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**Information Infrastructure Of The Future :
An Overview**

By

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INFORMATION INFRASTRUCTURE OF THE FUTURE: AN OVERVIEW

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INTRODUCTION

In recent times the subject of the information society has captured the imagination not only of technologists and social scientists, but also the lay public. Seldom in our history has a subject attracted such attention and generated such volumes of literature, yet yielded so little critical insight and understanding of its real long-term implications. The combination of wonderment about the unfolding technical possibilities and aggressive promotion by the sellers of equipment and services has created an impression that the new communication and information technologies and the services they can provide have a magical quality. One is led to believe that a healthy injection of communication and information technologies and services will solve a firm's, a society's, and the world's economic, social and political problems. People are invited to submit themselves to the authority of these technologies.

Yet, if history has taught us anything, it is that new technologies will not solve old social problems. They may significantly change power relations in society in favour of those who control and benefit from the new technologies. But, there is no magic embodied in new technologies that will suddenly and automatically transform the nature of social and institutional relations in beneficial ways. In fact, new problems usually are created. As Dato 'Fauzi bin Abdul Rahman, Honourable Parliamentary Secretary, Ministry of Information, Malaysia, observed in his keynote address to the CIRCIT Australia Conference on Learning Networks For the 21st Century last May, "Consistent with past social transformations brought about by technological change, information technology evidently has shown its propensity to behave as a double-edged sword, even sharper this time on both sides."¹ This paper provides an overview of some of the important issues raised by the rapid development of an electronic information infrastructure for the

information societies of the 21st century, with particular reference to the changing role of broadcasting.

COMMUNICATION AND SOCIETY

The functioning of any society depends upon information, and the efficient and effective communication of it among society's members. Information is generally interpreted as a "stock" concept, a store of knowledge and values. Communication is a "flow" concept, reflecting the process of transmission and exchange of knowledge and values, which itself creates information influencing knowledge and values. "Information" and "communication" provide different analytical perspectives on essentially the same phenomena. An examination of the information characteristics of any society must focus on its communication characteristics. New communication networks are often the driving force behind the generation of vast quantities of information.² In the broadest sense, the social, cultural, political and economic institutions in any society are defined in terms of the characteristics of the shared information within and among those institutions. In the narrower economic sense, it has been recognised generally that the most important resource affecting the economic efficiency of any economy, industry, production process or household is information and its effective communication. Now that entire industries and major sectors of technologically advanced economies are devoted to information - the search for it, the creation of it, the manufacture, storage, classification, summarisation, selection, editing, interpretation, hoarding, purchase, sale, and broadcast of it - the economic and social characteristics of information have been recognised as an area in which precious little is known.

Yet, it is apparent that the characteristics of information define the state of knowledge that underlies all economic and social systems. They affect the nature of economic markets and the structure of industry. They affect the internal structure of organisations ranging from corporations to government agencies, political parties, universities, labour unions, libraries and volunteer groups. They affect the formation of social and cultural networks; the nature of work and leisure; the role and definition of education; the structure, content and effective control of the mass media; and the information environment through which public opinion is formed.

The importance of information flows and communication patterns to the establishment and maintenance of particular institutions has been well understood since earliest times. Trade routes and communication links were deliberately designed to maintain centres of power and to overcome international comparative disadvantages. Britain still benefits substantially from its historically established communication links with its former colonies, long after the empire's formal demise. Universal telephone service was adopted as a policy objective in many countries to encourage economic and social interaction within the country as a way of promoting national unity. In many countries national government or public broadcasting organisations have been established to promote and reinforce a national identity. The European Economic Community is attempting to foster a new European identity by promoting increased communication and information exchange - in both telecommunication and broadcasting - as a basis for stimulating increased trade among its member countries, completing the single European market and creating a more

cohesive European culture. Many countries in Asia and elsewhere are attempting to use new communication and information technologies and services to stimulate economic and social development within the nation, create international competitive advantages, and expand trade, while at the same time preserving cultural traditions, national identity and autonomy. The "IT 2000" programme of Singapore was one of the first, and Malaysia's more recent "Vision 20/20" is not only one of the most ambitious programmes, but also has captured the most imaginative title.

