationally);
- implementation of a 'return to industry' scheme which enables staff to upgrade, reinforce and extend their skills through structured, first-hand experience of industry;
- implementation of a management development scheme which will identify management competencies for VET managers, generate a team performance planning system and institute a management development network;

- development of a National Framework for the Recognition of Training (NFROT)—NFROT is a framework for recognising training programs and skills Australia-wide, no matter where developed;

- best practice providers being empowered to accredit training, and best practice ITABs being empowered to advise on industry-based recognition for accreditation purposes;

- States being required to adopt nationally consistent client service standards for the accreditation of courses and the registration of providers;

- ITABs being given the role of ensuring that curriculum meets the objectives of competency standards and can be delivered in a range of settings;

- development of a network of providers with staff who meet assessor competency standards to directly undertake assessment or assist enterprises with workplace assessment.

Goal 3: Improved Accessibility
In 1992 the State and Federal Ministers endorsed an expanded system of competency based, entry level training, incorporating apprenticeships and traineeships, with the intention of creating a wide range of substantially work based VET pathways designed especially for transition from school to work. The system is called the Australian Vocational Training System (AVTS.

Other strategies relate to targeted groups: the disabled, women, Aboriginal people, people in isolated rural areas and people with inadequate English language and literacy skills.

ANTA is committed to achieving the provision of training designed to meet the needs of the client rather than the convenience of the provider. Flexible delivery of training is a priority of ANTA in the context of improving accessibility.

Goal 4: Increased Efficiency
VET constitutes a major item of national expenditure. Efficiency and best use of resources are key goals. Reduced costs allow more people to be trained for the same expenditure.

Strategies to increase efficiency are:

- reporting on student outcomes in terms of:
  - actual versus target student load
  - module load completion rate
  - training completion numbers
  - average cost per student hour;

- have accepted agreed standards for delivery costs and distribute funding accordingly;
- promote efficient use of existing capital resources;
- develop a national information and statistical system;
- survey employers and students to determine satisfaction levels.

Conceptually the AVTS represents the most comprehensive and far reaching attempt to overhaul our post year 10 education system. It envisages a future where all young people will be in some form in education and training and/or combinations of work and training on leaving school.

The key features of the AVTS concept are that it:

- creates a system accessible to all;
- provides universally recognised entry points across all industries/occupations'
- enables existing workers to gain recognition and upgrade skills;
- provides greater flexibility through acceptance of multiple pathways to achievement of competency;
- is underpinned by national competency standards, key competencies, and quality assurance processes leading to nationally recognised qualifications;
- forms the base for further education and training at higher levels.

As Bill Mansfield of the ACTU says:

... it embodies an approach which reflects the needs of a society prepared to accept that our education and training infrastructure must correspond to the world of work emerging through the high skills/human resource model of global competitiveness.

.... This move to establish a mass vocational education and training system will only work if employers accept its value to them (Bill Mansfield, *Australia's Future Global Competitiveness Through Competencies*, presented at the Global Competencies Conference, Sydney, 1 March 1995).

As VET systems have aimed to be more responsive to the needs of clients, and have looked to more flexible ways to deliver training, communication technology has taken on new significance. Many training programs in VET now are dependent upon the use of communication technology for their effective operation.

What is communications technology? It is a broad label that refers to the diverse range of mechanical means that we can use to enable us to communicate with others. The communication may be one way or interactive, but is any situation where the communication is enhanced by the use of technology. Communications technology can produce one way, or two way interactive communication.

Issues of equity, access and social justice can be addressed as technology brings training into the homes, workplaces and communities where people need training opportunities.

Communications technology can cater for a diverse range of learning styles through providing materials in print, audio, video and computer formats for self-paced delivery.

As we consider the interface of technology and learning, it is important to distinguish between the delivery of the content of education and successful models of education. We need to consider whether information technology is being used merely as a teaching aid, or is starting to redefine the learning environment, including organisational and learning relationships. Different technologies provide different educational services; some are excellent for delivery of content, some for interactivity, and some for both. Generally, those which are able to reach large numbers are best for delivery, whilst smaller numbers benefit from those fostering interactivity.

Into an already complex and changing environment, we expect that in the next decade we will witness a revolution in communications locally, nationally and globally.

National Response

Within Australia, there are government ministries and departments (both national and state), with their sole focus on communications and related technolgoies, numerous high level committees and working parties, and an increasing number of reports. Current reports of relevance at the national level include:

- **'Networked Nation'** (the Australian Science and Technology Council (ASTEC) review of the future requirements of research data networks). September 1994.

- **'Matching Science and Technology to Future Needs: 2010'** (ASTEC's study reviewing Australia's future needs for science and technology). Due November 1995.

- **'Inquiry into the Development of Open Learning in Australia'** (The Senate Standing Committee of Employment Education and Training examination of the three agencies of the Commonwealth's Open Learning Initiative).

- **'Communications Future Project'** - 1995-2000 - a series of six papers undertaken by the Bureau of Transport and Communications Economics including reports on Emerging Communications Services, Delivery Technologies in the New Communications World and Networked Communications Services to the Home.

- **'Networking Australia's Future'** - report of the Broadband Services Expert Group. March 1995.

- **'Creative Nation'**

Many of these reports see education as central to developments. For example, amongst its major recommendations the Broadband Services Expert Group's final report, "Networking Australia's Future" recommends the development of a national strategy for broadband networking in education and the development of broadband linkages to educational institutions, libraries, medical and community centres. The transmission of digitised information on broadband networks will provide enormous potential for the education community to communicate simultaneously and interactively.

It is envisaged that the Australian Education Network will link all schools, TAFEs and universities and other education and training providers across the nation as well as providing a publishing platform and market for our education and information technology product. Other complimentary networks include a national Community Information Network (CIN) and the linking of Australia's 1400 public libraries to create a national information network (a major initiative of "Creative Nation".

The Commonwealth's Open Learning Initiative has funded the development of the Open Learning Agency (OLA), the development of OpenNet (formerly the Open Learning Electronic Support Service) and the Open Learning Technology Corporation (OLTC). OLA is a consortium of 18 member universities, in conjunction with our national broadcaster (ABC). OpenNet will provide an Australia-wide electronic network linking open learning students, staff and other users. The Open Learning Technology Corporation (OLTC), established by Australia's Ministers of Education and Training began formal operations in late 1993 after two years of planning by the Australian Education Council Working Party on a National Education Communications Framework. As a national collaborative education communications body it has been established to facilitate and co-ordinate collaboration in the use of education communications and related open learning technologies by providing appropriate education, technological and project management services to its members and to other organisations and persons.

At the State level, many of the activities are replicated and most administrations have an Office of Information Technology or equivalent.

School attendance is compulsory throughout Australia between the ages of 6 and 15 years (16 years in Tasmania). In 1993 the number of full-time students attending school totalled 3,098,375. These were accommodated in 9,865 schools, 74.7% of which were government operated.

Primary schooling provides a general elementary program lasting for seven or eight years in which the main emphasis is on the development of basic language and literacy skills, simple arithmetic, moral and social education, health training and some creative activities.

Secondary education is generally comprehensive and co-educational. In most secondary systems the first one or two years consist of a general program followed by all students. In later years a basic core of subjects is retained with students being able to select additional optional subjects.

Students attaining the minimum school leaving age may leave school and seek employment, or enrol in a vocationally oriented course in a TAFE institute or private business college.

While the final two years of schooling generally fall outside the compulsory stage of education, in 1993, 87.4% of students remained at school until Year 11 and 77% remained until Year 12.

Case Study details obtained from
Open Learning Technology Corporation Limited 1995

SCHOOL OF THE AIR

The first School of the Air in Australia began in Alice Springs in the Northern Territory in 1951.

In 1991 the School of the Air became a campus of the Open Access College. The School's charter now extends its traditional service for geographically isolated Reception to Year 7 students in South Australia via high frequency (HF) radio and also covers geographically isolated, home-based and school-based Year 8-12 students. The HF transmission can cover a range of approximately 1,000 kilometres. Radio can cater for a variety of students in remote and isolated locations who are unable to gain their schooling by more traditional means.

In addition to lessons taught using HF radio, teachers of secondary (Years 8-12) and adult school-based students communicate by telephone and interactive audiographics. The School is one of the first in the world to trial the Tryst (now called Collaborator)—an interactive video/audio/data system, based on an IBM compatible personal computer which uses the existing telephone network for transmission. This allows students to see and interact with their teacher and each other, enhancing their learning experience.

Teachers at the School of the Air feel that they are using the most appropriate distance education teaching methodologies to ensure that isolated students have access to an enriching and exciting curriculum.

TECHNOLOGY IN PRACTICE IN A PRIMARY SCHOOL

Camden Primary School has an enrolment of 200 students ranging from Reception to Year 7. The School established a computer room of stand-alone computers incorporating compact disc read-only memory (CD-ROM), scanners, printers, a digital camera, a computer display device for overhead projectors, modems, sound equipment, a video camera, a video recorder and similar equipment. The library is equipped with a CD-ROM and computer equipment and the music room has a keyboard laboratory and computer support. All offices are equipped with computers and have access to a laser printer. All computers are networked for the convenience of information transfer.

The School uses technology across the Reception to Year 7 curriculum and to train teachers from throughout South Australia.

Students use the technology to:

- produce video clips;
- record personal commentaries;
- plan layouts;

- prepare maps and diagrams;
- scan and animate images;
- prepare interactive slide shows;
- capture information from;
- electronic retrieval systems;
- prepare animations to enhance projects;

A trolley of six lap-top computers, complete with a mobile printer, is connected and organised for convenient access by any class within the school on demand. All students from Reception to Year 7 have a set time of 80 minutes per week in the technology area.

The School has spent up to $250,000 on information technology in the last four to five years and expects to spend a further $60,000 on upgrades this year. Equipment is progressively replaced every 12 months with the latest state-of-the-art technology.

Technology provides opportunities for educators to rethink ways of delivering curricula. This has implications for current and future classroom design.

INTERACTIVE SATELLITE TELEVISION

Interactive satellite television is a satellite system that transmits live programs from the studio to the classroom. Programs are produced in a central studio and beamed via satellite to those Victorian schools equipped to receive the signal through television monitors already in classrooms.

Students have the opportunity to communicate with the central studio while watching the programs and can ask questions and have them answered immediately, allowing them to be actively involved in the learning process.

Classroom teachers work in partnership with the television presenters to ensure that the students maximise their learning outcomes. Print and audio materials are supplied to participating schools for use between broadcasts.

Each site in the project needs to be supplied with a dish and decoder. Connection to a television set with a telephone nearby completes the system. Currently 170 sites have been installed at an average cost of $1,700 per site. Equipping the remaining sites will cost approximately $1,500 per site.

Educational benefits include:

- the removal of costly and time-wasting travel for participants and lecturers;
- allowing the presenter to be heard and seen on screen by all;
- providing equality of access to in-service programs;
- making better use of scarce resources;
- maximising participation.

Higher education institutions (universities) offer a great variety of courses. Fields of study with the largest numbers of total students in 1992 were Arts (22.4%), Business and Administration (20.9%) and Science (14.4%). These fields also had the largest numbers of completing students.

The basic undergraduate course at most higher education institutions is a bachelor degree course of three or four years duration.

A total of 559,365 students were enrolled at Australian universities in 1992. 61% of these students were enrolled in full-time study, 28% in part-time study and 11% in external studies.

Case Study details obtained from
Open Learning Technology Corporation Limited 1995

INTERACTIVE MULTIMEDIA AND THE REMOTE AREA TEACHER EDUCATION PROGRAM

The Remote Area Teacher Education Program (RATEP) is an innovative development in open learning.

This program allows students to study for a teaching qualification by providing course delivery to remote locations in Queensland. The course is delivered in open learning mode through interactive multimedia (IMM) computer courseware and other electronic technology. There is also an on-site tutor. The IMM computer courseware incorporates movies, video tapes, scanned pictures and similar media.

Each off-campus site has a combination of a computer system, a fax machine, teleconference facilities, a video camera and video recorder, a television monitor and a modem. These technologies are used by lecturers, programmers, students and tutors in the development, teaching and learning of the subjects.

Depending on the learning activity, students use a computer, print material, and/or videotapes. The fax machine is used extensively for communication between sites as well as between lecturer and student. Audioconferences are usually conducted weekly or every two weeks to clarify points, promote understanding and discussion and provide feedback on written work.

The retention and graduation rate of RATEP students is 84-100%. This compares favourably to a 30-40% retention and graduation rate for special entry Aboriginal and Torres Strait Islanders who study the same diploma on-campus.

QUEENSLAND OPEN LEARNING NETWORK

The Queensland Open Learning Network (QOLN) is a State Government initiative that was established to develop a state-wide delivery system for education and training courses using interactive communication technologies. The Network consists of over forty open learning centres spread throughout the State.

Each Open Learning Centre offers the following:

- one IBM and one Apple Macintosh computer with CD-ROM and modem;
- teleconferencing equipment;
- fax and video machines;
- audiographics;
- audioconferencing facilities;
- E-mail facilities;
- satellite reception facilities.

All Centres offer 24-hour access to most computer facilities, and only differ in that the larger Centres have more equipment.

The Centres' facilities are available to anyone within the community.

- Business and industry groups use the network's teleconferencing facilities to link with colleagues in other cities and towns, to access self-paced courses for employees and conduct training workshops using network facilities.

- Universities and TAFE Colleges/Institutes use the network for orientation sessions, career information evenings, student meetings with visiting lecturers, and teletutorials.

- Community members gain access to information about university and TAFE courses throughout Australia, attend career information evenings, and use computing facilities.

Students enrolled in tertiary institutions or TAFE Colleges/Institutes are able to access the centres at no cost, as these organisations pay a membership fee. Employees who attend training courses at the Centre are usually funded by their employer. Individuals who wish to attend courses or access facilities can do so on a user-pays basis. The initial pilot project was funded by the State Government. Funding is now based on a combination of government grant, membership fee and user-pays.

The Network has been highly successful, exceeding all expectations and it has increasingly become a model for supporting open learning.

Most vocational education and training in Australia is provided in government administered institutes generally referred to as Institutes of Technical (or Training) and Further Education (TAFEs). Vocational education and training is also provided by some higher education institutions and private providers.

The TAFE institutions offer a wide range of vocational and non-vocational training programs, ranging from recreation and leisure, through basic employment and educational preparation to trades, para-professional and professional levels.

Under a recently introduced national system, State training agencies manage the delivery of vocational education and training in a manner consistent with a national strategic plan.

In 1993, 1,042,547 students undertook vocational education and training in TAFE Institutes in Australia. The vast majority (88.0%) studied on a part-time basis, and nearly 100,000 studied by distance education.

A further 701,396 persons enrolled in courses under the banner of Community and Adult Education. These are courses which cater for recreation and leisure pursuits.

Each State and Territory has its own system, but national co-ordination has recently culminated in the establishment of the Australian National Training Authority (ANTA) to oversee the provision of vocational training nationally.

Most commentators would agree that there has been considerable activity in open and flexible learning within this sector with major developments occurring around the country.

Programs are structured to support lifelong learning. Curriculum is being developed into competency based format with focus on outcomes and performance; with facilities for articulation into other courses and sectors; modularisation allowing for selection for elective study; and recognition of prior learning (RPL). This latter process has been set up to formally recognise competencies that have been acquired on-the-job and/or through life experiences, thus enhancing opportunities for those adults wanting to re-commence formal training.

The National Framework for Flexible Delivery in TAFE was endorsed by the National TAFE Chief Executive's Committee in November 1992 and the Australian National Training Authority (ANTA) has recently approved funding for projects to further develop collaborative arrangements in Flexible Delivery.

Finally, case studies from the wider Community and Adult Education system, (details obtained from Open Learning Technology Corporation Limited 1995), and my own Institute.

THE READING WRITING ROADSHOW

The Reading Writing Roadshow is a television series of 20 programs. The series was designed to provide literacy tuition to people who were outside the usual literacy learning and teaching provision.

The programs were televised twice a week and supported by a range of activities and materials. These included the accompanying workbook that reflected and supported the television series, using the same style and language, and a freecall Hotline to answer enquiries emanating from the programs. The freecall Hotline was staffed by experienced teachers able to give advice about the programs, help with the workbook, refer people to adult literacy and basic education courses nationwide or give out general information about adult literacy.

Subjects covered included:

- Formal letters
- Food labels
- Danger labels
- Job applications
- Maps
- Song
- Spelling
- School notes and children's stories
- Timetables
- Poetry
- Paying bills
- Personal letters

The television series has been to air twice (April-August; November-January) and there are plans for a third run from February to July, 1995.

The Reading Writing Roadshow series provides a stimulating environment that aids the literacy development of participants.

ABORIGINAL STUDY CENTRES PROGRAM

The policies of social justice and equity are central tenets to the provision of all Aboriginal policy and programs, and to the provision of equal access to vocational education and training. As the Aboriginal population is widely dispersed, the challenge is to enable equitable access to accredited vocational training and education programs for remote and rural communities.

The Study Centre Program has developed a cost effective, efficient and comprehensive delivery system. Essentially in involves the establishment of a study centre in an Aboriginal community, and the usual location is within the local TAFE campus. The study centre is equipped with a loudspeaking telephone and a facsimile machine. In addition, print-based learning resources and assessment packages are provided to each enrolled student. A learning support person is based in the local study centre.

This innovative program successfully provides opportunity in situations where classroom activity had failed. There are now 26 study centres located throughout South Australia, with a total number of 515 enrolments. The average retention rate is 73%, which is extremely high for an Aboriginal adult education program. The educational objectives of the Study Centre Program are to enable Aboriginal people to achieve independence and an educational status equivalent to any other Australian.

