

**Beyond the borders of South Africa - Distance education via digital satellite television: A report on the status and potential of Interactive Teleteaching [ITT] at the University of Pretoria**

CWI Pistorius (Snr)  
L A du Pisani  
University of Pretoria

**BACKGROUND**

The late Professor Louis van Biljon, then head of the department of Electronic Engineering, established an interactive television unit at the University of Pretoria in the early 1980's in die Faculty of Engineering. Professor van Biljon was inspired by the successful interactive television project at the School of Engineering of the Stanford University in California, and was convinced that the same model could be implemented successfully at the University of Pretoria. A normal classroom in the Engineering Faculty building was equipped for interactive television and experimental transmissions of graduate programs in electronic engineering commenced in the middle 1980's.

The original purpose of the project was to offer graduate courses in electronic engineering through interactive television to students at various high-tech business organisations in the Pretoria area. With the facilities available at the time, only a single microwave signal could be transmitted to a single receiving point.

Alternative applications for interactive television were considered and two programs were selected-

- A bridging program in science subjects to black schools in the Pretoria area, and-
- Transmission of undergraduate lectures to the Witbank Campus.

To accommodate these programs it was necessary to extend the technological capability of the Interactive Teleteaching Unit (ITT). A broadcast studio was established in the Education and Law building and the University negotiated with the signal distribution division of the SABC for the provision of an omni-directional microwave transmitter on the Lukasrand tower in Pretoria,

An extensive bridging program in a number of matric subjects was developed and transmitted through the microwave facility to schools in the Pretoria area.

Telkom provided a fibre optic link to Witbank and transmissions of undergraduate lectures to the Witbank campus commenced in 1992. The Telkom link was initially provided at no cost to the University until 1994, when full commercial charges were then levied.

The schools program was extended in 1995, when the University installed a second microwave transmitter at the Hartebeespoortdam which gave coverage into Atteridgeville and areas to the north-west of Pretoria.

The limited coverage of the terrestrial-based technology in use by the University until

the end of 1996 however, limited the scope of interactive television in tertiary programs.

The only tertiary programs offered through the ITT unit up to the end of 1996 were:

- Selected subjects in undergraduate courses in the faculties of Economic and Management Sciences, Arts and Education were transmitted to Witbank.
- An undergraduate course offered by the Department of Nursing to the students at Witbank.

In April 1997 the University entered into an agreement with Orbicom for the lease of a satellite television channel, with national coverage. This facility created a tremendous potential for tertiary interactive television programs.

## ***THE TECHNOLOGICAL ITT CAPABILITY***

### **2.1 Overview**

The ITT unit at UP has at present a potential capability to present interactive educational television programs through four channels-

- A digital satellite television channel covering the whole of Southern Africa
- An analogue terrestrial microwave television channel covering an area around Pretoria.
- A cable television channel to the Witbank campus.
- A Video conferencing facility.

The University has the exclusive use of all these systems which are available 24 hours a day for 7 days a week. The interactive feedback for the first three channels mentioned above is analogue-audio through normal telephone lines.

Apart from the facilities for external transmission, four classrooms on the main campus are equipped to receive audio and video from a central studio.

### **2.2 Specifications of Technology**

#### *2.2.1 Digital Satellite Television channel (DSTV)*

The University has a five year contract with Orbicom for the lease of a 2,256 Mbit/s satellite channel with one video and two audio channels in the Ku-band [12 GHz] on the Panamsat 402 satellite. The capacity of the space segment makes no provision for data transmission for digital feedback systems. The feedback from remote sites is analogue-audio through telephone lines at normal call charges.

Orbicom uses the Mpeg 2 digital compression algorithm and the IRDETO coding technology for all its channels. This means that the channel leased by the University is compatible with all Multichoice decoders, of which there are approximately 1 00 000 installed in Southern Africa.

The central studio on the campus is connected through a dedicated leased 34 Mbit/s optical fibre link to Orbicom in Randburg. At Orbicom the signal is digitally compressed, coded and mixed with the rest of the programme bouquet of Multichoice and then uplinked to the Panamsat 402 satellite. This satellite covers the whole of South Africa and with weaker signals, which require larger parabolic antennas, also includes the southern parts of Namibia, Zimbabwe and Mozambique.

### *2.2.2 Terrestrial Multiple Microwave Distribution System [MMDS] Channel*

The University operates two television transmitters in the 2.6 GHz MMDS band. One transmitter is situated on the Lukasrand tower in Pretoria and the other on the Magaliesberg at the Hartebeespoortdam. The Lukasrand transmitter was installed in 1992. The Magaliesberg transmitter/receiver unit was purchased by the University in November 1994.

The signal from the central studio on the campus is transmitted to the MMDS transmitter at the Lukasrand tower via a microwave link, Normal Telkom telephone lines are used for audio feedback from the various receiving points to the central studio on Campus. The feedback system allows for a maximum of 15 remote sites at any given time.

### *2.2.3 Fibre Optic Cable link to Witbank Campus.*

The link from the Pretoria campus to the Witbank campus is a 34Mbit/s optical fibre system. The signal from the central studio on the campus is transmitted via the microwave link to the Lukasrand tower from where it is then fed into the Witbank link. The fibre optic link to Witbank is available on a 24-hour per day basis. As stated in the previous paragraph, the Witbank cable link shares the microwave link with the MMDS transmitter system.

