

7 High Technology and the UN

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INTRODUCTION

The various agencies of the United Nations, like all other actors in the international system, have to respond to changes in their environment.¹ One important source of change is technology. The invention and diffusion of new technologies is an important factor not just in military/strategic competitions among nation-states but also in economic competition among firms in the international economy. We use the term 'high technology' to refer to a set of relatively newer technologies which have become increasingly important in the competition among states and enterprises.

Examples of high technology industries are: aerospace, computers, telecommunications, semiconductors, new materials and biotechnology. These new industries are important in and of themselves because of the wealth and the employment they generate through their rapid growth. A number of high technology industries have a direct relationship with military capability. Beyond their direct economic and military impact, however, one must also consider their effect on the relative power and wealth of nation-states in the international system. Thus, all the member states of the United Nations have a stake in the creation and diffusion of high technology.

The United Nations system is just one family in the tribe of international organisations (IOs) which are concerned with technology. The Bretton Woods institutions – the GATT, the IMF and the World Bank – deal with technology issues within their broad economic purview. The Organisation of Economic Cooperation and Development (OECD) has several committees expressly dedicated to high technology issues. Older IOs like the International Telecommunication Union (ITU) have technological mandates. There are also a few relatively new IOs, like the World Intellectual Property Organisation (WIPO), which became part of the UN system of specialised agencies in 1974, and the Intergovernmental Bureau for

Informatics (IBI), founded in 1978, headquartered in Rome, and devoted entirely to issues connected with information technology.

The UN system differs from other IOs in having a nearly universal membership and by giving somewhat more weight to the developing countries in its voting schemes. While the UN system occasionally competes with other IOs for jurisdiction over technological issues, generally speaking there is a cooperative set of relationships among the non-UN and UN agencies in this issue area, in which the UN agencies specialise in those technology issues in which North-South economic relations are the primary concern.

UN AGENCIES WHICH CONCERN THEMSELVES WITH HIGH TECHNOLOGY

The UN system has a number of agencies which deal directly with technology issues, primarily in the context of North-South economic relations. These are the UN Industrial Development Organisation (UNIDO); the UN Conference on Trade and Development (UNCTAD); the UN Centre on Transnational Corporations (UNCTC); and the UN Centre for Science and Technology for Development (UNCSTD).

UNCTAD, as Stanley Michalak's chapter indicates, deals primarily with preparing proposals for the series of trade and development conferences which have been held in various locations since the founding of UNCTAD in 1964. Formally, UNCTAD is an organ of the General Assembly, but it maintains a secretariat and headquarters in Geneva, where most of UNCTAD's analyses of high technology issues are carried out. With a relatively small staff and budget, and a broad mandate to cover the range of North-South trade and investment issues, UNCTAD – like UNIDO – is not able to do much work on high technology industries. Nevertheless, in preparing for the Uruguay Round of the Multilateral Trade Negotiations under the GATT and for UNCTAD VII, UNCTAD prepared a number of studies on trade in services and high technology items. UNCTAD has been pressured recently by a number of its members, particularly the newly industrialising countries (NICs) within the Group of 77, to shift some of its analytical efforts away from the relatively fruitless pursuit of commodity agreements and toward issues more likely to pay off for the developing countries. Thus, one can expect UNCTAD to expend more of its resources on the analysis of technology issues in the coming years.

Probably the most important UN agency in high technology is the UNCTC, already discussed in different context by Thomas Weiss. While the UNCTC also has a small staff and budget, its mandate is to focus on multinational corporations who are the main actors in the creation and international diffusion of high technology. The forty-eight-member Commission on Transnational Corporations was established in 1974 as an intergovernmental subsidiary body of ECOSOC. Election to the Commission is based on geographic distribution. Its main functions are to 'discuss and keep under review all issues related to TNCs [transnational corporations], to draft the UN Code of Conduct on Transnational Corporations and to advise ECOSOC in all matters relating to TNCs'.²

The UNCTC has distinguished itself primarily through the work of its Sixteen Expert Advisers and their staff at the Centre on Transnational Corporations, which is headquartered in New York. The Centre has undertaken and completed major studies on the following high technology issues: the semiconductor industry,³ transborder data flows and multinational corporations,⁴ remote sensing,⁵ direct foreign investment in data services,⁶ on-line data bases,⁷ and transborder data flows in Brazil and Poland.⁸ Its work is unusual in that it provides data both at the level of firms and nation-states and focuses on the implications of competitive strategies of firms for policies of states. The UNCTC has built a reputation for itself of careful research and relatively objective analysis, which has allowed it to become one of the best sources of information on high technology industries in the world.