ABORIGINAL COMPUTER BASED LEARNING

The interactive computer based literacy and numeracy program provides a flexible and exciting tool which complements other delivery methods of literacy education used in the Anangu Pitjantjatjara (AP) Lands Program.

Members of the target group of local young people are either unemployed or employed part-time on community work programs. Existing educational levels are low. On average, English literacy and numeracy are at Grade 3 primary level. The target group requires training to gain employment, and further education to enable them to delivery services to their own communities.

The Principle of the Alphabet Literacy System (PALS) is a structured phonemic approach, aimed at students with low literacy levels, which uses an interactive computer system for delivery. Students are generally able to work independently, with the lecturer providing support as problems are encountered. This flexible delivery system caters for students to become independent learners, a key priority of the program.

The literacy program is based in a learning centre and the use of computers has dramaticaily increased the amount of English-based text in the community.

INTERNATIONAL PROGRAMS UTILISING TECHNOLOGY

Adelaide Institute is a designated **UNEVOC** (United Nations Vocational Education project) Centre of Excellence for the Asia-Pacific region. It therefore is actively involved with the collaborative sharing of expertise, curriculum, learning materials and communications technology expertise between member countries. Several consultancies and exchanges have facilitated international understanding of vocational training programs, whilst specific projects, have effectively provided practical support for lifelong learning in the member countries. An example is the development of a curriculum for Entrepreneurial Skills for Small Business as an international co-operative venture.

In addition, Adelaide Institute has **international collaborative learning projects** with three community colleges in mainland USA and one in Hawaii. As a result of this collaboration, direct teaching programs have developed involving Adelaide students and students in community colleges in the USA. These programs have used both teleconferencing and videoconferencing technology.

The programs have not only provided a rich cultural experience for students, but the opportunity for curriculum exchange, articulation arrangements, staff and student exchanges and exchange of teaching materials.

Apart from the social interaction, both parties involved benefit from a broadening of their perspective in the various historical, cultural and economic approaches discussed. Staff interaction regarding curriculum, methodology, assessment and timetabling has been equally beneficial.

USING CD-ROM FOR INDEPENDENT STUDENT LEARNING

The *Skills Tracking System* (STS) is the name (patent-pending) used to describe the composite training package developed, used, and marketed by the Centre for Hair and Beauty, Adelaide Institute of TAFE. The computer-based modular learning method is supported by integrated textbooks, student information books, instructional videos and interactive authorware and **CD-ROM** programs. The STS permits flexible attendance patterns, absolute accuracy of student progress reports and the potential for early release of competent trainees.

The reduction of teacher-centred instruction has provided increased opportunity for lecturers to give individual support and direction to the student users of the program. Class sizes have been increased, providing alternative staffing possibilities, and time previously spent with labour intensive assessment and reporting tasks has been slashed by the use of accurate bar coded progress report strategies. The subsequent reduction of normal lecturer preparation time has allowed staff to develop and extend support materials and software.

The system's methodology can be applied to any area that requires the acquisition of practical skills accompanied by related theoretical understanding, in the development of competence. The benefits gained are both measurable and substantial, and flow equally between employer, trainee and training institution.

MUSIC TECHNOLOGY CENTRE

Adelaide Institute, while playing a leading role in the use of technology in education, has always recognised the arts as having a high priority in our culture. The recent installation of the Music Technology Centre within the School of Music has placed it in a unique position to create a high profile in music education not only in South Australia but on a national basis.

The centre comprises a fully networked 20-workstation music computer laboratory with overhead display monitor linked to the No. 1 Workstation, 24-channel stereo mixer (sound monitoring of individual stations), **CD-ROM** and access to two laser printers. It also offers a digital piano practice studio.

Software programs with 'student disks' are now available for students to develop their aural skills and acquire a fundamental knowledge of harmony through self-paced learning. They will also learn how to use computers for original composition, sequencing and arranging. In addition, all students in the diploma course will learn to use wordprocessing, database and spreadsheet programs to enable them to prepare for financially viable and well-organised careers.

The mission of the Music Technology Centre is to provide excellence in both vocational training and further education and to promote an understanding within the community of the roles which technology and music will play within the 21st century.

VIDEOCONFERENCING

Servicing twelve centres throughout South Australia, Adelaide Institute is part of the South Australian Department for Employment, Training and Further Education Tele-learning Consortium. The project began in December 1987 when it was proposed that the then revolutionary 'codec' (Digital Coder/De-Coder) development be investigated. Because of the distribution of our population we were keen to explore the possibility of codec technology being used for the delivery of courses to small rural centres. Staff from the academic, technical and operational areas, and their students, have embraced this technology and the consortium has been most successful. It is a very busy network, operating up to 45 hours per week, usually with groups of 15-25 students spread across 3 to 4 sites. Sometimes there are 4 simultaneous and separate courses taking place.

An independent review in 1992 stated *"Through ingenious and innovative use of electronics.... and through clever use of computer controlled touch screens for the lecturer.... the system is 'user friendly'...."*

BROADCAST TV FOR DELIVERY OF VOCATIONAL EDUCATION

Open for Business is a 13 part television series jointly developed by the Adelaide Institute of TAFE and southern Television Corporation (Channel 9), with support from the South Australian Economic Development Authority. It is an example of the way in which the private and public sectors are able to co-operate for the benefit of the wider community.

Open for Business is linked to the successful TAFE open learning course, Small Business Management, which provided the key training outcomes for each program.

The series has been designed to be entertaining as well as informative and motivational. It employs a television magazine format rather than a lecture presentation to communicate both training outcomes and desired attitudes.

(Ref:Manila.Pap)

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

STATUS OF TECHNICAL VOCATIONAL EDUCATION AND USE OF NEW TECHNOLOGIES OF TRAINING IN PAKISTAN

By: *S Irshad Hussain Tirmazi*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

Experts Group Meeting on
NEW TECHNOLOGIES OF TRAINING FOR TVE
Organized by Colombo Plan Staff College
in collaboration with
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Manila, Philippines
3 - 7 July 1995

STATUS OF TECHNICAL-VOCATIONAL EDUCATION AND USE OF NEW TECHNOLOGIES OF TRAINING IN PAKISTAN

By Dr S Irshad Hussain Tirmazi

Present Status

Technical Education as a separate stream in Pakistan was started in mid-fifties with the establishments of two Polytechnic Institutes at Karachi and Rawalpindi. Since then there has been a manifold increase in the number of institutions and technologies offered there in. At present, engineering technicians are being trained in 47 Polytechnic Institutes (13 for females) and 11 Colleges of Technology where as commerce education to train manpower for business sector and offices is provided in over 200 commercial training institutes.

The Manotechnic/Polytechnic Institutes and the Colleges of Technology offer 3-year post Metric Diploma of Associate Engineer ((DAE) in over 20 Technologies. No single institution however, offers all the technologies. The average number of technologies offered by the Polytechnics/Colleges of technology is about four. The Commercial Training Institutes offer one year post Matric Certificate in Commerce (C. Com) and 2-year Diploma in Commerce (D.Com) courses. Beside these, there are over 100 Vocational Institutes mainly for Women operating under the Provincial Education Departments imparting training in various trades.

In order to provide diploma holders (graduates of polytechnics) opportunities for enhancing their qualifications and upward mobility in the profession, a number of Polytechnic Institutes were upgraded to the level of Colleges of Technology in mid-seventies. These Colleges of Technology, in addition to DAE programme, offer post diploma B. Tech. (Pass) and B. Tech (Hon) courses. B. Tech (Pass) involves one year supervised on the job training followed by one year education and training in the college after diploma where as B.Tech (Hon) degree requires one year on the job training and one year education & training in the college after B.Tech (Pass).

The administration of Monotechnic/Polytechnic Institutes, & Colleges of Technology, Vocational Institutes and Commercial Training Institutes lies with the Directorates of Technical Education (Technical Education wing of the Provincial Education Departments). The Boards of Technical Education are responsible for conduct of examination and award of certificates/diplomas. For B.Tech programmes the Colleges of Technology in various parts of the country are affiliated with respective Universities of Engineering and Technology.

Beside Education, there are a number of other Ministries/Departments and organizations running Vocational training institutions. Ministries of Labour & Man-power at the Federal level and departments of Labour & Man-Power, Social welfare, Industries and Agriculture in the Provinces are worth mentioning. In addition, a number of corporate bodies e.g. PIA, Railways, Pakistan Telecommunication Corporation and Pakistan Steel also run programmes for training of their workers.

Despite manifold quantitative expansion the situation is far from being satisfactory and TVE is riddled with multifarious problems. Three studies carried out with the Collaboration of ADB revealed the following key issues and problems in TVE Systems & Training.

1. ***Quality and Internal Efficiency***. Recent studies have revealed there is evidence that as many as 75 percent of polytechnic teaching staff lack recognized pedagogical training. Many also lack relevant industrial experience as they were recruited directly from engineering colleges or from within the polytechnic system itself. The studies further confirm that internal efficiency with the polytechnic system is very low. The average time taken to complete a three year diploma course is four years. There are relatively few drop-outs as most students who fail the examinations stay on and resist failed examinations. The reasons for their high repeater rate include lack of up-to-date and relevant workshop equipment / facilities, insufficient text-books and learning materials, poor teaching methods, inadequately prepared or motivated teaching staff, the highly subsidized cost of technical education.

2. ***External Efficiency***. Traditionally most polytechnics were established to train students for entry into government service where their qualifications (diploma) served as an assessment of general intellectual capability. Very little attempt, however, has been made to assess employers needs, within the public or private sectors. This failure has contributed to the marginalization of the polytechnic system with employers showing little interest in the program or performance of the students. Due in part to lack of communication with industry at both student and teacher levels, as well as to the employers perception that little can be done to change the system. Polytechnic curriculum is frequently out of step with the needs and expectations of the work place, and according to employers, graduates require lengthy periods of re-training once employment commences. This can be only changed by establishing closer contacts with industry, placing employers into positions where they can provide positive assistance to curriculum change and where they can propose new and appropriate standards of technical education.

3. ***Inadequate Financing***. Over-all financial problems account for the lack of funds for regular staff development programs and the failure to provide for adequate building and equipment, maintenance. Financial means for overall maintenance and service of technical institutes, refurbishment, replacement of teaching materials and equipment as well as new investments in new class rooms, new technologies, new equipment and other development activities are provided through provincial recurrent and development budgets. However, provincial

recurrent budgets are generally too small to cover anything but the barest necessities and every day expenses. The result of a complete reliance over the years on limited budgetary means are the dilapidated and unsafe state of many buildings, outdated and non-operational equipment, lack of alimentary teaching materials, untrained teachers, and so on and so forth. There is no doubt that the key to a sustainable technical education system in Pakistan lies in enhanced cost recovery.

4. ***Poor Cost Recovery***. Like other sub-sectors of Education, Technical Education too is highly subsidized in Pakistan. Cost recovery ranges from <1% to 7% in various provinces. A weighted average for all provinces would result in an overall cost recovery rate around 4-5 percent of recurrent costs.

5. ***Imbalances in Supply & Demand***

   The system is supply oriented rather than demand driven. The result being that while there is over supply of technicians in Conventional technologies there is shortage of trained manpower in new areas.

6. ***Coverage***

   There are only 58 Polytechnics/Colleges of technology for a population of nearly 120 million spread over an area of about 0.8 million square kilometers. The spatial coverage is even worst. For example, Balochisten is largest of the four provinces area-wise but has only about 5 1/2% population scattered over an area of about 0.3 million sq kilometers. There is only one Polytechnic Institute for boys in this Province and none for the women.

Technical Education Reforms Project

Abovementioned - is what can be said a rather very gloomy picture of the present state of TVE in Pakistan. However efforts are being made to alleviate the situation. Based on the findings of aforementioned studies, a massive project to reform TVE has been formulated at a Capital cost of US$78 million. The project interalia includes:

I. Strengthening of selected institutions (44/58) through provision of equipment, furniture and renovation of buildings.

II. Staff Development - ~2500 person - months.

III. Consultancy services including key area e.g. Institution-Industry linkages, market surveys, cost recovery systems, curriculum reforms, entrepreneurship development etc. - 825 person-months.

IV. Introduction of new technologies in demand in job market interalia including computer, telecommunication, textile, food technology, electronic printing, etc.

V. Strengthening of existing Technical Teachers Training Centers (TTTC) and establishment of two new Centres and starting a pre-service B & Ed (Technology) programme at NTTTC, Islamabad.

VI. Administrative reforms and enhancing cost recovery.

VII. Strengthening of R & D capacities at provincial and federal levels.

Beside this project which would be launched in early 1996. Rs400 million $13 million) have been provided in the ADP during the fiscal year 1995 - 96 (starting July 1995) for vocational training programs under the Federal Ministry of Education.

Use of NTTs

All the TVE institutions operating under the Education, Labour and Manpower, Social Welfare and Industries Department, etc mentioned earlier are using Conventional methods of training hardy using any advanced information technology techniques or employing computer mediation.

The situation however is not all that bad. Beginning has been made. Allama Iqbal Open University (AIOU) has been involved in distance education through correspondence courses using print media. The university is offering a wide range of course in general education starting from secondary school certificate level to masters degree level as well as teacher training courses. The University is also using television and radio media as well, as part of its delivery system. The university has study centers with tutors all over the country for tutorials and practical work. The range of technical and vocational courses being offered at present is however, rather limited confined to few computer software and elementary level vocational courses. University also offers vocational courses for neo-literated using charts and audio-cassettes combination.

The situation is expected to improve further. Recently a new television Channel PTV-2 has been started basically for AIOU and other educational programs. Lack of expertise and financial constraints remain the major hurdles in the way of expanding use of NTTs further by AIOU.

In addition, under the new Technical Education project computer technology is being introduced in few more places and the computer labs at NTTTC are being strengthened. This would also help promote use of computers in teaching/learning process. The NTTTC, has already embarked up on this, though in a very humble way and is offering short courses for Polytechnic Teachers in the use of computers in teaching/learning process.

Further more with the opening of telecommunications sector to the Private Sector and change of Telephones and Telegraphs Dept. as PTC, the facilities are expanding fast and with the availability of infrastructures, the use of NTTs employing telephone media will also improve.

At the end it may be said that there is great potential for use of NTTs in the field of TVE in Pakistan to improve coverage, for continuing education and to improve cost effectiveness. The resource constraint both financial and expertise are the major limiting factors and would continue to be so for quite some time.

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EXCELLENCE IN TECHNOLOGY TRAINING THROUGH PARTNERSHIP

By: *Chris Wong*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

Excellence in Technology Training Through Partnership

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Abstract

The IC was established to provide industrial training to students. The quality of the training has been well received by the industry. In the recent years, more and more enterprises of Hong Kong move the majority part of their manufacturing operations to China and remain in Hong Kong only the high valve added operations such as marketing and product development. Consequently, young engineers are having less and less workplaces to receive their industrial training. Under such circumstance, the IC's role in industrial training is going to be even more vital than it has been in the past. Only through the coherent partnership with the industry, the IC can sustain sufficient resource to strive for its mission, ie. providing high quality industrial training to meet the need of the industry and the society.

Introduction

The Polytechnic University has a proud history of providing quality industrial training to its students. This stems from a long tradition through which the Institution and the industrial sector have developed mutually beneficial relationships.

In 1936 the Government of Hong Kong, recognizing the growing importance of technology in the development of the local economy, established the Hong Kong Trade School in co-operation with the Building Contractors' Association. This was the cradle of technical education in Hong Kong. In 1947 the School was renamed the Hong Kong Technical College which was the predecessor of Hong Kong Polytechnic. The Institution gained full university status in January this year.

The Polytechnic University identifies and conducts courses to satisfy the demands of Hong Kong industry for initiated future technologists. Through the years, and after undergoing many developments, it is now the only institution in Hong Kong to offer Industrial Training complementary to students' academic studies at tertiary level. The training standard is accredited by the Hong Kong Institution of Engineers and other relevant professional bodies in the UK.

The University pledges to produce graduates who will be 'preferred' by employers. The students are equipped with utilitarian knowledge that they may apply as soon as they embark upon employment. They are equipped with practical experience (the major part of which is gained in the Industrial Centre) and are well prepared for their first jobs. So far more than 150,000 students have graduated. These students were proven to demonstrate their worth.

Role of IC

The Industrial Centre (IC) of the Institution was established in 1976 with the mission to provide quality practical training to students effectively integrated with and complementary to their academic studies. It's operational philosophy lies in the promotion of professionalism, the encouragement of innovative powers and the appreciation of technological processes. The services provided by the IC are being well received by the industry and the community. In addition to the PolyU's own students, students from the Hong Kong University of Science and Technology are currently undertake training in the IC. Specialist courses are also organized upon the request of local industry and international organization as well such as CPSC and ILO. Such courses are usually 'tailor-made' to suit the specific requirements of the participants.

Trends in Industry

In recent years the Hong Kong industries have been dogged by a number of difficulties: labour shortages, spiraling wage rates, staff losses to immigration etc.. To survive, local manufacturing enterprises in particular have only two choices of either

a. moving their products up market by adopting modern manufacturing technologies or

b. moving their manufacturing operations to across the border in an attempt to cut the cost of land and labour.

The former choice of course involves substantial investment in getting the new technologies both in terms of people and facilities. This means long term investment is required. Under the political uncertainty, it is not surprise that large number of industrialists are quite reluctant to make heavy investment in Hong Kong at this moment but choose a better alternative, ie. move majority operations to China while the critical operations such as marketing and product development are still being based in Hong Kong.

