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ABSTRACT

This paper looks at the role of modern information and communication technologies, and their impact on education, from two distinct perspectives. The first is the classic perspective of how they can be used directly in support of educational goals and strategies. However, the exponential growth of the media and information technologies, especially the computer, as a prime vector in social organization and behavior also implies another level of analysis. Increasingly the media have become a major, in some societies a dominant, source of information and an educational determinant, at times explicitly, more often implicitly. This second perspective leads the researcher to draw some conclusions on the relationship between communication technology and concepts of literacy, and the need for educators to be fully aware of communication processes. The paper focuses on developing countries, but necessarily must do so from a base of technology with its origins in the industrialized world. Whatever promise the new technologies may have, this is invariably subject to constraints of a cultural, economic, social, or psychological nature, which have to be realistically acknowledged. There is a tension between the opportunities of technology, that are themselves constantly shifting, and the conditions attached to their application, the ability of the sustaining social, educational, and management system to accommodate technology at a particular level of performance. In principal the particular opportunities offered by information and communication technologies to sustain educational processes offer: (1) outreach; (2) economies of scale; (3) richness of illustration and visualization; and (4) individualization. A diagram relates technology types and processes in a single matrix. (DK)

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CONTEMPORARY INFORMATION AND COMMUNICATION TECHNOLOGIES AND EDUCATION

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Contemporary information and Communication Technologies and Education[1]

INTRODUCTION

This paper looks at the role of modern information and communication technologies, and their impact on education, from two distinct perspectives. The first is the classic perspective of how they can be used directly in support of educational goals and strategies. However, the exponential growth of the media and information technologies, especially the computer, as a prime vector in social organization and behaviour also implies another level of analysis. Increasingly the media have become a major, in some societies a dominant source of information and an educational determinant, at times explicitly, more often implicitly. This second perspective may lead us in turn to draw some conclusions on the relationship between communication technology and concepts of literacy, and the need for educators to be fully aware of communication processes.

I. Media and information technologies in support of education

The paper focuses where possible on the developing countries, but it has necessarily to do so from a base of technology with its origins in the industrialized world.

We begin therefore with some basic explorations of technology itself. It is important to stress that, whatever promise the new technologies may have, this is invariably subject to constraints - of a cultural, economic, social or psychological nature - which have to be realistically acknowledged. There is a tension between the opportunities of technology - which are themselves constantly shifting - and the conditions attached to their application: the ability of the sustaining social, educational and management system to accommodate technology at a particular level of performance.

(a) Technology

While a recital of innovation is unnecessary, it is important to understand, at least, the particular opportunities offered by information and communication technologies to sustain educational processes.

In principle, they can offer :

outreach : the opportunity to reach a very large number of people, in many cases simultaneously.

economies of scale : the economic consequence of outreach is a lowered unit cost (which has often led to a view of educational technology as a less costly variant of expensive traditional structures : this has been characteristic of distance education approaches).

richness of illustration and visualization (including such special applications as ultra-high definition, or microscopy).

individualisation : a more recent function, associated with the spread of cassettes, compact discs (CDs), and computerized applications.

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[1]This paper draws partly on papers and ideas submitted by Manual Alvarado, Head of Education, British Film Institute and John Mayo, Professor, Center for International Studies, Florida State University.

access to information (including new concepts of archiving and storage linked to interactivity).

simulation : prospects for the future, including artificial or multi-sensory presentations of reality.

Not all of these functions are attributable to all technologies so that further examination by both communication types and communication processes is needed.

We can use a classic typology, of **print**, **film**, **audio**, **video**, and **data** (computerised forms/information technology). But each of these basic types has been subject to considerable refinement over time (and interaction with other technologies), particularly in relation to the processes of media and information creation.

These are, put simply, **production** (the originating creative process), **recording** (in modern times largely inseparable from production, since most production is not live or ephemeral), **distribution** (by physical or electronic means, but more often mixed in these days of remote transmission and facsimile printing), and finally **utilization**. The last is really a complex of processes, since it covers both the storage of information (often over long periods of time, as in archiving), and its access by producers and audiences, with variable degrees of interactivity.

In Figure A a simple attempt is made to relate technology types and processes in a single matrix; the main types are noted here in relation to production phases, and the myriad links between them explored.