UNCSTD was established by the UN General Assembly in 1979 to assist in the implementation of the Programme of Action for Science and Technology for Development which was adopted at the UN Conference on Science and Technology for Development in Vienna in 1979. There is an Intergovernmental Committee on Science and Technology for Development along with an Advisory Committee of twenty-eight experts from all the major regions of the world to advise the UN system on how to implement the Vienna Programme of Action. The Centre provides staff assistance to the Intergovernmental Committee and Advisory Committee. It consists of seventeen professional staff members.⁹

In June 1983, the Intergovernmental Committee charged UNCSTD with the operation of an Advance Technology Alert System (ATAS) which has three components: (a) the publication of a semi-annual document called *The ATAS Bulletin*, (b) the establish-

ment of a network to link institutions dealing with science and technology forecasting and assessment in the developing world, and (c) direct technical assistance to the governments of developing countries who are trying to respond to challenges posed by new technologies. Most of the resources of UNCSTD go toward the third function, but it has also been able to publish two volumes of commissioned studies on microelectronics¹⁰ and new information technologies.¹¹

Beyond these four agencies, UNESCO deals with technology of various communications media from the perspective of educational and cultural affairs, while the regional economic commissions cover regional technology matters. UNESCO was the principal forum, for example, for the discussion of a New International Information Order (NIIO). In addition, UNESCO administers the Universal Copyright Convention, which is an important element in the debate over the protection of intellectual property. High technology in the nuclear field is part of the mandate of the International Atomic Energy Agency. Obviously, technology issues also emerge in the various Special Sessions of the UN General Assembly as well as in meetings of ECOSOC and the Second and Sixth Committees of the General Assembly.

The rest of this chapter will focus on the nature of the challenge posed to North-South relations by the rapid growth of information technology industries (a specific example of a set of high technology industries), the response of UN agencies to this challenge, and the potential for future UN responses.

RAPID GROWTH OF INFORMATION TECHNOLOGY

Revenues in most information technology industries – such as computer equipment, software, telecommunications equipment, and telecommunications services – have grown at a very rapid pace, that is between 20 and 30 per cent per annum for the past decade. In most of these industries, with the exception of basic telecommunications services, employment has also grown rapidly. There are a few key factors which help to explain this dynamic growth: (a) the growing demand for computing and telecommunications from increasingly internationalised private business concerns, (b) the decreasing costs of computing and telecommunications made possible by a series of major innovations, and (c) changes in the regulatory environments

of businesses which are producers or consumers of information technology.

The demand for information technology comes primarily from the information technology industry itself, financial services, governments, and (only in the last few years) manufacturing industries. As the prices of small computers have declined, the demand has broadened to include many small businesses and professionals who could not previously afford to purchase or rent sophisticated equipment.

It is estimated, for example, that there are around sixteen million personal computers in the United States and at least an equal number of computer terminals for larger machines. The relevant figures for Europe and Japan are much smaller, of course, but by the same token growth is more rapid in those regional markets. Even though costs have been sharply reduced for hardware, software costs remain constant or have increased somewhat. In any case, prices are still too high for consumers in many developing countries and diffusion is frequently limited by the lack of human or physical infrastructures. Thus, one challenge posed for the international system derives from the uneven diffusion of information technology related to the pre-existing inequalities of income and wealth.

The rapid growth of information technology industries is partly a result of changes in the regulatory environment for business enterprises in the world economy. The growth of firms which operate production and research facilities in more than one country has created a demand for a global telecommunications infrastructure which allows them to monitor the activities of their widely dispersed subsidiaries and to transmit and receive information which is important for their international competitive strategies.