In this industrial scenario, engineering technologists will have a vital role to play but with a bit different requirement. A new and more sophisticated breed of engineering technologists will be required, one who understands computer aided design and manufacturing, computer integrated manufacturing system, and rapid prototyping and manufacturing; who is capable to implement total quality concept, process planning and control systems; and who is familiar with the commercial and contractual aspects of engineering endeavour.

Where will such people come from? Where will they receive their industrial training? As more and more companies are moving to China, the number of training placements in local industry are getting less and less. Under such circumstance, the IC in industrial training is going to be more and more important.

Partnership

In many aspects of modern technology there is a continue need for the IC to rethink and implement a strategy to meet the ever changing needs and demands of the local industry. Such a strategy implies a commitment of providing more high level training and sharing views of the companies and industry concerned through close working contact. This is to ensure that the training contents are up to date and beneficial to students and eventually to the industry.

Aware of the importance of industrial training and the contribution thereto by the IC, industry has committed significant resources to further improve the facilities of the Centre.

Industry and manufacturers enter the partnership with the IC by donation/consignment of equipment in such a way that their equipment are being seen and used by thousands of students all of whom will be their potential customers. Students get hands-on experience on such equipment during their training of which the 'brand name' will stay for life with them. Experience shows that when the students climb up their career ladder and become decision maker in some day, those 'brand names' are their 'preferred' choices. This can be further illustrated by the fact that the corresponding value of the equipment inventory of the Centre has been increase from HK$40M three years ago to about HK$120M today which are largely attributable to donations from industry. Of the many generous supports form the industry, I would like to mention a few distinguish examples in the following:

Carl Zeiss Precision Measuring Centre

The Precision Measuring Centre was jointly established by the IC and Carl Zeiss Far East Co Ltd in 1987. Carl Zeiss provides two CMMs of the latest model amount to HK$11m and is responsible for the upkeep of the equipment while the IC provides the space and the building services. The arrangement is one whereby Carl Zeiss get 50% of the usable time for training of their customers and the IC get the other 50% for use in training students, research and consultancy.

Charmilles EDM Authorized Training Centre

Mold and die making is an important industry in Hong Kong. Wirecut Machine and Electro Discharge Machine are indispensable machines in mold and die making. Siber Hegner Machinery Co generously consigned four Charmilles CNC EDM Die-sinking and Wirecut machines to set up an Authorized Training Centre dedicated to the training of personnel for the industry. The total consignment is amount to HK$6m

Computervision Centre of CADCAM

Computervision recognizes the well-established strength and record of the IC in CADCAM, and works with the Centre to make it one of Asia's key CADCAM Education Centre by providing the latest workstation level CADCAM hardware and software amount to HK33m. Furthermore, a strategic alliance agreement has been signed which grants the IC full access to the Computervision's CADCAM products at no cost.

Intergraph Microstation CAD Training Centre

An agreement has been signed between Intergraph and the IC early this year that Intergraph supplied 21 sets of the latest Pentinum Computers and the Microstation CAD software totally amount to HK$4m to set up an Authorized Training Centre of Microstation CAD. In return the IC is going to organize training course for their customers.

Asia Info 3D Rapid Prototyping and Manufacturing Technology Centre

Rapid Prototyping and Manufacturing technology provides solutions which minimize the time-to-market in product development cycle and help build market superiority. It is rapidly becoming one of the most important technology in use in the manufacturing sector and is something which Hong Kong industry cannot afford to do without. With this scenario, Asia Infosciences Corporation Ltd has donated a stereolithography Apparatus (SLA), together with associated software, to the IC and to establish a RP&M Technology Centre for the express purpose of developing projects related to the application of SL technology. The donation is amount to HK$2m.

Dataworks MRP II System

The Dataworks System includes report-intensive engineering, financial, manufacturing, sales and marketing modules providing a stable integrated business solution. The company is impressed by the operation of the IC and decide to make the IC as the reference site of their product by the donation of the software system of amount to HK$2m.

AST Computer Workshop for CAM Training

The CAM Training Workshop is designed to provide students with opportunities for hands-on experience in the latest CAM technology and applications. Equipping the IC with up-to-the-minute computer capabilities brings the realities of industry directly into the training environment. The donation includes 21 sets of PCs and the network hardware and software is total amount to HK$1m.

Nanco Surface Mount Technology Training Unit

Surface Mount Technology (SMT) is widely accepted in the electronics packaging industry as it reduces costs, increases packaging density, speeds up operation and improves product reliability. Since 1989 the IC has joined efforts with Nanco Electronics in setting up an SMT Training Unit to provide facilities and service for training, research and development on SMT. The total amount of the facilities is HK$2m.

Allan-Bradley Motion Control Workshop

An assortment of motion control products including servo drives, servo controllers, PLC, and demonstration units amount to HK$1m were donated by Allan-Bradley (HK) Ltd for the purpose of setting up a Motion Control Workshop for student training in automation and Computer Integrated Manufacturing.

Mitsubishi Electric Air Conditioning Equipment

A batch of advanced air-conditioning equipment and programmable logic controllers (PLC) amount to HK$650,000 were donated by Ryoden International Ltd for training in Building Service Technology and Industrial Automation.

Sandford Process

The Sandford process is proprietary low voltage electrochemical process for hard anodizing aluminum alloys. The process renders wear qualities superior to case hardened steel, exceeding the requirement of MIL-A-8625. A model line of the Sandford process of amount to HK$750,000 is provided in the Centre to serve the training need and the industry in Hong Kong.

PENC Automatic Plating Line

PENC Plating Engineering and Chemicals Co Ltd generous donated a computerized automatic electroplating line to provide students the opportunity to appreciate the latest technology related to batch production in electroplating industry. The Line is worth HK$350,000.

Heidenhain CNC Trainer

The partnership between Bridgeport (UK) Ltd and the IC can be dated back to last decade. Apart from granting large discount on the machines supplied to the IC, Bridgeport donated a latest Heidenhain CNC Trainer which worth HK$200,000 last year. This trainer is specially designed for training CNC part programming for the Heidenhain controller.

LK Die Casting Machine

Die Casting Technology is indispensable in the light engineering industry which occupies a very significant place in the economy of Hong Kong. LK Machinery contributed die casting machines to the IC of worth HK$250,000 to promote and further develop the technology.

Vega Laser Processing Machine

The application of Laser is receiving more and more attention from the industry. Vega, a renown Swiss Laser machine manufacturer, generously granted significant discount in providing the IC with its top model to promote and further develop the technology.

Photo Chemical Machining Facilities

Photo Chemical Machining (PCM) is a complicated machining process combining computing, mechanical, chemical and optical technology to produce high quality sheet metal parts with extreme accuracy and fine details. The IC received enormous discount from various vendors in acquiring the facilities for the entire process.

Conclusion

The quality of IC training is well recognized by local as well as international professional bodies. May I quote the wording from the IEE Accreditation Panel of our Electronics and Manufacturing Engineering Degree Course *"The Industrial Centre was a valuable asset, and provided good industrial exposure for full-time students"*. However, without the generous donation and the strong partnership with the industry, the IC could never become such an asset.

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VOCATIONAL EDUCATION AND TRAINING FOR THE 21st CENTURY "STRENGTHENING THE KNOWLEDGE AND INFORMATION BASE OF VOCTECH"

By: *Jiro Yoshio*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

Teaching & Learning Resource Development
Jiro Yoshio

1. INTRODUCTION

For any country, human resource development is an important activity for national development. Since technicians play a critical role in developmental activities, technician education occupies a crucial position in the educational system. However, technician education is facing severe problems in many Asian countries. The surveys conducted at Colombo Plan Staff College (1,2) identified a "shortage of teaching and learning resources" and the "inadequacy of teacher's competency" as the two negative factors in many Asian countries.

The technical and financial constraints impose severe limitations on the development and dissemination of vital teaching and learning resources. The recent advances in computer technology and declining costs of computer hardware and software offer a solution to the problems faced by the technician education systems in these countries. Since it is now feasible to develop teaching and learning resources (T/LR) in an efficient and cost effective manner through the use of computers in these Asian countries and they should take advantage of this technology.

Since the development of teaching learning resources for technician education is an enormous task, it cannot be undertaken by a single institution or even by a single country. It demands the cooperative efforts of many countries. This cooperation is made more important from the dissemination aspect. The task of developing and disseminating computer-based teaching and learning resources could be undertaken only with international cooperation.

To facilitate and promote this effort of developing computer-based learning resources, some initiatives were taken by Colombo Plan Staff College for Technician Education, Manila (CPSC), the Regional Center for Vocational and Technical Education of the South East Asian Ministers of Education Organization (SEAMEO-VOCTECH) and the Okinawa International Centre of Japan International Cooperation Agency (JICA). The Colombo Plan Staff College has been offering programmes on "the use of computers for instructional materials development" over the past six to seven years, for the key technical and vocational education personnel of its member countries with the objective of building up institutional capacity in the member countries. The efforts and the programmes of Colombo Plan Staff College are supported by JICA. Similarly, the SEAMEO-VOCTECH programmes are also supported by JICA . The Okinawa International Centre of JICA has been offering training programmes for a long time especially for technicians who deal with the development of instructional material.

It is well understood that current advances in computer technologies have made it possible to produce effective teaching and learning materials at an incredibly low cost. They also permit the easy use of the T/LRs by ordinary teachers who had no prior training or had limited training in the use of computers. Besides this, the products developed in any institution or country could be disseminated to and used by any other institution or country in a simple and inexpensive manner. Often the materials can be used directly in the classroom with little or no modifications as dictated by the medium of instruction, the curriculum requirements or the teaching style. These ready-made T/LRs would also be specially helpful to the technician education systems of the less-developed nations because most of them have fewer opportunities and capabilities to produce and access such teaching and learning resources.

To utilize the advantages offered by the current computer technologies for the advancement of technician education systems, there is a need to develop a linkage system to exchange information, share experiences and share products amongst interested or concerned organizations and special interest groups. It is possible to cooperate and share products and experiences with each organization retaining its individualism and objectives.

The utilization of computer technology to provide the teaching and learning resource is essential and absolutely necessary for technician education. This becomes vital for fast changing technologies for which neither the teachers nor the instructional materials are available. Further, the reputation and credibility of technician education is at stake in a world dominated by computer technology, if it does not appreciate and utilize the computer technology for its advancement.

A large number of teaching and learning resources are required to support technician education because of its size and variety of technologies involved since the development time for each of the resources is considerably long. However, the market segment is too small to attract commercial companies or establishments to undertake this activity. Hence, it is essential that these teaching and learning resources must be developed by technician teachers themselves. Unless the teachers take the initiative, the technician education system will have no chance of having computer-based teaching and learning resources of its own.

Hence, this presentation urges strongly the technician education sector to set up a coordinating body to encourage and promote the movement for the development and dissemination of computer-based teaching and learning resources.

A model of clip-media data-base and a self-learning program package produced by one of the graduate students of Tokyo Gakugei University using the data-base will be presented as an illustration.

2.0 Teaching and Learning Resources

Teaching and learning resources play very important role in accomplishing the objectives of technician education.

2.1 Technician education and T/L resources

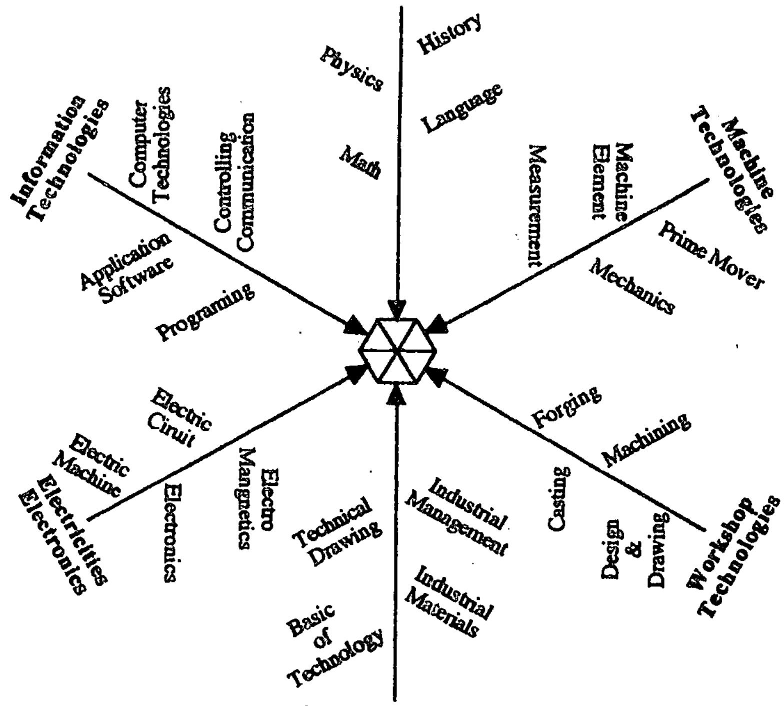
The objectives of technician education would be as follows:

- To provide students with the necessary knowledge and techniques needed by the industrial technicians in each field of industry.

- To provide students with the scientific basis of industrial technology and to develop their ability and desire to strive for its improvement and progress.

- To provide students with an understanding of the social and economic significance of industry to the development of the society and to develop their ability and desire to strive for its industrial development.

In order to become a technician, the student must study a variety of technical subjects. The illustration in Fig. 1 shows possible contents of a technician education student's study program in a school.



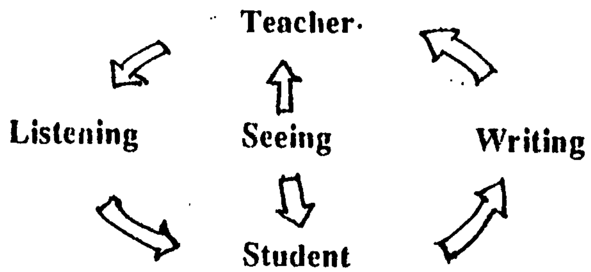
BROAD AREAS OF STUDY IN TECHICAL HIGH SCHOOLS

Teaching and Learning Resources: To implement the curriculum, teachers make use of appropriately chosen teaching methods, and teaching and learning resources. Using these methods and resources, they communicate the desired knowledge and skills to the students. The illustration in Fig. 2 shows an example of a teaching and learning activity which is important to implement curriculum.

Fig. 2

INTERACTIVE STUDY

Listening and Writing



- Question and Answer

Promoting Discussions
Providing Exercises
Asking Questions
Ensuring plenty of Practice
Supply "Fill-in" Summary

Fig. 3 illustrates the characteristics of Technical Education, the relative importance of practice and conceptual education. The integration of theory and practice is very important for a better understanding and application of technology, specially in the case of technicians.

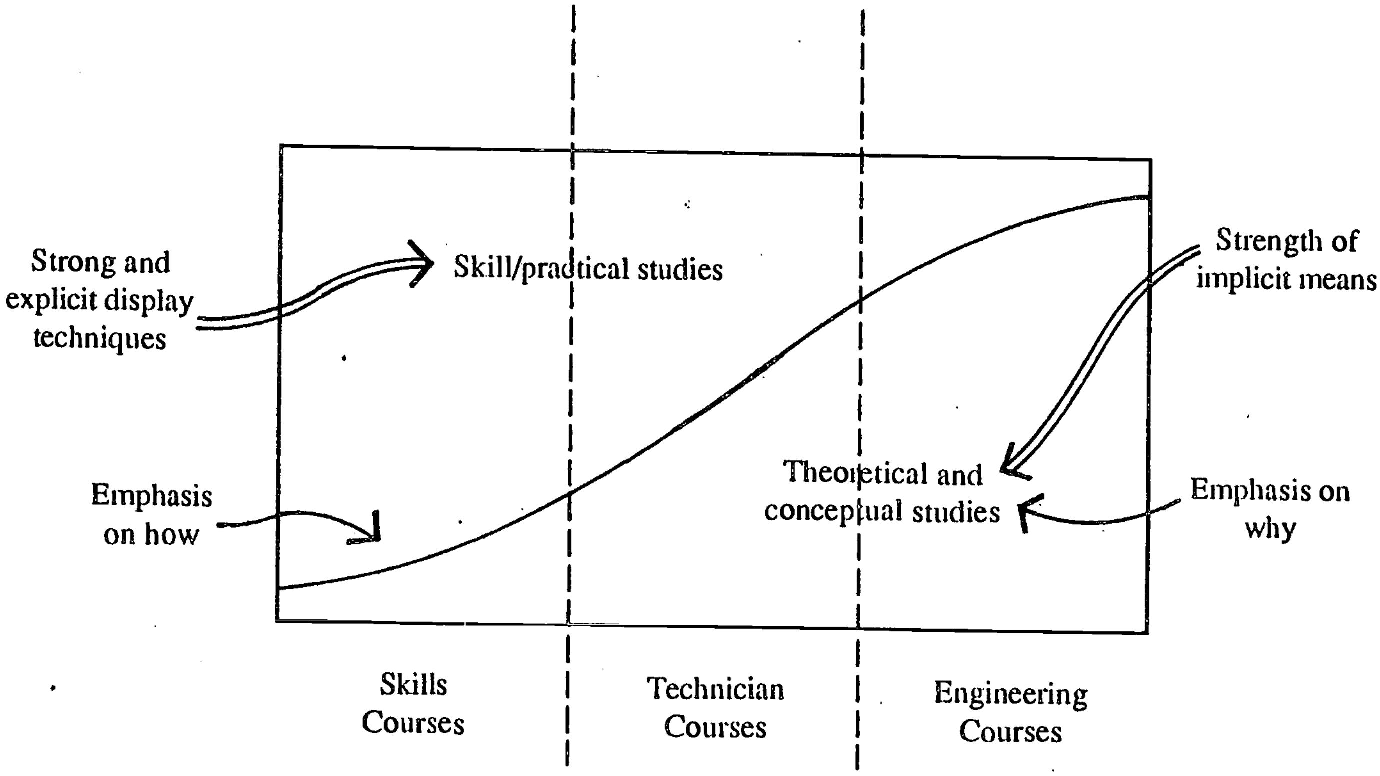


Fig. 3 Characteristics of Technical Education

It must be emphasized and that the boundaries of training are dynamic and change depending upon the level of technology in the country, cultural background and the nature of technology. However the broad frame work remains unaltered.

