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Article 1

The Challenges of Distance Education

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1. Introduction

Education is of extreme importance as it is key to equipping the workforce with the skills needed to develop national economies. The importance is exemplified by the "Education for All" movement, a global commitment to provide quality basic education for all children, youth and adults, which links directly to the UN Millennium Development Goals (MDGs). Sustainable development of quality primary education is dependent on complementary development in the secondary and tertiary education sectors. With economies relying more and more on the generation and application of knowledge, productivity is increasingly dependent on the development and spread of technological innovation. Higher education and life-long learning are today more important to development than ever before, due to the role knowledge plays in development - "knowledge is power".

But inequalities in access to quality education are still tremendous. The situation, for example, in Sub-Saharan Africa is particularly dire. In 2000, only 5 per cent of the higher education age group was enrolled in universities compared to a world average of over 16 per cent. The problem of inadequate higher education capacity, dwindling government support, low enrollments in the secondary system and the introduction of school fees, have resulted in limited and unequal access to higher education. There is a need for large scale interventions to improve the higher education sector not only in Africa, but also in other regions, for example Latin America, Arab States, Asia and South-East Europe, if the problems of access and inequality are to be resolved.

In many countries enrolment in tertiary education is significantly lower than the norm and secondary education has expanded to the point that large numbers of qualified school drop-outs cannot get access to tertiary education. There is an unsatisfied demand for tertiary education but there are not enough institutions and trainers to train them, resulting in a shortage of qualified labour within the national economies.

Low enrolment in tertiary education is due to several factors. The first is funding. There are competing needs that governments' educational budgets have to satisfy and the relatively high unit costs of tertiary education restrict university expansion. The second is costly infrastructures, including student housing, which will increase overall university costs. The third is the lack of qualified academic staff, particularly for those areas in which there is the strongest demand from the

private sector, such as computer science. In many countries these problems are exacerbated by the dramatic effects of HIV-AIDS both in skill shortages the result of high mortality rates and in reducing the effectiveness of the workforce through morbidity.

Furthermore, there is an issue relating to the general quality of graduates from the secondary school system. Curricula that are currently in use at secondary level are often outmoded and cannot be easily modified because of a lack of funds to update teachers and produce new materials. Weaknesses in science teaching at this level hamper learning of sciences at tertiary level and (as a result) the ability of the countries in question to compete in a global world. Graduates who do not acquire the qualifications to proceed to the tertiary level do not acquire the skills required to function effectively in civil society. There are direct correlations between investments in higher education on one hand and economic growth on the other hand.

There is a great uncertainty about the changing labour market, coping with an avalanche of new knowledge, and new demands on education in both traditional and emerging fields. There is a need to provide educational services to everyone, anywhere, anytime with a focus on learning and teacher empowerment - all under conditions of an ever-expanding base of learners and limited physical and human resources to get them ready.

Economic, societal, political, and technological developments require that all members of society have a minimum level of education. The biggest challenge is to reach individuals and groups that are historically underserved, such as girls and women, groups with special needs, rural populations, and adult workers.

Lifelong learning and vocational training cannot be confined to the traditional classroom and early life training. To cope with the diversity, complexity, and changing demands for education services, delivery must extend beyond the traditional "face-to-face" teaching. It needs to include distance education, enrichment through mass media, and non-formal instruction and training.

2. Role of Satellites in Education

The evolution of technologies over the past decade, in particular the utilisation of such telecommunications technologies as satellites, has increased know-how about how to effectively deliver distance education and integrate ICTs into educational systems. Many countries have achieved successes in combining pedagogical and organizational goals to create innovative educational solutions using modern information and communication technologies. The early experiences and a large number of present distance training initiatives have focused on increasing access and enhancing the kind and quality of instruction through the delivery of education materials at a distance. These include both distance education based on postal exchange of educational correspondence

between teachers and remote learners, and the use of radio and television to broadcast non-interactive education programmes.

Today, distance education consists of a richer set of practices. These include education activities with geographical or time drift between teachers and learners with possibilities for self-paced education, instructor- and tutor-facilitated education and instructor-led education. Current models offer two-way synchronous and asynchronous communication channels to provide for teaching and tutoring that has alternative feedback paths, that allow learners to communicate among themselves, and to provide all education partners with quick access to other educational databases, resources, methodologies and tools.