No longer is the world economy dominated by US-based multinational corporations (MNCs); the US-based MNCs are increasingly challenged by European and Japanese firms, as well as by selected firms based in the NICs in the developing world. Changes in telecommunications technology – especially the growing use of microwave, satellites, and fibre optics for the transmission of signals to supplement the previous wire and cable systems – have made it much easier and cheaper to transmit digital information. These changes have created important challenges to the monopolistically organised telecommunications agencies/firms – such as AT&T in the US and the post, telephone and telegraphic services (PTTs) in the rest of the world. Greater amounts of competition have been permit-

ted in markets for telecommunications equipment and services than previously existed, creating major incentives for the innovation of new products and services and for the further lowering of prices.

DEBATES OVER THE DISTRIBUTIVE EFFECTS OF INFORMATION TECHNOLOGY

It may appear from the above that the main beneficiaries of the diffusion of information technology are the MNCs and that the main losers are the smaller, nationally-oriented firms – along with the PTTs and those who depend on them for jobs or business. But the general decline in the cost of computing and telecommunicating has also led to an equalising effect on businesses; access both to advanced equipment and to telecommunications infrastructures has increased even for the smallest firms. Private individuals have more access to information, at affordable costs, than was ever previously available to them. The diffusion of information technology in this century resembles, in this respect, the diffusion of print technology beginning in the fifteenth century.

Within the industrialised North, there is concern that the diffusion of information technology may accentuate inequalities in domestic societies – hence the concern for increasing 'numeracy' or 'computer literacy' in the general population, for retraining and relocating workers displaced from traditional manufacturing jobs, for inducing high technology firms to locate production facilities in areas of high unemployment, and for creating a sound technological base for maintaining the pace of innovation in strategic industries.

The fact that innovations in information technology have originated primarily in the industrialised North and have been spread primarily through Northern-based MNCs makes people in the South wary of a possible concentration of benefits in the North and an undermining of their indigenous cultures by the diffusion of technologies with an implicit Northern cultural bias. The economic pressures on the South to adopt the new technologies in order merely to maintain, if not to improve, their competitive positions in the world economy are felt even as governments confront domestic political pressures to reduce the rate of diffusion.

The major underlying theme of all contemporary policy debates over information technology is the effect of the diffusion of information technology on the global distribution of power and wealth. It is

not surprising, therefore, that this should also be the major theme of UN debates. But because the UN has been predominantly concerned in recent years with North-South relations, the UN debate remains focused on the distributive effects of the diffusion of information technology. To some degree, that North-South focus on UN forums makes the representatives of industrialised countries reluctant to use UN forums for the discussion of certain key technological issues, thus undermining the UN's ability to influence the outcomes of international discussions.

Further evidence for the tendency of industrialised nations to avoid the UN system in dealing with high technology issues can be seen if one turns to some of the key international policy debates of the last few years over the New International Information Order (NIIO), restrictions on transborder data flows, protection of intellectual property and the setting of international standards for computing and telecommunications. Most of these debates have taken place outside the UN system. The debate over the NIIO is the exception that proved the rule. The UNESCO-based discussions convinced the industrialised countries that it was necessary to bypass UN institutions if they were to avoid international policies that could hamstring their efforts to take advantage of new technologies.

THE NEW INTERNATIONAL INFORMATION ORDER

The debate over the NIIO began with a conference organised jointly by UNESCO and the Intergovernmental Bureau for Informatics (IBI) on Strategies and Policies for Informations (SPIN). During the conference the main focus was on implications for the mass media of development in telecommunications technology. Some of the issues in the NIIO flowed out of the earlier debates on the New International Economic Order beginning in 1974. Developing countries were concerned, in particular, with the unfavourable coverage they received by journalists from the industrialised countries and wanted the NIIO to deal with these injustices by conferring more extensive rights on states to regulate the content of stories filed from within their borders. In addition, some states felt that there should be a Third World alternative to the major news agencies like Reuters, the Associated Press (AP), and United Press International (UPI), which would focus on more positive stories and thereby improve the image of the developing countries in the rest of the world.