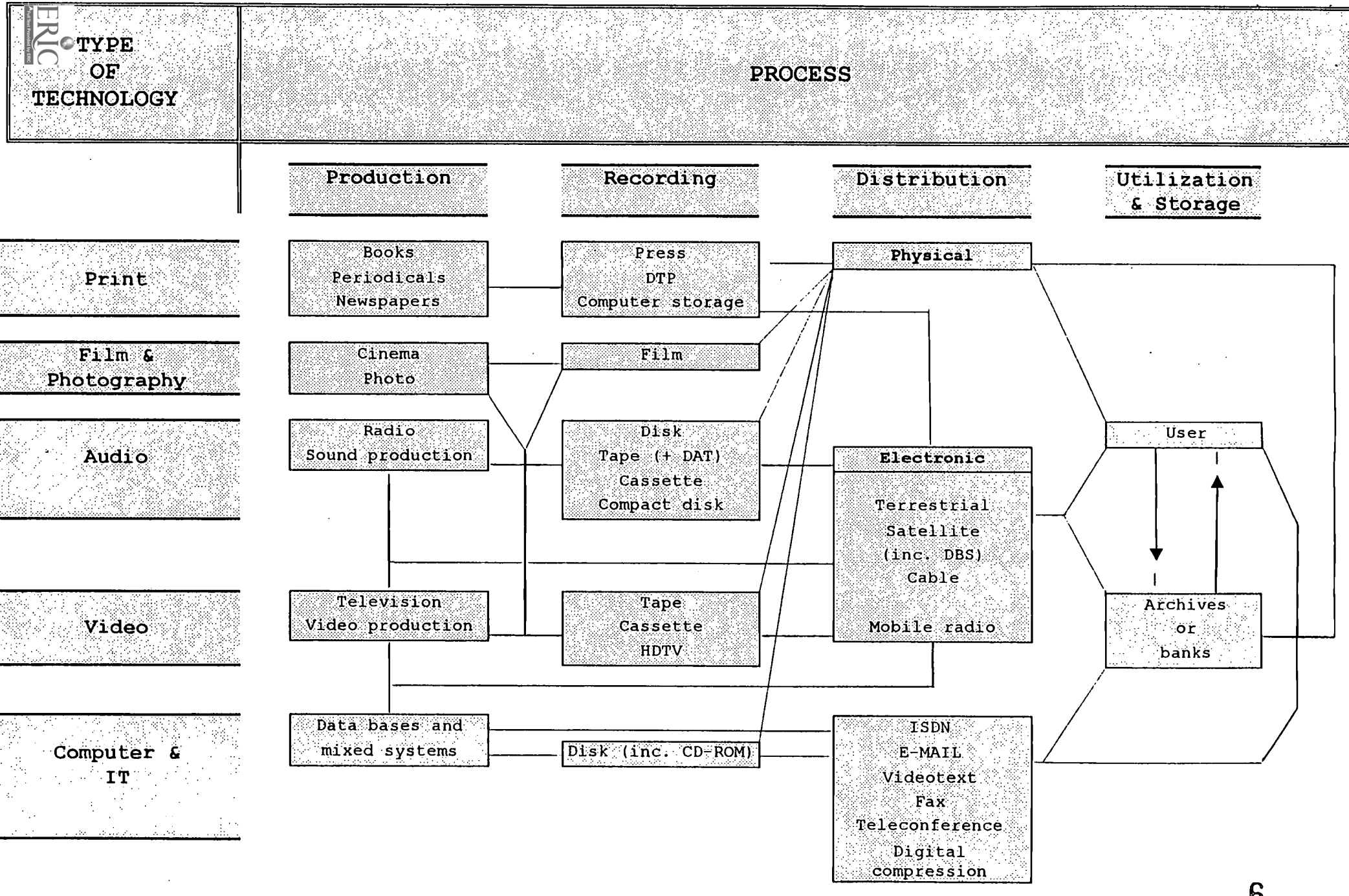
The diagram needs some commentary, especially in relation to its horizontal (process) axis.

Under the **production** column, each basic medium is broken down into its subsidiary forms: books, radio, TV etc. The added dimension of **recording** expands this division considerably, to a point where we almost seem to be faced with new media: tapes, cassettes, CDs, and various possibilities for recording etc. re-recording, etc. In recording, a qualitative supplement may also be found: higher resolution, fidelity or definition, leading to more faithful and complete reproduction. It is similarly in recording that electronic technology plays a determining role, further confirmed at the **distribution** stage, where physical distribution processes are most often combined with electronic transmission (e.g.facsimile printing, the copying of video materials, or of data).

