UNESCO Initiatives in the Field of Engineering Education

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Abstract

Engineering education is an essential component of UNESCO's science programmes and it is oriented towards serving Member States on a continuous basis. After a discussion of several major distance learning programmes in the world, this paper concentrates on the status of UNESCO's current distance learning initiatives: the Satellite Universities of Science and Technology for the Arab States, Eastern Europe and Central Asia, Africa, and Central America. A final discussion concerns the role of UNESCO's International Committee on Engineering Education which provides advice to the Director-General on issues relevant to the strengthening of engineering education at the global level.

Introduction

The intention of this paper is to simply provide information on UNESCO's distance learning initiatives in the field of engineering education together with information on how UNESCO is trying to support engineering education in its Member States. We aim here at inviting engineering institutions and individuals to comment, criticize and provide feedback about these initiatives to the concerned authorities of UNESCO. Our objective is to make these initiatives as useful as possible to the world engineering community and to seek and encourage the participation and/or comments of engineering educators. Before we discuss in detail the initiatives, we strongly believe it will be essential to provide a brief background about UNESCO for those who may be in need of this information or who simply want to know more about the organization.

UNESCO

The United Nations Educational, Scientific and Cultural Organization (UNESCO) [1] was founded on 11 November 1946 on the premise that "since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed." UNESCO's constitution was signed in London on 16 November 1946 by 37 countries. The mission of the organization as defined in Article 1 of the conditions, is to "contribute to peace and security by promoting collaboration among the nations through education, science and culture in order to further universal respect for justice, for the role of law and for human rights, and for fundamental freedom which are affirmed for the peoples of the world without distinction of race, sex, language or religion, by the Charter of the United Nations." UNESCO, in 1996, celebrated its fiftieth anniversary.

UNESCO [2] is composed of the following three bodies:

- The General Conference of Member States–This is UNESCO's supreme governing body. It meets, in general, once each two years and follows the principle of one vote per country. The General Conference approves the organization's Programmes and Budget.

- The Executive Board–Is composed of 58 representatives of Member States, and meets generally, twice a year. It acts as a kind of administrative council; it prepares the work of the General Conference and is responsible for effective execution of conference decisions.

- The Secretariat of UNESCO–This is the Organization's executive branch. It is under the authority of the Director-General, who is elected for a six year term. The staff of the secretariat implements the programme adopted by the General Conference (Member States).

UNESCO consists of the following sectors:

- Education Sector (ED)
- Natural Sciences Sector (SC)
- Social and Human Sciences Sector (SHS)
- Culture Sector (CLT)
- Communication, Information and Informatics Sector (CII)

The Natural Sciences Sector comprises the following Divisions:

- Division of Basic Sciences (SC/BSC)
- Engineering and Technology Division (SC/EST)
- Bureau for Coordination of Environmental Programmes (SC/ENV)
- Division of Earth Sciences (Secretariat of ICCP) (SC/GED)
- Division of Ecological Sciences (Secretariat of MAS) (SC/ECO)
- Division of Water Sciences (Secretariat of IHP) (SC/HYD)
- Policy Analysis and Operations Division (SC/PAO)
- Coastal Regions and Small Islands Unit (SC/CSI)
- UNESCO Intergovernmental Oceanographic Commission (IDC)

Samples of Major Programmes

Education for all throughout life–A cluster of activities under the programme designed to renovate education systems to make lifelong education accessible to all. Examples of sub-programmes include:

- Educational strategy for the twenty-first century
- Renovation of general secondary and vocational education
- Higher education and development

The Sciences in the service of development–The activities of this programme provide support to the Member States in the fields of higher technical and scientific education and also in the application of these sciences in research and development. Examples of sub-programmes

include:

- Advancement, transfer and sharing of scientific knowledge for socio-economic development
- Earth sciences, earth system management and natural hazards
- Man and the biosphere programme (MAB)
- Hydrology and water resources development in a vulnerable environment
- UNESCO Intergovernmental Oceanographic Commission

Communications, Information and Informatics – The activities of this programme are geared to promote the free flow of information, freedom of expression, press freedom, media independence and pluralism. Examples of sub-programmes include:

- Access to information and new technologies
- Development of communications
- Development of libraries, archives and information services
- Development of informatices and telematics applications

UNESCO Clubs

UNESCO clubs [3] are groups of people of all ages and social and professional backgrounds who share UNESCO's ideal and endeavor to make it known and associate themselves with its work by undertaking activities directly inspired by those of the organization.