Journalists in the industrialised countries reacted strongly to these initiatives, claiming that they would restrict the free flow of information and make it possible, in effect, for states to censor coverage. The socialist countries aligned themselves with a number of developing countries in pushing for a more restrictive regime, fuelling the fears of the industrialised countries that this was not going to be a favourable forum for them.¹²

During the SPIN conference, transborder data flows were added to these mass media issues as a result of pressures from developing country participants.¹³ The concern here was that multinational corporations might abuse access to global telecommunications networks to engage in practices either illegal or highly unfavourable to developing host nations. Some developing countries, and even a few industrialised countries, claimed the right to monitor all data transmissions or to otherwise restrict certain kinds of data flows across national boundaries (see more detailed discussion of this below).

RESTRICTIONS ON TRANSBORDER DATA FLOWS

Transborder data flow became an issue in the international system with the adoption of regulations by a variety of governments to monitor or restrict various forms of computer-mediated communications. 'Transborder data flow may be defined as the transmission of machine-readable data and information over transnational computer and other electronic communication systems for the purpose of storage, retrieval or processing.'¹⁴ Initially the main concern of governments was for guaranteeing individual privacy, but eventually other concerns – such as the promotion of high technology industry or the regulation of the domestic activities of multinational corporations – were added to the debate.

Sweden was the first country to enact legislation to control the automated use of personal data with the Swedish Data Act of 1973. The main instrument established for this purpose was the licensing of public and private organisations that maintained data on individuals. 'Name-linked' data which goes beyond what is available in phone books are the main objects for protection under the Swedish and subsequent regulatory regimes. If one wishes to protect domestic citizens in this way, it is logical that one has to protect them not only from abuses by domestic users but also by foreigners. Thus, some feared that the need to protect privacy would lead to the monitoring

and restricting of transborder data flows.¹⁵ Privacy protection has diminished in importance in recent years as various forms of data encryption have become available to provide technological assurance that computerised data will not be abused by either domestic or foreign users.

Of greater concern in recent years has been the use of restrictions on transborder data flows to monitor the activities of multinational corporations or to promote domestic data processing. The Brazilians have one of the most restrictive policies, but the Canadians and Germans have also adopted 'local content' requirements for various types of on-line data-processing services. In addition, the PTTs of a number of countries have restricted sales of advanced telecommunications equipment to prevent the construction of private facilities capable of bypassing the public networks. These practices are quite irritating to private telecommunications equipment and services firms, and the major users of their equipment and services, who would rather live in a minimally restrictive environment. This conflict of interests is at the heart of the politics of transborder data flows.

The main international organisations involved in the debates over transborder data flows have been the Intergovernmental Bureau for Informatics (IBI), UNESCO, and the OECD. The IBI and UNESCO have taken a decidedly pro-Third-World perspective on this issue, thus creating a strong demand for alternative forums on the part of the industrialised countries. The industrialised countries, and especially the United States, have retreated to the OECD to formulate codes of conduct on transborder data flows and to establish new intergovernmental bodies. In 1980, the OECD issued its *Guidelines on the Protection of Privacy and Transborder Flows of Personal Data*.¹⁶ The emphasis in that document was on establishing criteria for licensing and registration regimes that made sense from the perspective of protecting privacy and was not overly restrictive.

On 11 April 1985, the Ministers of OECD member countries adopted a *Declaration on Transborder Data Flows* which recognised that efforts to protect privacy had been made and that future attention needed to be focused on 'transparency and stability of policies, regulations and practices'. They pledged themselves to harmonise policies and to 'consider possible implications for other countries when dealing with issues related to transborder data flows'.¹⁷

While the OECD Declaration has created a precedent for rule-making outside the limited boundaries of the OECD membership, it

is likely that the industrialised countries will return to more universal forums to try to put the new norms on firmer ground. The next step is likely to be the discussion of transborder data flow questions within the GATT at future multilateral trade negotiations. Industrialised nations are likely to avoid UN bodies as principal forums for the discussion of this issue for a long time to come.