KEY ELEMENTS OF THE INFORMATION INFRASTRUCTURE

Essentially the information and communication sector of a technologically advanced society consists of, microelectronics; computer hardware, software and services; telecommunication equipment and services; the mass media; and a plethora of new database and information services, as well as the more traditional forms of information and communication such as libraries, publishing and postal service. Stimulated by rapid and continuing technological change, this sector has experienced a high rate of economic growth in recent years. Moreover, the direct economic effects are compounded by the fact that major parts of this sector provide important infrastructure services or enabling functions that affect the operation and efficiency of almost all other industries, including manufacturing and agriculture, as well as government agencies and most other institutions.

Many analysts believe that information gathering, processing, storage and transmission over efficient telecommunication networks will provide the foundation upon which technologically advanced nations will close the twentieth century as so-called 'information societies', i.e., societies that have become dependent upon complex electronic information and communication networks and which allocate a major portion of their resources to information and communication activities.

The primary focus of attention to date in the evolution toward an information society has been on the so called "information superhighway", the electronic telecommunication infrastructure. Although clearly very important, this is far from the whole story, and not the most interesting part. As has been observed, the information superhighway is only "the plumbing" for the future information society. The real action is in the information content and the new forms of communication.

The overall converging electronic communication sector is illustrated in Figure 1. The Telecommunication Facilities Network provides the electronic infrastructure for the information society, and unquestionably, telecommunication reform issues are extremely important, especially in those countries that have not yet achieved a universal service. Anyone who is not reached by the universal service policies of telecommunication provisioning will be seriously disadvantaged in the information society of the future. And we do not have to be reminded that the majority of the world's population still does not have reasonable access to a telephone.

But there are a number of other related, and equally important components of the information infrastructure that are essential to the successful development of an information economy and information society. Computer and telecommunication

convergence takes place principally with the transformation of the telecommunication network from analogue to digital communication standards. This raises important economic issues with respect to a country's industry policies in the information technology sector (microelectronics, computer hardware and software), as well as the purchasing practices of the dominant telecommunication operator – most often a government PTT or national telecoms operator. In Figure 1, this is illustrated by the arrows linking Computing/Information Technology and Telecommunication Equipment Manufacturing in the Telecommunication Facilities Network.

The telecommunication network provides the electronic platform for the development for new communication and information access services, increasingly provided by service suppliers other than the PTT or Telecom operator. These include value added services, data base access., the Internet, Pay TV, HDTV, multimedia, etc. They are all made possible by the digitalization of the information and media content for efficient transmission on the telecommunication network, and the introduction of a variety of new interactive services where the interactivity is determined by the users. Traditional video broadcasting services can be expanded and diversified to provide not only more channels, but also closed user networks such as encrypted Pay TV, education and corporate training networks, and video as a component of interactive multimedia and other services. In Figure 1, this is illustrated by the arrows linking Electronic Services to the Telecommunication Facilities Network over which the services are provided, the increasing variety of Content being created, and the higher levels of Interactivity that characterize many of the planned future services.

But the real potential benefits of the new information and communication technologies and services are to be found in Applications in other sectors of economic and social activity – e.g., banking and finance, education and training, health and medicine, the media and cultural sector. Only if and when these sectors fundamentally transform their traditional ways of operating, so as to make full use of the new electronic infrastructure opportunities, will it become possible to achieve the major potential benefits of the so-called information superhighway. This will require a fundamental restructuring of traditional organisations, some significant changes in the skill base, and a major reform of the 'modus operandi' of entire sectors of industry and government. In Figure 1, the arrows linking Electronic Services to Applications illustrate some of the key sectors where there are, or will be, major attempts to integrate the new information communication services.

Take education as an example. Training and learning for the 21st century will require that distance education and computer assisted learning move from the fringes to the centre of national learning systems. Education and training will be moved onto the electronic communication network. This will require a convergence between telecommunication and education/training policy development. For the future, governments will not want to invest primarily in the bricks and mortar of stand-alone educational institutions. Rather, investment must focus on more diversified electronic access to information and teachers, new forms of content, teachers with the skills to facilitate learning in these new electronic environments, providing students with the skills to take maximum advantage of the new opportunities, and the development of new communication and information services that

are specifically responsive to these needs. The development of a whole new structure of communication networks is essential to redesigning the education/training system for the 21st century.

