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The changing use of computers in organizations of the United Nations system in Geneva: Management issues

Prepared by

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I. INTRODUCTION

1. Computers have been a part of the substantive and administrative activities of the United Nations system for almost two decades. In the past few years, however, the pace of change in the computer field has accelerated dramatically, providing powerful new tools to improve services and help staff carry out their work.

2. Much has been made of the arrival of the "information society" with its new telecommunications, information and computer networks. Already information occupations are being proposed as a "fourth sector" of economic activity (along with agriculture, manufacturing and services), and it has been estimated that by the year 2000 information technology will account for about 40 per cent of world industrial value added. Technology advocates believe that the powerful new information tools may also help developing countries to bypass traditional growth stages, and that co-operative information systems built and managed by international agencies can greatly facilitate the worldwide sharing of knowledge.

3. A second important trend is rapidly expanding computer use. The number of computers rose from 0 in 1946 to 10,000 worldwide in 1960 and then to 10,000,000 by 1980. Even more significantly, however, the miniaturization of integrated circuits in computer "hardware" (the actual physical equipment) has brought enormous increases in computer performance and decreases in cost: it is estimated that a US dollar will purchase 4 million times as much computing power in 1984 as it did in 1962. The $US 100 billion invested in computer "software" (programmes of instruction which direct the computer to perform specific tasks) over the years has made computers useful for an ever-wider range of activities. Modern telecommunications have greatly facilitated linkages between computers, and the advent of video display terminals (VDTs) has allowed more and more people to use them. The computer has become perhaps man's most powerful tool, because of its ability to manipulate thousands of numbers per second and to store, sort through, retrieve and transmit immense amounts of information.

4. The most significant current trend in the computer field is the decentralization made possible by microelectronics. A silicon chip the size of a fingernail can now contain as much computing power as a room-sized central computer had in 1960. This has led to the small "personal computer" (also known as the "micro" or "desk-top" computer or the computer "work station") for individual use at a current cost of only about $3,000 - 5,000 each, and many new standardized software "packages". About 4 million such computers were sold to organizations worldwide in 1984 alone, an increase from almost none in 1980.

5. This development indicates a major modification of the old rules of computer use. Rather than computer units centralized in large public and private organizations and tended by sophisticated specialists, the spread of the personal computer makes computer power available to poor nations as well as rich ones, very small organizations as well as large ones, and to individual managers and office workers as well as central management staff.

6. These computerization and information trends can have a very positive impact in improving the operations of the United Nations system organizations. They also underline the value of viewing each organization as an overall information system, i.e. as a co-ordinated effort to gather, organize, store, retrieve, process and disseminate information for specific purposes. The exchange of information is a permanent mandate of most of the organizations, and the Administrative Committee on Co-ordination (ACC) stated in a 1982 report that

> "The United Nations family is in the information business: beyond what are ostensibly information activities, much of the work of the organizations is based on imparting knowledge and therefore information in widely varying forms. Seen in this light, information gathering, analysis and dissemination is the stock-in-trade of the organizations and should be conducted as a major function on which hundreds of millions of dollars are expended annually. Efforts should be made to ensure the quality of the information collected, processed and disseminated, and

that appropriate mechanisms are in place to exploit the different information products and services of the United Nations family". 1/

7. Governing and inter-governmental bodies, particularly the Economic and Social Council (ECOSOC), have long emphasized the need for effective computer use and information services. ECOSOC resolution 1981/63, for instance, emphasized the importance of "rationalizing, co-ordinating and ensuring the useful compatibility of hardware, software and data-set information systems" to provide effective services, maximize development activities, and provide information on the use of resources made available to the system. In 1982, ECOSOC resolution 1982/71 stressed information as "one of the most valuable resources at the disposal of the United Nations system", the need to facilitate the access of developing countries to these information systems, and the importance of co-ordinating and harmonizing them from the perspective of needs of users at the national level.

8. In accord with this last ECOSOC resolution, the organizations are now working to better meet Member States' information needs. Changing patterns of computer use within the organizations have received less attention: a broad survey of computer activities within the system has not been done since the mid-1970s.

9. The purpose of this report is to briefly survey patterns, initiatives, opportunities and problems experienced in using new computer technologies and approaches to improve operations, efficiency and effectiveness in the organizations. Since changes are so rapid in this field, the report can hardly be definitive. The following chapters therefore stress in particular management strategies, approaches and controls for the process of computerized systems development.

10. The study was limited to Geneva agencies, which nevertheless provide a diverse sample of organizations of all sizes and types. Some references are made to relevant actions or documents of other organizations in the system which came to the Inspector's attention, and he hopes that this summary of Geneva activities will prove useful for organizations outside Geneva as well. The 17 organizations covered (see the Annex table) include all organizations in Geneva except the General Agreement on Tariffs and Trade (GATT) and smaller agencies or units with less than 30 staff (many of which, however, are provided with computer support by the United Nations Office at Geneva (UNOG)). The Inspector held many discussions with officials of these organizations, reviewed relevant documents and reports, and surveyed the ever-growing volume of literature on "state-of-the-art" organizational computer systems. He wishes to thank all who contributed for the many ideas and insights which they provided.