The UNESCO Associated Schools Project

This project was launched in November 1953 to promote education in schools for international understanding and cooperation. The main purpose is to encourage educational institutions at all levels to organize special programmes designed to increase knowledge of world problems and develop international understanding of other peoples and cultures, and to strengthen understanding and observance of the principles of human rights.

UNESCO's Budget

UNESCO's budget is composed of the obligatory contributions from Member States and the extra-budgetary funds which are contributed mainly from other international organizations and individual Member States earmarked for the execution of specific projects. For example, the budget from 1994–1995 was:

- $455 million dollars as contributions of Member States
- $275 million dollars as extra-budgetary funds

The breakdown of the budget by major activity for 1994 –1995 was as follows: 36% for education; 21% for basic and natural sciences; 16% for culture; 10% for communications, information and informatics; 9% for social sciences; and 8% for interdisciplinary programmes.

Summary of Key Figures

- 186 Member States
- 2352 Headquarters and Field Staff
- $554,367,250 Budget for 1998–1999
- 4748 Associated Schools
- 395 Associated Non-governmental Organizations
- 5400 Clubs, Associations and Centres

Distance Learning

Distance education systems have proved to be very efficient and cost effective and are in use in advanced and developing countries. Several of these systems have been in place for several decades. UNESCO has assisted many countries from its Member States to establish their distance education facilities and there are now hundreds of educational organizations all the world using distance learning processes of which the following may be described:

- The UK Open University [4] was established in 1969. It was the first, and remains the most well known, open university in the world. It offers both undergraduate and post-graduate courses in various fields including science and technology and awards degrees such as the BA/BSc. The university is based on an open door policy and there are no academic entry qualifications. Presently, the Open University claims about 200,000 students taking courses and some of these students are outside the UK mostly in European countries and the Sudan. The university employs a large number of highly qualified university personnel, tutors and administrators. There are about 800 fully qualified staff involved in the production of high quality course materials. The Open University ships some of the educational materials on the basis of license fees to requesting countries in Europe, Japan, China and others. Fifty-six percent of the funding for the Open University comes from the government, thirty-five percent from tuition and nine percent from other sources. In terms of the quality of teaching, the National Scheme for assessing quality of teaching in universities, has assessed nearly seventy universities and only fifteen have received a score of excellent. The Open University is one of them. In 1997, the OU quoted 124,946 undergraduates, 25,000 post-graduates and 25,000 international students.

- The Stanford University instructional television network [5] was established in 1964. It offers more than 200 televised courses to over 2000 students most of whom are employed by sponsoring organizations. Most of the students are working towards the M.S. in various engineering disciplines or taking non-credit short courses. Stanford University has strong working relationships with many industries in the Silicon Valley. The University has 250 corporate partners and is the largest single university provider of televised graduate engineering courses in the world. The system is operated by a team of professionals. The University awards the same degree as those on-campus receive although there is a surcharge on tuition for off-campus distance learning students. Stanford's revenue is about $14 million per year.

- The University of Maryland's instructional television system [4] was established in 1976

and began broadcasting in 1980. It produces high quality courses and uses sophisticated communications systems. Lectures are transmitted five days a week live and interactive from 8 am to 10 pm. The system of the university is operated by a team of full-time technicians and educators. Most of the students are part-time, from the full-time working employees of neighboring high tech companies such as IBM and government agencies such as NASA. The University offers high quality graduate courses leading to Master's degrees in engineering, computer science and management. Majors include aerospace, civil, electrical, mechanical, environmental, reliability and systems engineering, electronic materials, fire protection and others. In the area of lifelong learning the University offers a variety of courses to keep the professional at the top of their field in such areas as computer science, engineering, management, networking/communications, science and technology, telecommunications, etc. These courses are usually prepared and delivered by faculty members. Standards are high for admissions. Students must have the normal high level of academic achievement before admission. Fees are comparable to on-campus students but modest support service fees are charged.

