Education And Information Communication technologies(ICT)

Prof .AK. Manihar Singh

Why Education?

Education is a process of human enlightenment and empowerment for achievement of a better and higher quality of life. A sound and effective system of education results in the unfoldment of ones's knowledge and transformation of their attitude and value. The purpose of education is not only to train people for specific employment role but rather to train them to cope their lives in the discipline, intelligence and will. Recognizing such an enormous potential of education, focus is on to provide Quality Education for all.

India has successfully created *one* of the biggest educational systems in the world. The quality of many top institutions is recognized to be par with the best anywhere. With more then 300 universities level institutions, deemed to be universities. Institution of national importance, 15,000 colleges, 9(nine) million students and half a million teachers. However, India still has a large population of illiterates -302 million above the age of six years according to census of 2001. Female illiteracy is as high as 45.8 % and rural illiteracy is about 43% . We still rillddled with problems like a high dropout rate, low rate of girl child education, inadequarte teacher to pupil ratio and weak infrastructure and financial resources.

Problems

* India one of the biggest higher educational system in the world.
* More than 300 University Level Institutions.
* 15,000 Colleges, Nine million students and half a million teachers.
* India still has a large population of illiterates- 302 million above age of six years.
* Female illiteracy is as high as 45.8 (Census 2001).
* Rural illiteracy is about 43%
* A high duopout rate, Low rate of girl child education; Inadequate teacher to pupil ratio, weak infrastructure and financial resources.

ISSUES

Education for all means : A three dimensional Challenge.

* Education for all ages
* Education of in school and out of school people.

* Education in various occupation.

1. That of equitable distribution of knowledge resources(i.e. meaningfully education a one billion strong nation).

2. Access to Quality.

Solution:

Traditional methods and conventional response will be far too inadequate. Effective response to such a complicated challenge to educate millions with quality could be Satellite base ICT enabled education.

Challenges

Education for all would mean a three dimensional challenge; education for all ages, education of in-school and out of school people and education in various occupations.

The challenge is two fold that of Equitable knowledge Resources (that of number- i.e. meaningfully education a one million strong nation) and of Access to Quality. One must realize that to face such a complicated challenge the known traditional methods and conventional response will be far too inadequate. **Effective response** to a **such** a **complicated challenge to educate** millions with quality could **be sstetUte based ICT enabled education.** The clever and innovative integration of information communication technologies In an open and flexible academic structure would help India to address questions like Increasing demand, quality and excellence and utility of higher education. This is being developing through the UGC-INFONET Initiative.

The key player (utilization of ICT):-

India has extensive experience in the use of broadcast technologies for education. The Indian Space Research Organization(ISRO) has pursued the utilization of space technol ogy for education and development. Satellite Instructional Television Experiment (SITE-1975-76) is an example of extensive application of satellite for education and development. The India National Satelltte(INSAT) series, beginning from INSAT 1A(April 10,1982) to the successful launch of INSAT 3A on April 10,2003 is poised for further expansion of Its capabilities to provide enhanced services to meteorology, telecommunications, education, development and broadcasting. Within higher education, India has been using broadcasts television to enrich classroom content since 1984 in its Countrywide Classroom(CWCR); and has added the use of broadcast television and teleconferencing for distance education since the mid 1980 s. Thus India continues to forge ahead in its space programme thereby providing benefits to its people (Kasturirangan, 2003). Development and Educational Communication Unit (DECU) of ISRO'.s Ahmedabad has been a nodal agency for several of ISRO's communication application projects. DECU performs the important function of user interface.

Educational Channel

Gyan Darshan -1 (GD-1)

Launched on January 26,2000, as a solitary 24 hour satellite based national educational and development channel, by the Ministry of HRD and Prasar Bharati with IGNOU as the nodal agency, GD-1 is the India's first truly educational channel. GD -1 offers informative programmes of relevance and value to specialized categories, pre-school kids, primary and secondary school children, college/university students, youth seeking career opportunities, housewives, adults and many others. These programmes are contributed by major educational institutions such as IGNOU, UGC/CEC, NCERT/CIET, Directorate of Adult Education, IIT, TTTI and other educational/ development organizations of the country.

The footprint of satellite being the entire country. GD can be conveniently received without any special equipment anywhere. Gyan Darshan transmission, uplinked from earth station of EMPC-IGNOU, New Delhi can be accessed all over the country throughout the year and round the clock without any break.