PROTECTION OF INTELLECTUAL PROPERTY

The international intellectual property regimes have assumed greater importance in recent years with the growth in information technologies. Changing technology has altered the nature of domestic regimes because of the greater ease of copying the very large amounts of information which can be stored on electronic media. It is no longer sufficient to protect written works with copyrights, and manufacturing products and processes with patents, if the original intent of the intellectual property laws is to be pursued – that is, to create incentives for people to create and innovate.¹⁸

The United States has already expanded its domestic regime with the 1984 Semiconductor Chip Mask Protection Act, which provides a new category of protection to the physical masks which are used to etch the surfaces of semiconductor wagers. Copyright protection has been extended to the producers of videotapes as well as to the authors of video games. Both videotapes and computer games produce CRT screen images which can be protected by depositing videotapes with the Library of Congress. But there is concern that the traditional regime has been undermined either by failing to cover new forms of creativity or by becoming too inclusive of things which should remain in the public domain.

The international side of this debate has focused on the issues of piracy and counterfeiting that may result from either lax enforcement of existing domestic intellectual property protection or from insufficient legal protection itself. Some developing countries, especially in Latin American and Southeast Asia, have encouraged the copying of software, for example, to reduce import expenditures and to free resources for other types of investment as a way of promoting domestic information technology. Even some industrialised countries, such as Japan, have attempted to implement policies of reduced copyright protection for foreign software.¹⁹ This policy has brought them into conflict with a number of computer hardware and software

firms and the home governments (mainly the United States) of these firms.

Intellectual property guarantees will be discussed in the GATT because the industrialised countries would like to establish more uniformity of legal regimes across nations. Although sometimes it is not in the interest of developing countries to agree to such uniformity, because it fails to consider their special needs, in this case it may well be in their interest to defuse this issue and get on with more important business. The short-term gains of reducing costs to software users may be far outweighed by the long-term costs of being denied access to new products and of fighting battles with foreign governments.

SETTING OF INTERNATIONAL STANDARDS

Standards are very important in information technology because they make it easier and cheaper for both producers and users to deal with the uncertainties of rapid product innovation. This has been very evident recently with the rapid adoption of standards in microcomputers. Apple (based on Motorola microprocessors) and IBM (based on Intel microprocessors) machines have become standards in the market. Standards make it possible to produce chapter 'clone' machines and add-on products that increase the utility of such machines. There are standards in software and telecommunications as well, which have had a very salubrious effect on innovation, user-friendliness, and utility of machines.

Lack of standards is sometimes the result of intense competition when it has not yet become clear where a particular technology is heading; but it may also arise when an effort is made to use technical incompatibilities to shelter certain products from competition. The latter is a greater cause for concern than the former. An initial period of incompatibilities driven by rapid technological change is usually followed by convergence on a smaller number of standard products which have particularly favourable performance characteristics. Thus, standard setting can occur by default without governmental intervention. When lack of standards is part of a sheltering effort by firms or governments, then intergovernmental bargaining will be required to establish international standards.

One of the most important international standards setting bodies in computers is the International Organisation for Standardisation

(ISO), which has its headquarters in Geneva. In telecommunications, the single most important standards setting body is the International Telegraph and Telephone Consultative Committee (CCITT), which has been a permanent consultative committee of the ITU since 1957. Several private standards organisations have sprung up in recent years which have relatively high membership fees and are populated primarily by international firms – that is, the X/OPEN group in Europe, and the Corporation for Open Systems (COS) in the United States.²⁰

The reason for the recently increased importance of these organisations is that users of large computers are increasingly interested in connecting them in networks. Getting computers and other types of equipment (including factory automation equipment) to talk with one another over networks is becoming a central element in the competitive strategies of firms around the world. Networking of computers that are physically separated provides a number of advantages: (a) one can spread out peaks in demand over a broader set of time zones and reduce average processing costs, (b) one can get almost instantaneous feedback on research, production and sales efforts, and (c) one can establish an extensive intrafirm telecommunications system to supplement or bypass the public telecommunications infrastructure.