Even at the level of this simple diagram, the increasing complexity of distribution forms is apparent, and the marriage of computer and distribution technologies to create new systems (videotext, teletext, E-Mail and teleconferencing) which considerably increase data storage, access and interactivity. Ultimately a point is reached where the computer is itself used as a logical, discursive and intellectual tool in expert systems, artificial intelligence which mirrors human thought processes, or combined with audio-visual media to stimulate reality in a multi-sensory form (so-called 'virtual reality').

At the bottom of Figure A, the main educational functions already attributed to media and information technologies are assigned to different stages of the production process. 'Illustration and visualization' are largely functions of production and of recording: in educational programmes, they enlarge the range of experience, of sensory or intellectual access, by helping students to cross time and space barriers. 'Outreach' is a function of distribution: enlarging and expanding audience numbers (or audiences themselves) since modern multiplexing and multi-channel techniques can expand the range of choice and not simply numbers). 'Economies of scale' are largely achieved through distribution processes (though lowered costs of production and recording certainly make their own contribution). But 'access' and 'individualization' are primarily dependent upon technological innovations applied to the system as a whole.

At a theoretical level, technology is already able to overcome many of the limitations to which it was formerly subject. Both theoretically and in practice it can combine high capacity information storage with virtually individualized access and large scale distribution. The current limitations are



5

6

Expert systems / Artificial intelligence / Simulation

(Illustration ------ . Visualisation)

(---------- Access

(Outreach)

(Economies of scale)

---------- Individualization ----------)

those of the technology support systems: weaknesses in the economic and industrial base (witness the recent change in status of IBM from 1st to 15th in the world); the human and financial resources of educational infrastructures; the ability of students to connect to and emphasize with technology. These constraints are paramount in determining technology's contribution to education, and should not be underestimated.

In particular, what was said above concerns technology in the abstract, and needs to be contextualized. There are, for example, sharp differences in environment and potential between industrialized and developing countries, reflecting contrasted conditions of investment, opportunities for original research and design, market possibilities and rates of return. For the most part, possibilities for modifying technologies in the developing countries are limited, except in countries like India or Brazil where a reservoir of design talent exists, and there are facilities for exploitation. At the same time, the educational priorities of the developing countries are also different, since basic literacy levels are much lower, infrastructures much less developed and resources fewer. This can be illustrated, for example, by comparing the relative priority attached to the various functions of the media described above. In the developing world, it is the possibility of outreach and of economies of scale which is most immediately attractive, rather than richness of illustration, or individualized access and interactivity; in the industrialized world, the position is reversed, since distribution and access are more or less guaranteed, and individualization can count for much more.

(b) From Theory to Practice

When we read, in the World Declaration on Education for All - 'In addition to the traditional means, libraries, television, radio, and other media can be mobilized to realize their potential towards meeting basic education needs of all' - we may be forgiven for thinking that the use of media and information technology in education has a limited past. In fact, it has a long and relatively well-structured history dating back to before the Second World War, when educational radio first made its appearance. The most direct tradition can be traced to the publication of Wilbur Schramm's seminal work The New Media: Memo to Educational Planners, (published by UNESCO in I967 and originated, appropriately enough, at the International Institute for Educational Planning (IIEP). This tradition is more or less unbroken, even though to the novice it may read more like a history of successive and dramatic innovations, with significant steps taken en route in American Samoa (educational television), the Ivory Coast (ETV) (now Côte d'Ivoire), satellite broadcasting (SITE, India), the Open University (distance education), interactive radio (Nicaragua and many more examples since).

What has changed over the years has been not only the range and sophistication of the technologies employed, but also a concern for an expanding set of audiences, beginning with formal, classroom-based instruction, but expanding upwards and downwards in age range, from pre-primary audiences to the elderly, from formal and non-formal settings to the wider, open community. These have come to the forefront as educational fashions and priorities have themselves changed. However, there has been a continuing debate over most of this time on the role of media and information technologies7: whether they are intended for use as direct instructional devices, aids or replacements to traditional instructional settings, or rather as enrichment tools, drawing on audio-visual media and information technologies to expand learning, enrich experience, enlarge the knowledge base, develop teaching and learning techniques. This debate still continues, and cannot be said to have been resolved one way or the other, since the nature of educational media and their use depends upon local cultural and educational contexts. It is affected, for example, by whether the educational system in a particular case is centralized or decentralized (since large scale distribution of identical materials for learning purposes has, for most of media history, been possible only in centralized systems).