II. POLICY FRAMEWORK

11. The first computers were installed in the United Nations system in the mid-1960s (in the ITU, WHO and ILO in Geneva, as well as at FAO, IAEA and the United Nations in New York) for statistical production, substantive research, data bank creation, registry work, and administrative data processing. Because of the interest of inter-governmental bodies in co-ordinating computer activities, the ACC created a Computer Users' Committee in 1968, composed of all Geneva-based agencies plus other interested agencies. The Committee was given responsibility for developing inter-agency co-ordination and co-operation in Geneva and planning for the agencies' combined future computer needs.

12. At the end of the 1960s three major reports appeared. In 1969 an advisory committee on the application of science and technology to development (ACAST) made the first report on potential international co-operation in the use of computers for development. The "Capacity Study" made of the United Nations development system in 1969 included a conceptual design for a comprehensive information system to support the system's development activities, with an extensive analysis of system requirements and an outline of sub-systems for technical and scientific information, economic and social information, and operations and administrative information. In 1970 the Auditor General of Canada surveyed the current uses and emerging role of

electronic data processing in the organizations of the system, identified possibilities for future growth and effective utilization, and stressed the "urgent need" for inter-agency co-operation in computer use. 2/

13. As a result of this last-mentioned study, the International Computing Centre (ICC) was established in Geneva in 1971 to make a common data-processing facility and services available to the agencies, stimulate effective computer use, and develop better co-ordination. The original participating agencies (the United Nations, UNDP and WHO) were gradually joined by others, and the ICC remains an important element of the system's computer activities today. At the same time, the Inter-Organization Board for Information Systems and Related Activities (IOB) was also created to replace the Computer Users' Committee. The IOB was tasked with developing inter-organization management information systems, particularly for economic and social development activities.

14. A 1974 ACC report on improving management information systems and programme co-ordination in the system concluded that the task would be complex, but that progress could be made by increasing IOB consultative services, developing inter-organizational working sessions, and pursuing a pilot project, the Common Register on Development Activities (CORE). 3/

15. During the mid-1970s governing bodies produced a variety of resolutions on information systems development and improved computer use. General Assembly resolution 31/94 B of 1976, for instance, urged further analysis of electronic data processing and information system co-ordination, establishment, and usefulness in light of

> "... the rapidly expanding applications of electronic data processing techniques to information systems and data banks throughout the United Nations system, their potential value in accelerating the implementation and co-ordination of important programmes, particularly in the field of economic and social development, and the importance of ensuring efficient use of available resources".

16. Efforts to improve international information exchange were also expanded. In addition to UNESCO's many activities in this field (see Chapter V), the General Assembly requested the development of a global network to exchange technological information for development. An Inter-agency Task Force established initial information on the needs of governments, institutional problems at national and regional levels, United Nations system activities, and further actions needed.

17. In 1978, the Committee for Programme and Co-ordination (CPC) considered an ACC report on the organizations' information systems. 4/ The CPC expressed concern at the limited information provided on information systems activities within the organizations, the slow progress in co-ordinating information systems, and the slow implementation of the IOB work programme.

18. A subsequent analysis by the ACC in 1981 concluded that the IOB had achieved very limited co-ordination results over the years. The large-scale information systems which it had initially sought to establish proved far too complex, while the more limited activities undertaken later had still achieved little because they did not clearly identify user needs and specific areas where co-ordinative activities would be possible and useful. The ACC therefore decided to terminate the IOB and consider new approaches.

19. ECOSOC requested further substantive review of this issue. The resulting ACC report in 1982, based on a study by independent experts and further inter-agency consultation, proposed establishing a set of specialized inter-agency panels for particular projects, to provide "fresh impetus" for building an infrastructure for the longer-term development of information systems co-ordination. 5/ An Advisory Committee for the Co-ordination of Information Systems (ACCIS) was endorsed by ECOSOC resolution 1982/71 and established by the ACC in 1983.

20. ACCIS seeks to make information from the United Nations system more accessible for national users. In order to do this, it promotes the improvement of the system's information infrastructure. The ACCIS work programme for 1984-85

covers five areas: information needs of Member States; tools for accessing system information; a register of development activities; proposals for new information systems; and basic co-ordination services, including the monitoring of information technology.

21. The policy framework for United Nations system computer and information system activities which has developed over the past 20 years has contained three broad, interrelated aims. As first enunciated in the trio of reports in 1969-70 and elaborated on since, these aims are: (a) to promote effective international information exchange, especially for development co-operation; (b) to develop co-ordinated or at least compatible information systems within the United Nations system; and (c) to effectively develop and use computerized systems to improve operations within the organizations.

22. Actions needed to improve information exchange have been given new impetus by the emphasis of ECOSOC resolution 1982/71 on meeting needs of users at the national level, and are reflected in current activities of ACCIS, UNESCO and other bodies. Efforts to improve information system co-ordination and compatibility through specific projects are also now underway through the ACCIS technical panels. The study of organizational computer use, however, has languished somewhat, despite the dramatic new developments in computer system technologies and approaches. The following chapters provide a brief survey of current computer use and potentials, which have significance for the broad information exchange and co-ordination/compatibility issues as well.