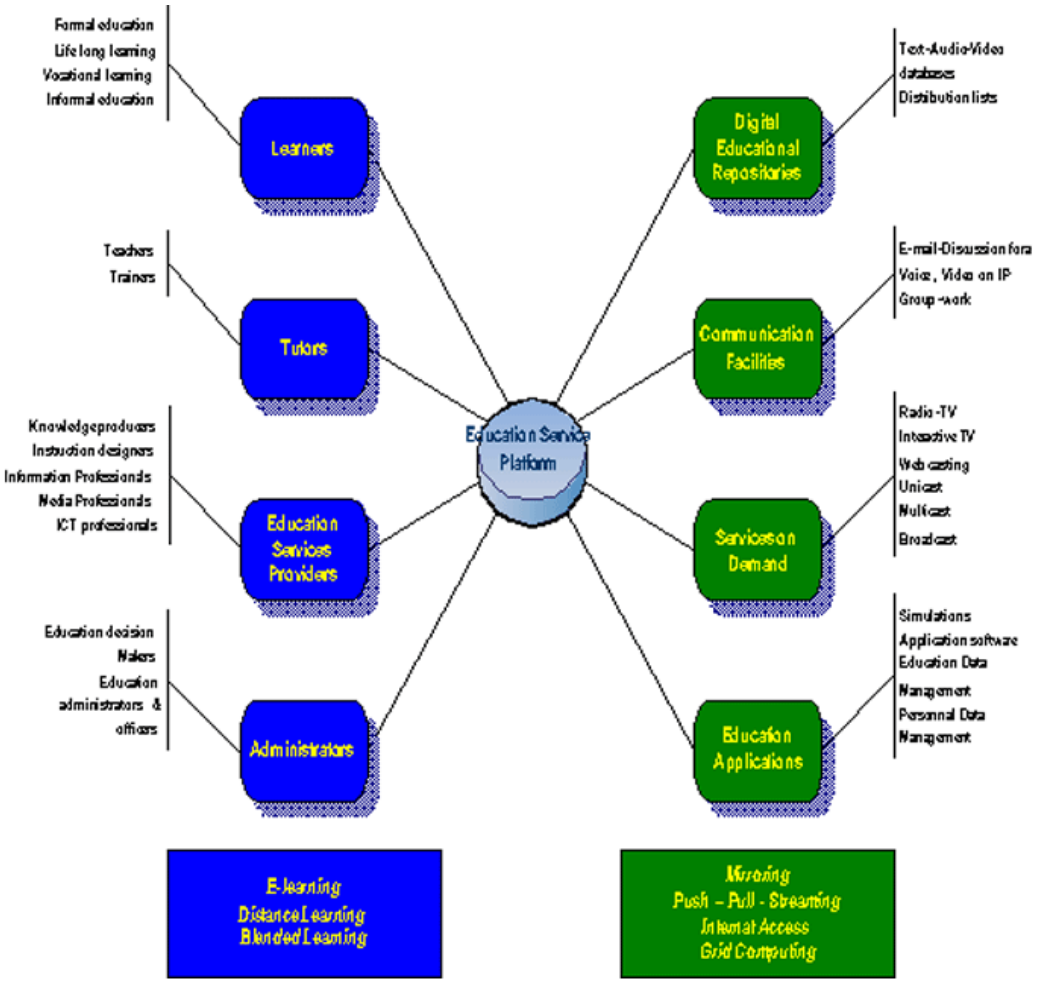
Open learning is yet another concept that introduces additional flexibility in the learning process and in curricula certification. The goal is to facilitate access to education for learners facing constraints when it comes to admission and required prerequisites, pace of learning, and to alternate ways to earn certification and qualification. Open learning can include both distance training and distance education. Open learning is well adapted to life-long learning and professional development outside the traditional academic environment.

Access to education is not only about access to technology but also access to content, services, expertise, through different forms ranging from off-line databases (such as directories, training materials, guidelines) to distant publishers, databases, web sites, and other open distance learning resources that can be reached in real time or not.

This new educational and technological context requires of educational planners and providers the operation of a variety of specialized sub-systems interacting with each other and managed in a very comprehensive way. The development, delivery and management of e-learning has emerged as a complex process that includes different stages and requires a large variety of actors and modalities of work, producing deliverables, products and services. The educational delivery system is in some ways similar to an industrial process: there are learners, teachers and trainers, instruction and multimedia designers, information and ICT professionals, managers, and decision makers, and all these must work smoothly together.

