Information and Communication Technology based Education in Higher Education through EDUSAT in Karnataka -ACase Study

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Abstract

Implementation of EDUSAT program in the Department of Higher Education in Karnataka has been studied and outcomes have been evaluated.Karnataka being one of the earliest states to adopt EDUSAT facility has implemented the program in 40 Engineering Colleges 317 Government First Grade Colleges and 67 Government Polytechnic Institutes and has reached annually over 2 lakh students. Both two-way interactive SIT channel and one-way ROT channel were used for content delivery. It is learnt that a more serious approach is required for making the unique EDUSAT program to be effective at higher education institutions. Use of GSM technology along with satellite facility can make the program more effective.

Key Words: *EDUSAT, ICT, SIT, ROT, Tele-education, Education*

1. Introduction

Higher education systems have grown exponentially in the last few decades to meet the demands of quality education for all. This aspect has further gained momentum due to swift advancements in Information and Communication Technology (ICT). Demand for skilled and competent labour is ever increasing in the contemporary globalised society. In this backdrop, access to quality in higher education for all has emerged as determining factor of economic growth and development. In order to increase the access to higher education and improving its reach to the remotest parts of the country, contribution of open and distance learning facilities is on the increase. In addition, it is catering to life-long learning aspirations and that too at an affordable cost.

The Information and Communication Technology (ICT) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, and network hardware and software, satellite systems and so on, as well as the various

services and applications associated with them, such as videoconferencing and distance learning. When such technologies are used for educational purposes, namely to support and improve the learning of students and to develop learning environments, ICT can be considered as a subfield of Educational Technology. ICTs in higher education are being used for developing course material; delivering content and sharing content; communication between learners, teachers and the outside world; creation and delivery of presentation and lectures; academic research; administrative support, student enrolment etc.

In the current information society, people have to access knowledge via ICT to keep pace with the latest developments. In such a scenario, education, which always plays a critical role in any economic and social growth of a country, becomes even more important. Education not only increases the productive skills of the individual but also his/her earning power. It gives them a sense of wellbeing as well as capacity to absorb new ideas, increases their social interaction, gives access to improved health and provides several more intangible benefits. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes and CD ROMs have been used in education for different purposes.

Society expects more and more of higher education each year. This stems partly from the continuing expansion of knowledge, and therefore of what must be included in courses and curricula, and partly from growing cognitive challenges and diversity.

Progress, convergence, and integration in information technology have driven fundamental change in the information technology faculty, students, colleges, and universities have or might be expected to acquire.

Integrating ICT in teaching and learning is high on the educational reform agenda. Often ICT is seen as indispensable tool to fully participate in the knowledge society. ICTs need to be seen as "an essential aspect of teaching's cultural toolkit in the twenty-first century, affording new and transformative models of development that extend the nature and reach of teacher learning wherever it takes place".

The Information and Communication Technology (ICT) provides a broad perspective on the nature of technology, how to use and apply a variety of technologies, and the impact of ICT on self and society. Technology is about the ways things are done; the processes, tools and

techniques that alter human activity. ICT is about the new ways in which people can communicate, inquire, make decisions and solve problems.

Enhancing and upgrading the quality of education and instruction is a vital concern, predominantly at the time of the spreading out and development of education. ICTs can improve the quality of education in a number of ways: By augmenting student enthusiasm and commitment, by making possible the acquirement of fundamental skills and by improving teacher training. ICTs are also tools which enable and bring about transformation which, when used properly, can encourage the shift an environment which is learner-cantered.

Satellite communication technology using EDUSAT satellite is one of the tools for the development of distance education. The students visualize the teaching and methods from the video programs delivered through EDUSAT[3]. Important advantages of satellite-based distance education are:

- Reaching the unreached
- Cost-effective & Quality Education using emerging ICTs
- Need-based education
- Increased access to learning and training

2. The EDUSAT System

GSAT-3 satellite, more commonly known as EDUSAT, was launched on 20th September 2004 by the Indian Space Research Organization (ISRO). This ambitious project was mainly intended to meet the demand for satellite communication-based distance education system for the country. It was aimed at providing connectivity to schools, colleges and other academic institutions[1]. The program is primarily meant to support non-formal education. EDUSAT was the first dedicated "Educational Satellite" that provided the country with satellite based two-way communication to class room for delivering educational materials with the following objectives.