- The National Technological University [6] is a private, non-profit institution formed in 1984. It consists of a satellite television network of 51 leading universities in the United States. NTU offers courses in many engineering disciplines leading to certificates and thirteen M.S. degrees as well as an International MBA. All courses are offered through the satellite television network or over the Internet and originate at the participating universities. NTU is the largest university in the world using satellite delivery as its educational process. Telecasts are received not only in the U.S.A., southern Canada, northern Mexico, but throughout the Asia Pacific region, as well. NTU annually broadcasts about 25,000 hours of telecasts. NTU has awarded over 1300 M.S. degrees since its inception and currently has about 1200 students admitted into degree programs. The NTU educational policy is oriented to bringing knowledge to the workplace. A major part of its students are engineers employed by high-tech industry such as Hewlett-Packard, IBM, Motorola, etc. NTU is accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. The admissions requirements at NTU are similar to the academic admissions conditions of traditional engineering institutions. The courses are generally produced by the participating universities and they are of high quality. NTU has established good relations with many universities in the world and also with the agencies of the United Nations systems such as UNESCO.

There are many other facilities in the U.S. using distance learning in their educational processes. They mostly use correspondence courses but many are moving towards using the World Wide Web and the Internet. A number of institutions are experimenting with asynchronous learning networks (ALN) that promise learning any time, any place. Only time will tell how successful this experiment is.

Other Open Universities

In the Arab States there are at least three open universities currently operating: Cairo Open

University in Egypt, Al Quds Open University in Palestine, and Tripoli Open University in Libya. There are plans to develop a new open university for the entire Arab region called the Arab Open University [4].

In Asia a number of other open universities are operating: Indira Gandhi Open University in India, Universitas Terbuka in Indonesia, Allama Iqbal Open University in Pakistan and the Housou Open University in Japan. Korea and Taiwan also have open universities.

Australia and Canada also have open learning programmes. And the largest university in terms of students in Israel is an open university.

Distance Learning in Africa

There are a few universities and facilities in Africa [7] engaged with the production of courses using distance learning. For example, distance education has existed in South Africa for a number of years primarily through correspondence courses but technology is now being used. The University of South Africa was established as a federation of colleges in 1916 although its roots can be traced back to the founding of the University of the Cape of Good Hope in 1873. In 1966 it became a full fledged correspondence university. It engages in teaching, research and community service. Distance courses provided were mainly limited to humanities but it also provides distance learning courses leading to degrees in mathematics, life and physical sciences, but not engineering. Vista University provides diploma courses serving school teachers and residential diploma courses to pre-service teachers. It had about 2100 enrolled teachers in 1992. Technikon SA is the main provider of degrees at national diploma level. About 7% of these are in the fields of science, engineering and technology. Technisa is a technical college which uses the medium of correspondence courses. It has about 7000 students taking 12000 subject enrollments in the department of engineering studies (mechanical, electrical, building, mining, woodwork and drawing, mathematics and science). There is no opportunity for practical work because Technisa has no laboratory or workshop facilities and this situation is common at many of the residential colleges. In addition to the South African distance learning system, an open university is in place in Tanzania.

Distance Learning in Europe

We have already provided some information on the UK Open University. However, it is useful to mention that other countries also have open universities such as the Netherlands, Germany, Italy, and EuroPACE in Belgium. One of the more interesting is the program in Italy which also serves Albania.

NETTUNO [8] is a consortium of universities and companies promoted by the Ministry of the University and Scientific and Technological Research. The consortium sets out to arrange distance learning courses on the principle of "if you would like to, but you cannot go to university, a solution is at hand, the University will come to you." With NETTUNO, the distance University Network, university-level courses are now available for those who work, those who want to study at home and those who want to obtain a diploma conferred by state universities.

The founding members of the consortium consists of polytechnics and high-tech companies, of which the following may be mentioned: Milan Polytechnic, Turin Polytechnic, the University of Naples "Federico II," the RAI Corporation, Confindustria, IRI and Telecom Italia. Among the ordinary consortium members is the Distance Teaching National Centre of Tirana, set up by eight Albanian universities.

NETTUNO courses are produced by teaching staff members in participating universities and polytechnics. All diploma courses are video recorded and broadcast by RAIDUE from 2:50 am to 6:45 am and around the clock by RAISAT NETTUNO through the EUTELSAT-Hotbird 2 satellite. Diploma courses in engineering are offered in the fields of computer science engineering, telecommunications engineering, electrical engineering, electronic engineering, mechanical engineering and logistical and production engineering. It takes three years to obtain a diploma in engineering. In three years, NETTUNO has produced 180 engineering video courses spanning over 7,200 hours. Diplomas are also offered in economics and business administration. In these two fields, 180 video courses are being prepared.