III. CURRENT COMPUTER USE

23. In June 1977 the IOB made an inventory of computer facilities in the United Nations system. It found, in Geneva, a very small number of central computers and terminals. (A terminal is equipment which allows users to communicate with a computer, such as video display terminals, keyboards, printers, word-processing work-stations and - more recently - personal computers in which the terminal and computer are combined). In June 1984 the JIU surveyed 17 of the Geneva organizations (see Annex table) and found the following overall changes:

	Organizations:		Geneva:	
	Using Computers:	With Own Computers:	Total No. of Computers:	Total No. of Terminals:
June 1977	10	4	4	132
June 1984	17	14	427	1,867
Increase (%)	70%	250%	10,000+%	1,300+%

24. These figures show a dramatic increase in total computerization and in widespread computer use in Geneva, especially since most of the growth has come only in the last two years. In 1977 most of the 17 organizations used computers, but they relied largely on a few terminals linked to the ICC computer. In 1984, in contrast, all the organizations used computers, and almost all have obtained some computer equipment of their own. The total number of terminals in use or on order has grown thirteen-fold and the total number of computers more than one-hundred-fold (and it should be noted that most of the 382 "little" computers in Geneva in mid-1984 have a basic memory capacity which is not much less than that of the "central" computers that were being used in 1977).

25. The 17 organizations which JIU surveyed include headquarters units which also support field operations (ILO, ITU, UNHCR, WHO); self-contained specialized agencies (WIPO, WMO); regional or subsidiary units (UNICEF, ECE, UNEP, UNOG); specialized units within larger organizations (Human Rights, UNCTAD, ITC, UNDRO,

IBE); and the two inter-agency secretariats in the computer field (ACCIS and ICC). These organizations vary in estimated annual expenditure from almost $500 million (WHO) to only $1 million (IBE), and in staff size from about 1,600 (UNOG) to only 7 (ACCIS). It is not possible to establish precise figures or comparisons of the computer activities of these organizations, not only because of their differing size but also because of their differing programmes and actual computer uses, varying computerization policies and stage of development, and a lack of clear-cut terminology and categories of activity in this rapidly-changing field. With these caveats in mind, however, several very general observations can be made on patterns which the data in the table indicate.

26. Staff use of computers The 7,615 staff in Geneva presently have 1,867 terminals available. Since about 850 of these terminals are either dedicated word-processors or printers, however, the personal computers or terminals connected to the ICC amount to about 1,000 "inter-active", multi-purpose terminals, or roughly one for every 7.5 staff members. It has been estimated that the ratio of computer terminals to staff in large organizations in developed countries is presently about one to 20, but that in a few years it will be one to two or one to three. Some "information-intensive" organizations are already at this latter stage. In addition to ACCIS and ICC, the usage ratio is currently highest in ITU, WIPO and UNEP, and lowest in UNOG and several units which it supports. In general, however, the organizations in Geneva have moved relatively rapidly to begin computerizing their operations in the last few years (but see also "use of terminals" below).

27. EDP staff Presently there are some 247 staff posts in central information system or EDP units in the organizations. The units have slightly more professional staff than general service (126 to 121), suggesting that a shift is already underway from past large clerical staffs for batch-processing EDP work towards a more professional computer systems support role. In addition, if the ICC posts are not included, there are 115 central computer unit professional staff posts to support 7,572 total staff, or one such post for each 66 total staff posts. This ratio appears to be spread particularly thin in ITC (1 to 120) and in UNOG (1 to 180), and is more than one to 215 in UNHCR when the central unit's responsibility to support field activities is included. (The critical role of central system support staff is discussed further in Chapter VI.E).

28. Costs Establishing solid financial data on computer activities in the United Nations system has proven difficult, as indicated by ACC and JIU attempts in the late 1970s. 6/ Computerization priorities differ, as do stages of computer development and procurement arrangements, and there is no agreed method for determining information system costs or even agreeing on such terms as "information systems" or "computer services".

29. Recognizing all these difficulties, JIU nevertheless gathered data on three elements of estimated computer expenditures in Geneva for 1984-85: central information system unit or EDP unit costs; computer equipment, peripherals, consultants, supplies, furnishings, and maintenance costs; and the organization's estimated share of ICC costs. The central computer unit costs and the shares of ICC costs appear to have remained generally stable for the past few years, while computer equipment and other expenditures have grown steadily. The total expenditures of some $47 million represent about 1.5 per cent of these organizations' total budgets. This figure is a considerable sum, but in light of ACC's observation that the organizations are "in the information business", it might be regarded as still relatively modest. The key question, of course, is not total costs per se, but the efficiency and effectiveness benefits which computerization should bring with it (see Chapters V.C. and VI.D.).

30. Types of terminals The 1,867 terminals in use or on order in the 17 Geneva organizations in June 1984 tend to fall into three broad groups:

(a) approximately one-third (588) are linked with the ICC. This group has become a much smaller proportion of the total number of terminals since 1977 as the organizations have developed their own systems. However, the ICC role has also been changing from a computer centre to more of a telecommunications centre

which allows its users to communicate with and transmit information to organizations, offices, commercial networks, and users throughout the world on an around-the-clock basis.

(b) Some 875 terminals are primarily word-processing work stations. Because most of the organizations are now decentralizing computer equipment to operating units as multi-purpose work stations in which word-processing is only one function, however, this primary use for word-processing should decline considerably in the future.