Firms like Digital Equipment and Wang Laboratories have eaten into IBM's world market share for large computers by offering smaller but networked computers. IBM has responded to this competitive challenge somewhat slowly, but it has its own Systems Network Architecture (SNA) which is supposed, eventually, to allow all IBM computers to talk with one another over a network. One of the major sources of interest in international standards setting organisations is the idea that one can do a competitive end-run around IBM by establishing international standards for interconnection of computers which are incompatible with IBM's internal standards.

This is one of the main reasons for the strong lobbying by mostly European computer firms within the ISO for an interconnection standard called Open Systems Interconnection (OSI). OSI provides a seven-layer Reference Model for interconnection which provides guidance to manufacturers who would like to design machines that can talk with one another easily. Not all the layers have been successfully negotiated, however, with most of the disagreements coming at the higher layers which are closest to the actual applications important to end users.²¹

The Europeans criticised IBM sharply for boycotting initially the discussions over OSI, but IBM claimed that, on the contrary, it had been very forthcoming in providing technical information to make negotiation of the OSI layers possible. The dispute over OSI in Europe began to spill over to the United States, as a variety of US firms began to see an interest in learning more about both interconnection and network architectures so that their machines could talk with both European and IBM machines. This was, in essence, the origin of the Corporation for Open Systems. X/OPEN and COS originally had an in-built, anti-IBM bias to them. But the members of both organisations found that they had greater interest in including IBM than in excluding it, since the installed base of IBM mainframes is so large. Also, their customers wanted to make sure that their non-IBM machines could talk with their IBM machines.²²

The reader will note that the debate over interconnection and network architectures has taken place without any participation by developing countries. It is unlikely that any governments or firms outside the industrialised countries are aware of the significance of these debates and negotiations. Even within the industrialised world, many governments have underrated the importance of standards because of the technical complexity of the issue and the lack of disinterested experts with which to consult.

ISSUES FOR THE FUTURE

The overall thrust of the preceding discussion has been that high technology is of increasing importance in the international system, and the diffusion of the new technologies will have an important impact on all nations. Some of the most important international issues have not been discussed within UN institutions because of the perception of industrialised countries or their firms that the results of earlier discussions – that is, over the New International Information Order – were not desirable. UN agencies have tended to specialise in high technology issues which affect North–South economic relations. This, in itself, is both inevitable, given the nature of the contemporary UN, and commendable, since some international organisations must specialise in this way.

Industrialised countries and their firms have focused, for the most part, on less universal bodies for discussing vital technology issues. This has the unfortunate effect of marginalising the participation of

developing countries in those discussions. Thus, while the behaviour of all parties in this area is understandable, the end result may be quite undesirable for the developing countries, and could further fuel the resentment of the South for its treatment by the North.

One beneficial shift would be to change the mandate of UNCTAD from its current, almost exclusive focus on commodity price stabilisation to a broader concern with trade in manufactures and technological goods and services.²³ Upgrading the status of UNCTC and UNCSTD might also be wise for the UN system. UNCTAD, UNCTC and UNCSTD would be used more extensively for producing guidance to developing countries in the GATT. Avoidance of future fiascos, such as the one surrounding the discussion of the New International Information Order within UNESCO, may also be the course of prudence. Finally, the developing countries might lobby for inclusion in some of the more important non-UN forums at reduced prices so as to have some of their interests represented where they are currently ignored. Rapid or extensive changes in the current way of doing business probably are out of the question here, but there is certainly room for some incremental change.²⁴

Regardless of efforts to reform the role of UN institutions in international debates over high technology issues, all governments, and especially those of developing countries, will have to adjust their perspectives in order to deal successfully with the challenges posed by the diffusion of new technologies. It would be a shame if all nations did not benefit from the rapidly declining costs of computing and telecommunicating. Not only are there potential benefits in terms of growth and employment, but also there are potential gains to be made in the overall quality of life through better access to information on a global level.

But there remains a potential dark side: (a) an increased gap between rich and poor, within and across nations; (b) the abuse of new technologies for deprivation of human rights (i.e., privacy abuses or harnessing of information technology to instruments of repression); (c) further concentration of economic power in a handful of globally organised corporations; and (c) a decline in the openness of the world economy with new forms of protections (i.e., restrictions on transborder data flows). The new technologies, in other words, are creating a set of choices that will have to be made. The outcomes of those choices will affect all nations. The UN, therefore, will have an opportunity to renew its reputation as a key instrument for global participation in international decision making.