- Providing effective teachers training
- Supplementing curriculum-based teaching
- Strengthening distance education efforts initiated by various agencies
- Access to Quality Resource Persons (Higher & Professional Education)
- Providing Access to New Technologies
- Taking Education to Every Nook & Corner of the Country

EDUSAT was a Geo-synchronous satellite developed on I-2K bus. GSAT-3 is co-located with METSAT(KALPANA-1) and INSAT-3C at 74^{o} E longitude.Table 1 shows the technical parameters of GSAT-3[4].

Table 1:

Mission	Education
Spacecraft Mass	1950.5 Kg mass (at Lift - off)
	819.4 Kg (Dry mass)
Onboard power	Total four solar panel of size 2.54 M x 1.525 M generating 2040 W (EOL), two 24 AH NiCd batteries for eclipse support
Stabilization	3 axis body stabilised in orbit using sensors, momentum and reaction wheels, magnetic torquers and eight 10 N & 22N reaction control thrusters.
Propulsion	440 N Liquid Apogee Motor with MON - 3 and MMH for orbit raising
Payload	Six upper extended C - band transponders
	Five lower Ku band transponders with regional beam coverage
	One lower Ku band National beam transponder with Indian main land coverage
	Ku beacon
	12 C band high power transponders with extended coverage, covering southeast and northwest region apart from Indian main land using 63 W LTWTAs
Launch date	20-Sep-04
Launch site	SHAR, Sriharikota, India
Launch vehicle	GSLV-F01
Orbit	Geostationary (74oE longitude)
Mission Life	7 Years (minimum)

EDUSAT set up consists of Transmission and Receiving systems. Content production studio, Uplink facility (HUB) and Satellite form Transmission system and Receive Only Terminal

(ROT) and Satellite Interactive Terminal (SIT) with dish antenna, LNB and set-top-box, along with the Display and Audio system at the school/ college end constitute Receiving System. Currently operational networks and other systems are as in Table 2[2].

Table 2.

Tele-Education Networks	Ku-Band	Ext. C-Band	C-Band	Total
Deployed Networks	64	18	1	83
Operational Networks	56	13	1	70
HUBs	28	8	1	37
SITs	2268	344	10	2622
ROTs	44956	1086	-	46042
Bandwidth Allocation	113 MHz (INSAT – 4CR & GSAT -8)	42 MHz (INSAT - 3A, 3C & GSAT -12)	10.5 MHz (INSAT- 4A)	178.5 MHz

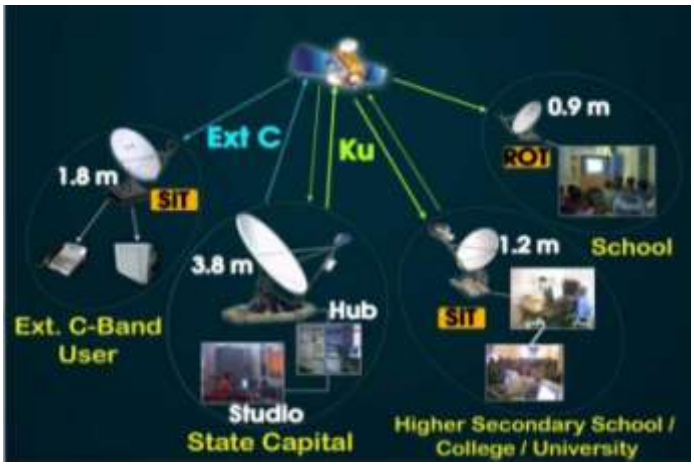

Figure 1: A schematic of EDUSAT System

3. EDUSAT Program in Karnataka

Karnataka wan one of the earliest states to adopt EDUSAT facility and has implemented the program in 40 Engineering Colleges 267 Government First Grade Colleges and 67 Government Polytechnic Institutes and has reached annually over 2 lakh students. Both two-way interactive SIT channel and one-way ROT channel were used for content delivery to Higher Education institutes.