(c) The total also includes 382 personal computers, which form not only the newest category but the fastest-growing one.

31. The JIU survey also disclosed 15 different makes of computers and 19 different makes of printers or graphics equipment being used in the organizations. While this is not much in view of the 300 different computer hardware manufacturers currently active in Europe, and while most of these makes are "odd" single units held by only one or a few organizations, this diversity does indicate the challenge for some agencies (and for inter-agency efforts) in developing more coherent computerized information systems.

32. Use of terminals JIU asked the organizations to categorize the primary current use of their terminals: if used 50 per cent or more for one purpose, then in that category; if for several purposes, with no one use amounting to 50 per cent, then as multi-use. The results indicate that, as expected, the major current use is for word-processing purposes (875 of 1,867 or 47 per cent). However, terminals used for substantive operations (data base entry or searching, statistical work, econometric modelling, research, etc.) are a significant 18 per cent. Primary use for administration and management is only 13 per cent, and primary use for communications is small (2 per cent). The very limited training use (1 per cent) reflects a serious training deficiency (see Chapter VI.A.). Software development is a small but important function (4 per cent), and multi-purpose use, while modest, is already becoming significant (14 per cent).

33. Future growth The organizations do not yet know how much further computerization may expand, in part because of continuing rapid change in computer and information technologies, and in part because many of them are still in the early stages of computerized information system development. Some small ones expect little further growth, some larger ones expect an additional doubling or tripling, and many simply do not know. The ICC, however, estimates that the total number of terminals linked with it (including non-Geneva agencies and organizations) may grow from about 640 at present to as many as 3,000 to 4,000 terminals by 1990. Thus the dramatic growth in number of computers and terminals which occurred between 1977 and 1984 may well continue.

IV. PLANNING AND CONTROL OF INFORMATION SYSTEMS DEVELOPMENT

34. The data in the preceding Chapter shows that the new computer technologies are already being applied in many ways by the organizations in Geneva as a present-day reality, rather than representing a mere future possibility. To properly manage this complex and rapidly changing process, each organization requires a carefully considered planning and control process with clear-cut responsibilities for coherent information system development and operation.

35. The new computers, terminals, and work stations, despite their moderate and decreasing costs, are not just another type of office equipment to be routinely purchased and installed. If their potentials are carefully applied and harmonized throughout the organization, they can significantly increase overall productivity and effectiveness. If they are left to an ad hoc and haphazard process, however, the new computers can become what has been characterized as "the world's most expensive paperweights".

36. Several organizations in Geneva have met this challenge of developing coherent overall information systems with a variety of positive initiatives. The World Health Organization (WHO) has by far the longest-standing and best developed process. In 1973 WHO established an Information Systems Development Working Group to draw up a new, user-oriented WHO information system to serve the secretariat, Member States, the World Health Assembly, and United Nations system co-ordination needs.

37. The Group's studies led to recommendations for a strategy and, in 1976, establishment of a global information systems programme, combining a programme management information system (with information about WHO's programmes) and special purpose technical and scientific data information systems (with information for WHO's programmes). A technological master plan for development of the overall WHO information system was approved and established in 1978. Actions were then taken to install a new WHO reporting system, develop direct technical services to programmes, computerize the administrative and financial system, introduce word-processing equipment, and decentralize electronic data- and word-processing services to WHO regional offices.

38. During the past few years, WHO's information system support work has concentrated on (a) further operation and development of WHO's information system to support programme management and international exchange of health information and experience, and (b) direct and indirect support to Member States in developing certain aspects of their national health information systems. Six "teams" in the headquarters Division of Information Systems Support in Geneva provide technical and methodological support and services to the system, and similar units are being established in the WHO regional offices.

39. WHO has recognized "profound changes" in computer use since 1978, including the shift of its computing work to countries or to contracting firms wherever possible, and the redesign of the many previously unrelated WHO computer applications into common data bases. In addition, WHO is combining new but standardized personal computer, word-processing, and telecommunications applications with its continuing extensive use of the ICC central computer. In recognition of these changes, the WHO technological master plan is currently being revised, after extensive consultations, to guide information system support activities under the WHO Seventh General Programme of Work 1984-89. The Programme itself stresses the "integral role" of information within the unified WHO managerial process, in worldwide health information transfer, and within the health activities of Member States.

40. The International Telecommunication Union (ITU) was the first organization in Geneva to have a computer (in the mid-1960s), the first to use small computers (in the mid-1970s), and presently has the most extensive computer network (even though it does not participate in the ICC). The ITU network links its two mainframe systems with dedicated terminals and many multi-function work-stations, provides for some distributed processing applications, and will link up with programmable work-stations now being installed in ITU field offices. This decentralized system supports the many ITU statistical publications, bulletins, registers, and data bases in the telecommunications field. In 1982 ITU began purchasing new, standardized personal computers, in conjunction with a survey of all departments which identified some 100 potential new computer applications. ITU is also implementing a major long-term programme, begun in the late 1970s with the aid of a Group of Experts from Member States, to further automate important regulatory functions through a computerized Frequency Management System.