From the aforementioned survey of operational distance learning programmes in many countries all over the world the following can be extracted:

- Distance learning is used in several developed and developing countries and it is being accepted.
- Distance learning programmes started in humanities but, little by little, science, engineering and technology have been added.
- Due to the advancement of technology, the distance learning process is changing from a text-based correspondence programme to a programme delivered by video and the Internet.

As a result of this short survey we could say that the distance learning concept is feasible, in use and in increasing demand. It will probably form a major educational system of the twenty-first century.

UNESCO, as part of its mission, always attempts to use the latest developments in technology in the educational systems of its Member States in order to be responsive and in a position to properly advise its Member States. For this purpose, UNESCO formed the International Commission on Education for the Twenty-first Century [9]. The following quotation was taken from the Commission's report to UNESCO

> "The progress of the information and communications technologies should give rise to a general deliberation on access to knowledge in the world of tomorrow. The Commission recommends:
> - the diversification and improvement of distance education through the use of new technologies,
> - greater use of those technologies in adult education and especially in the in-service training of teachers,
> - the strengthening of developing countries' infrastructure and capabilities in this field and the dissemination of such technologies throughout society; these are in

any case prerequisites to their use in formal education systems, and
- the launching of programmes for the dissemination of the new technologies under the auspices of UNESCO."

UNESCO initiated four educational projects based on long-distance learning via satellite delivery. These projects were satellite-based universities to be proposed to the countries in the following regions: the Arab States, Africa, Eastern Europe and Central Asia, and Latin America.

UNESCO's cooperation with the National Technological University began in 1987. A memorandum of understanding was signed in 1993. NTU has accepted, in accordance with this memorandum, to provide the technical assistance to the above mentioned project proposals. It is important to note that NTU is the largest and only university in the world using satellite television for technical education on a national, regional, and international level.

Main Objectives of the Satellite University Projects

The main objectives of the satellite university projects are:

- Improve the skills and capabilities of scientists, technical professionals and their managers by providing them with an opportunity to pursue their personal goals in the workplace through instructional courses delivered by satellite television and the Internet.

- Providing employees (engineers, technicians, managers and administrators) of industry with educational services, such as continuing education (lifelong learning) courses, at the workplace in order to update and broaden their knowledge and improve their technical capabilities and skills leading to higher productivity, higher quality output, and reasonable economic growth for the entire country.

- Encouraging and developing the creativity of both the faculty and students as the most dynamic response to a rapidly changing technological society.

- Offering selected programmes prepared by persons with outstanding qualifications and performance records to assist faculty members in the region's universities in their own professional development.

- Increasing public awareness of the importance of science and technology, through information programmes consisting of open fora and reports, and programmes oriented to the education of women and towards eradication of illiteracy, the introduction of total quality management concepts (TQM) in industry, enterprises, etc.

- Acting as support services for universities in the region in general and for universities participating in their networks in particular. These universities will also provide employment opportunities for the staff involved in the preparation, production and conducting of the programmes.

- Offering of degree granting and professional development programmes targeted at students located in a wide variety of universities and employed in the private (industrial) and public (governmental) sectors, who wish to pursue advanced degrees or who need to update and develop their knowledge and skills for their professional career growth and advancement.

Proposed Programmes of the Satellite Universities of Science and Technology

These universities will have the opportunity to use the available courses available in the market at the beginning of their operations. These courses are available for sale or hire and are produced in commonly used international languages such as English and French. However, after a certain period of operation they may start their own production of educational programmes. In this case, the following points should be carefully considered:

- Distance learning courses need significantly more preparation and detailed planning than traditional lecture courses.

- Distance courses should be suitable for this type of education which means it should be self contained and self directed.

- Methods of interacting with students and instructors should be secured. Interactivity is normally provided by the Internet, e-mail, telephone, facsimile or by the postal services.

- Materials related to information on courses offered should be well prepared and a study guide and should be provided to students to keep them motivated.

- In order to prepare a reasonable new distance course a considerable investment in time and money is required. The time-frame is from 3 to 6 months. Support staff include faculty members, instructional designers, graphic artists and video production and are essential for success.