In reality, in the development of educational media and technology, periods of euphoria have alternated with periods of hesitation as innovative projects have been introduced, but have in many cases not lived up to their expectations. The euphoria stemmed mainly from the apparent potential of educational technology to resolve so many pressing problems, both qualitative and quantitative. These include coping with student numbers, infrastructural limitations, the lack of material and financial resources, and the need to re-train or motivate the teaching force; while the inherent qualities of the media to enrich and visualize teaching processes have always been recognized, it is rather their economic potential that has fired enthusiasm over the decades. Over the years, therefore, the multi-channel educational television service in American Samoa came in the sixties (and has largely gone); the ETV service in the Ivory Coast (Côte d'Ivoire), originally instructional in purpose, has been transformed into a general public service; the promise of the experimental satellite project in India (SITE) which was a focal point of the seventies, is still not fulfilled. The main conclusions of the evaluators of educational media (and many of these experimental systems, such as El Salvador, the SITE project, and the Ivory Coast system have been extensively evaluated) are that technology per se is no solution or panacea to educational ills; it has to be employed within a multi-media system, linked with traditional approaches and infrastructures, not as impressive add-ons or as stand-alone alternatives to traditional forms of instruction. As with other forms of innovation, the main challenges to be faced are those of retaining momentum and support, of maintaining quality and an adequate resource base over time: in other words, of institutionalizing successful demonstration projects.

In order to make a distinction at this point between the industrialized countries and the developing world, it may be helpful to return to the brief earlier discussion of the functions of media in education. In the developing countries, it is the possibility of addressing massive audiences, or of reaching audiences that are not normally reached at all which is important : the villages accessed by the Indian satellite (SITE) project, the USAID Rural Satellite Program, the establishment in the eighties of a dedicated educational radio network in Thailand, a national distance education programme in China, applications of surplus satellite capacity in Intelsat's Project Share. The same considerations are pre-eminent in many of the new ideas currently under review: planning a low-orbit satellite system for information distribution in Africa; dedicating part of the HISPASAT provision (designed to cater for Spanish domestic telecommunications needs) to Latin American television networking; developing interactive radio across the Portuguese-speaking countries.

Conversely, in the industrialized world, more often than not the illustrative properties of audio-visual media, and their potential to reach specialized, minority or disadvantage groups are emphasized. The Open University (United Kingdom) was originally constructed on this premise (initially it drew up very detailed profiles of the groups to be favoured). Transmissions for specialized audiences have been accommodated for more than thirty years in the television channels of European and American public broadcasting systems; a variety of projects has introduced both in-school and out-of-school audiences to computer operations; much of the development in the library field, whether for print, audio-visual or other forms of data, has been to facilitate cataloguing and retrieval, and such customized approaches are at the heart of modern library planning. Compression and multiplexing techniques have given cable systems a greatly enhanced channel capacity (by now their range is more restricted by economic considerations), and some satellite projects, like the OLYMPUS satellite experiment of the European Space Agency, have offered networking opportunities to specialized interest groups (linguists, teachers, social workers etc.).

The search for greater access, variety and individualization in learning and study materials has been accompanied by a search for more interactivity (to simulate the tutor/student relationship). Many interactive videodiscs have already been made for training and orientation purposes. Potentially, the limits of computer/telecommunications systems, interfacing with audio-visual media, are difficult to circumscribe, depending as they do upon context, economic conditions and the sophistication of the tasks which they are set. Most probably, it is the world of industrial training, teleconferencing and marketing that is shaping this future, rather than educational demands.

(c) Distance Education

Today a special focus of attention is distance education: an interest originally sparked off by the development of the Open University (United Kingdom) in the early seventies, from which many analogues have been derived. Examples are to be found in Thailand (the Sukkothai Thammathirat Open University), Pakistan, China and Venezuela, to name but a few; information and research are disseminated by the Commonwealth of Learning (in Vancouver), and in the U.K.-based International Centre for Distance Learning. Some of the earliest pilots for distance education were organized by the International Extension College, which celebrated its coming of age in Cambridge (U.K.) in 1992 with a conference which analyzed a number of case studies. These included distance teaching experiments (some of them of long standing) at the secondary, adult basic, teacher training and university levels, employing a variety of delivery channels (correspondence courses, radio, audio-visual media, study groups, summer schools, telephone tutorials and teleconferencing). The role of the media and educational technologies was seen to vary widely within and among these systems, although in the main distance education ("a process in which a significant proportion of the teaching is conducted by someone removed in space and time from the learner") does not normally use radio and television as primary means of instruction (and even when they are dominant the accompanying instructional guides are critical). In general, in the developing world, radio has had a better history of success than television, though this is probably due more to the greater ease with which radio can be accommodated to the infrastructures and resources of the developing countries than to any innate advantage. Many evaluators have noted that differences within media outweigh differences between media in terms of cost effectiveness and performance.