In most sectors of potential application, this kind of major transformation is only at the earliest stages of discussion and experimentation. In broadcasting, changes in many countries are being driven by the continuing improvements in satellite broadcasting and the commercial incentive to maximise audience size for global mass market advertisers.

SOME CHARACTERISTICS OF INFORMATION IN AN INFORMATION SOCIETY

In reality, of course, all societies have been information societies. The most significant change between technologically advanced society and the oral tradition of the Greek city-state - still practiced by some native cultures today - is not in the role of information in society, but in the way that information processes are institutionalised. The dominant form of information creation and exchange has shifted from oral discourse flowing outside the bounds of formal market arrangements to the establishment of information generating, storage and transmission institutions, the commoditisation of information and its exchange through markets. Perhaps the most significant change is not the volume of information, but the structure, the distribution, the institutions, and the dependence.

The information society of the 21st century will be far from a uniform, homogeneous condition. Moreover, the optimal rate of technological adoption is not necessarily the fastest, as many governments and corporations painfully have learned in recent years. The hard realities of the market cannot be ignored, but the particular values and priorities of individual societies need not be ignored, as a result.

The stock of knowledge in society at any one time, i.e., the skills and education of the populace, the detailed factual information relating to such things as the working of production processes, the interrelationships and interdependencies of different sectors of the economy, etc., collectively represent a primary resource of society. The value of this stock of knowledge to society depends upon how pervasively it is spread throughout society, and upon the institutions for maintaining, replenishing and expanding the stock of knowledge, i.e., education and training system, and research generating new knowledge. Economic and social benefits come in the form of improved decision-making of all kinds throughout the economy.

Once information has been generated, the cost of replicating it is very much lower than the cost of generating it in the initial instance. The consumption of information by one user does not destroy it, as occurs with almost all other resources and products. The information remains to be consumed by others, the only additional costs being those associated with bringing the same information and additional consumers of it together under conditions where it can be consumed, i.e., learned. And, once a given level of penetration is reached, a multiplier effect comes into play with many types of information, as the information is spread throughout society by informal communication processes outside the formal processes of learning and training. Hence, although the costs of adding to the stock of knowledge may be very great, there are generally significant economies in

spreading that information throughout society, and to other societies if the incentive exists to do so. The implications of this economic characteristic of relatively low cost replication of information can be extremely beneficial under some circumstances such as the spreading of knowledge throughout society, e.g., information about AIDS. But, it can create special problems and difficulties under other circumstances, for example, for a smaller society - like Canada - that is attempting to protect its culture and society from being engulfed by the spread of information and values from a dominant neighbour like the United States, e.g. via US television and films.

In the new age of information, some of the new information that is generated has its greatest economic value in scarcity rather than in widespread distribution. For example, information that has become important as a resource input to industrial, commercial and professional activities is specialised information sought to provide "inside" or superior knowledge of the behaviour of consumers, suppliers, competitors, government decision-makers, etc. In essence, in imperfect economic markets, this inside information for private consumption strengthens the negotiation or market power position of the organisations or individuals that have access to it. Such information may or may not be costly to obtain, but its economic value clearly lies in its scarcity, i.e., in the monopoly of information. Once such information becomes generally known to all interested parties, its economic value dissipates drastically.

Specialised information services for the private consumption of a restricted clientele are springing up almost daily. They range from special research studies of the details of international markets for transnational corporations, to confidential assessments of the negotiating strength of a specific customer, competitor, trade union, or government. They include remote sensing satellite data identifying the detailed swimming patterns of schools of fish, and pinpointing the location of mineral resources and the progress of crop growth in distant countries.

Many governments already have taken steps to attempt to restrain the march of information markets into the details of people's personal lives and to regulate the conditions of access to certain kinds of data banks, for example, credit, medical and tax files, as well as to protect national broadcasting systems. The pursuit, sale and use of information in accordance with the incentives of the market-place clearly cannot be totally unrestricted. But the production characteristics of: (1) the relatively high costs of establishing most content services, e.g., databases, television programs; and (2) the relatively low costs of extending the market for services already created, provide a powerful tendency toward centralisation and monopoly on an international basis. Thus, competitive forces in many information markets are likely to be rather weak. This, in turn, can be expected to raise important issues of national and international government policy.