Karnataka has been provided with one uplink (HUB) facility with the following details:

Uplink Facility Details:

- 6.3M Ku- Band Hub at DSERT, Bangalore
- Capacity: 2 Interactive & 2 ROT Channels
- Interactive channel
  - Outbound: DVB –S2, ACM, Symbol Rate – 1.25Msps
  - Inbound: Data rate – 819 Kbps, FEC – 4/5, Symbol Rate – 512Ksps
- ROT Channel: Data rate – 4.10 Mbps, FEC – 3/4, Symbol Rate – 2.96Msps

3(a). Collegiate and Technical Education

Both Collegiate and Technical Education Department are using EDUSAT facility extended by ISRO for delivery of live and recorded lectures to government colleges polytechnics since 2006. Currently there are 267 Government First Grade Colleges and 67 Government Polytechnics installed with ROTs. The departments share ROT channel time with each other and telecast for 3 hours daily on week days using VTU studio setup available at DSERT campus for content delivery.Over 300 sessions have been completed by each of the departments.

3(b). Visvesvaraya Technical University (VTU)

Visvesvaraya Technical University (VTU) is using tele-education for content delivery since 2003 and has adopted EDUSAT for its tele-education program in 2005. Currently there are over 156 Engineering Colleges installed with SITs. VTU uses SIT channel full time and transmits educational programs through its dedicate d studio set up at DSERT campus. VTU transmits both live and recorded lectures for about 4 hours daily on week days.

Important reasons for challenges and issues with EDUSAT system are:

- Lack of ownership by users due to low priority
- Tele-Education programs are not part of curriculum
- Unavailability of trained & dedicated manpower for network operations
- Longer down-times due to erratic power supply
- Lack of centralized repository for content

- High dependency on ISRO for continuous technical support/ consultancy
- Lack of Central Govt. sponsored schemes or earmarked funds for Tele-Education
- Interactivity during lecture delivery is not possible with ROT system
- Limited number of SIT channels available for adopting interactivity

Both Collegiate and Technical Educations departments, and VTU are using EDUSAT system for successfully delivering educational content to the remotely located institutions.

With the recent trends in GSM technologies internet is becoming available on mobile devices and this can be leveraged for improving the effectiveness of EDUSAT system by having hybrid system of satellite for content delivery and GSM for interactivity.

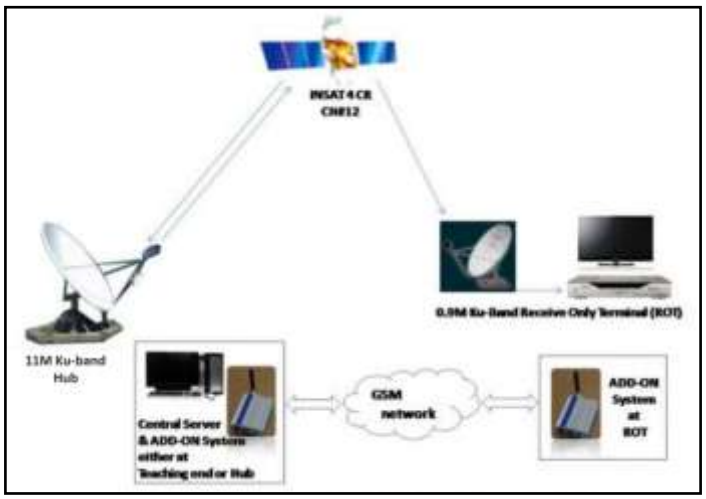

Figure 2: A schematic of EDUSAT and GSM Hybrid System

4. Conclusions

EDUSAT program implementation in the state of Karnataka in the Department of Higher Education has been studied and outcomes have been evaluated. Departments of Collegiate and Technical Education have used ROT channel on time sharing basis since 2006 and each department has successfully telecasted over 300 programs using the VTU studio facility. Interactivity with audience during telecasting of lectures was clearly a missing factor. VTU has adapted EDUSAT for tele-education since 2005 and is successfully using SIT channel of EDUSAT system for delivery of educational programs in interactive mode. Programs are conducted regularly for 4 hours daily on all week days and is planning to expand the facility for more colleges. Use of GSM technology for interactivity and satellite technology for lecture

delivery can be an easy solution both in terms of use of available ROTs for interactivity and cost effectiveness.

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