John Mayo and Tony Dodds, the authors of a review paper prepared for the International Extension College anniversary conference, came to a number of conclusions as to the likely future of distance education. The most likely future audiences, in their opinion, in the developing countries will be threefold : adults seeking advanced accreditation and training, with career improvement as their primary goal; adults with little or no previous formal education seeking basic and non-formal education; and adolescents and young adults who have just left school, have not settled down in employment, and are seeking a substitute form of, or re-entry to secondary schooling. In each of these cases, distance education is seen as a potential means of overcoming failure in the existing educational system, whether formal and in-school or part of employment. (This is, of course, a different set of primary audiences from those most common in the industrialized world, and it reflects both a different level of infrastructural development, and a different degree of failure). Nevertheless, Mayo and Dodds still think that we should be careful of treating distance education as a potential remedy for all educational ills; from experience, it seems to be better adjusted to educating motivated and older audiences, than to providing an alternative mechanism for drop-outs.

The authors agreed that the demand for distance education will grow dramatically over the coming decade, though not always perhaps for the best of reasons. They also predicted that the demand will grow at several educational levels, including areas where it has already been shown to be less effective, simply because the pressures and problems involved are so great that radical solutions are looked for, even when previous experience shows they seem to be inappropriate. At times, given the drop in available resources, distance education may appear to be the only available means of compensating for the absence of certain vital infrastructures.

The difficulty in predicting future growth in distance education in the developing world arises not so much from uncertainty about technology, but rather from problems of timing and confidence. Even in the industrialized world, growth is hard to assess, with even giants in the computer and telecommunications fields also losing ground to recession; developments which might otherwise have been telescoped may now take much longer to materialize. Their transfer to developing countries is more difficult still to pinpoint, if a genuine adaptation, rather than a synchronic transfer, is visualized.

Over time, however, with increasing trends towards individualization, the learning situation of distance students cannot but improve. And as this happens, there will also be more convergence between distance learning and other kinds of remote activity (e.g. 'teletravail'), as habits of distance working, distance marketing household and leisure management are better integrated economically and socially. For distance learners and workers both, the separation between education, work and leisure will become further blurred, as the phenomenon of technology convergence comes into play (i.e. common channels for carrying a variety of kinds of information). But the gap between the arrival of these practices in industrialized and developing countries is likely to increase, rather than diminish, unless a major effort of political and economical will is made to secure the necessary investment in human and technical infrastructures in the developing world.

All of this implies an enlargement of actors and partners in the distance education and educational technology field: with the private, the non-governmental, the political and the professional sectors crossing frontiers traditionally reserved for educators.

(d) Communication for Development

Some blurring of frontiers between educators and communicators has already been in progress for several decades. Outside those channels normally considered 'educational', it has been concentrated on development support, and on community building. Many professional communicators entering the development field have been convinced that the mass media, and the techniques adopted by producers and advertisers, can be deployed for educational and developmental purposes: for public campaigns (health, anti-smoking, literacy, population), or for sensitizing and motivating audiences normally resistant to educational programmes. Possibly the best known example of such an approach in relation to children was the early work of the Children Television Workshop in the US, which produced "Sesame Street", using the techniques of advertising, the analytical tools of the psychologist and the market researcher, and the magnetism of the television medium, to introduce deprived children to basic literacy skills and motivate them better towards education. This experimental approach was repeated in many parts of the world, including the developing countries, and it has recently been returned to in India and in a new UNICEF programme.

Other attempts to cater for special audiences, which fall outside the mainstream mass channels, are to be found in community radio and television, the rural press, alternative video and community communications, which seek through low cost, small-format techniques to cater for the special interests of women's groups, rural audiences, young people. In a broader sense, the same approach is also reflected in the FM radio services of large modern cities.

In parallel, a long tradition exists of applying the media to development processes, in what is generally termed 'development communication': special programming, employing a variety of audio-visual formats for development campaigns, specialised audiences for agriculture, health and population, field and extension workers. Often these use the techniques of distance education to reach dispersed target groups in a highly focused way.