BROADCASTING IN AN INFORMATION SOCIETY

The new information and communication technologies are associated with quite fundamental changes in the role and structure of broadcasting in society. We are just beginning to appreciate that the traditional role of broadcasting is about to be radically altered over the next decade. But, it is important to recognise that broadcasting is not

changing in isolation. Broadcasting is but one part of this microelectronic revolution which is affecting electronic communication of all kinds, and the transmission and distribution of virtually all kinds of information content – old and new.

The expansion of the information and communication sector serves to integrate the national economy more easily into the international economy by means of the more efficient international information and communication networks that are created. As international economic integration is expanded, the impact of domestic public policies is reduced. Control over the domestic economy by national governments is weakened. The effectiveness of national regulation is eroded. In Asia, this is nowhere more evident at the present time than in the satellite distribution of foreign television programmes from outside the countries.

These developments are forcing national governments to reassess the strength and relevance of their national policies and regulations. They are also recognising the need for a full range of international trade policies, addressed not only to direct trade in information and communication equipment, content and services, but also to the implications of global information and communication networks and services for other industries, and particularly broadcasting. For example, these considerations are central to current discussions at the International Telecommunications Union (ITU) on technical standards for global telecommunication networks, broadcast satellites, HDTV, and other matters, as well as at the GATT, on conditions for international trade in services, including broadcast services.

Radio and television have required use of a public resource since their inception – the radio spectrum. Effective communication has required at least a system of licensing and technical regulation that specified frequency, power and other characteristics of broadcast signals, and restricted entry to the industry. The technological conditions which required a high concentration of monopoly power, meant that government had to be involved, either as supplier of the service or regulator of the dominant private suppliers.

Different countries, each following its own traditions, adopted different institutional models for attempting to insure that broadcasting was in the national or public interest. In some countries government owned and operated national and/or "public service" broadcasting entities were established. In the United States a model of government licensing and regulation of private broadcasters was adopted. Specific requirements for programming in the public interest were established in all systems – government, public and private. In many countries, including Australia and Canada for example, a mixed system has come to be adopted as a means of encouraging a diversity of both programming and control.

Research has demonstrated how the characteristics of media content are heavily influenced by the structure of the institutions that make up the total broadcasting system. The major differences in programme content produced by competitive commercial, and monopoly national and public service broadcasting are well known. But there is greater variation within both the commercial and public service models. In the past, commercial

broadcasting has not been totally ruled by profit maximisation and often has provided some public service programming. Historically there have been limits on the extent to which commercialisation is permitted to penetrate programme content. For example, there normally has been an observable separation between the programmes and the advertisements, and limits on the quantity of advertising.

Similarly government objectives for public service broadcasting are defined differently in different countries, and are constrained in varying degrees by cost and audience criteria. For example, the Canadian Broadcasting Corporation (CBC) mandate is to promote national unity, to develop a national consciousness and to interpret Canada for Canadians, undoubtedly a reflection of its proximity to the US. In addition, the system of finance, the structural relations within government and with production houses, the standards of accountability employed and other factors all affect programme content. These institutional constraints do not deny creativity and discretion so much as channel it toward particular directions. Some of the most creative programming is channeled into advertisements and government propaganda.

New communication technologies, including fibre optic transmission, direct broadcast satellites and VCRs are opening a variety of new options for delivering broadcast content, and for implementing new methods of payment such as subscription and pay-per-view. International broadcasting is also expanding programme options. In the past, international broadcasting primarily involved exchanges among countries of national programmes produced for domestic consumption. This is now being superseded by programme production specifically created for global markets, often involving co-production among multiple countries and sometimes bringing together public service and private commercial broadcasters in co-productions.

Clearly the traditional distinctions between government public service and private commercial broadcasting are being eroded. The former positions of privilege and power enjoyed by the dominant institutions at the national level in both systems are diminishing. Many national and public broadcasters have a new and potentially lucrative opportunity to enter global broadcast markets. But they will have to shift part of their programming away from traditional national public service broadcasting. For example, the CBC has been instructed by the Canadian government to direct its programming toward global markets as a means of reducing its government subsidy. Many national governments are paying particular attention to the export potential of their public service institutions, including broadcast programming.