The programmes that are proposed to be broadcast by each of these may be classified as follows:

- Postgraduate courses–These should be offered by participating universities in each satellite network and in disciplines specified by the curriculum committees in each satellite university. Generally, the offered courses will lead to a M.S. degree. It is anticipated that a detailed programme leading to a M.S. degree will be prepared in advance showing the courses which will be offered by each participating university. Degree programmes for part-time students should take three to four years; a full-time student should be able to complete a program in two years or less. Students would be employed by industries or government organizations. When a student completes the programme, the satellite university would award the degree.

- Certification programmes–These should be available in specialized disciplines for those who are interested in furthering their studies in a particular sub-discipline. The requirements of the certificate should be about one-third of a M.S. degree programme. The credits gained by the student during the certificate should also count towards a later M.S. programme if appropriate.

- Lifelong learning programmes–These relate to continuing education in various professional categories such as agronomists, educators, managers, medical personnel, in addition to engineers and scientists. Specialized programmes for women are another possibility. Lifelong learning is a prerequisite for a learning society.

- General programmes–These are designed to be broadcast as of broad interest to a large audience. Broadcasts in support of public health and preventative medicine, the protection of the environment, the eradication of illiteracy, the teaching of languages, and international scientific and technical events are all possibilities. Many other programmes could also be considered under this category.

It is important to add that a satellite university, especially those serving regions comprised of several countries, may play an important role in establishing better relations between nations and help to reduce conflicts and increase the stability of peaceful relations.

Proposed Management Structure of a Satellite University of Science and Technology

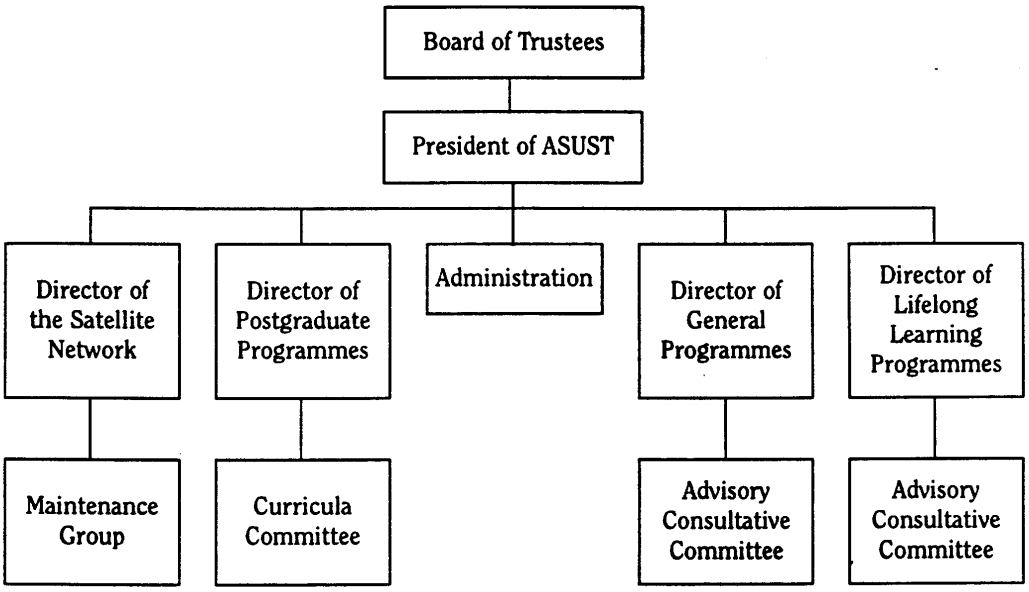

Figure 1: Proposed Organizational Structure of a Satellite University

The management structure [10] of the satellite university of science and technology should be based on a gradual growth principle, starting with the minimum number of required personnel. Part-time employees may be used at the beginning of the operation of the university. The organization chart is shown above and brief descriptions for each post follow.

Board of Trustees–The Board is composed of presidents of the participating universities, participating industrial leaders and government officials. The Board of Trustees delegates authority to the President of the satellite university. The administration and the various committees recommend academic programmes, policies and procedures to the President, who then submits these to the Board of Trustees. Once approved by the Board, these become binding. The administrators and committees manage the satellite university programmes within the framework of the approved policies and procedures.

