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ABSTRACT

This paper begins with brief background on types of broadcast satellites and satellite programs in Europe. Reception and transmission costs, as well as predicted access to satellite transmissions, are then discussed. Uses of satellites for education and training in countries outside of Europe, particularly the program at the National Technological University in the United States, are summarized. Distinctions are drawn between the various media (television, audio, or data) and configuration (point-to-multipoint or network) used. Descriptions of initiatives underway for the use of satellites for training in Western Europe--PACE, OLYMPUS, COMMETT, and DELTA--are presented. The extension of training beyond national boundaries and establishment of a training communications network are identified as ways satellites could be used. Low cost, easy production, speed, European-wide reach, open access to transmission, security, and funding opportunities are listed as benefits of using satellites. Constraints are also identified: alternative modes of distance training may be cheaper and/or more effective; identification of trans-national training needs and target groups is necessary; specially-designed courses are needed; print and tutorial support and follow-up are important; supporting cost, particularly the cost of production, may be greater than transmission and reception costs; and government will need to ease public telephone company control over tariffs and access to up-links. (4 references) (MES)

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New Educational Media: New Directions in the Training of Trainers?

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THE USE OF SATELLITES FOR TRAINING IN WESTERN EUROPE

(background paper)

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Satellites for distance training: '2001 Space Odyssey' or 'pie in the sky'?

Will satellites prove to be a major communications medium for distance training in Europe, or will they prove to be yet another technology in search of a role? It is argued that the value of using satellites for training depends not on the technology itself, but on the ability of trainers to define appropriate national and trans-national training needs in Western Europe that can be satisfied more effectively or economically by using satellites, rather than more conventional training methods.

Satellite provision in Europe

There are basically three kinds of satellites, low-powered, medium-powered, and high-powered (the latter usually called Direct Broadcast Satellites or DBS). Essentially, DBS and medium-powered transmissions can be received directly in homes using small and cheap dish aerials, while low-powered satellites require a larger and more expensive dish, with television signals usually being redistributed by cable or terrestrial transmitters to people's homes. Satellites though can also transmit voice and data signals, using a fraction of the capacity of a television channel, and hence at far less cost, a point of particular significance for distance training.

The European Space Agency's launch rocket, Ariane, has the demanding schedule of one satellite launch a month from September, 1987. A substantial proportion will be satellites intended for use over Europe. With a

1 in 15 chance of a launch failure, a lot could go wrong. Already the German DBS launch failed, because a technician forgot to remove a clip holding together the folded solar panels. However, the media loves bad news, and other successful launches, such as Eutelsat's first medium-powered satellite, ECS-1F5, have gone largely unnoticed. What we can be sure of is that there will be a rapid expansion in satellite capacity in Europe within the next five years, from the current 21 television channel capacity to somewhere around 100 television channels (CIT Research, 1987).

Access and costs

Parallelling these developments in space, there is expected to be a rapid expansion in the numbers of people capable of receiving satellite transmission in Europe, either relayed through cable systems, or through direct reception.

Low-powered transmissions can now be received on equipment costing around £1,000 (1,500 ecus). This includes a 1.4 metre steerable dish, a 'black box' of electronics to convert the signal for reception on a standard domestic TV monitor, and a tuner to find the desired satellite and the desired channel on each satellite. DBS on the other hand can be received on much smaller aerials (between 0.5 and 0.9 metres in diameter). The total cost of DBS reception equipment (in addition to a 'standard' domestic TV monitor) is likely initially to be around £300 (450 ecus), dropping eventually to around £200 (300 ecus), including installation costs.

In 1986 there were 10,000 satellite TV receivers in Western Europe. This figure is expected to rise to 1 million shortly after 1990. By 1996, 46 million (40%) of West European households are expected to receive satellite services, either directly or via cable (Tydeman, 1987).

Transmission costs range for full bandwidth television from free up-link and transmission facilities for educational and training users (on OLYMPUS), to £1,800 (2,700 ecus) an hour on Eutelsat (including transponder charges) for peak evening transmission. While not insignificant, transmission costs though will usually be minor compared to the costs of production, administration and ground support services (for a full discussion of educational satellite costs, see Bates, 1987). Neither reception nor transmission costs are likely to be a significant barrier to the use of satellites for training in Europe, when compared to the costs of producing training materials for satellite delivery.

How have satellites been used for education and training?

Several countries outside Europe already have extensive experience of using satellites for education and training, in particular the USA, Canada, India, Australia, Indonesia, the University of the South Pacific (USP) and the University of the West Indies (UWI). In addition, a number of countries have participated in Project SHARE, a series of health and education applications linking developed with developing countries via the INTELSAT system.