The apparent surfeit of new opportunity and choice that seems to be arising in the broadcast media could be interpreted as justification for a major relaxation, if not complete elimination of public service and public interest obligations and regulations. Indeed, Rupert Murdoch has been pumping this message heavily through his media outlets for some time. However, greater choice does not necessarily mean greater diversity, adequate service to either majority or minority interests, easier access to audiences for alternative programming or a more informed public opinion. A high concentration of monopoly power still exists, and shows no signs of withering away.

The public interest responsibilities historically imposed on the broadcasting sector remain. The challenge to future public policy in all countries is to fashion workable institutional arrangements that will ensure that those responsibilities are met by the system as a whole. This may well require a different system of regulation, but not an abandonment of public policy objectives. However, given the internationalisation of broadcasting it is questionable whether a decade from now, any individual nation will have the power to implement its public policies without the cooperation of its neighbours. This in turn opens the challenge of whether regional policy development in the broadcast sector is possible.

THE EVOLVING ECONOMIC STRUCTURE OF BROADCASTING

Broadcasting has grown from a national to a regional dimension, and now is on the threshold of a true international dimension. Almost certainly there will be compatible global equipment standards. New satellite, microwave and cable networks will provide for rapid global distribution. Programming for the international market (as opposed to the exchanges of national programmes that characterise the predominant current practice) involves a fundamental shift in audience focus toward international common characteristics and away from distinctive national characteristics. Transnational corporate advertisers already are preparing for unified global mass marketing via television.

These developments are facilitated by the increasing absorption of commercial broadcast stations and networks into the stables of large transnational corporations, often with ownership interests that cut across all the media and many countries. Yet, there has not been, and there is no sign of, a comparable development of international public service programming. Nor is there international public interest regulation, although Europe is currently struggling with the concept of regional regulation at the level of the European Community as part of its European "Television Without Frontiers" policy. The evidence to date points strongly in the direction that the international market will be overwhelmingly commercial. In most countries it is likely to increase the quantitative choice, but reduce the real programme diversity provided by alternative institutional structures.

Indeed, there is increasing evidence that the real diversity of programme sources is being significantly reduced already. The diversity in broadcast programming that now arises from a variety of different national industry structures, ranging from national public service to commercial, is gravitating toward a much more homogeneous international structure responding increasingly to the interests of global mass market advertising. For many public service broadcasters, the increasingly absolute costs of programming (which will be driven up further by high definition television), the increasing opportunity costs of foregone commercial revenue, and the pressures for international co-production for global markets already are directing them even closer to commercial programming standards. This could end up as privatisation of purpose, if not ownership.

National governments have not been quick off the mark in assessing the most appropriate public policies for the future global broadcasting market. This may be, in part, because applications of the new information and communication technologies are tending to erode heretofore separable areas of public policy. Industrial policy, social policy and cultural

policy are becoming more integrated than they have been in the past. Each has significant implications for the others. Being preoccupied with industrial policy, many governments are now looking at broadcasting and the "cultural industries" for export earnings and economic growth, rather than for informing the public and promoting increased understanding and awareness at the local and national levels.

In this new international commercial broadcast environment, there are pressures and opportunities to exploit the commercial potential to its fullest. Entertainment programmes, particularly in the US, are increasingly being designed around the sale of products. This includes the packaging of the characters and their behavior, the story lines and what the characters wear and consume. This almost complete commercialisation of programme content was pioneered in the mid-1980's by the US children's programme *Thundercats* which was designed solely for the purpose of merchandising products. It quickly spread to prime-time programmes, as evidenced by *Miami Vice*. Ironically these programmes are shown in many countries as public service broadcasting. One of the recent children's shows, *Power Rangers*, has been banned in a number of countries for its excessive violence.

The coming of interactive television opens a new dimension to programme commercialisation. The viewer must buy equipment, such as electronic weapons (with different models for father and son), to play electronic war with the enemy on the tube and to get an accurate count of hits and misses. The video game dimension of broadcasting is just beginning to be explored, opening a whole new dimension of products that are essential to participation.

CONCLUSION

Without major intervention by governments at both national and international levels, current trends point quite clearly in the direction of 21st century mass media television taking on the characteristics of a global electronic billboard. It is likely to be "entertaining", offering a plethora of choice within the narrow framework of intensified commercialisation, to the primary benefit of global mass marketing by transnational corporations attempting to reach global mass markets.