President of the Satellite University–The President is normally appointed by the Board of Trustees and in certain cases by the President of the hosting university. The President is responsible for managing the university in accordance with the programmes and policies approved by the Board.

Director of the Satellite Network–The network director is responsible for the integrity of the network and supported by a few technicians in charge of operating the network for the benefit of the satellite network participants.

Director of Postgraduate Programmes–The director is responsible for implementing the programmes recommended by the curriculum committees and approved by the Board of Trustees.

Director of General Programmes–The director is responsible for implementing the recommendations of the advisory consultative committee on general programmes once these have been approved by the Board of Trustees.

Curriculum Committee for Postgraduate Programmes–The members of this committee should be selected by the President, and the Director of Postgraduate Programmes, in consultation with the participating universities. The committee is intrusted with curricula development, course selection, and issues relating to student admissions criteria, student and course evaluation, teaching materials, etc.

Advisory Consultative Committee on Lifelong Learning Programmes –The President of the university should decide on the composition of this committee in consultation with the participating universities. The committee is intrusted with selection of fields of lifelong learning on the basis of the region's needs and requirements, acquisition and/or the production of programmes for specific areas of lifelong learning, as well as all other related issues for this kind of education.

Advisory Consultative Committee on General Programmes –This committee should be formed

in the same way as the previous committees and be charged with selection of general programmes on the basis of quality, discipline or field supported, and cost. All selected programmes either acquired or produced should meet the requirements of the majority of members of the network.

Satellite Network–The satellite network will comprise all the members of the satellite university of science and technology with network control originating at the university's headquarters. For economic reasons, it is anticipated that the network will utilize single channel per frequency, compressed digital video signals when the network consists of multiple universities supplying courses or multiple channels per frequency if centralized broadcasting is the mode of operation. It is anticipated that KU-band will be used when possible but that C-band remains an option. The receiving stations should be under the control of the satellite university using some form of encryption when pay-per-view is required. When telecasts are to be in the open, encryption is not required. With modern high powered telecommunications satellites, very small diameter receive antennae are possible, on the order of 60 cm., depending on the receive station's location in the satellite footprint.

Evaluation of Coursework–All courses offered on the satellite network should be evaluated by all members of the receiving location. This is the only way to maintain quality control and to implement continuous quality improvement. Poor producers must be removed from the network and excellent producers must be rewarded.

Accreditation of Programmes–Once the university has officially been established and begun offering programmes, accreditation of the degree programmes should be considered in accordance with whatever rules and regulations are in place. UNESCO may be requested to provide expertise to bring the degree courses to international standards for some regions.

Costs–Satellite costs have become cheaper over time but the costs still remain high for transponder rental. Uplinking costs are still on the order of $250-300,000 per site while receive equipment has plunged in costs recently because of the small antennae now used and the commercialization of electronic digital decoders with current costs on the order of a few hundred dollars. The typical cost of a video classroom with minimal remodeling and television equipment is about $100,000. It should be possible to become a participating university for about $500,000. The cost for beginning a satellite university including equipment, transponder leasing, educational materials, salaries, etc. should not exceed $2 million dollars.

Progress of UNESCO Satellite University Projects

The progress of the four UNESCO projects to the present may be summarized as follows:

- Arab Satellite University of Science and Technology–The project brief was sent by mail to key universities and concerned authorities in Ministries of Education and to well known leading industrial enterprises in the Arab States. Ninety-eight percent of the replies were positive and encouraging. Among the institutions which have shown interest in the project was Cairo University in Egypt. UNESCO together with NTU undertook two missions to Egypt to clarify and discuss issues related to this project with

the concerned authorities in Egypt. In September 1997, UNESCO was officially informed by letter from His Excellency the Minister of Higher Education and Scientific Research of their agreement to establish this university on the premises of Cairo University. A second joint UNESCO–NTU mission was undertaken in May 1998 at the request of the Egyptian authorities, to establish an implementation programme and to highlight any other related issues with respect to beginning operations. During this mission, positive steps were taken as an agreement was signed between His Excellency the Minister of Higher Education and Scientific Research and the Nilesat Company for the leasing on an annual basis of three television channels for educational purposes. They are expected to begin broadcasting up to ten hours of continuing engineering education courses each week in early November 1998. Initially, the broadcasts will be experimental and limited to Egypt but they will expand to other interested Arab States after gaining experience and also after defining the procedures for expansion. Both UNESCO and NTU are doing their best to support this university's operation and to make this important project operational.