2.2 TYPES OF TEACHING AND LEARNING RESOURCES

In technician education, a variety of teaching and learning resources are used for curriculum implementation in order to provide a better understanding of the technical aspects of the study to the students.

The following chart shows teaching and learning resources used normally in technician education:

TEACHING AND LEARNING RESOURCES

(A) Printed Resources

- Text Book
- Work Book
- Hand-Out
  - Information Sheet
  - Operation Sheet
  - Job Sheet
  - Laboratory Sheet
  - Assignment Sheet
- Supplement
- Wall Chart

(B) Non Printed Resources

- Projected Media
  - Overhead Transparency
  - Slides and Filmstrips
  - Films and Video
- Audio Media
- Non-Projected Media
  - Chalk & Board
  - Chalk & Flip chart
  - Felt board/Magnetic board
  - Models & Actual Objects

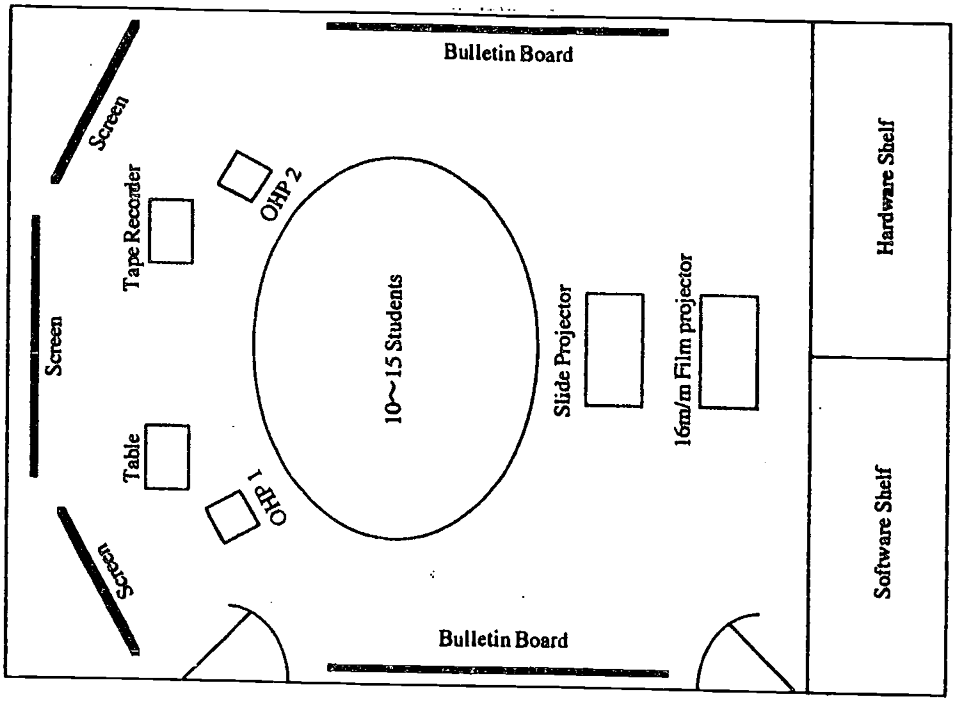
(C) Multi Media CAI

- Clip Media
- Hyper Media
- Simulation

2.3 TECHNICAL INNOVATION

In the past, providing such a variety of teaching and learning resources was very difficult since all these equipment and software were expensive and required additional training.

The following illustration shows an example of a class room in the United States that was fully equipped with a variety of impressive audio-visual machines.



AN EXAMPLE OF WELL EQUIPED LECTURE ROOM IN MICHIGAN

It was not possible to think of setting up such a class room in Japan at that time. However after twenty years, it has become possible to provide all such teaching and learning resources in the classroom using computers. The advancement in computer technology has made it possible to realize this not only in Japan but also in many other countries.

3. Teaching and Learning Resources Development Using Computers

There are some apprehensions with regards to using computers for developing teaching and learning resources. These apprehensions are over such things like computers are very expensive, difficult to use, and need a trained technician to make and use the T/LRs produced by computers.

Advances in computer technology have changed the situation very drastically and these apprehensions are not valid any longer. In fact, the reverse situation is true. Compared to the other traditional types of teaching and learning resources, the costs of computer-based development are much less as compared to the traditional methods of development of teaching and learning resources. Using computers needs much less time and effort. You can say in the present context, that if you have the money you can use video, OHP, slide projector and others, but if you have no money and no manpower, you must use computers.

It is also true that by using computers, teachers can develop more efficient and effective instructional materials by themselves than with other media.

In addition, if T/LR materials are to be developed with international cooperation, computers must be used for both technical and economic reasons.

3.1 Advantages of Using Computers for Teaching and Learning Resource Development

- **Cost Performance:** As discussed in the previous sections, the cost of equipment, the production process and the media are less expensive when using computers than when using conventional equipment for the development of teaching and learning resources. Further, the maintenance and operational diversity are reduced in the case of computers and thus, greatly reducing the costs.

- **Ease of Handling:** Since most software come in the form of CD, MO media, the media is more flexible, easier to handle and operationally simple compared to the other conventional forms of instructional resources. It is also easier and less expensive to send digital data over long distances in this manner than through either mail or on disk. The media is hardy, cannot be corrupted and can be handled with minimum training.

- **Effectiveness:** Technician training requires a variety of instructional resources depending upon their appropriateness for a situation. Since all the forms can be stored on CD ROM, all that the teacher has to do is to put the materials available on CD ROM in appropriate sequence according to the needs of presentation. As a result, the teacher can prepare instructional materials that fit into the contents of his lecture.

- **Efficient:** After the establishment of the teaching-learning data-base, the production of the instructional materials is very efficient as it consumes much less time and effort to produce the courseware. Further, the production can be undertaken by any teacher, even those with no formal background in computers.

- **Sharing and Dissemination:** The sharing and dissemination either of the data-base or the instructional resources are easy as they are both in digital form.

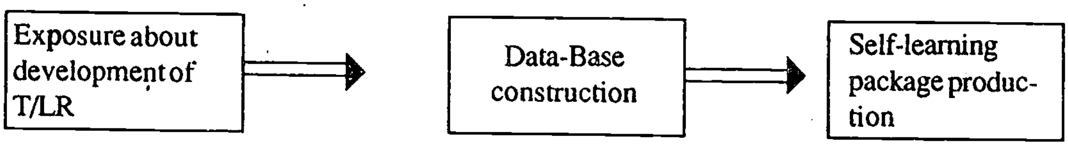
- **Cooperation:** Considering the magnitude of the tasks, it is very important that there be cooperation at the national and international levels to set up the large data-bases and also to develop and disseminate instructional resources. This cooperation is possible only because the data is available in digital format.

3.2 Strategy of development of T/LR

Since computer technology is quite new and since people have different views of computers, to make the project of teaching and learning resource development a reality it will be necessary for us to prepare an appropriate strategy.

The experience at Colombo Plan Staff College indicates that there is a strong need for the exposure of teachers and administrators to teaching and learning resource development using computers. This is very understandable because it is difficult for teachers to have a general picture of the work involved in the development of instructional resources without becoming familiar with the hardware, the software and the process of actually making the resources. Without this information, the teachers may not be attracted to the project.

The most appropriate steps to carry out the programme are shown in the following chart.



- **Exposure:** Since teachers are not familiar with developing T/LR using computers, there is a need for them to be exposed to the process of development of T/LR materials using computers. They also need an exposure to the kind of hardware and software environments needed to produce the T/LRs and to use the T/LRs. Most people would have to see the actual way of producing T/LR using computers before they believe.

- **Data-Base:** When teachers instruct students, they explain the subject matter contents showing illustrations, pictures, graphs, video, photos, etc. But in most case, it would be very difficult for the ordinary teacher to prepare and use such diverse materials. However, if teachers use computers for preparing such presentations, it would be much easier. For instance, the teacher can put almost all the teaching and learning materials into a data-base and can project the desired materials on the screen of either a computer or a TV set.

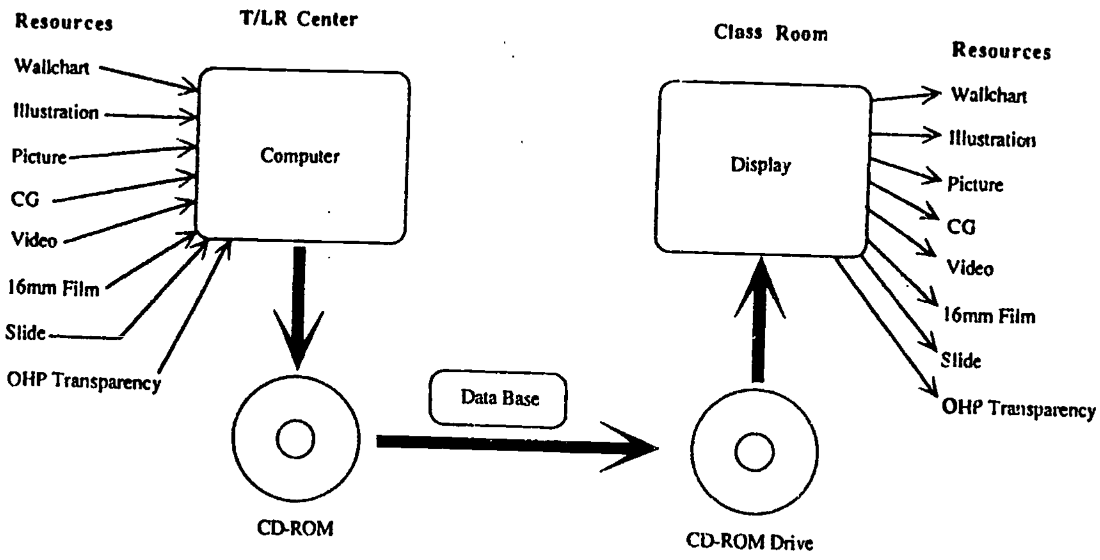


Fig-11 DEVELOPMENT OF T/LRs USING COMPUTER

- **Self-learning package:** After the data-base is developed, it is possible for a teacher to make a self-learning package. What teachers should do is to make an action plan of his teaching. Based on the action plan for his lecture, the teacher compiles materials from the data-base and students using the self-learning package would be able to study by themselves. The same material could be used by the teacher in an ordinary classroom screen from screen and speaker.

3.3 Current situation of T/LR development

Currently a number of schools, institutions and publishing companies are producing the so-called digital materiasl. But unfortunately only a limited volume of resources can be produced by publishing companies in the form of digital materials suitable for technician education. The T/LR materials that might be used for technician education is limited but most of the available materials can be used as raw materials for the data-base.

The Colombo Plan Staff College has started a T/LR development project with JICA assistance four years back. So far, efforts have been at an exposure level. The participants from the member countries learn what is T/LR development using computers and how to develop such materials, what kinds of hardware/software are needed for developing T/LR using computer. The persons who participated in these

After four year of starting the course, this course will soon be evaluated by JICA experts. If JICA were to continue to support this programme for the next five years, the College would start developing clip-media data base for class room use.

--JICA OIC

The Okinawa International Center is offering T/LR development courses for various kinds of fields/people, such as the police, environmental education, broadcasting, etc. These sectors are very different from those addressed by CPSC and Voctech. But OIC has well-developed facilities and a number of technicians and instructors for supporting their training programmes.

Their training programmes heavily depend upon audio visual education and training.

-- SEAMEO-Voctech

Voctech is a late comer to the field and covers only ASEAN countries. They have started a T/LR development programme already and the course contents are similar to the CPSC's computer course.

Since ASEAN countries are members of both CPSC and Voctech and since both institutions deal with technician education for industries, they keep in contact with each other.

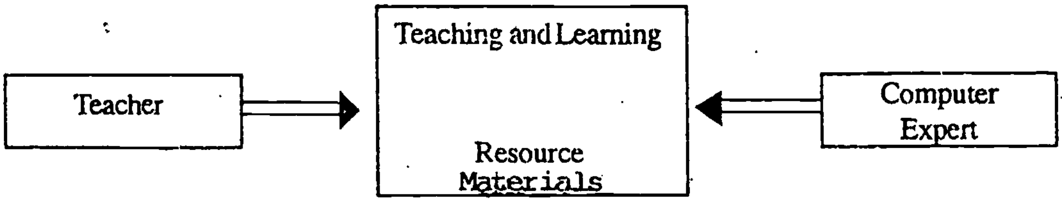
-- Support group

JICA experts who have worked with CPSC form a loose type of support group for the College. They produce the models for development of computer-based T/LRs for exposure purposes. Such a model is very useful for course participants to get some idea about T/LR development using computers. The support group also joins CPSC courses as experts for computer- based T/LR materials development.

3.4 Remarks on development of T/LR using computer

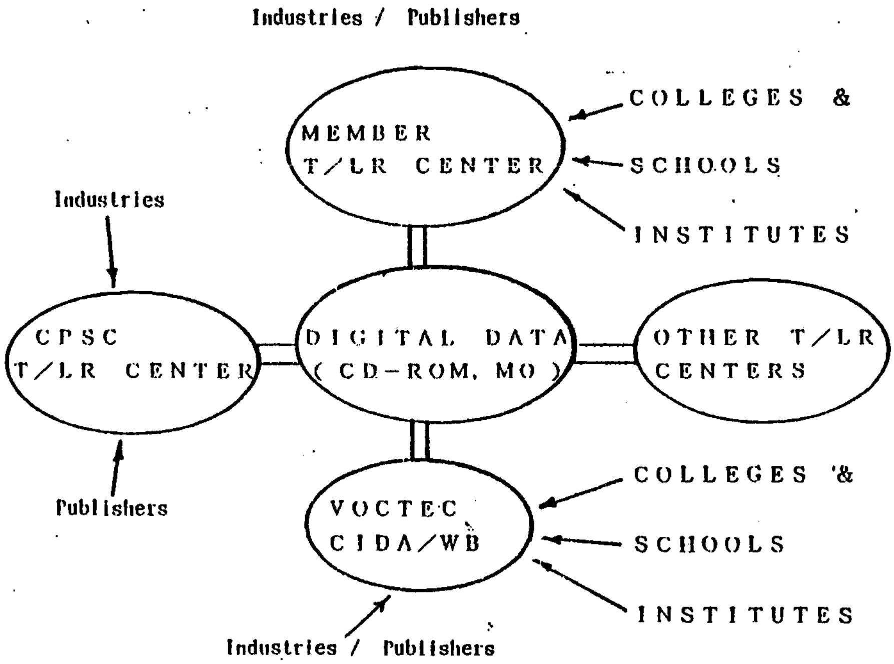
Close cooperation between the teaching staff and the computer experts to develop teaching and learning resources using computers is necessary to develop a team.

Fig. 6



- **Copy Right:** Since the materials placed on data-bases will be collected from many sources and will be disseminated to users in various countries, the problems of copyright have to be overcome. Some effort is needed to clear the copyright. The basic idea behind the data-base construction is illustrated in Figure 7.

CONSTRUCTION OF CLIP-MEDIA DATA BASE



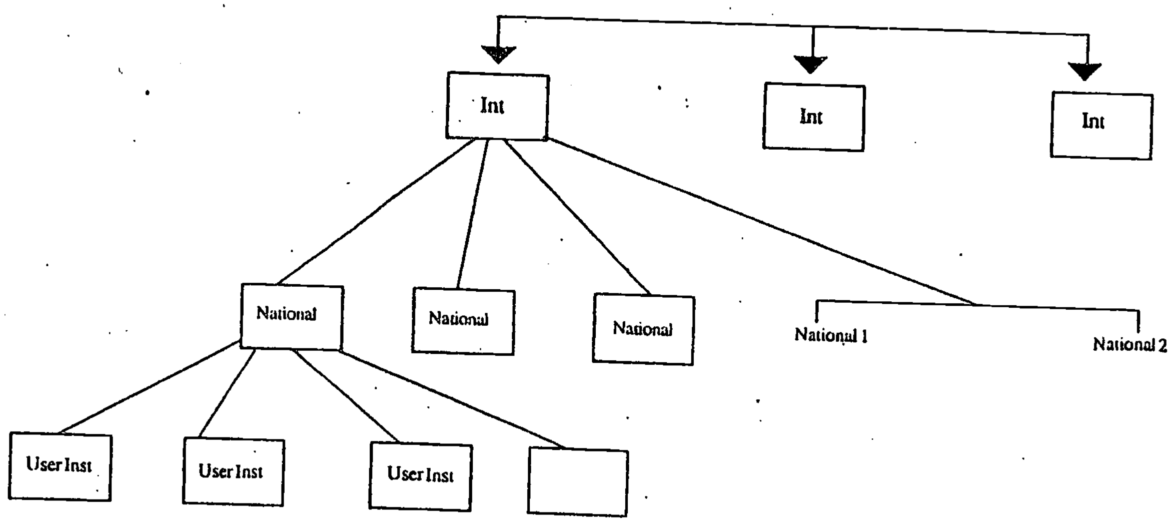
4.0 INTERNATIONAL COOPERATION

Though a number of organizations and institutions are working independently in the area of development of T/LR, there is a need for concerted and coordinated efforts as the task of producing T/LRs to support technician education system is a tremendous one. A coordinated and cooperative effort in the development and dissemination of T/LRs at the regional or international level will help in the speedier development of instructional resources and make them available at nominal costs to the most needy countries. This will go a long way to support the economic development of the countries. The materials will also be of immense value to continuing education programmes.