Many of the experimental approaches described above have been outside the formal educational environment, and as a result are not always widely known by educators:many bureaucratic separations exist between ministries and agencies of education and other development or information ministries. These divisions, found in the developing and industrialized world alike, make it difficult to function in the intersectoral manner essential for the worlds of education and a mediated society to be regularly and usefully bridged. It is only through such deliberate experiments as the Open University or the Childrens Television Workshop that this bridging has been forced in the past; the most successful experiments have usually been the outcome of imaginative personal interventions (by scholars, politicians, philanthropists), which have been brought to a successful conclusion by sustained, interdisciplinary work.

II. Media and Information Technology as Education

In turning now to the impact of communication technologies on a wider society we are reversing the telescope trying to assess an impact which is largely unplanned upon learning and social behaviour.

(a) The Information Society

The twentieth century has witnessed the invention and development of records, radio, television, audio tape, video tape, computers and the possibility of transmitting electronic signals through terrestrial systems of aerial broadcasting, cables and satellites. Telecommunications systems have developed ever more sophisticated systems of interpersonal communication - telephones, faxes, computer modems.

The most striking aspect of all these developments, however, has not been technological but economic and social. All these technological systems are now small and cheap enough to be widely available for domestic use by most people in the industrialised world and by increasing numbers of people in the developing world.

Secondly, the technological shift that has taken place with these developments can be characterised as a shift from the general to the particular,i.e. a shift from broad through narrow casting to inter-active possibilities and facilities.

There is no need to labour the idea of an increasing penetration of media into people's lives, notably in the industrialized world (where the statistics are more readily available), but increasingly in the developing countries. In 1992, for example, in the United Kingdom, a survey by the Independent Television Commission revealed that 99% of all households had one television set, 67% had two, and 30% had three. Video recorders had achieved a penetration of 77% : home computers already had 30%. These overall percentages were even more exaggerated in homes with resident children (91% had a video recorder, 51% had a home computer). The figures in other industrialized countries are comparable (and higher in the United States).

Expressed in temporal terms, some five years ago the average individual television viewing time was 360 minutes per household in the United States, 267 per household in France, 218 per individual in the United Kingdom; in 1991 a UNESCO survey gave figures for Bulgaria as 131, for Hungary as 117. In the United Kingdom, children now spend approximately 25% more of their time watching television than they spend in the classroom (and 11 hours a week, on average, are devoted to viewing 'soaps' or 'feuilletons'.

Social research shows that considerable changes are taking place in the ways in which we receive, process and verify information. For example, television is now the major channel for world news: a recent survey (1992) shows 71% of respondents giving TV as their major source (as compared with 17% for the press). Conversely, the position for local news is quite different: 51% of residents derive their information from the press, and only 24% from television. While this in part reflects television distribution patterns, it also has something to say about the changing functions of the print media.

Given a world with multi-channel transmission possibilities, compression techniques which increase the amount of information that can be carried, and transfrontier distribution, it is not surprising that new patterns of audience use are developing, with existing formats turning into virtually new media. The example of video is characteristic.

(b) Video/print technologies

Video offers vastly different distribution patterns from all previous celluloid and electronic media. Three examples are:

1) The use of video by minorities, such as the Asian community in Britain. With virtually every Asian family possessing a video recorder, the Asian community imports huge numbers of movies and TV programmes, on video tape, which provide both entertainment alternatives to British TV but also act to encourage and maintain Asian cultures and identities within British family structures.

2) Migrant workers from many parts of the world are using video to maintain closer links with their families and cultures.

3) Given the lack of developed broadcasting systems, many families in the Gulf States purchase multi-standard equipment (i.e. capable of playing back PAL, PAL-M, horizontal and vertical SECAM, NTSC etc.) in order to maximise the sources from which they can obtain films and television programmes on video.

Additionally video offers new, alternative and localised production possibilities. Some examples are:

1) The use of video during the Sandinista period of government in Nicaragua.

2) The development of the worker's Video Co-operative TV dos Trabalhadores in Sao Paulo in Brazil which offers a radically different view of the country, and of South America generally, than that offered by the broadcast television companies.

3) The use of video by various aboriginal communities in Australia.

Not surprisingly the relationship between print and audio-visual media is changing, and it has been argued that in the industrialized world, for certain entertainment functions the video-cassette may actually supplant the book in a short space of time.

In the developing world, this trend could be even more rapid, since constraints of illiteracy can slow down book distribution; it has even been argued that, in such cases, developing country populations may bypass the printed word, moving directly towards media literacy.