Networking of the various education actors is essential for providing them with an environment primed for teamwork, open to the possibilities of exchanging knowledge, know-how, best practices and information, for teaching and learning, and for delivering and accessing quality education.

Such a model is as follows.



Technologies used in distance and open education systems are a combination of traditional technologies and communication channels to include face-to-face sessions, correspondence, telephone and fax, radio and television, audio and video cassettes, and other off-line and on-line electronic media such as CD-ROM, e-mail and electronic forums, television broadcasting, digital audio and video multicasting and streaming, digital libraries and e-books, shared and distributed applications and the World Wide Web. They are used for the development and storage of education content, provision of access to and dissemination of educational materials, for managing learning processes and ensuring the quality of education.

The following table cross-references the main education functions with the main satellites services, which are most appropriate:

Satellite Services / Education functions	Internet Access	Unicasting Multicasting Broadcasting	Voice on IP Visio-conferencing	Video-conferencing	Interactive TV
Access to digital repositories	Π	-	-	-	-
Receiving materials	Π	Π	Π	-	Π
Communication with teachers, tutors, other learners	Π	-	Π	Π	-
Group work, e-laboratory	Π	-	Π	Π	-
Lecture	Π	Π	Π	Π	Π
Local data storage, mirroring	-	Π	-	-	-

3. The Experience of India

India has a long experience in the use of satellite for education. Its first satellite service for education was launched in 1975 within the framework of the Satellite Instructional Television Experiment.

Video tapes were prepared by All India Radio/Doordarshan in Delhi, transferred to the Ahmedabad Centre and beamed from its ground station to the Satellite. The programmes achieved considerable progress in the areas of information, awareness and knowledge of health, hygiene, family planning, political processes and overall contemporary thinking. In addition 50,000 rural teachers were enrolled during the experiment in a multimedia programme, training them in the teaching of mathematics and general science. The simplicity of community television sets and the efficiency of their maintenance were sufficient to keep 90 per cent of the sets working at any time providing a picture quality better than the normal VHF receivers in Indian cities. One and a half hours of broadcasting in the morning were devoted to school children and two hours in the evening to general audiences, which averaged 100 people per set. From a total of 2,400 villages in six states receiving the programmes, 27 were chosen for continuous analysis, with 270 interviews per day.

Mr. Yash Pa1, the Director of the Space Application Centre, Ahmedabad, reported that the experiment was a valuable experience for all, that the benefits were greater for the under-privileged classes, such as females and illiterates, and that these gains increased as TV viewings multiplied.

In 1993, the Indira Gandhi National Open University (IGNOU) and the Indian Space Research Organisation (ISRO) initiated collaboration for the development of a satellite network for education by delivering IGNOU distance education programmes. In 2000, Gyan Darshan launched from IGNOU a bouquet of TV channels as a common channel for the Indian education system. Today, IGNOU has 775 nationally distributed interactive terminals.