4.1 Cooperation Model

Cooperation is necessary in matters such as procuring the basic resources, creating data-base and producing T/LRs, and exchanging information and materials at the level of data-base and T/LRs.

For this, linkages between various international, national and individual groups should be established using existing electronic mail systems such as Internet and Bulletin board/windows systems. The architecture of the linkages may follow a hierarchial network to reduce traffic on the networks and to minimize the costs as shown in Figure 8. The Bulletin board/window may be set up voluntarily by an international organization. The organization must have a strong technical education base.



4.2 Coordinating Body

To orchestrate and operationalize the exchange and sharing of information, there is a need for a central coordinating body. Such a body could be centrally-located in the Region to facilitate such exchanges. It could serve as the clearing house and depository of T/LR materials. Other participating institutions can then link up with such centers to draw the needed inputs for their respective T/LR development efforts.

4.3 Copy Right: The concept of the data base is based on the premise that the basic clip-media resources are collected from either existing sources (video films, printed brochures, etc.) or specially produced for this purpose. If the materials are included in the clip-media data-base, they will be used freely by developers of T/LRs. Hence, it is essential to take copyright clearance, where required. Instead of clearing of copyright on a case to case basis, one identified international organization could take up the responsibility for obtaining necessary copyright clearances. This could be a major function of the Coordinating Body.

References:

1) **Jiro Yoshio:** " A Study on Problems and Issues of the Technical Education in the Colombo Plan Regional Countries."

Bulletin of Tokyo Gakugei University - 1982

2) **Jiro Yoshio:** " A Study on Problems and Issues of the Technical Education in the Colombo Plan Regional Countries:

Common problems and Specific problems "

Journal of Technical and Vocational Education - 1992

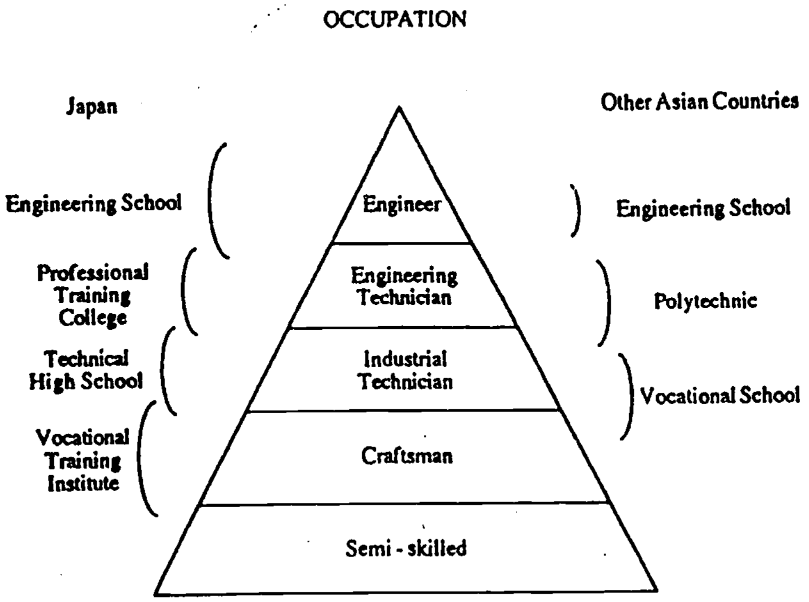


Fig-1 OCCUPATIONAL CATEGORIES AND EDUCATION & TRAINING

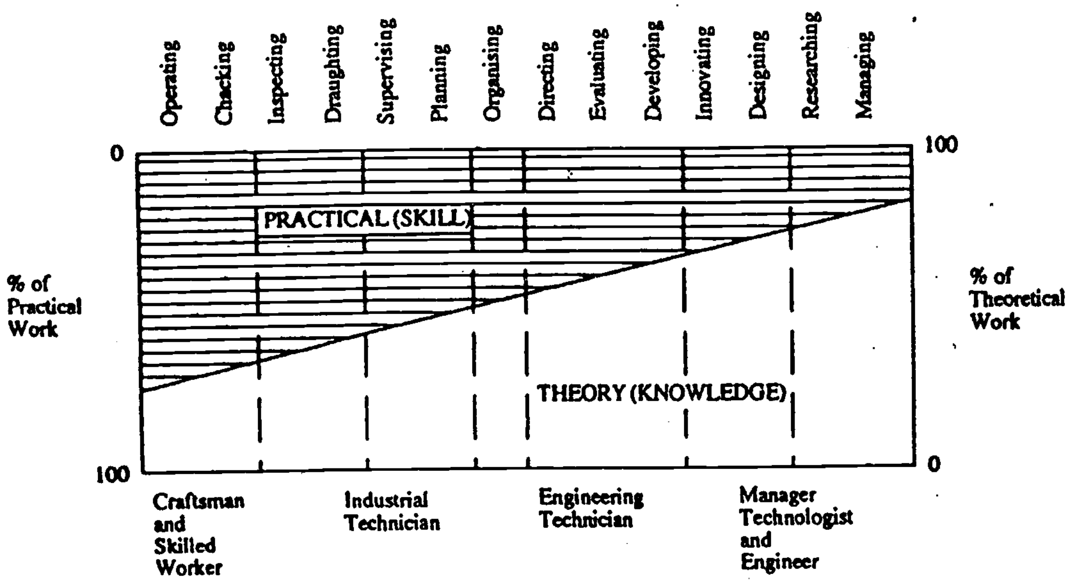


Fig-2 Activities and Knowledge / Skill mix of Different Occupational Categories

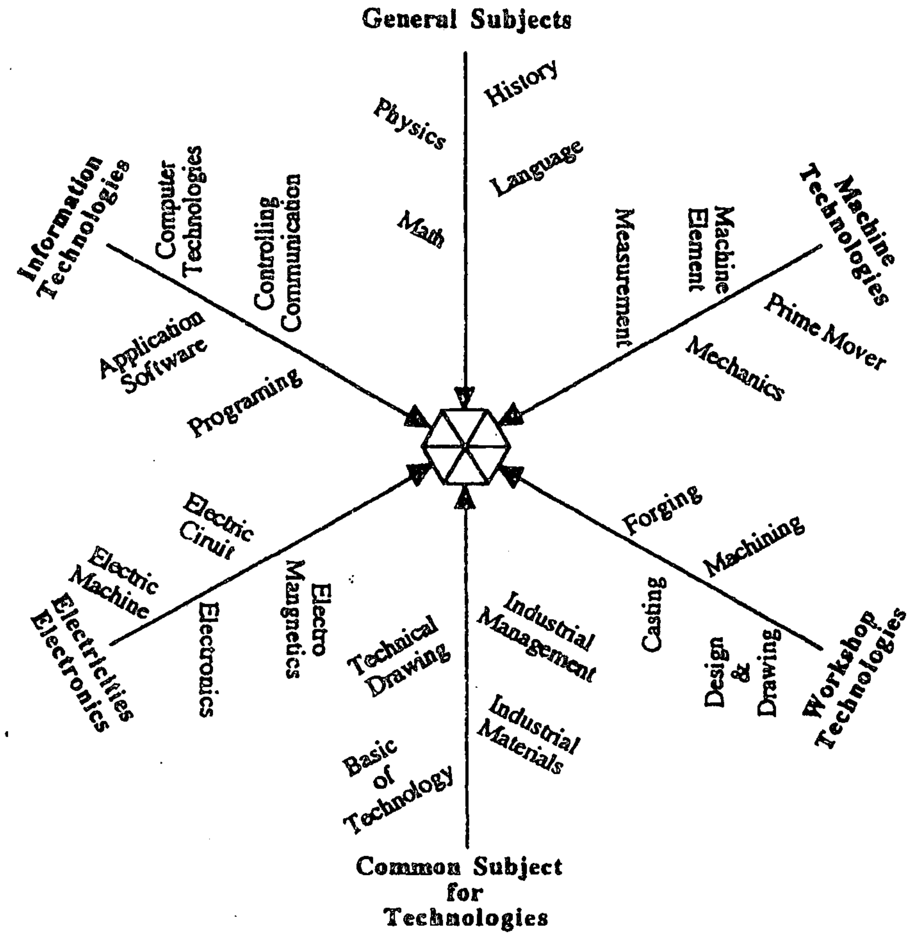
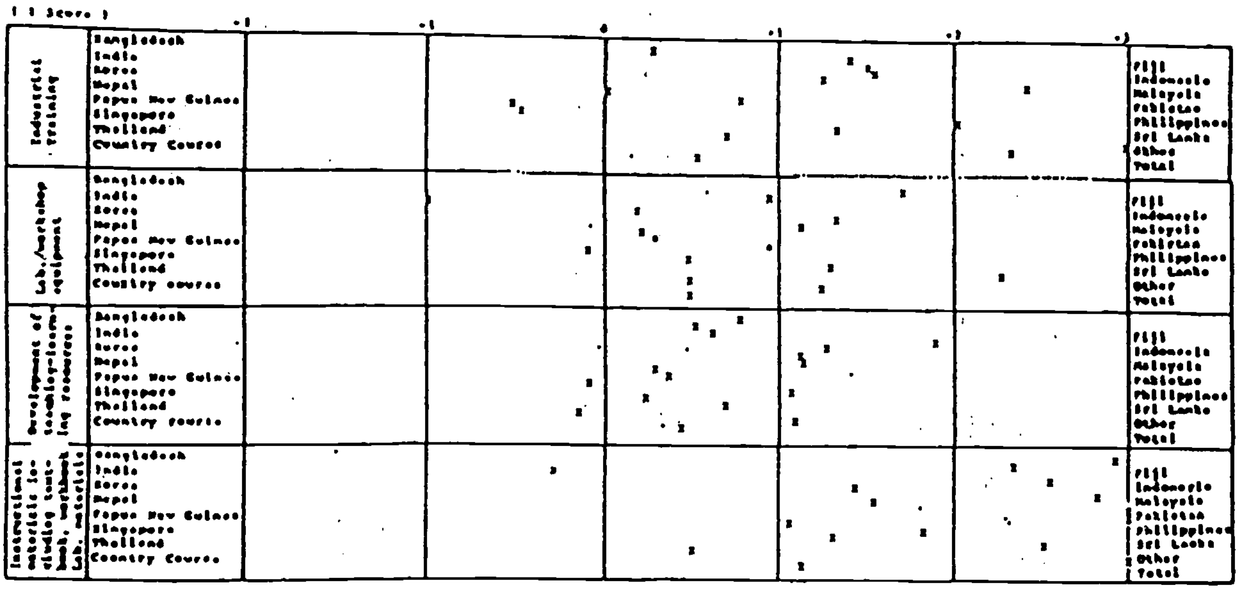


Fig-3 BROAD AREAS OF STUDY IN TECHICAL HIGH SCHOOLS

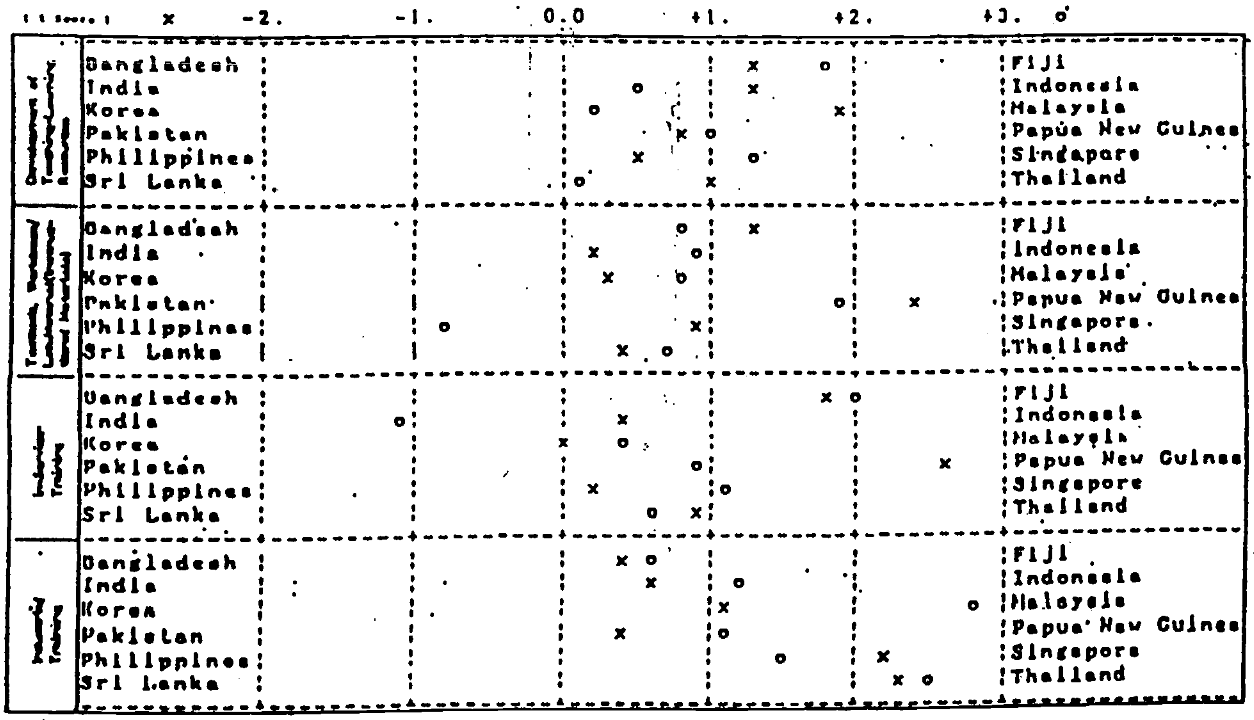
Fig-4 A SCHEME OF TECHNICIAN DEVELOPMENT

Z-Score Graph 1)



Jiro YOSHIO;"A Study on Problems and Issues the Technical Education in the Colombo Plan Regional Countries" Bulletin of Tokyo Gakugei University. 1982

Z-Score Graph 2)



Jiro YOSHIO;"A Study on Problems and Issues of the Technical Education in the Colombo Plan Regional Countries: Common problems and Specific problems"
The Journal of Technical and Vocational Education. 1991

Fig-5 THE PROBLEMS OF TECHNICIAN EDUCATION IN COLOMBO PLAN REGIONAL COUNTRIES

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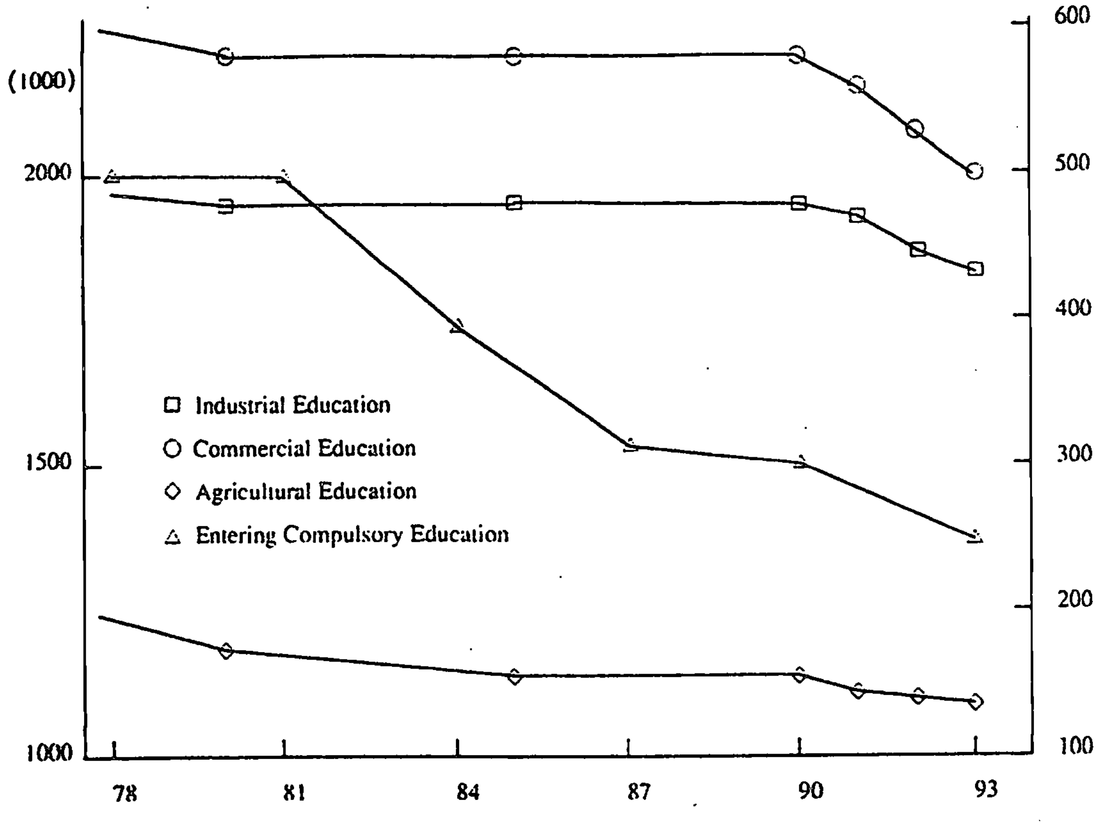
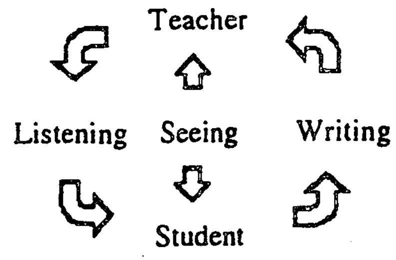