The public interest objectives of true diversity of programming in response to the diversity of interests and cultures in society, and of maintaining an informed public, are not likely to be high priorities on this system. These objectives are likely to be met, in part by special programmes supplied on Pay-TV, and by national and public service broadcasters playing a much different role in the new structure – closer to narrowcasting than broadcasting. But the Pay-TV audience is not likely to be universal. With the upgrade in quality and increased cost associated with HDTV and other improvements, and even more sophisticated and costly multiple purpose receiving and sending sets of the future, plus the additional costs for the programmes themselves and transmission to the viewer, Pay-TV will be a "Yuppie" medium for a long time.

If this extrapolation of current trends comes about, it will illustrate one of the very serious potential problems that could characterize the future information society. In an age of

information abundance, a major portion of the population may be less informed. The distribution of information in society may directly parallel the distribution of income. The alienation and estrangement of major sections of society may become a very serious social and political issue. The double-edged sword of technological change could cut extremely sharply into the economic and social structure of society.

The traditional notion of the public interest in broadcasting does not rest on any communication technology or industrial structure. An informed and aware public, and a community that cultivates its shared values and understandings is essential to human development and participatory government. Policymakers in all countries must now turn their serious attention toward fashioning national and international policies that will ensure all sectors of society benefit in the new broadcast environment and in the information society of the 21st Century. This is a task that will require considerable research and analysis of policy options and their implications. It is a task to which the Asian Mass Communication Research and Information Centre (AMIC) will continue to make important contributions, as will many people and organisations participating in this important conference.

Selected References:

Asian Mass Communication Research and Information Centre (AMIC), Media Asia, (special issue on Satellite Broadcasting), Vol. 20, No. 1, 1993.

Antonelli, C. (Ed), The Economies of Information Networks, Elsevier, Amsterdam, 1991.

Bell, D., The Coming of Post-Industrial Society: A Venture in Social Forecasting, Basic Books, New York, 1973.

Boulding, K.E., "The Economics of Knowledge and the Knowledge of Economics", American Economic Review, No. 46, May 1966.

Collins, R., Broadcasting and Audio-Visual Policy in the European Single Market, John Libbey, London, 1994.

Innis, H.A., The Bias of Communication, University of Toronto Press, Toronto, 1951.

Innis, H.A., Empire and Communications, 1950, Revised by Mary Q. Innis, University of Toronto Press, Toronto, 1972 (first published 1950).

Machlup, F., Knowledge: Its Creation, Distribution, and Economic Significance, Princeton University Press, Princeton, N.J., 1980-1984.

Melody, W.H. "Electronic Networks, Social Relations and the Changing Structure of Knowledge" D. Crowley and D. Mitchell (Editors), *Communication Theory Today*. Cambridge, Polity Press, 1994.

Melody, W.H., "Communication Policy in the Global Information Economy: Whither the Public Interest?", M. Ferguson (Editor), *Public Communication The New Imperatives: Future Directions for Media Research*, Sage, London, 1990.

Melody, W.H., "Information: An Emerging Dimension of Institutional Analysis, *Journal of Economic Issues*, Special Paradigm Series, XXI, 1987, vol. 3.

Melody, W.H., Salter, L. and Heyer, P., (Eds), *Culture, Communication, and Dependency: The Tradition of H.A. Innis*, Ablex, Norwood, N.J., 1981.

Porat, M.U., "Global Implications of Information Society", in *Journal of Communication*, No. 28, Winter 1978.

Rahman, Dato' Fauzi bin Abdul, "Building Open Learning Links With Asia," CIRCIT Conference on Learning Networks For The Twenty-First Century: Opportunities to Enhance Access, Diversity and Value Through Telematics, Melbourne, 23-24 May 1994..

Silverstone, R., "Future Imperfect: Media, Information and the Millennium", PICT Policy Research Paper No. 27, London, 1994.

Notes:

1 Dato' Fauzi bin Abdul Rahman, "Building Open Learning Links With Asia," CIRCIT Conference on Learning Networks For The Twenty-First Century: Opportunities to Enhance Access, Diversity and Value Through Telematics, Melbourne, 23-24 May 1994, page 1.

2 William H. Melody, "Electronic Networks, Social Relations and the Changing Structure of Knowledge" D. Crowley and D. Mitchell (Editors), *Communication Theory Today*. Cambridge. Polity Press. 1994 pages 254-273.