41. The ITU Computer Department is an independent service unit which works closely with users to develop their applications. It has established an extensive staff training programme and has "outposted" some of its staff to user departments. As part of this process, the Department's staff functions are shifting away from application programming and data entry operations to a dominant emphasis on system assessment, development, support, training, and data base management functions. Computer system policy originates with governing bodies, with subsequent guidance provided by the top-management ITU Co-ordination Commit-

tee, and since 1982 by a Working Group on Programmable Work-stations. ITU has also standardized word-processing, spreadsheet, database and other software packages for all types of office automation use ITU-wide.

42. The International Labour Office (ILO) represents perhaps a more typical case of organizational adaptation to rapid changes in information system technology and approaches. An Information Systems Advisory Committee (ISAC) was created in 1977 and then restructured in 1983 in view of rapid computer technology development and growing user requirements. The ISAC advises on ILO-wide policy and priorities for comprehensive information systems, reviews feasibility studies and evaluations of cost-effectiveness of computer use, and oversees computer equipment and service operations. In recent years ILO has developed an automated statistics system, a work control and costing system, communications links with outside printers, and use of optical character readers (OCRs).

43. ILO is also working to gradually but systematically develop a general framework and methods to improve the quality of the information it collects on labour problems, to be known as the ILO International Labour Information System (ILIS). Some existing computerized data bases will be strengthened and new ones established, considering needs of both the developing and developed countries. The Bureau of Information Systems (BIS) provides central facilities for operating and developing information systems and services and systems analysis and technical support throughout the ILO, and has issued a Systems Manual on ILO information systems structure and operations. ILO staff participate in steering groups on text processing, the ILIS, telecommunications, and in a new Micro-computer Users' Group. In early 1984 ILO issued guidelines to standardize procurement and use of personal computers and certain software packages, and began a very active personal computer training programme.

44. The Office of the United Nations High Commissioner for Refugees (UNHCR) has been able to make a fresh start in computerized information system development. A project to set up refugee registers in Southeast Asia in 1979 was followed by establishment of an EDP Unit in Geneva in 1980. Because of the very rapid growth in UNHCR operations in recent years, the pent-up demand for computerized systems has been quite strong. Initial attention focused on administrative systems and the introduction of word-processing, and the system which is emerging blends centralized processing, heavy use of communications through the ICC facilities and the introduction of personal computers at headquarters and in the field.

45. UNHCR is currently testing the use of personal computers in 10 field offices for word-processing, electronic filing, local accounting, project administration and monitoring, and telex operations, with a view to installing such systems in all field offices. The EDP Unit, which is presently very thinly staffed, is responsible for specific applications, general technical support, hardware and software procurement, and overseeing the EDP budget. It is also beginning to address its responsibilities for systems development and feasibility studies with users, staff training needs, guidelines and standards. An Information Systems Committee of representatives from main user divisions participates in this systems development process.

46. The International Trade Centre UNCTAD/GATT (ITC) is a smaller organization which has recently moved from a modest reliance on the ICC to a considerable expansion of its own computerization activities. In 1982 ITC established an EDP Steering Committee to guide the progressive adaptation of electronic data processing within its programmes, with emphasis on studying needs and related costs for further EDP use; increasing the productivity of ITC headquarters, field and counterpart staff; and actively seeking out future EDP areas rather than passively awaiting suggestions. A further working group on a Computerized Management Information System (CMIS) was established in May 1984 to work towards a comprehensive and efficient computerized information system for all levels of management, with initial concentration on a project monitoring sub-system.

47. A small EDP unit in the Market Information Section supports the Committee and other computer activities and co-ordinates hardware and software acquisition.

Because of its technical co-operation work in export promotion, the ITC is actively exploring applications for personal computers in its field projects, and it has developed a variety of computer applications to provide specialized international market data, trade statistics and trade directories. To facilitate such data-gathering, the ITC has become one of the most active users of the bibliographic and statistical commercial data bases which are accessible through the ICC network.

48. The United Nations Economic Commission for Europe (ECE) has worked towards substantive information system development in three major ways. The Data Systems Unit in the Office of the Executive Secretary acts as the central ECE unit for systems development, applications support, training, and EDP management. In 1981 the Unit installed a decentralized, interactive statistical data system, the ECE Data Management, Analysis and Publication system (DMAP), which supports the extensive statistical, economic research, and econometric modelling and simulation work of ECE divisions, most of which is based on machine-readable data. The innovative DMAP approach provides co-ordinated and integrated statistical data storage and management; automated production and publication of statistical bulletins using various output formats and graphics equipment; and data analysis through appropriate software packages.

49. As part of this process, ECE appointed a data-base administrator in its Statistical Division in 1982, to work with other divisions to assess computerized statistical information needs, develop unified formats, and co-ordinate computerized data file management. An inventory of all statistical data files was completed in August 1983, and proposals for a common ECE data base and draft guidelines for documenting statistics in the data base were prepared in February and July 1984. In addition, in light of growing interest in word-processing and personal computer use in ECE divisions, the central Unit developed and ECE has installed a network of decentralized microcomputers and terminals as a complete, integrated hardware/software system.