Fig-6 DECLINING OF STUDENTS POPULATION IN JAPAN

- Listening and Writing



- Question and Answer

  Promoting discussion

  Providing Excercise

  Asking Question

  Ensuring plenty of Practise

  Supply "Fill-in." summary

Fig-7 Interactive Study

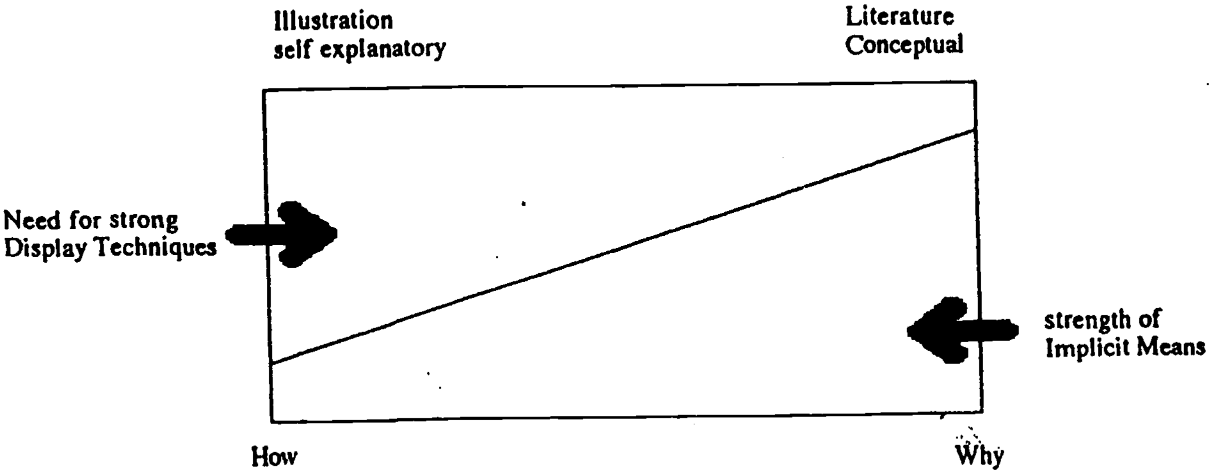


Fig-8 Types of Medium

```
(A) Printed Resources
  - Text Book                 |-- Information Sheet
  - Work Book                 |-- Operation Sheet
  - Hand Out -----------------|-- Job Sheet
  - Supplement                |-- Laboratory Sheet
  - Wall Chart                |-- Assignment Sheet

(B) None Printed Media
                              |-- Overhead Transparency
  - Projected Media ----------|-- Slides and Filmstrips
                              |-- Films and Video
  - Audio Media

  - Non-Projected Media ------|-- Chald & Board
                              |-- Chald & Flipchart
                              |-- Felt board/Magnetic board
                              |-- Medal & Actual Objectves

(C) Multi Media --------------|-- CAI
                              |-- Clip Media
                              |-- Hyper Media
                              |-- Simulation & Game
```

Fig-9 TEACHING AND LEARNING RESOURCES

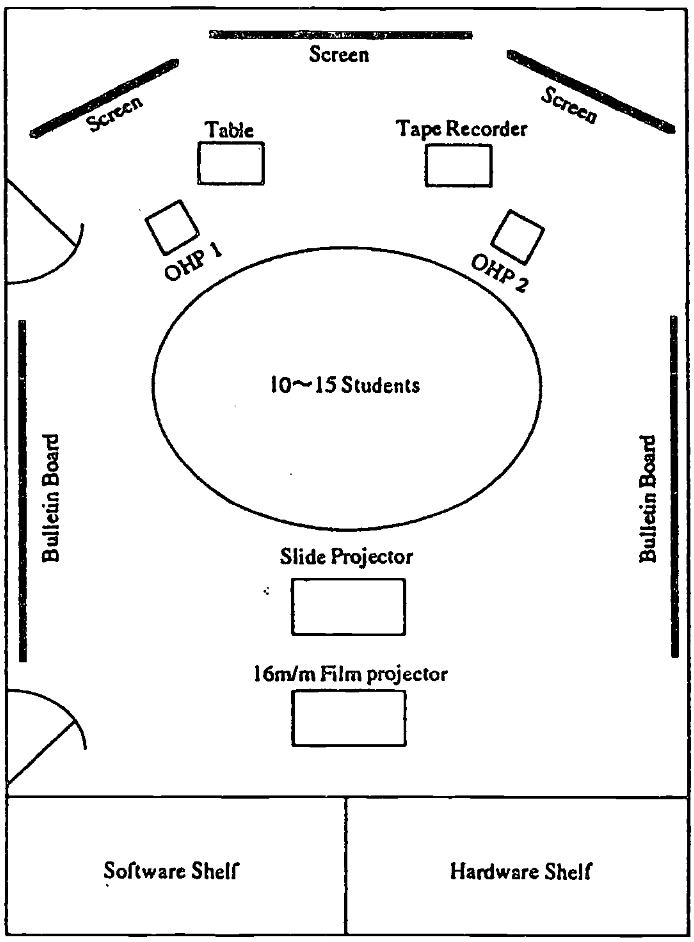


Fig-10 AN EXAMPLE OF WELL EQUIPED LECTURE ROOM IN MICHIGAN

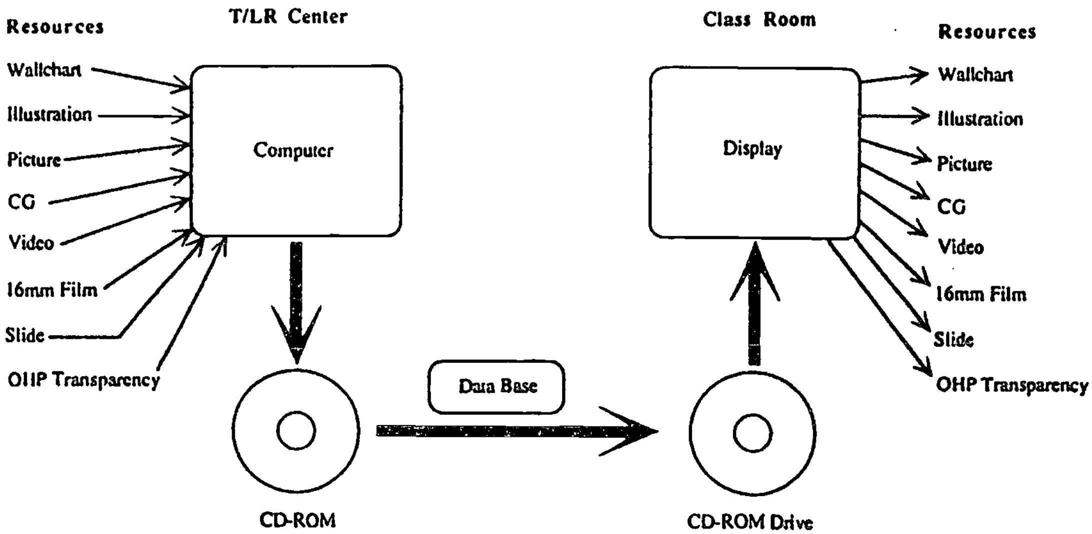


Fig-11 DEVELOPMENT OF T/LRs USING COMPUTER

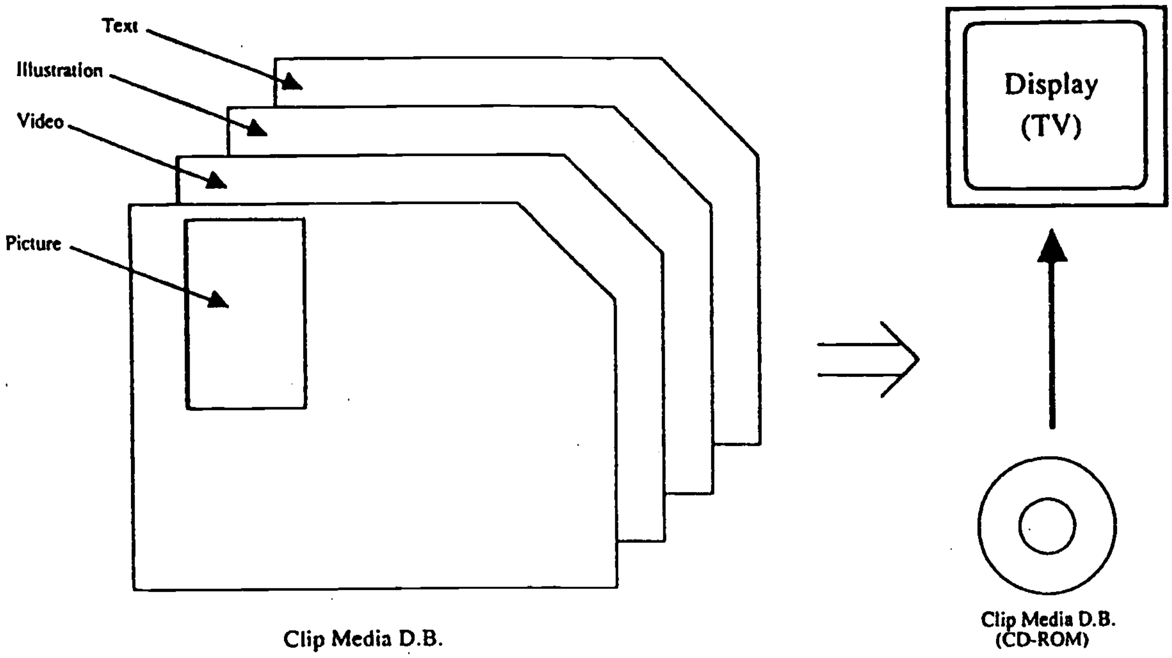


Fig-12 A CONCEPT OF CLIP MEDIA DATA BASE

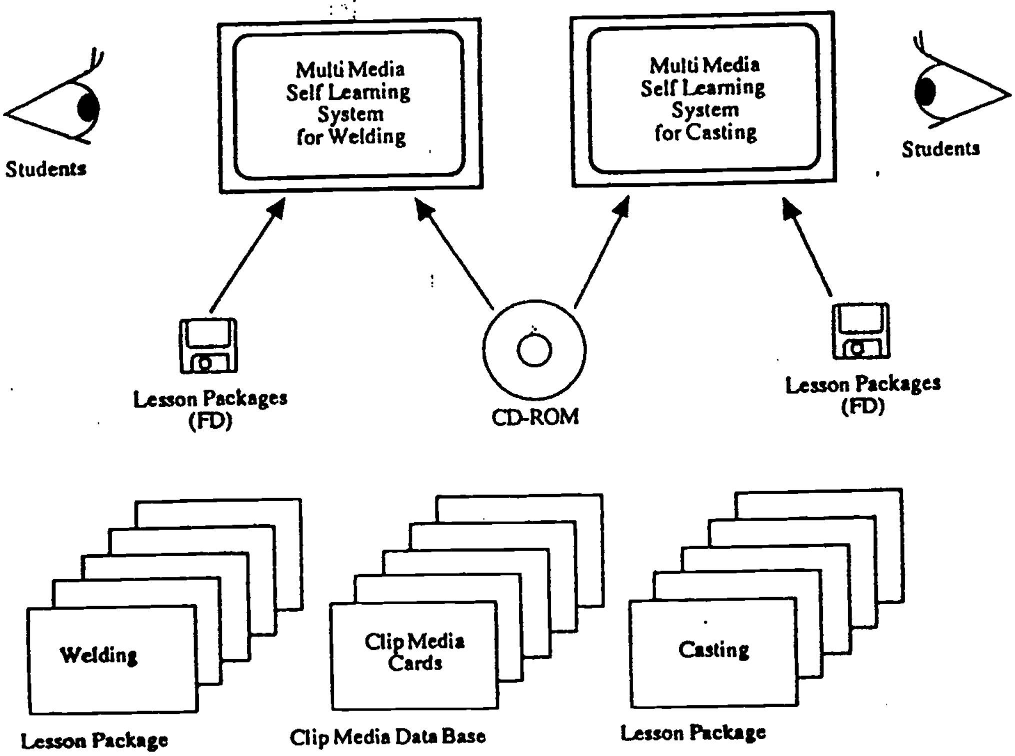


Fig-13 ACONCEPT OF SELF LERNING SYSTEM

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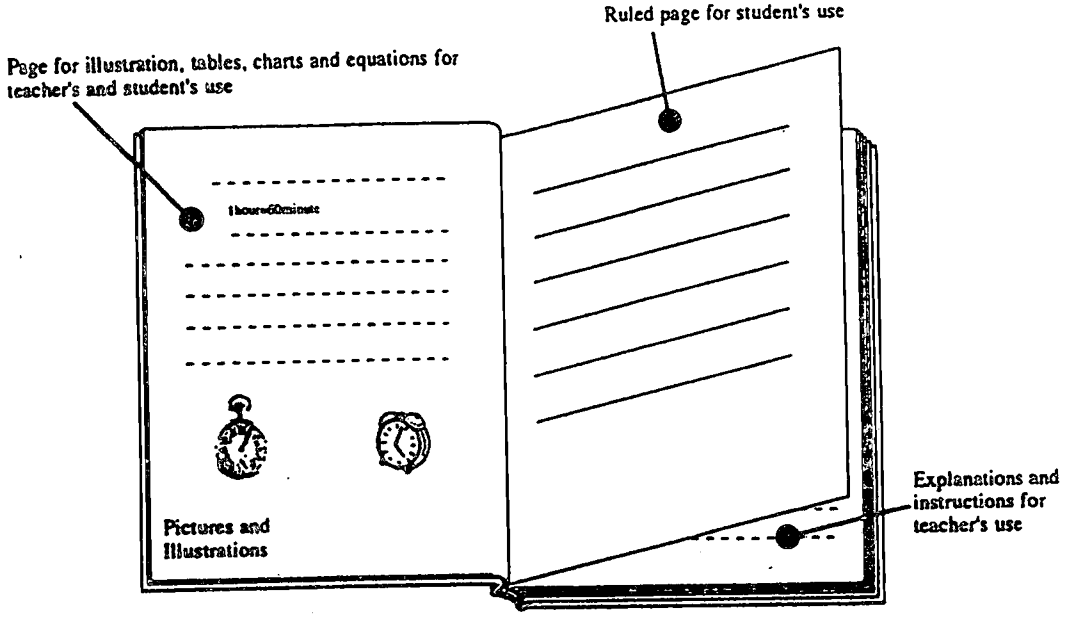