Gyan Dharsan -2(GD-2)

The channel is an interactive channel operated exclusively by IGNOU and caters to the training requirements of different agencies. The viewers can directly access the teacher/experts in the studio during an ongoing programme, (interaction between the teaching and learning ends during an ongoing session is done through communication) via STD telephones/ FAX/e -mail installed at the learning ends, that, is received in the studio at the up-linking .end, so that the resource persons can respond to the learners in real time. Tele conferences are regularly held for various educational needs like tele-counseling, tele-teaching, tele-collaboration, educational seminars etc.

Gyan Dharshan-2(GD-2) is a one-way video and two-way audio satellite-based interactive system operating on the C-band of INSAT 3B. The footprint of the satellite being nation wide the signals can be received anywhere across the country with the help of downlinks.

Web-site: www.ignou.ac.in

www.gyandharshan.ernet.in

e-mail : gyandarshan@ignou.ac.in

IGNOU interaction facilities- toll free Ph.No. 16001-12345

Gyan Dharshan- 3 (GD-3) "EKLAVYA" (Technology channel)

Launched on January 26, 2003, Eklavya brings quality education to the students pursuing engineering education throughout the country. Eklavya features lectures of the courses taught at IITs situated at Kharagpur, Mumbai, Kanpur, Delhi, Guwahati, Roorkee and Chennai. Eklavya. Channel transmits 24 hours daily with eight courses running in parallel. Sunday are reserved for special interest programmes on Technology and science

Eklavya-Technology channel reaches every corner of this country through INSAT 3C Satellite on C Band (74 degree East). Downlink Frequency 4165 Mhz. Symbol Rate 26.00 SPS, FEC1/2 polarization Horizontal. This is free to air channel.

Gyan Dharshan -4(GD-4) "Vyas"(UGC-CEC) Higher Education Channel

Realizing the potential of the use of electronic media in education of the use of electronic media in education as a means to cost effectively reach a wide audience, enrich the quality of higher education and equalize access to quality instruction, the University Grants Commission has been utilizing the Indian Satellite (INSAT) system for broadcasting high quality educational materials. A need has however been felt to provide an institutional framework for sustaining and enhancing these activities. For this purpose, the commission has under Section T2(ccc) of its Act No.3 of 1985 established the Consortium for Educational Communication (CEC) as a model agency at the national level to address itself to the media needs of higher education in the country.

UGC-established Seventeen media centres in the country (seven EMRCs and ten AVRCs) All the Media Centres are an autonomous organization and has been receiving recurring and non-recurring grants from UGC. The media centres was established with the objectives, Producing of Audio-Visual Programme; Conduct of relevant research and Training of necessary manpower.

Launched on January 26,2004, Vyas CEC/UGC Higher Education channel brings quality education to the students pursuing higher education throughout the country. Higher education channel reaches every corner of this country through INSAT 3C Satellite on C Band (74 degree East), Downlink Frequency 4165 Mhz. Symbol Rate 26,000 sps FEC 1/2 Polarization Horizontal. The channel is free- to -air channel.

Educational Satellite communication

The Government of India and Indian Research Organisation (ISRO) on September 20,2004 launched (EDUSAT) a satellite dedicated exclusively for educational purposes. EDUSAT will provide support to education through low-cost ground segments and reach the un-reached **in** every nook and cover of India.

The satellite communication systems are now a major part of most telecommunication networks. The education satellite channels in India operate in C, Extended C and KU band. The Satellite Communication systems can be utilized in the following satellite TVRO(Television receive only) bands.

P- Band 200-1000 MHz

This band is used for the Mobile satellite communications. The capacity available in P band is very small with data rate of a few kilobits per seconds.

L - Bands: 1530° - 1650 MHz

Fibre-optics L-Band transmission finds application in multi dwelling Units (MDU's). Such as apartment buildings, College dormitories etc. via a broad band amplifier and RF splitter. Global positioning and timing offers another important application for L-Band Satellite transmission links. GPS used for navigation, relies on signals from satellites in a geosynchronous orbit around the earth. This synchronization is required for personal communication systems (PSC) such as cellular telephones. PCS base station signals using fiber optic transmitters and receivers experience low loss and high quality.

S- Band -1700-3000 MHz.

S - band is used to transmit information to or receive information from the ground. This system can communicate either directly between orbiter and ground or through the TDRS (Tracking and data relay satellite system).