50. The World Intellectual Property Organization (WIPO) has recently re-organized its computerization functions to strengthen system development efforts. Computer activities only began in WIPO in 1978, concentrating on three major substantive areas (international registration of trademarks, international patent applications, and industrial property statistics), plus several smaller administrative functions. In January 1984, however, WIPO established a Computerization Section in the Office of the Director-General to deal with all matters concerning computerization and text processing. The new unit provides co-ordination, support and training for the expanding, decentralized word-processing activities in WIPO, and is also reviewing existing computerized administrative, publications, and statistical functions.

51. The major current systems effort, however, is to complete an overall design for, and implement, an integrated WIPO administrative system for budgetary control, accounting and payments ("FINAUT Project"). A combined team from the Computerization Section and the Budget and Systems Section, in close collaboration with user sections and using a standardized systems analysis method to determine administrative information flows and needs throughout WIPO, has defined general objectives, selected priorities, and developed a general framework for the future system. Work over the next two or three years will develop detailed technical requirements and will implement the system as quickly as possible on a modular basis.

52. Finally, an organized systems development effort is possible in small organizations as well as larger ones, as shown by the efforts of the International Bureau of Education (IBE) of UNESCO, the smallest organization covered in the JIU survey. In early 1984 an internal computer task force studied possibilities for a co-ordinated computer system for IBE's documentation/information, publications, studies, and programme/administrative units. The group identified 12 particular services required by IBE, and then analyzed five alternative computerization strategies to best integrate present and possible hardware, software, communications, support and training, and user needs factors. IBE then requested a mission of UNESCO information specialists to supplement this examination, and they confirmed IBE's own conclusions that it would be best to establish a permanent link with UNESCO headquarters computer systems in Paris via the ICC.

53. These positive steps taken by the above Geneva organizations clearly reflect differences in their programme content, organization structures, past computer activities, and computerization priorities. But they all focus on the same activity, which the Inspector finds to be the single most important element in effectively managing changing computer use: a coherent, specific information systems development process in each organization.

54. The initiatives taken in Geneva, and the growing body of literature on current computerization strategies, underline the importance of an orderly process to properly plan, develop and co-ordinate the many possible new computerized applications (see Chapter V) and related staff responsibilities (see Chapter VI). This process should be:

(a) forward-looking and strategic: ensuring carefully considered, long-term information systems development which is closely integrated with evolving organizational objectives and the programmes and needs of internal and external users, instead of constructing haphazard, ad hoc and little-used applications;

(b) creative and adaptive: keeping informed of continuing, rapid technological changes and actively seeking out new opportunities and applications in a continual learning process, rather than becoming trapped in "computer paralysis" or tardy acceptance of yesterday's events and technologies;

(c) participative: involving managers and users in identifying and implementing priority computer uses, rather than relying solely on an often overloaded central computer systems staff;

(d) pragmatic: assessing and establishing computer applications based on their ability to significantly contribute to organizational efficiency and effectiveness, rather than obtaining sophisticated equipment for its own sake;

(e) coherent: working towards a single comprehensive and integrated information system, which:

(1) is organization-wide, blending central data processing with decentralized applications in all types of units;

(2) includes management information about programmes as well as substantive information for programmes;

(3) blends old and new systems, hardware, software, services and staff, linked and standardized as far as possible;

(4) is as compatible as possible with technologies and systems of users and other organizations outside the organization.

55. As these considerations indicate, there is no one "best" approach for information systems development. There do, however, appear to be several basic components which each organization should incorporate:

(a) First and foremost, establish clear-cut central responsibilities for overall information systems development (a unit, committee, or individual depending on organization size), with sufficiently high-level stature and adequate management and technical staff expertise and time made available.

(b) Make an inventory of existing equipment, software, telecommunications, systems projects, staff resources and data bases throughout the organization, and assess their adequacy and degree of integration.

(c) Develop a guiding policy and strategy statement for information systems development, specifying purposes, objectives, general lines of action, and participative roles and responsibilities.

(d) Carefully analyze, choose and then standardize new equipment and software acquisitions, and develop guidelines for their use.

(e) Make an initial identification, in close co-operation with users, of significant new applications that should be developed, in terms of their expected contribution to programme objectives, organizational efficiency, and coherent systems development.

(f) Establish priorities among these new applications, and then begin developing and implementing them on a modular, step-by-step but integrated basis, within the scarce information system resources and capacities available.

(g) Encourage staff creativity and some experimentation to continually identify new computer applications, then balance with critical assessment with users of feasibility and priority, then gradually expand use and establish controls as the applications prove their value.

(h) Ensure staff participation and management oversight throughout this process by establishing a committee of major users, proper training for staff, and periodic review of system progress and strategy by top management.

(i) Stay alert to and anticipate longer-term changes in technology, telecommunications, co-operative arrangements, and computerization approaches, and adapt the overall strategy to include them as significant opportunities arise.

56. This planning process, when well-established, can have much broader benefits than just providing a technological support mechanism. Effective information systems strengthen the overall ability of any organization to understand and manage its operations and to become a steadily improving and learning one. They allow it to be more closely attuned to rapid changes and developments in its fields of activity and thereby better serve the changing needs of its clients. These systems can also significantly increase office efficiency, thus helping to cope with an era of budgetary stringency and to free funds from outmoded and costly bureaucratic routines for priority programmes and more effective services.