Notes

1. UN agencies are international actors, as opposed to being mere arenas for action, when they have an autonomous capability to affect international outcomes. Thus, to the extent that UN agencies can provide independent analyses of international problems, participate as equal parties in organisations or regimes, dispose of sizeable budgets, and possess the resources to maintain permanent secretariats with skilled staff, they can be actors in international politics.
2. This quote was taken from a pamphlet on the UNCTC written by that agency and circulated in 1986 with no date or title.
3. *Transnational Corporations in the International Semiconductor Industry* (New York: UNCTC, 1986).
4. *Transnational Corporations and Transborder Data Flows: Background and Overview* (New York: Elsevier-North Holland, 1984).
5. *Transnational Data Flows: Transnational Corporations and Remote-sensing Data* (New York: UNCTC, 1984).
6. *Trade and Foreign Direct Investment in Data Services* (Boulder, Co: Westview Press, 1986).
7. *Transborder Data Flows: Access to the International On-line Data-base Market* (New York: UNCTC, 1983).
8. *Transborder Data Flows and Brazil* (New York: UNCTC, 1983); *Transborder Data Flows and Poland: A Policy Case Study. A Technical Paper* (New York: UNCTC, 1984).
9. *ATAS Bulletin*, no. 2 (November 1985), p. 5.
10. *Microelectronics-based Automation Technologies and Development*, Issue no. 2 (November 1985) of *ATAS Bulletin* (New York: UNCSTD, 1985).
11. *New Information Technologies and Development*, Issue no. 3 of *ATAS Bulletin* (June 1986) (New York, UNCSTD, 1986).
12. Klaus Grewlich, 'Free Electronic Information and Data Flow?', *Aussenpolitik*, vol. 36, no. 1 (1985), p. 59.
13. Peter Robinson, 'An International Policy Framework for Trade in Services and Data Services: the Current Debate in International Organizations.' Paper prepared for a seminar on Toward an International Service and Information Economy sponsored by the Friedrich Ebert Foundation, New York, February 24-5, 1987.
14. Rolf T. Wigand, Carrie Shipley and Dwayne Shipley, 'Transborder Data Flows, Informatics, and National Policies', *Journal of Communication*, vol. 34 (Winter 1984), p. 154.
15. Grewlich, 'Free Electronic Information', note 12, p. 63; David M. Cooper, 'Transborder Data Flow and the Protection of Privacy: the Harmonization of Data Protection Law', *Fletcher Forum*, vol. 8 (Summer 1984), pp. 335-52.
16. See Cooper, *ibid.* pp. 344-6.
17. OECD Press Release, PRESS/A(85)30, Paris, 11 April 1985.
18. See US Congress, Office of Technology Assessment, *Intellectual Property Rights in an Age of Electronics and Information* (Washington, DC: US Government Printing Office, April 1986).

19. Susan Chira, 'Japan Plans to Provide Protection for Software', *New York Times*, 19 March 1985, p. D13.
20. Willie Schatz, 'The Big Huddle', *Datamation*, 15 February 1986, p. 26; Geoffrey Charlish, 'Why Rivals are Clubbing Together', *Financial Times*, 23 January 1986, p. 19.
21. For a good introduction to the technical aspects of networking and interconnection, see John Voelcker, 'Helping Computers Communicate', *IEEE Spectrum*, March 1986, pp. 61-70.
22. Interviews with IBM personnel; see also 'IBM Joins Group for Standards on Interconnection', *Electronic News*, 10 February 1986, p. 16.
23. See Stanley Michalak's paper in this volume for other suggestions concerning changing the focus on UNCTAD's work.
24. The UN system might benefit, in addition, by applying some new information technologies to its operations. There is already some talk of selling UN-collected data in machine readable form via on-line data bases to raise revenues for the UN. The Secretary General's office could benefit from access to the latest telecommunications technology. During international crises, it would be very useful if the Secretary General could get access to new types of satellite photographic data, such as marketed now by the French SPOT satellite system.