Fig-14 Pictorial Workbook

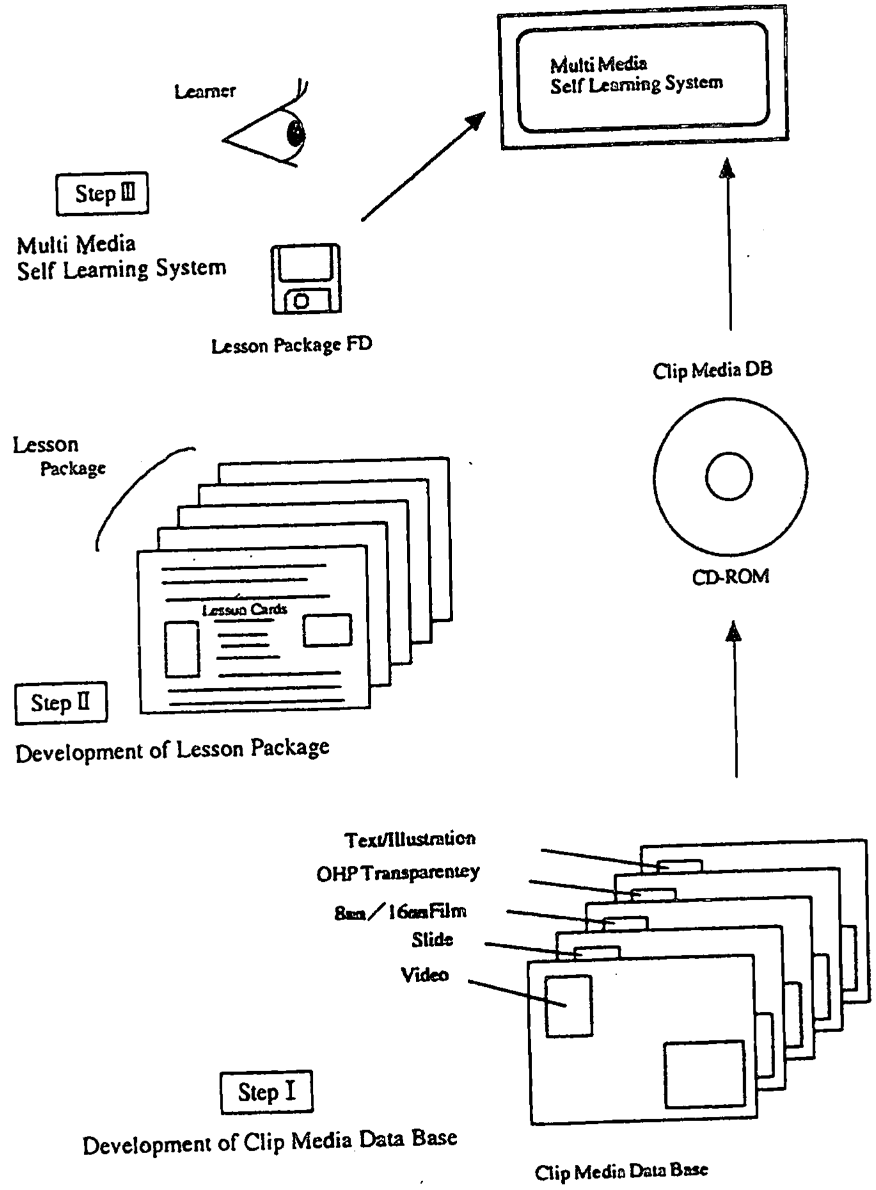


Fig-15 STEPS OF T/LRs DEVELOPMENT

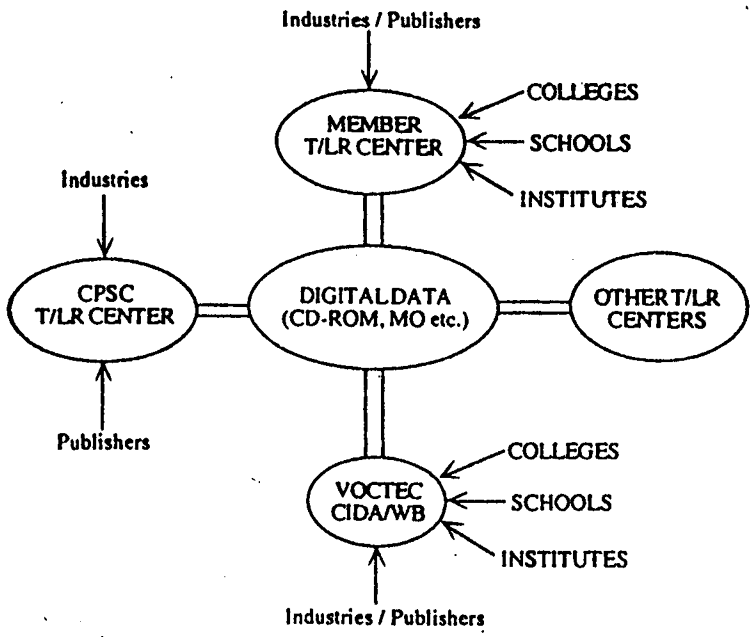


Fig-16 A SCHEME OF COLLECTION OF CLIP MEDIA

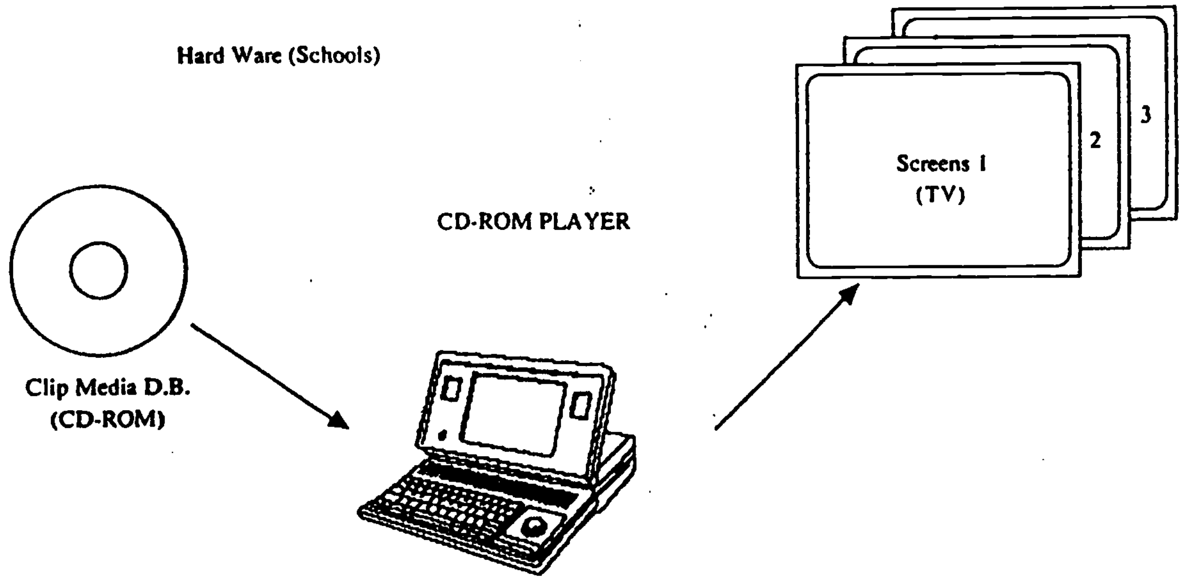


Fig-17 A USE OF CLIPMEDIA DATA BASE IN SCHOOL

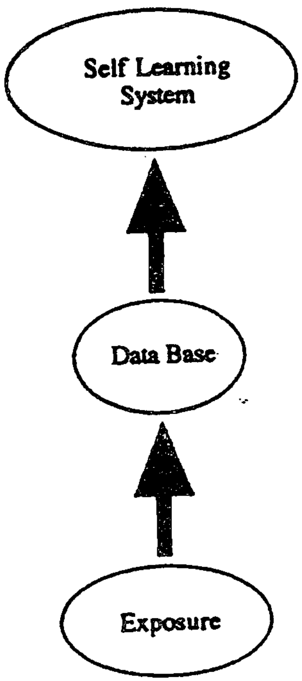


Fig-18 FLOW OF TRAINING PROGRAMMES FOR T/LRs DEVELOPMENT

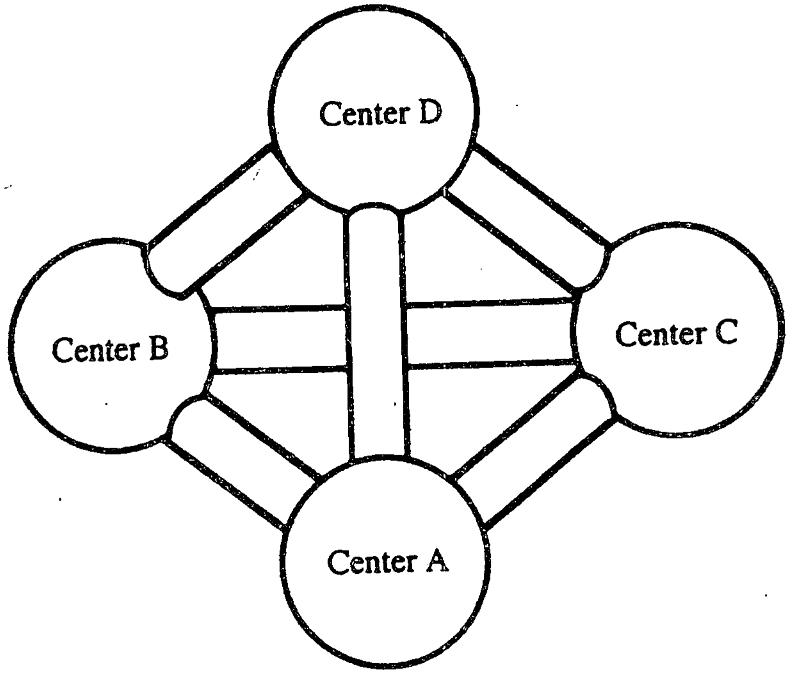
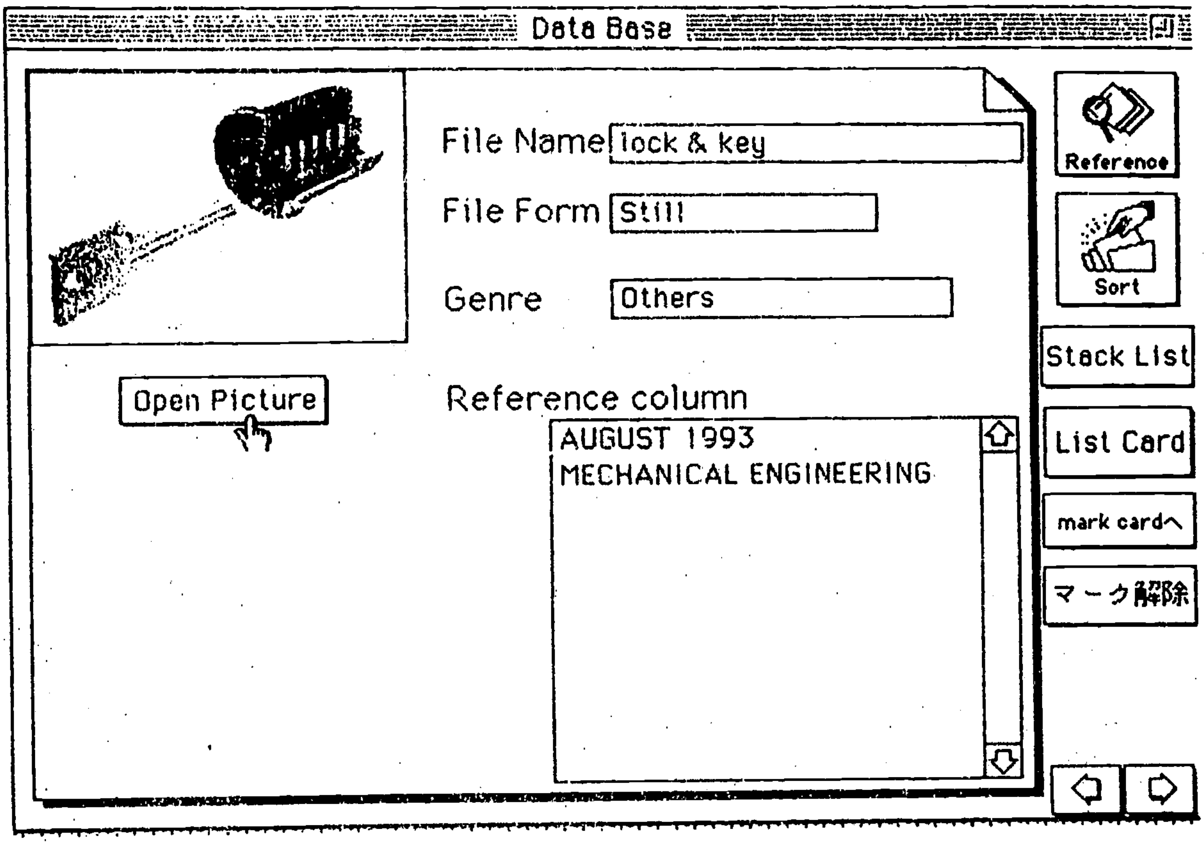
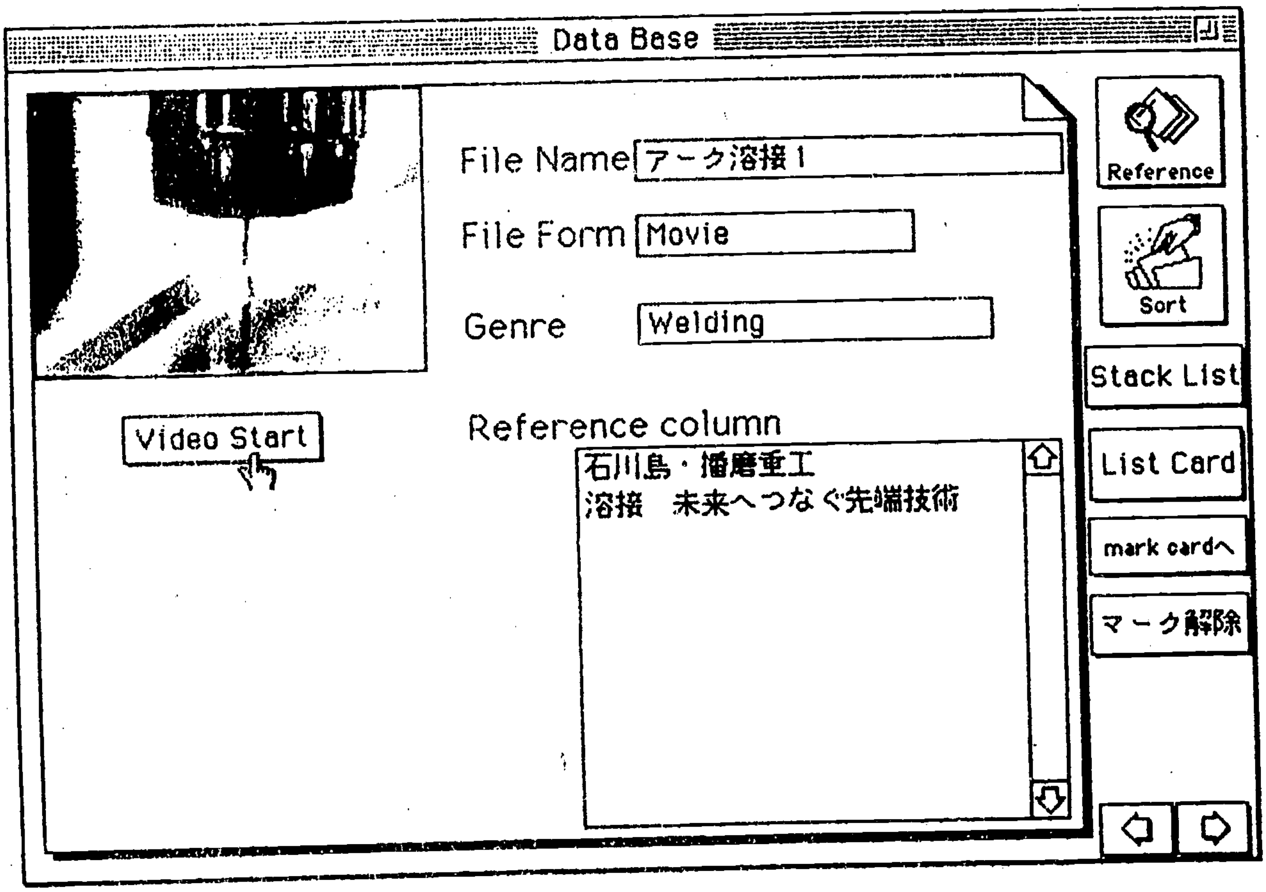


Fig-19 INTERNATIONAL CONSORTIUM

1) Picture (Lock & Key)



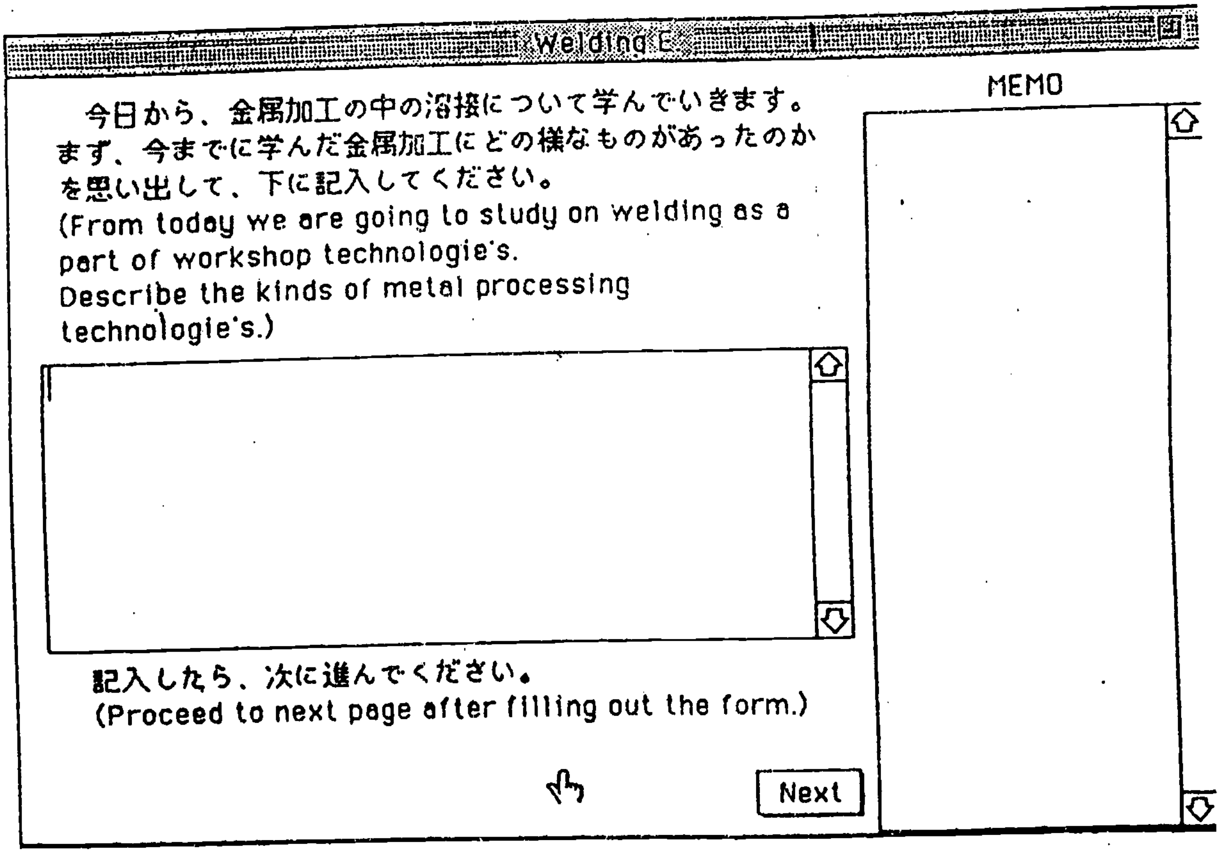
2) Video (Arc Welding-1)



Card-1 CLIPMEDIA CARDS

1) Cover

2) Introduction



Card-2 LESSON CARD

An International Expert-Group Meeting on

New Technologies of Training for Technical and Vocational Education

Manila, Philippines, 03 to 07 July 1995

NEEDS OF INTERNATIONAL COOPERATION FOR DEVELOPING T/LRs USING COMPUTER

By: *Jiro Yoshio*

organized by

United Nations Educational, Scientific and Cultural Organization
Paris, France

International Training Centre of the ILO
Turin, Italy

Colombo Plan Staff College for Technician Education
Manila, Philippines

NEEDS OF INTERNATIONAL COOPERATION FOR DEVELOPING T/LRs USING COMPUTER

by Prof Jiro Yoshio
Tokyo Gakugei University

Introduction

Technician education in the Asian countries is faced with many problems. To identify the problems and issues confronting technician education in the Asian countries of the Colombo Plan region, this writer conducted two survey studies on behalf of the Colombo Plan Staff College in the 1980's. The respondents clearly indicated that the major problems facing technician education in the region were the *shortage of teaching and learning resources* and *the inadequacy of teachers' competency.*

In an attempt to address some aspects of these identified problems, this writer developed a model for **clipmedia database** with a self-learning system which he demonstrated in various occasions in different agencies that are concerned with the development of T/LRs using computers and with programs on T/LRs development. In developing the clipmedia database, it is necessary to collect a large variety of information and materials since each lesson in technical and vocational education requires specific T/LRs to meet the level of the students and the scope of the area of study. Hence, it is essential that these T/LRs must be developed by technician teachers themselves.