C - Band 3400-4200 MHz

The C-band is used for terrestrial radio relays and satellite transmission. The C-band is commonly called 6/4 GHz to illustrate that the uplink frequencies are around 6/GHz and the downlink frequencies and around 4 GHz. C-band was the first part of the spectrum to be applied extensively to satellites communications, and still widely used due to low cost and wide availability of the components. The back ground noises of the sky are the principal cause of signal degradation in the atmosphere Each. C-band satellite covers 500 MHz of band width with number transponders. Each Transponder usually has 5-10W Traveling Wave Tube(TWT) amplifiers or the most state power amplifiers upto 8.5 W. Transponder comprises of a number of clusters of receivers, frequency translators and transmitter. Each transponder has 36 MHz of bandwidth.

All the five Channel GD-1, GD-2, GD-3,GD-4,GD-5(Kissan & Gyan Vani) are using the C-band Transponder and are uplinked in the MCPC(Multi channel per carrier) mode. The up-link is the signal from a satellite ground station to the satellite transponder. The main equipment used for the uplink are the baseband quipment like VTR"s, Vision switcher, Audio Mixer.Audio/video distribution amplifiers,Syc.Pulse generators, Audio/ video monitoring, Patch, Frame synchronizer etc. and RFequipment like Encoders, up converters .Modulators, High power amplifiers (HPA).Wave guide, Multiplexers, down converters etc.

In order to accommodate all the five channels in the same transponder (C-12 on INSA-3C) video compression is used. Without compression, a broadest quality television signal requires up to 240 Mbits of information to be transmitted per seconds. With Digital Video Compression (DVD), the video requires between 6 and 8 M bits/sec and provides similar visual quality as the higher rate.This results in significant reduction in the bandwidth required for the television signal.

Extended C-Band. 4500-4800 MHz.

The extended C-band range of the satellite communication is developed by ISRO and is only used in India. The band was initially used by ISRO to provide educational TV(ETV) A general enrichment programme on higher education is telecast on the national network. The Training and Development Communication Channel(TDCC) of ISRO is an interactive satellite based one way video two way-audio network for distance training, education and teleconferencing. The audio and the video signal from the studio are sent to the earth station for the uplinking, while the return audio is received through the telephone line. INSAT 3B has 12-extended C-band transponders. ISRO mainly used this satellite to provide educational network in the states of Gujarat, Maharastra. MP, Chattisgarth, Karnataka, Osrissa, UP and Rajasthan.

The uplink and the downlink equipment for the extended C-band are expensive as compared to C-band, but the configuration are more or less similar. The extended C-band equipment like up-converter, down converter, LNCB etc. is also not easily available. Due to this reason this band is not quite very familiar and there is reluctance among the cable operator to show this channels to the viewers.

X-Band-7200-7250 **MHz.**

X-band is used extensively for Government and military satellite communication system in the same manner as C-band is used for commercial system. X-band frequency is also shared with terrestrial infrastructure and must be coordinated.

KU1-Band 10.9-11.75 GHz. KU2-Band

(DBS) 11.75-12.5 GHz.

To avoid the congestion in C band, newer satellite operator in the in the higher frequency bands such as KU band. The KU band has the advantage that portions of the band are not shared with terrestrial radio networks and coordination in therefore not required. The ITU has allocated three portions within KU band to different services within different regions. The third portion of KU band 18/12 GHz, is allocated to the BSS

(Broadcast television and other direct to home transmissions) and is not shared with terrestrial services. These broadcast services can be delivered to smaller less-expensive antennas because of the higher frequency of KU band and the high transmit power (60-120W) that are possible. The main isadvantage of KU band is that the higher frequencies are more heavily affected by atmospheric attenuation and, in particular rain. The compensate for these effects, earth station located in heavy rain areas are designed with more transmit power.