57. To date, not many organizations have regularly reported on progress in this information systems development process to their governing bodies, perhaps because the newest wave of the "computer revolution" has arrived so quickly or because guiding policies and governing body interest have not yet become sharply focused. As examples of various reporting approaches that can be employed:

(a) The annual activities reports of ITU to Member States include detailed reporting on systems development and new computer applications in the Computer Department and in other programmes. 7/ In 1982 the ITU Plenipotentiary Conference cited the needs for the "fullest possible application" of modern office technology to help make optimum use of scarce ITU human and financial resources and rationalize ITU work.

(b) WHO has included a section on information system activities and progress in each biennial report of the Director-General since these reports began in 1978 8/, and ILO and WIPO make similar reports.

(c) In 1983 the Director-General of UNESCO reported on the impact of the development of computer technology, or informatics, as a specific UNESCO subprogramme, in other UNESCO substantive programmes, and as part of UNESCO's internal operations. 9/

(d) The FAO biennial Review of the Regular Programme 1980-81 included a "first-time" in-depth assessment of the FAO system of data collection and analysis, including future data system needs. 10/

(e) Annual reports of the Secretary-General of the United Nations on UNDRO for the past several years have discussed new systems and expanded services within the data-processing and communications activities which are essential to UNDRO's disaster relief functions.

58. In light of the significance of future information systems development activities in the organizations and the early stage of development at which many organizations find themselves, their governing bodies might wish to request an overall status report, periodic progress reports, or a section in regular reports on programme performance to inform them of system development policies and progress being made.

V. NEW OFFICE USES OF COMPUTERS

59. The new personal computers, software packages, and communications technologies are bringing very significant changes to traditional office operations. "Office automation", also known as "the electronic office", the "integrated office", or "the office of the future", is not just a manufacturer's slogan. It involves totally new types of technologies, new ways of analyzing and doing work, new roles for staff, and changes in the physical and organizational environment of the office. Chapter VI discusses the opportunities for, impact on, and responsibilities of the people involved. First, however, this Chapter surveys the major areas of office automation, the difficult but essential task of harmonizing the technologies as an effective network, and the productivity improvement perspective which should guide their development and use.

A. Areas of office automation

60. Computer use in the not too distant past generally meant centralized batch-processing of large amounts of administrative data. In the past few years the focus has shifted to word-processing work, and now it is shifting once again to systematic use in all types of office work as computer power becomes available to staff in general. The following sections very briefly outline major areas of use - and their potentials and hazards - and indicate the possibilities and activities which are already emerging in the Geneva (and some other) United Nations system organizations.

1. Substantive databases

61. The international exchange of scientific and technical information is essential for worldwide economic and social progress, and the United Nations system organizations have a more and more important role in facilitating such exchange as the "information revolution" grows. This places a great responsibility on the organizations to carefully select, develop, co-ordinate, and disseminate information in systems and databases which meet Member States' diverse needs.

62. In December 1984 ACCIS published the most recent directory of databases and information systems of the United Nations system, as a reference tool for users outside the system and for system agencies. The directory identifies over 600 selected databases, information systems and services fully or partially operated by 38 organizations of the system, including libraries, documentation centres, referral centres/clearing houses, research centres and others. 11/ At present, however, full computerization of and computerized access to these activities is very limited: an international survey in late 1984 identified more than 2,400 databases operated by some 1,200 producers around the world which are publicly available to users with remote computer terminals or microcomputers. Of this total, however, only 16 - or less than one per cent - are produced by United Nations system agencies (and this total of 16 has not grown at all since 1979).

63. The publicly available and even the presently-computerized databases still represent only a fraction of the total number of substantive databases and files in the organizations. A 1976 survey in WHO identified 290 special-purpose information systems, and the need both to rationalize these systems and to develop new ones. A similar ECE survey of its statistical activities in 1983 disclosed about 200 statistical "files" of widely-varying scope, format, and degree of computerization (later reduced to an inventory of 77 formal data files), and the need to eliminate data overlap, duplication, and inconsistencies. As a result of these surveys, both organizations appointed staff as database administrators, responsible for assessing needs, organizing and standardizing data formats, upgrading system documentation, and co-ordinating and advising on overall computerized database operations and policies. Other organizations will need to establish such database management responsibilities and procedures as they modernize, rationalize and co-ordinate their multiple databases.

64. Many information systems in the organizations are bibliographic databases, the best-developed of which are the INIS (nuclear) system of IAEA and the AGRIS (agricultural) system of FAO. Both provide computerized information-sharing

services and publications to a worldwide network of national information points. In Geneva, ILO established a computerized bibliographic database in 1964 and has made it publicly available since 1978. A recent JIU report on libraries in the United Nations system 12/ discussed the need to better organize and control the masses of information gathered and documentation produced by the organizations, and the importance of using computerized information tools in the more than 80 libraries of the system to better meet the information needs of internal and external users. The report recommended the creation of an inter-library panel to strengthen library co-ordination and information system support roles, with particular emphasis on meeting the long-standing need for improved bibliographic control and for indexing vocabularies.

65. Many other significant computerized databases exist in the organizations for statistical, register, referral and other purposes. Among the many examples that could be cited are: statutory international registers of trademarks and patent applications (WIPO); 1,000 summary tables and 30,000 annual time series of labour statistics (ILO); lists of enforced or involuntary disappearances of persons (UN Centre for Human Rights); lists of export and import trade contacts (ITC); country and consultant profiles for the disaster-management community (UNDRO); referral services to Climatological Data Banks (WMO); lists of ship stations and international frequency registrations worldwide (ITU); and registers of refugees (UNHCR).