- Satellite University of Science and Technology for Eastern Europe and Central Asia–The Technical University of Istanbul (ITU) has indicated that it is willing to host this university on its campus. A regional meeting was organized by ITU with support from UNESCO to discuss the project and to create the national and regional networks. The meeting was attended by representatives from almost 40 Turkish universities, Azerbaijan, Bulgaria, and Romania. During this meeting a national network was agreed to be created and a nucleus of a regional network was initiated. In a later meeting, contacts with Uzbekistan and Turkmenistan were established. These countries indicated their interest in the project in a formal report. The authorities of the ITU have made considerable efforts to begin implementation of their goal by beginning broadcasting within Turkey by the end of 1998. But there are some problems which need to be settled such as negotiating with the authorities of Turksat for leasing educational television channels, defining the modalities of operating the network, procurement and installation of equipment, acquisition and/or production of educational materials, and the training of the staff who will be responsible for operating the network. In spite of these outstanding matters, they intend to be operation on a national level by the end of 1998, a rather aggressive schedule.

- The Satellite University of Science and Technology for Central America –The project was proposed by UNESCO and accepted by the Secretary General of SICA who visited UNESCO for this purpose and to request a mission to attend an organizing meeting at the Headquarters of SICA in San Salvador, El Salvador to discuss in depth issues related to this project with educators from the Member States of SICA. Based on this request, a joint UNESCO–NTU mission to El Salvador was undertaken in October 1996. The mission discussed the details of the project with the Secretary General of SICA and a team of experts from six Central American countries. During the meeting a draft project document was prepared in Spanish and translated into English. The document was to form the basis of a fund raising effort. This effort was started but has not been completed mainly due to the fact that the Secretary General of SICA completed his term of office and regular contact with his replacement was not established. However, efforts

will be intensified because there is still a chance to make this project a reality.

- African Satellite University of Science and Technology – This project was proposed by UNESCO during the international meeting entitled "*Audience Africa*," [11] which was held in Paris in February 1995 under the auspices of UNESCO. The principle objective of the meeting was to provide Africans with the opportunity to undertake an incisive examination of the whole question of development and development priorities in their continent in light of the new challenges facing the world. Audience Africa brought together Heads of States or their representatives, senior officials from bilateral aid agencies, intergovernmental organizations of the United Nations system, the Organization of African Unity, the African Development Bank, the Economic Commission for Africa and various non-governmental organizations, independent figures from civil society and sympathetic specialists concerned with Africa from the world of education, science, culture and communications. The project was adopted in this meeting and the recommendation to UNESCO, as stated in the meeting's final report, is as follows:

  > "That extra-budgetary resources should be sought from funding agencies for the creation of an African University via satellite so as to develop science and technology in the continent."

  However, due to various difficulties very little progress has been made on this project. Zimbabwe was contacted and they expressed their willingness to host this university. Unfortunately, due to lack of funds, visiting them was not possible. But there is no doubt that this university would be a very effective tool to help African nations strengthen their science and technology. Therefore, the efforts of UNESCO will be intensified to realize this project and the door is open for those who want to join or support these efforts.

The International Committee on Engineering Education (ICEE)

This committee was created by the Director-General of UNESCO to advise him on issues related to engineering education to better enable UNESCO to serve the engineering education cause in its Member States. The committee is composed of nine educators with outstanding international reputations. The main tasks intrusted to the committee are to advise on:

- Issues related to strengthening engineering education world-wide.
- Matters related to making available services of the World Wide Web, electronic publishing, and text books for staff and students of engineering institutions in developing countries.
- Encouraging use of the latest developments in technology in engineering education such as the use of satellite and the Internet.
- Issues related to the globalization of engineering education.
- Issues related to accreditation of engineering programmes.
- Other matters which may help to strengthen engineering education in the Member States of UNESCO.

The committee meets at least once a year usually at UNESCO's Headquarters in Paris. The committee members are identified and may be contacted through its Secretariat at UNESCO Headquarters in Paris or its World Wide Web site [12]. The engineering community is invited to comment, provide proposals and/or suggestions to the committee which is a forum for all educators from the engineering world community.

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