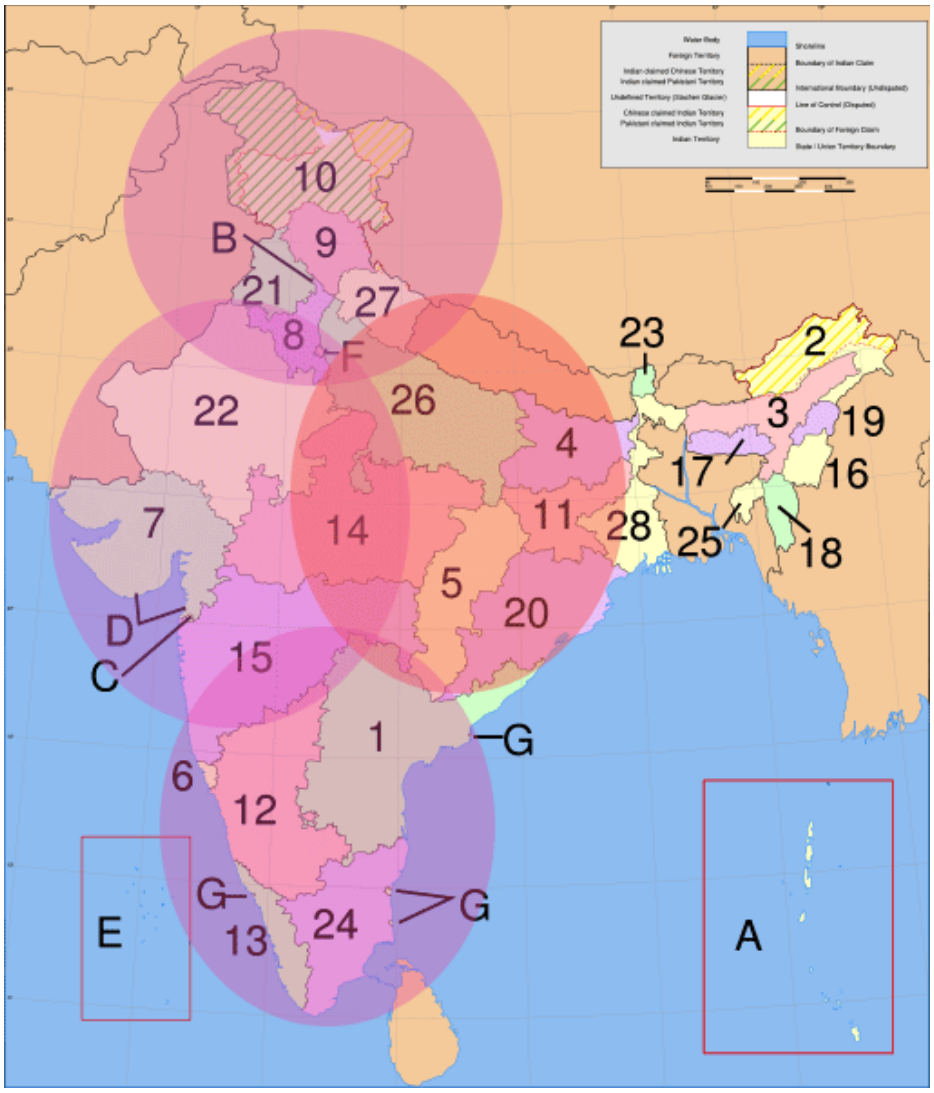
In September 2004, ISRO launched EDUSAT in a Geo-Stationary Orbit. EDUSAT is the first Indian satellite designed and developed exclusively for serving the educational sector. It is mainly intended to meet the demand for an interactive satellite-based distance education system for the country.

It reflects India's commitment to use space technology for national development, especially for the development of the population in remote and rural locations. EDUSAT is a collaborative project between the Ministry of Human Resources Development (MHRD) and ISRO. MHRD proposed to use the ICT capabilities of the EDUSAT satellite for Elementary Education, Literacy, Vocational Training and Teacher's Training. A later phase will include agriculture, health and community development programmes. EDUSAT, in its first stage, is providing benefits to:

- Indira Gandhi National Open University (IGNOU);
- All India Council for Technical Education (AICTE);
- Indian Council of Agricultural Research (ICAR);
- National Council of Educational Research and Training (NCERT);
- University Grants Commission (UGC).

The adopted education strategy is based on linking existing resource centres like IGNOU, NCERT, SIET to share initial expertise and experience, translating and transforming available content and the participation of some of the best teachers and experts available at the State and national levels for recording their lectures and their interactions with students.

The EDUSAT satellite has six Ku-Band transponders and six C-Band transponders, as shown in the map below.



4. Critical Success Factors

The quality of results obtained by using ICTs and satellites in education does not depend solely on the technology used in distance education delivery. The level of education and the methodology for disseminating education programmes and implementing projects are also important. A number of distance education projects, using radio or television, did not produce the expected results and failed because:

- they intended to reproduce traditional face-to-face education, especially in primary education;
- their scope was too ambitious and the educational and social risks were underestimated;
- their human resources were mainly based on outside technical assistance, ignoring local capacity; and finally,

- some of them were principally technology driven.

In most developing countries the constraints facing ICT and education are related to policy matters, insufficient financial resources, poor infrastructures and weak technical capacities and lack of skilled staff. Important parameters are the appropriateness of technologies, the suitability and quality of instructional materials and educational services made available, learning effectiveness and appropriation of new ways of work, and the cost benefit ratio. It is, therefore, important that policy makers are sensitised to the need for national plans for ICT in education at all levels.

For example, unfavourable telecommunication policies impede ICT-enhanced education programmes, network-based activities and interaction, and access to sources of information. Some countries charge a high tax on computing and telecommunications equipment making the costs unaffordable or prohibit the installation and use of some telecommunications technologies, which limits the utilization of large bandwidth capabilities. Another example is the price of computers and software licenses, which are significantly higher in developing countries than in industrialized countries. In this context, cooperation with the private sector is required so as to make equipment, software and services affordable, especially to educational and research institutions. Free and open source software can be a means to strengthen long-term capacities.