KA Band:

The Ka-band satellite is for a new generation of communication satellite to provide full two way services to and from small earth stations comparable in size to to-days satellite television dish. To do this they use multiple pencil like spot beams. A number of proposals also include use of inter-satellite links. A variety of orbits are being considered. Apart from the conventional geostationary orbit, both low earth orbit (LEO) and medium earth orbit (MEO) systems have been planned. The Geo stationary orbit (GEO) is 35,000 Kms. above the equator and it takes 24 hours to complete one circle. Three GEO stationary Satellite can cover the entire globe. Low earth orbit (LEO) is 160-1000 Kms. above the equator and it takes 1.5 hrs. to complete one circle. About 35 satellites are required to cover the entire globe. Medium earth orbit (MEO) is 10-15,000 Kms. above the equator and it takes 4-8 hrs to complete one circle. Ka Band Satellite systems can provide the optimum solution for the distribution of broadband signals to users everywhere in the world. GPS- aided navigation is a killer application for which Ka Band is a natural source, when compled with the provision of broadband communications and entertainment to mobile platforms, especially aircraft. The Ka band systems can provide large clear sky bandwidth in flight to meet the essential needs of the cabin and the entertainment and communications needs of the passengers, and then scale back to the needs of the cabin on the ground and during take off and landing, thus maintaining good link margins at constant power.

The other advantages of Ka Band for this application are the small size and low weight of the hardware and the global frequency allocations. Ka band satellite systems have also been described as "multimedia satellite" "broadband switched" and "broadband interactive satellites".

K-Band:

The K-Band is divided into a lower K-Band (12.5-18 GHz) and an upper K-Band (27.5 GHz - 31 GHz.) These two ranges are specifically designed to avoid the 22 GHz frequency, where the resonant frequency of water vapour severely attenuates signals. K-Band mostly used in the mobile units and the rader system. The typical Radar and Laser speed monitoring systems used in the bandare Hand Held radar guns, Gatso Cameras, Mini Gatso Cameras etc. Traffic light sensors and some automatic door openers use K-band transmitters so that a false alarm may result when approaching these devices.

DTH television service in KU band and Digital Terrestrial television Broadcasting (DTTB) are the technologies, which will revolutionize broadcasting in India. These two technologies will offer wider choice of programmes to the viewers and could also provide wireless Internet services at a high capacity data rate.

Downlinks:

IGNOU with the support of the various Educational institutions has established about 650 downlink facilities in the various parts of the countries. The details regarding these can be found out from the IGNOU Web site(www.ignou.ac.in). The equipment used for the downlinks are 12/8 Ft. dish antenna, C band LNBC , C band Feed horn, Low loss RF cable, and Digital satellite receiver (IRD). The 8 Ft. dish antenna are recommended for the places like Delhi, Haryana, Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, Hyderabad, Punjab, Gujarat, Maharashtra, Jharkhand, and Orissa etc. In the remaining places, it is recommended to have a 12 Ft. dish antenna. The antenna has to be mounted on the roof-top(of the office building) or on the ground whichever is near to the office or place where the TV is to be placed for viewing of the program.

A dish antenna is a parabolic structure made of aluminum ribs and auniform Aluminum punchsheet reflector. It has three support rods for holding the feedhorn and LNBC situated at the focal point. It also consists of a middle ring to provide extra strength & support to the parabola. The antenna can be moved on an azimuth of 360 degree and an elevation of 5 to 90 degree. A feedhorn is a cylindrical structure with a scalar plate. It is used to collect the signal reflected by the dish antenna at the focal point and provide a passage to the signal for the LNBC.LNBC is known as Low Noise Blockdown Converter,, which is used to convert the signal, received from the feedhorn in to L-band Intermediate frequency (between 950 Mhz. to 2150 Mhz.) with the help of the local oscillator and pass it to the receiver. It gets D.C. power of 12/18 V power supply provided by the Satellite Receiver. Co-axial Cable is a special kind of cable used to carry the signal from the LNBC to the Digital Receiver. The cable has a conductor atthe center covered by dual insulator. There are various models of Cable, which are used. Generally we use LRG-6 for lengths less than 40 meters. Digital Satellite Receiver is an electronic device which is used to convert the IF signal received from the LNBC to Audio-Video output or RF signal so that the signal can be viewed on the TV monitor. It is connected to TV by a Audio/video or RF lead.

Despite considerable advantages, the most significant disadvantage of C band is that the band is effectively full. Most of the existing microwave radio relays links are already assigned frequencies to operate within these bands, which may cause interference. Frequency coordination is therefore very importance in C-band. The earth station and their receiving antennas also have to be located carefully so that they do not receive or cause interference with terrestrial microwave radio reiay links or other satellite links that are using the same frequencies.

About Author: Prof. AK. Manihar Singh, Department of Chemistry and Director AVRC, ML), Centre Director Confederation of Indian University. Dean of faculty of Science. The has long experience in the production of ETV programme of CEC-UGC.