From a training point of view, developments in the USA are the most

relevant. The National Technological University, with its headquarters in Colorado, is a network of universities and company training sites across the country, linked by satellite transmission. NTU provides courses in engineering leading to a Master of Science, at a post-graduate level. Leading experts from either universities or companies are contracted to give lectures. These are up-linked from the host site and broadcast to member institutions via satellite across the States. At each reception site are local tutors, who 'take over' from the expert, and conduct local tutorials. Sometimes, classes can telephone in questions to the expert (using the terrestrial telephone system), which are answered 'on-air'. Similar formats have been used for in-house company training, by companies with a central training site providing the up-link, and multiple branches all round the country.

From these experiences, it is important to distinguish between both the media used (TV, audio, data) and the configuration (point-to-multipoint or network):

1. Broadcasting: the dissemination from one point to many points, for teaching purposes, with no return communications (e.g. TV: INSAT, India).

2. Interactive broadcasting: one-way satellite television, with terrestrial telephone used to allow students to call in (voice only) to the broadcast (e.g. National Technological University, USA; Knowledge Network, Canada).

3. Two-way audio communication between several points, for both

teaching and administrative purposes (e.g. USP, UWI, and Indonesia).

4. Two-way audio communication between several points, for both teaching and administrative purposes, supplemented by low-band graphics such as slow-scan TV or electronic writing (e.g. USP, UWI, and Indonesia).

5. Satellites can also be used for carrying electronic mail, computer conferencing, text transfer and access to remote data-bases, at lower cost than even voice communication.

6. There has been limited use in education and training of two-way full bandwidth television communications on satellite, presumably because of the very high costs, although there are some examples in the USA, mainly for in-house training between several sites across the continent. However, using compressed video techniques, video-conferencing is now possible using a fraction (2 megabits per second) of the full television bandwidth, and soon it will be possible to have video-conferencing using just 64 kbs.

Satellite is rarely the only communication technology; most systems using satellites for training purposes also make use of terrestrial telephone services, local tutorials and some print support as well.

European educational satellite initiatives

There are several initiatives already underway for the use of satellites for training in Western Europe.

1. PACE. This is a consortium of multi-national companies (including IBM, DEC, Hewlett-Packard, British Telecom, Thomson, etc.), using both satellite and computer communications, to deliver a Programme of Advanced Continuing Education in Europe to companies throughout Europe, drawing on key researchers in European universities and companies (very much following the NTU model). This is being funded partly by sponsorship and partly by the sale of courses, and and has already begun, using one of the Eutelsat ECS satellites.

2. OLYMPUS. This large and experimental satellite, built by the ESA and able to cover 60% of Western Europe with a single high-powered television transmission, is due to become operational in 1989. The ESA is offering free transmission on Olympus to educational and training users. ESA appointed an educational programming committee, under the chairmanship of Dr. Alan Hancock, of UNESCO, to allocate programming, then organised a meeting in April, 1987, at Avignon, of potential users. At this meeting, the users elected a planning committee, charged with bringing back recommendations on the structure and management of an open access educational channel to run on OLYMPUS on their behalf. This will be reporting back to the next users' conference in Vienna in April, 1989, and the channel is expecting to be operational by October, 1989.

3. COMETT. This is a European Economic Commission (EEC) initiative, designed to increase co-operation between European enterprises and universities, through the joint production of courses and training initiatives.

One strand of the COMETT programme request bids for the use of multi-media technology (including satellites), and provides funding possibilities for joint programmes between European distance teaching universities. PACE has already received some funds under the COMETT programme. COMETT started in 1987, and is expected to continue at least until 1989.

4. DELTA. The EEC is funding another initiative, totalling £14 million (20 million ECUs), to start in 1988, to improve the technological and communication infra-structure for education and training within Europe. This project includes a proposal for a satellite-based European educational communications network, suggesting that there will be opportunities for funding satellite-linked activities within the DELTA programme.

There are therefore considerable opportunities for funding satellite projects to deliver training, particularly if they involve co-operation between companies and universities.

For what purposes should satellites be used for European training?

It is possible to think of many different ways in which satellites could be used, but they all depend on an organisation's training requirements.

1. Extension of training beyond national boundaries. Where organisations have a central headquarters, and many local branches distributed all over Europe, satellites could be used for delivering training in new products, new

sales or accounting procedures, etc. The lectures could be up-linked from the headquarters site, and beamed to each local branch.