Problems

It is very true that the teaching and learning resources (T/LRs) play a very important role in accomplishing the objectives of technical and vocational education and training (TVET). The recent advances in computer technology and the accessibility of computer hardware and software offer a solution to the problems faced by TVET in the region. It is feasible now to develop T/LRs in an efficient and cost-effective manner through the use of computers technology. It is regarded that the most effective T/LRs for TVET are those with multimedia features.

Unfortunately, various information show that even now the situation has not yet changed since the beginning of the 1990's. Technical and financial constraints impose severe limitations on the development and dissemination of vital T/LRs. In the past, providing such a variety of T/LRs was difficult since all the hardware and software were expensive and required special training. There are some discussions to use computers for developing T/LRs in the countries in the region but there are some limitations on the implementation of this development. Budget constraints affect the operation and maintenance of equipment. However, advances in computer technology have changed and compared to the costs of T/LRs materials developed in traditional ways, the costs of T/LRs materials developed using computers are much less.

The development of T/LRs for technician education is an enormous task. However, the market segment is too small to attract commercial companies or establishments to undertake this activity to collect clipmedia and set up a database. It cannot be done by a single institution or even by a single country. It demands the cooperative efforts of many countries. The task of developing and disseminating computer-based T/LRs could be undertaken with international cooperation.

Projects

To solve the problem on the *shortage of teaching and learning resources*, several projects have been launched in the member countries. The objective of the projects is to develop T/LRs using computers.

The advantages of using computers in T/LRs development are described as follows:

1) *Cost Performance*: The costs of equipment, the production process and the media are less expensive when using computers than when using conventional equipment for the development of T/LRs. Further, the maintenance and operation diversity are reduced in the case of computers and thus, greatly reducing the costs.

2) *Ease of Handling*: Since most software come in the form of CD-ROM, MO media, the media is more flexible, easier to handle and operationally simple compared to the other conventional forms of instructional resources. It is also easier and less expensive to send digital data over long distances in this media than through either mail or on disk. The media is hardy, cannot be corrupted and can be handled by an individual with minimum training.

3. *Effectiveness*: Technician training requires a variety of instructional resources depending upon their appropriateness to a situation. Since all the forms can be stored on CD-ROM, all that the teacher has to do is to put the materials available on CD-ROM in appropriate sequence according to the needs of presentation. As a result, the teacher can prepare instructional materials that fit into the contents of his lecture.

4. *Efficiency*: After the establishment of the clipmedia database, the preparation of the instructional materials for lesson is very efficient as it consumes much less time and effort to produce the courseware. Further, the production can be undertaken by any teacher, even those with no formal background in computers.

5. *Sharing and Dissemination*: The sharing and dissemination either of the database or the instructional resources are easy as they are both in digital form.

6. *Cooperation*: Considering the magnitude of the tasks, it is very important that there be cooperation at the national and international levels to set up that large databases and also to develop and disseminate instructional resources. This cooperation is possible only because the data is available in digital format.

But in reality, most projects are offering only computer literacy type courses for T/LRs development without the total picture of the potential for the use of computers in developing and using T/LRs.

Since computer technology is quite new and since people have different views of computers, to make the project of T/LRs development a reality, it is necessary to prepare an appropriate strategy. The most appropriate steps to carry out the project would be: (1) exposure about the development of T/LRs using computer; (2) clipmedia database construction and (3) multimedia self-learning system.

7. *Exposure (Exploratory Experiences)*: Since teachers are not familiar with developing T/LRs using computers, there is a need for them to be exposed to the process of development of T/LRs materials using computers. They also need an exposure to the kind of hardware and software environments needed to produce the T/LRs and to use the T/LRs. Most people would have to observe the actual way of producing T/LRs using computers.

8. *Clipmedia Database (Instructional Materials)*: When teachers instruct students, they explain the subject matter contents showing illustrations, pictures, graphs, video, photos, etc. But in most cases, it would be very difficult for the ordinary teachers to prepare and use such diverse materials. Howeverm if teachers use computers for preparing such presentation, it would be much easier. For instance, the teacher puts almost all the T/LRs into a database and can project the desired materials on screen of either the computer or a TVE set.

9. *Self-Learning System (Teaching and Learning Package)*: After the database is developed, it is possible for a teacher to make a self-learning system. What teachers should do is to make an action plan o fhis teaching. Based on the action plan (learning package) for his lecture, the teacher compiles the learning package from the database, using the learning package and the students would be able to study by themselvesin multimedia environment.

To get better understanding of national leaders for developing T/LRs using computer, this writer produced some examples of T/LRs (clipmedia database[3]) and self-learning system[4]) which were developed using computers and were demonstrated for the national leaders of technician education in the regional countries.

The Colombo Plan Staff College for Technician Education statrted a T/LRs development project with the Japan International Cooperation Agency (JICA) assistance four years ago. So far, efforts have been at an exposure level. The participants from the member countries learned what is T/LRs development using computers. They learned how to develop such materials and what kinds of hardware/software rae needed in developing teaching and learning resources using computers. They were shown the advantages of using computers for T/LRs development, such as cost performance, ease of handling, effectiveness and efficiency, and they are shown the potential for sharing and disseminating materials and cooperating with each other to develop more materials. The national leaders who participated in these courses are expected to set up similar training courses and facilities in their own countries.

Though it is well understood that current advancements in computer technologies have made it possible to produce effective T/LRs at an incredibly low cost, to develop T/LRs using computers involves some problems which must be overcome before countries implement a T/LRs development program in this region. This means most of the leaders of technician education in the regional countries still need exposure and understanding oc concepts of developing T/LRs in using computers.

Need of Exposure

The participants' experience at the Colombo Plan Staff College indicated that there are strong needs to expose teachers and administrators in the regional countries to the potentials for producing T/LRs using computers. This is understandable because it is difficult for teachers to have a general picture of the work involved in the development of instructional resources withour becoming familiar with the hardware/software and the process of actually making the resources.

So far, the CPSC has not shown the participants any examaples of sharing materials and disseminating them (constructing databse) and the cooperation possible for developing T/LRs among concerned people and organizations using computer networking.

Ssince teachers are not used to developing T/LRs using computers, ther is a need for them to be exposed to the total process of the development of T/LRs using computer technology including the sharing and dissemination of materials.

Most people would have ot experience producing T/LRs using computers before they could fully understand how this technology would be useful to them. After observing the general features of developing T/LRs using computers, the participants of CPSC course pointed out the expected difficulties to carry out similar programs in their own countries. Analyzing the responses, it became clear that even national leaders of industrial education did not completely understand the basic concepts regarding the development of T/LRs using computers. It is understandable because computer technologies are rather new, and most people are not familiar with them yet.

To establish a firm base of development program for T/LRs using computers, there need to be an active exposure of the characteristics of the development of T/LRs to the leaders of industrial education in the member countries. Therefore, it was concluded that to implement T/LRs development projects in the member countries, more exposure to the development of T/LRs using computers is essential.

Need for International Cooperation

A large number of teaching and learning resources are required to support technical and vocational education because of the size and technologies involved and the development time for each of the resources is considerably long. Currently, a number of schools, institutions and publishing companies are producing digital materials.

Considering the magnitude of the tasks, it is very important that there be cooperation at the national, regional and international levels to set up a large database and also to develop and disseminate instructional resources.

Though a number of organizations and institutions are working independently in the area of the development of T/LRs, there is a need for concerned and coordinated efforts as the task of producing T/LRs to support technical and vocational education systems is a tremendous one. A coordinated and cooperativeeffort in the development and disseminartion of T/LRs at the regional and international levels will help in the speedier development of instructional materials and make them available a s nominal cost to the most needy countries.

Based on the experiences of T/LRs development programs, this writer states and urges the need for coordinated and cooperative efforts to develop and disseminate T/LRs among the concerned individuals or groups, and at the national, regional or international level. For this, linkages between various international, national and individual groups should be established using existing network systems such as Internet and other means.

Lastly, the establishment of a coordinated international cooperation body is necessary to collect and disseminate materials and to obtain necessary copyright clearance for developing T/LRs.

APPENDIX D

SUMMARY STATEMENT OF EVALUATION

SUMMARY STATEMENT OF EVALUATION

(on a five point scale, between Least Satisfactory and Most Satisfactory)

No	Description	Average Rating
1.	**The Objectives**	4.53
	1.1 Achievement of objectives	4.55
	1.2 Appropriateness of objectives	4.50
2.	**Instructional Strategies & Materials**	4.36
	2.1 General organization	4.78
	2.2 Relevance of topics or themes	4.65
	2.3 Sequence of topics	4.52
	2.4 Balance between lectures and group/individual work	4.00
	2.5 Adequacy of time for group or syndicate work	4.09
	2.6 Adequacy of time for lecture or plenary sessions	4.36
	2.7 Appropriateness of exhibition/demonstration	4.00
	2.8 Quality of handouts supplied	4.59
	2.9 Quality of audio-visual aids used by resource speakers/instructors	4.27
3.	**Presentors**	4.26
	3.1 Subject matter competence	4.44
	3.2 Planning and presentations	4.27
	3.3 Effectiveness of communication	4.32
	3.4 Coverage of materials in available time	4.05
	3.5 Efficient use of time by instructors	4.09
	3.6 Level of interest and motivation	4.39
4.	**Facilities and Administration**	4.72
	4.1 Adequacy of rooms for lectures and group work	4.41
	4.2 Adequacy of audio-visual aids	4.57
	4.3 Adequacy of secretarial support	4.87
	4.4 Adequacy of accommodation	4.90
	4.5 Adequacy of meal arrangement	4.83
5.	**Personal Achievement - Meeting and Experience**	4.42
	5.1 Gain in new experiences or knowledge	4.73
	5.2 Ability to transfer gains to your work situation	4.33
	5.3 Ability to organise and conduct a similar meeting in your home country	4.24
	5.4 Your own achievement in terms of the stated objectives	4.36
	Average Rating of the Meeting	**4.46**

Overall rating on five qualitative terms as below: **Poor** **Fair** **Good** **Very Good** **Excellent**	Excellent - 65% Very Good - 35% Good - None Fair - None Poor - None

APPENDIX E

DIRECTORY OF EXPERTS

DIRECTORY OF EXPERTS

ITEM NO	INSTITUTION / NAME / POSITION	ADDRESS	CONTACT NUMBERS
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PROFILE OF SPONSORS

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UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

The United Nations Educational, Scientific and Cultural Organization (UNESCO), a specialized agency of the United Nation, was founded in 1945 with a mission to spread knowledge and international cooperation for the promotion of education, science, technology, culture, communication and peace in the world. UNESCO is aimed towards the advancement of common welfare of mankind.

As a UN organization having a global reach and a multi-disciplinary mandate, UNESCO enjoys a privileged position within the intellectual community. It has a 50-year rich experience in building networks to link individuals and institutions across continents. It can mobilize governments, agencies and centers of learning to achieve its development goals. It can marshal the talents of outstanding individuals to serve humanity.

UNESCO's programs are centered around the major areas of education, science, culture, communication, and peace. Its activities include research and training, assistance in establishing and operating institutions dedicated to education, research and cultural development; helping countries and regions formulate national policies that will achieve these goals; stimulate debate on important topics; strengthen institutional capacity for research and training; foster international dialogues and cross-cultural understanding; set international standards; provide linkages and networking facilities that enhance the work of both individuals and institutions through resource-sharing and community partnerships.

The Headquarters of UNESCO is located in Paris, France. It has also regional offices around the world. The Principal Regional Office for Asia-Pacific is located in Bangkok, Thailand. A Regional Office of Science and Technology for Asia is located in Jakarta, Indonesia.

UNEVOC, launched in August 1992, under UNESCO, is an international project aimed at developing and improving technical and vocational education. UNEVOC focuses on exchanging information, networking and other methods of international cooperation among high-level specialists in technical and vocational education. UNEVOC provides a forum where countries can discuss common or similar questions and problems they are facing, and learn from one another.

International Centre for Advanced Technical and Vocational Training

The International Centre for Advanced Technical and Vocational Training (or the ILO Turin Centre) has been a focal point for the development of human resources for over 20 years.

It was established in 1964 by the International Labour Organisation (ILO), in collaboration with the Italian Government, to provide international expertise to meet the advanced training needs of its member States.

The object of the Centre is to provide advanced technical and vocational training at various levels, primarily for the benefit of developing countries, for persons who are considered suitable for more advanced training than any they could obtain in their own countries or regions.

Although the ILO Turin Centre operates within the framework of ILO's Technical Cooperation Programme, it also collaborates regularly with UN agencies, inter-governmental and non-governmental organizations in industrialized countries, and relies on the support of organizations in developing countries to enhance the impact of its activities on development.

The Centre supplements its own facilities and resources through its close links with and regular access to industry, enterprises, academic and technical training institutions in Turin and the surrounding regions.

As improved vocational training opportunities become available in developing countries, and as new human resource development priorities emerge, the Centre continues to expand and diversify its program in response to these new challenges.

The Centre's research activities focus on the design of training programs and curricula, the selection of appropriate methods and media, and continuous evaluation and field-testing for relevance and effectiveness.

The Centre produces printed and multi-media training materials (manuals, sound / slide packages, educational films) in several languages for use in its own training activities.

As the challenge of economic development requires flexible and effective training solutions geared to fit precise personnel needs,the Centre designs a range of training responses to suit specific national requirements, and implements them using the most appropriate venues, methods and resources.

The Centre keeps abreast of the latest developments in training technology and uses many new applications in its courses and individual training programs.

COLOMBO PLAN STAFF COLLEGE FOR TECHNICIAN EDUCATION

The Colombo Plan Staff College for Technician Education (CPSC) is an inter-governmental regional institution tasked with enhancing growth and development of technician education in its member countries in the Asia-Pacific region. CPSC membership currently consists of nineteen countries of South and Southeast Asia and the Pacific, namely Afghanistan, Australia, Bangladesh, Bhutan, Fiji, India, Indonesia, Islamic Republic of Iran, Japan, Republic of Korea, Malaysia, Myanmar, Nepal, Islamic Republic of Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka and Thailand. The people from member countries served by the College constitute about one-fifth of the world population.

The College occupies a unique position in the region as it is the only regional organization that consistently addresses issues in technician education in the member countries and provides leadership in innovative training and technology transfer.

The main objective of CPSC is to improve the quality of technician education and training in the region by meeting the needs of technician education systems who play an active part in in-service training and staff development programs in the member countries. The College organizes and implements a variety of training, research & development and consultancy (TRDC) programs specifically for technician educators, key technician teachers, and teacher trainers as well as senior planning officers and administrators of technician education institutions. Each year, CPSC conducts an average of twenty to twenty-five training programs both at the College and in the member countries. CPSC also undertakes information dissemination activities to keep its alumni and network of affiliate and collaborating institutions abreast of developments in technician education and CPSC.

The College responds to emerging global trends and issues through new initiatives such as computer-based instruction and management, new technologies of training in industrial and technician education, entrepreneurship development, distance education for technical teacher training, environmental education and management, women in technical and industrial development, and agricultural/forestry technician education training.

To maximize the utilization of resources, CPSC cooperates with other key institutions and development agencies. All CPSC programs are tailor-made to suit the specific needs of the participants. Books and other instructional materials are developed, produced and disseminated as part of its continuing publications program.

In recognition of its long years of operation and experience in the region, the services of the College have been sought both by other international organizations and by the Governments of member countries to implement special programs and projects on a consultancy basis.

The College is governed by an international Governing Board composed of the ambassadors of the member countries who are resident in the Philippines. The Director of the College is the member-secretary of the Board and CEO.

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