In general, however, while the audio-visual media have become increasingly important they have not yet superseded, nor will they eclipse the print media in education. The book still continues to offer the smallest, quickest, most efficient and economic form of interactive technology and research tool available. At the same time, an important distinction has to be made between the book and print media, on the one hand, and text and language on the other, since literacy in all media depends upon a mastery of verbal and textual communication.

Verbal language, and its written symbolic form, will probably always constitute the basic system for human interaction and inter-communication. Furthermore, computers, teletext, interactive video, CD-Rom (and their attendant instruction manuals) all require, and will continue so to do, the most subtle and complex of symbolic communication systems.

(c) Studies of the Communication Landscape

The study of communication and information, as a branch of the human and social sciences, is of relatively recent origin, dating back to the thirties (to propaganda and political opinion research), but blossoming as a component of social research only in the sixties. Inevitably, as it developed it fragmented into many separate strands and perspectives: semiotic and textual; economic; sociological; psychological. The substance of this research is outside the scope of this paper (and

has already figured in the work of other independent Commissions, notably the MacBride Commission which produced its report Many Voices One World under the aegis of UNESCO in 1980); nevertheless, the landscape which such research examines is very much that in which education and a mediated society interact. Today communications and information are major multinational concerns, which have recently seen many mergers and acquisitions, in particular amalgamations of US and Japanese interests, and confederations elsewhere.

In the international circulation and marketing of audio-visual media, only a dozen countries can now compete - and so dominate the world market place. These are Germany, the UK, Italy, France and Spain in Western Europe, the USA, Mexico and Brazil in the Americas, Nigeria in Africa, Egypt, India, China and Japan in Asia and possibly Russia and Poland from the old Eastern European bloc.

The reason for this situation is that only these countries have domestic populations large enough to provide licence fee revenues, advertising revenues or subscription sales adequate for the most expensive areas of domestic TV production such as high quality fiction. Furthermore, having amortised all costs against domestic transmission, these countries' TV producers can then market their programmes internationally at prices the individual purchasing country can afford. Thus, unlike other commodities which have to recover the unit costs of production, television programmes can in many cases be sold at highly variable prices according to the capacity of each and every market.

In consequence, the developing world has to import much of its audio-visual requirements. But the developing world can afford neither to sustain independent international news agencies and their support systems, nor to originate its own high cost fictional production.

While the 'new' electronic equipment is, to some extent, beginning to democratise audio-visual production in the industrial world, it is unlikely to change this unequal relationship with the developing world. Those countries which do have substantial alternative production systems (e.g. TV dos Trabalhadores in Sao Paulo) are countries which are already "media rich".

At the same time recent political changes throughout the world have shown how important are the media, and information distribution processes in general, to democratic development; the enhanced freedom of information visible in Eastern Europe is paralleled in many parts of the developing world, even though change is not uniform or invariably positive. There is a growing realization that pluralism of information channels, diversity of production and distribution means, are both a pre-requisite for and an indicator of democracy, quite apart from the fundamental importance of freely circulating information and comment. This makes, of course, for a less tidy, less regulated information landscape, inevitably demands an element of redundancy, without which pluralism cannot exist. In the most recent debates on information, many of the classic arguments on the tension between individual freedom and the need for social constraint have resurfaced in a new form, as have the debates on professional deontology. It is not simply a changing political climate that has led to this renewal; the new technologies have themselves contributed, as they have bypassed frontiers, found new ways of entering private homes, new patterns of access and distribution. Quite recently, for example, some reservations have been voiced on the implications of the European Directive on Transfrontier Broadcasting, which was agreed in March 1989 and came into effect in 1991, because it appears to make national control of satellite transmitted stations virtually impossible and unregulatable. In the developing world, a similar debate surrounds direct broadcasting by satellite, with respect to cultural identity and the promotion of endogenous production.

In this changing situation, the scope of communication research has also broadened, and now rests upon a considerable corpus of experience. The earliest research into instructional media and educational technology was largely designed to show that these could, if properly introduced and utilized, be effective educational agents; the bulk of current communication research deals with the influence of the media on human beliefs and behaviour. No-one would now contest that the media have a strong agenda setting and behavioural reinforcement function, even though some earlier claims that the media have a primary causal relationship with violence or deviance are believed to be exaggerated. Moreover the media themselves are major actors in current political practice and

decision-making, whether through opinion polling, televised commentary or more recently (as during the Gulf War, the U.S. Presidential campaign and various judicial hearings) through a live coverage of events, to the extent that scheduling and participation in these events is affected.