2. Establishing a training communications network. Satellites could form the base of an inter-site communication network (or even for communications within a system). For instance, where different components are produced on different sites, thus requiring training and communication between the sites, up-links at each site could provide a two-way 'mesh' network, with every site able to communicate with every other site. Because of the high cost of full broadcast television bandwidths, the communication may be limited to voice and data, allowing for two-way, simultaneous audio-conferencing between different sites, supported by computer-generated text and graphics (diagrams, etc.). A proposal of this kind has been submitted by the European Association of Distance Teaching Universities, based on the OLYMPUS satellite.

What are the benefits?

There are several reasons why trainers might consider using satellites:

1. Low cost. With reception equipment costing under 500 ecus a site, and transmission costs even at commercial satellite peak time rates of around 3,000 ecus an hour, it may well be cheaper to deliver training materials at a distance, if they are in the form of lectures.

2. Easy production. If lectures are used, the main training requirement is

to solve the logistics of setting up a simple studio, capable of combining simple graphics with speech, arranging local reception, timetabling and publicising the courses, and arranging assessment and/or feedback.

3. Speed. Because of the short preparation time, latest developments in company products or procedures can be made available very quickly to the relevant target groups in the work-force.

4. European-wide reach. As 1992 approaches, it will become increasingly important for companies to have local sites or agents all over Europe. Satellite transmission (if the right satellite is chosen) can provide instant coverage across the whole of Europe.

5. Open access to transmission. Unlike terrestrial broadcasting, the trainer has open access to satellite operators, who will not usually impose production or editorial requirements on the training organisation.

6. Security. Encryption will allow sensitive training material to be available only to sites with the right de-encryption equipment and codes.

7. Funding opportunities. Programmes like DELTA and COMETT provide opportunities for up to half-funding of European-wide training projects, provided several companies and countries are involved.

Constraints

There are several constraints hindering the greater use of satellites for training in Europe.

1. Alternative modes of distance training may be cheaper and/or more effective (e.g. audio-cassettes combined with print). As with terrestrial television broadcasts or video-cassettes. two key questions need to be asked. Why does one need full bandwidth television, given the huge difference in cost, especially if the satellite is merely relaying lectures? Why does one need to transmit, rather than mail video-cassettes (see Bates, 1988, for a discussion of the merits of television in distance education and training). 'Quality' television, i.e. television that exploits the unique presentational characeristics of television, is much more expensive to produce than lectures, but can be justified if large numbers are to receive the training, and the training needs high-quality visual presentation (e.g. manual procedures). Satellite may be a more economical way of distributing such materials than video-cassette distribution, if there are many sites.

2. Clear identification of trans-national training needs and target groups is a necessary pre-condition for any training unit before it decides to use satellites.

3. Success is likely to go to those courses which use a combination of technologies and course design appropriate to a European-wide audience. This suggests that as far as the use of satellites is concerned, there is a need to design courses specially for a European-wide audience, rather than the use or even adaptation of existing courses. It also suggests the need for new

types of course design, built round satellite and other technologies.

4. Experience in using broadcast television and radio for distance education indicates the need to provide adequate print and tutorial support and follow-up, and the need for a clear educational rationale for using television, audio or data, for any satellite initiatives.

5. The supporting costs, and especially the cost of production, are likely to be far greater than the actual transmission and reception costs of satellites.

6. Governments will need to ease PTT control over tariffs and access to up-links if the use of satellites for training purposes is to be encouraged. At the moment, unless OLYMPUS is used, and then only on an experimental basis for three years, it is essential to use a PTT-controlled up-link. Unfortunately, PTTs tend to add excessive charges to up-link costs, to keep costs in line with terrestrial services. Consequently, up-link and transmission costs can be higher by as much as a factor of 10 in Europe, compared with the USA, where PTTs do not have a monopoly on up-linking. Furthermore, it is essential, both for cost and educational reasons, that trainers can up-link from on site. The cost of using PTT land-lines or microwave transmission to relay television signals from the training studio to the PTT up-link is prohibitive. Portable up-links can be provided, but are also expensive. If the up-link is not from the training site, live, interactive lectures are ruled out. In the USA and Canada, educational and training institutions can buy their own up-link, and operate them on-site, paying only for transponder time.

Conclusions

As with other technologies, training goals need to be determined first, but are inevitably influenced by the availability of a technology. Just as it would be a mistake for satellite technology to determine training priorities, it would also be a mistake for trainers to ignore the potential of satellites. Successful use of satellites will require some adaptation of our teaching methods, but at the same time should allow new target groups to be reached.

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