### *2.2.4 ISDN Line*

The University leases a 128 kbits/s ISDN line from Telkom. The ISDN link is connected to a Pictoretel 4000 codec for video conferencing. This facility enables video conferencing on a national and international basis. The Pictoretel codec was purchased in November 1996.

The Pictoretel codec uses the Pictoretel SG4 compression algorithm, which is in general use at educational institutions. The codec however, is also compatible with the H320 world standard and other algorithms.

The video conferencing technology can be upgraded by the addition of an inverse multiplexer to 512 kbits/s and by the addition of a multi conference unit for multi point use, in which case additional ISDN lines will be required.

### *2.2.5 Satellite TV receiving capability*

The central studio is equipped with the following satellite TV receiving equipment-

- Panamsat digital Ku-band satellite receiver with MPEG 2 compression algorithm and IRDETO decoding technology.
- Grundig Ku-band and C-band analogue satellite receiver.
- Two Ku-band antennas.

With the addition of a C-band antenna it will be possible to receive C-band signals uplinked from the United Kingdom and Europe. Signals received from a satellite can be mixed with local content and retransmitted through any of the existing channels. This allows for international participation in local programs. It is also technically possible to uplink signals produced by the University of Pretoria on C-band transponders for viewers in Africa and Europe.

### *2.2.6 Broadcast Studios*

The central studio is fully equipped for live broadcasts through any of the available channels. No video editing facilities are available in the central studio but are available

at the Unit for Educational Technology studios on the campus. The main components in the studio are four broadcast quality cameras, two digital video mixers, one 12 channel sound mixer and two graphic computers.

The studio can accommodate only one transmission at a time. The Educational Technology studio in the Technical Service Building is not connected to the central studio although it is technically possible. With the addition of a communication link the Education Technology studio can also be used for broadcasting.

All signals to external transmission facilities are technically routed through the central studio network. Any signal produced elsewhere on the campus must therefore be routed through the central studio. To rationalise signal distribution on the campus, it would however, be necessary to install control facilities at each remote studio.

### **3. PRESENT USE OF INTERACTIVE TELEVISION CAPABILITY**

#### **3.1 Secondary level**

At present the University offers the following categories of programs at secondary level-

Secondary level academic bridging programs for grade 11 and 12 in:

- Mathematics
- Physics
- Biology
- Chemistry
- Accounting
- English
- Economics
- Business Economics
- Geography

These programs are offered throughout the academic year on a regular basis. Twenty two schools are participating in the programs, of which 9 schools on a regular basis. The secondary level support programs are transmitted for 1.5 hours per day, Monday to Thursday from 14h00 to 15h30.

Secondary level Winter and Spring school academic support programmes offered on 1 and 2 weeks basis during school holidays.

#### **3.2 Tertiary Level**

Two categories of tertiary level programmes are offered.

- The Witbank campus project
- Other tertiary programmes.

##### *3.2.1 The Witbank Campus project*

The original purpose of the Witbank campus project was to gradually convert the normal academic undergraduate programmes offered at the Witbank Campus to an interactive television basis. Teaching staff travel between the main campus and Witbank and it was hoped that interactive television programmes would, to a large extent, limit the amount of travel between the two centres with a corresponding substantial saving in cost and

time.

### 3.2.2 Other Tertiary Programmes

The following programmes are offered via the Teletuks satellite channel'.

1. B Cur (I et A) in the department of Nursing.

The full first year course of 4 subjects is offered through ITT to centres in Pretoria, Witbank (campus), Nelspruit (Methodist Church hall) and Hammanskraal (campus) via satellite. A total of 581 students are enrolled in this program. Eight hours per week is transmitted over 30 weeks per annum.

2. LLB programmes by the Faculty of Law of the University of Pretoria in co-operation with the Faculty of Law of Unisa. UP and Unisa students attend the same ITT courses. This program is transmitted to Rustenburg (Rustenburg Educational College) and to 21 individual Unisa students. 12 Students are registered with UP for this course. Two hours per week is transmitted for 30 weeks per annum.

3. Further Diploma in Education students receive at present 1 day per semester per group (2 groups) ITT lectures at Hammanskraal. This is part of a week-long block course.

The following departments have expressed an interest in presenting I-FT courses but are still in a planning phase:

- Graduate School of Management
- Department of Electrical and Electronic Engineering
- Faculty of Education for B.Ed programmes
- Department of Music
- Department of Communication Pathology

## 4. CONCLUSION

Students in rural areas have extremely limited or no access to higher education without substantial travel and expense. The ITT model permits easy access for students to tertiary education and accomplishes its instructional goals, with no less effectiveness than " traditional" courses taught on the main campus, with far It is important to remember that technology is only the communications channel and does not guarantee satisfied students and lecturers. Proper planning of the following administrative and logistical functions have been identified as some of the key factors for success or failure of a distance education programme.

### Academic Administration:

- Information for prospective students
- Applications, selection and enrolments
- Financial support
- Postal services

### Finance:

- Policy for student fees
- Collection of student fees and management of team payments

- Credit control

#### **Academic departments:**

- Preparation of study materials
  - Study guides
  - General information on support services
  - Evaluation
  - Academic support
- Regular visits to learning centres

#### **5. REFERENCES**

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