(d) Media Education

While much of this debate is outside the scope of the present paper, it is nevertheless a backdrop against which educational analysis has to be set. Mass media encountered outside the classroom furnish a mould for learning and the interpretation of events; moreover, the most significant application of information technologies to behavioural change is clearly in advertising, which has become a major multinational industry in its own right, as well as a prime source of media financing. Recognition by educators that the media constitute a very significant part of their students' universe, and that within the media advertising formats and techniques are likely to mould aesthetic preferences, implies that this dimension should form part of the processes of curriculum creation.

The importance of the concept of 'media literacy' (an analogue of basic and functional literacy) was realized by the Jomtien conference; understanding and using media and information technologies is rapidly becoming a pre-requisite for functionality in the contemporary world, whether industrialized or developing. (As such, it can be related to 'computer literacy', although in the latter case there is a greater emphasis on skills than on understanding in a social and economic context). The idea of 'media literacy' gives rise, in turn, to the concept of 'media education'. What does this constitute?

The question takes us back to the expanding horizons of media research. Fundamentally it can be argued that all films, television programmes and other audio-visual objects may be considered as both commodities and as audio-visual texts. As commodities they undergo the same conditions of existence as all other commodities (i.e. the stages of production, circulation and consumption). Investigating media products as commodities therefore involves a similar type of economic, regulatory, political and social analysis as exists for any other commodity.

As texts they are susceptible to analysis as objects which are constituted through, and by, a symbolic system - albeit a highly complex one that encompasses language, music, moving images, colour, gesture and all the other aural and visual elements of human existence. An important part of this analysis is the relationship between the text and the real world. The extent to which the text projects a useful and interesting relationship to the world as the viewer perceives it will determine how acceptable is that particular representation of the world.

It follows therefore that a crucial question to ask concerns the relationship between an educational system and its containing culture - to what extent has a culture produced the educational system it desires, in terms of reflecting or reproducing the social structure?

This view could be said to see education as essentially a process of socialisation. It is also a view which, with other (and often more idealistic) views, treats as unproblematic the way in which society presents itself to the pupil through the schooling process. Since the beginning of the 1970s, one of the major problems debated in Europe on media education has been whether or not to argue for the 'institutionalisation' of this new subject area. Opponents of the idea argued that this would have the effect of transforming the subject into just another area of the curriculum; furthermore it was felt that making the subject examinable (the next stage) would ossify it, rendering its syllabus rigid and difficult to change.

Those who favoured the study of media education argued that it was ridiculous for the major social, political and cultural form of communication in twentieth century civilisation to be ignored by a curriculum inherited from a nineteenth century education system. Furthermore, the position ran, until the area was examined at university level, it would be very difficult (probably impossible) to obtain the funding necessary to mount courses or to engage in much-needed research work. For a variety of reasons this last argument eventually prevailed, and media education began to enter the curriculum.

However, over the same period, yet another strand in the development of study of the media can be discerned. Partly on the basis of work in semiotics and structural linguistics, the possibility was raised of introducing the notion of visual literacy into the curriculum as a core element to take its place alongside the other core elements of literacy, verbal literacy and numeracy. In consequence, the concept of a 'core curriculum' became of crucial tactical importance to teachers embarking upon the debate about the location of media studies.

Without coming down clearly on any side, it can be argued that the problems which teaching these core areas have exposed begin to offer a new way of thinking about the curriculum. One starting point may be to ask what the study of the media has introduced in terms of fundamentally new understandings of the world? At one level at least, it has provided a place for the intersection of a unique combination of theoretical and political elements. Perhaps the question should be reformulated along the lines of 'What has that combination of elements achieved in terms of enabling us to re-think the media, media education and the curriculum as a whole?'

CONCLUSION

The purpose of this paper has been more to raise questions than to answer them: in particular, to try to ensure that the debate is allowed sufficiently broad margins. For the sake of analysis, it has treated communication and information technologies, first, as supports to the educational process, and second, as extraneous or surrogate educators. In reality, these divisions are arbitrary; the children in the classroom are also those who watch television and video at home. At the end of the day, when it comes to establishing policies and priorities, the view from both ends of the telescope is needed.

Nevertheless, a holistic view is not an undifferentiated view; while the starting point for a mediated society lies in technology, technology has no universal solutions to offer, but is applied in a social context, which differs as between industrialized and developing countries, and is dependent upon levels of access, investment, social imperatives.

In thinking about communication and information technologies, the educator necessarily adopts many guies : teacher, curriculum designer, social researcher and finally individual participant in a modern society.

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