The appropriate and effective use of technologies requires access to technology, content and services, the availability of competent, committed people, and the continued development of their capacity. In this context, capacity building of e-education professionals in charge of developing content and networks, delivering education programmes and services, managing the e-learning process and the interconnecting networks, is a key success factor. Capacity building should be approached in a systematic way based on a comprehensive definition of profiles and skills. Such a definition includes all education professionals concerned, such as teachers, e-learning and distance education designers and tutors, support and administrative staff, education technology specialists and information professionals.

A number of assumptions lead to success (or failure) of distance education, in particular the following:

- Distance education and learning are not similar to traditional face-to-face education and training;
- Face-to-face teaching and education support is strongly dependent on the age of learners ranging from children to adults;
- The quality of distance training materials is often poor and their interactive character undeveloped, in particular, their capabilities for simulation and virtual action;

- The wide range of skills and profiles required from human resources involved in distance learning and e-learning;
- The need for education-driven policy and projects rather than technology-driven.

Distance education has been frequently implemented through pilot projects and, therefore, is not considered a component of regular education requiring a large spectrum of inputs, in which capacity building takes a large place. A number of initiatives for the introduction of ICTs in education failed because of an under-estimation of capacity building requirements, limiting it to some technical skills. In fact, applications of ICTs in education require a wide range of skills and the definition of new multidisciplinary professional profiles.

In this context, the international community has underlined a number of priority areas for integrating ICTs in education, and has included them in the World Summit on Information Society (WSIS) Plan of Action and UNESCO's Information for All Programme objectives:

- The creation of programmes for capacity building with an emphasis on creating a critical mass of qualified and skilled ICT professionals and experts,
- The integration of ICTs into pedagogy, both directly into curricula at all levels, and indirectly, as a means to improve education through services to all education actors,
- The development and delivery of distance learning, training and other forms of education and training as part of capacity building programmes,
- The development and dissemination of innovative ICT-based alternative educational delivery systems,
- The deployment of new forms of ICT-based networking, linking education, training and research institutions between and among developed and developing countries and countries with economies in transition.
- Cooperation with the private sector to enhance the capacity, notably, of leaders and operational staff in developing countries and LDCs, and to apply ICTs effectively in the whole range of educational activities, and
- International and regional cooperation in the field of capacity building, including country programmes developed by the UN and its Specialized Agencies.

In May 2005, UNESCO and the Club of Rome organized a conference in relation to Chapter 4 "Capacity building" of the "Declaration of Principles" and the "Plan of Action" respectively, adopted by WSIS in December 2003 in Geneva, Switzerland. Chapter 4, paragraph 11 of the WSIS Action Plan stated, "Everyone should have the necessary skills to benefit fully from the Information Society. Therefore capacity building and ICT literacy are essential. ICTs can contribute to achieving universal education worldwide, through delivery of education and

training of teachers, and offering improved conditions for lifelong learning, encompassing people that are outside the formal education process, and improving professional skills."

The Conference aimed at discussing the use of ICTs, including satellites for capacity-building, and their strategic role in achieving the UN's Millennium Development Goals (MDGs) and for building knowledge societies. Its main focus was on new delivery methods of formal learning and associated skills development. It gave particular attention to the special needs of marginalized groups in areas that are un-reached by the traditional education systems but could be given access to new forms of education delivery through satellite technologies.

The purpose of the Conference was to identify prerequisites and success factors for capacity-building using ICTs to collect and disseminate testimonies and case studies from around the world on how to make a quantitative leap in development by using ICT, and to give the IT industry a platform from which to present technology that is both appropriate to the development environment and will meet the needs of emerging markets.

The Conference identified twelve factors that are critical for the success of projects in the area of ICT and capacity building. They should correspond to a clear vision and have a holistic and integrated approach. Local ownership and community participation are required. Government support and multi-stakeholder partnerships are essential. Such project should have the goal of developing human capacities, not only skills but state of mind and attitude. A large contingent of women should be involved. Projects should be adapted to local communities and contextualized to take account of local competencies (e.g. in terms of language), curricula and content. Projects should be based on flexible, innovative, and appropriate technology that require changes in attitudinal approaches and state of mind in order to meet the different levels of sophistication of the users. Projects must become integrated in the life of community to be sustainable and include monitoring and evaluation mechanisms for identifying intermediary and final outcomes that can be measured.