66. These databases vary in size from hundreds to hundreds of thousands of entries. Some require extensive central computer capacity while others can be handled on personal computers alone. Most require a high degree of accuracy, frequent searches and updating, and regular publication of their contents. To meet these heavy workload requirements in a cost-effective way, computerization has proven essential. Many of them provide unique information services for the international community which could scarcely be done at all, or only with considerable extra staff time, inaccuracies, and processing effort, if they were maintained in a manual system.

67. The organizations have further responsibilities to facilitate international information access and use, particularly to support developing countries' efforts to improve their national information infrastructures, services, and capabilities. While some organizations such as WHO and ITU have already provided assistance from their central computer units in their fields of expertise, the primary responsibility in this area has been that of the UNISIST programme of UNESCO. UNISIST has worked to develop normative guidelines and common tools for the exchange of scientific and technological information, along with the International Organization for Standardization (ISO). One of the most recent of the many UNISIST publications, for instance, provides a useful analysis and inventory of information software packages available worldwide. 13/ Another UNISIST study, perhaps now somewhat dated, discusses possibilities for using mini- and microcomputers in information handling for libraries and information centres, particularly in developing countries. 14/

68. The organizations' information systems often involve challenges, requirements and complications not found at the national level or in private organizations. A 1976 study by six organizations, while now somewhat dated, contains a good review of experience with international co-operative information systems, lays out the diverse needs of users, and explores technical and organizational aspects of a comprehensive information system design. 15/ More recent reports of the ACC 16/, the Administrator of UNDP 17/, and UNESCO 18/ indicate that serious problems of *ad hoc* databases and inability to effectively reach users still exist. As a result of these concerns and needs, the dominant focus of the work programme of ACCIS for 1984-85 19/ is on information needs of Member States, tools for accessing United Nations information systems, and a register of development activities.

69. The task of organizing, developing and making their information systems and databases useful is thus a fundamental management responsibility of the organizations. A very helpful 1981 report prepared for IOB analyses management considerations, issues, and constraints in deciding whether to develop information systems;

options for the management and control of such systems; procedures for establishing new systems; problems of data acquisition and dissemination; and relations with system users. 20/ It is clear that much remains to be done to develop fully effective substantive databases in the organizations and throughout the system, and that the new computer technologies, if well-applied, can play a critical role in this process.

2. Substantive analysis

70. The 1970 report of the Auditor General of Canada observed that computers were being used in the system more and more for substantive activities, with a number of "highly beneficial and imaginative applications". A major barrier to further development, however, was a lack of computer knowledge among substantive staff. The Auditor General urged the need for training in basic EDP concepts and how to apply the computer to substantive activities, specifically through the use of "packaged" planning, statistical, and information storage programmes.

71. Unfortunately, fourteen years later these suggestions remain largely unfulfilled. A considerable amount of large-scale econometric and statistical analysis is done by specialist staff in organizations in Geneva, using the ICC central computer and programmes, but most staff still have little access to or knowledge of the computer tools available to help them. Nevertheless, the prospects for change are now particularly favourable because of the spread of personal computers and applications software packages. Among the thousands of packages now available are several major types:

(a) statistical: many statistical tasks in substantive programmes involve processing, analyzing and interpreting a relatively small amount of data. Statistical packages now available allow users to enter and edit data, develop descriptive statistics, perform cross-tabulations, and develop other statistical procedures with much greater ease and accuracy than can be achieved manually.

(b) "spreadsheet": this very popular type of software package allows non-expert users to develop large computerized tables with hundreds of rows and columns to lay out planning, forecasting, budgeting, modelling, and "what if" analyses or projections for substantive decision-making. When a new variable is introduced into any "cell", the entire spreadsheet - related percentages, sub-totals and totals - changes accordingly. Many of the programmes now contain built-in formulas, functions, and common formats as well.

(c) project management: this software allows managers to develop a model for use in determining the time, money and resources a project will require; how best to schedule its various parts; and job cost accounting data. The packages can provide a considerable increase in the quality, quantity, and timeliness of information which a manager needs for successful project implementation.

(d) data base management: these packages enable staff to keep highly-efficient records on consultants, reports, address lists, employees, etc. Once established, the information can be searched, sorted, and selected according to specific needs; interfaced with word-processing, statistical and graphics programmes for reports and presentations; and in general used in ways rarely possible under traditional manual search and file procedures.

(e) integrated: the newest software packages for office use combine spreadsheet, information management, word-processing, graphics and communications functions in an integrated and flexible package.

72. The use of these packages must be tied to specific needs, because the many different packages available could lead to chaos if not carefully chosen. Organizations such as ITU and ILO have already selected and standardized several of these packages for organization-wide application, including training in their use. The packages can be tremendously valuable in helping staff simplify smaller-scale programme tasks which are presently very difficult, tedious or error-prone. Rather than time-consuming pencil and paper work, heavy use of a calculator, or rummaging through files to gather and prepare data for analysis, these computerized aids can free staff time to concentrate on the analysis itself. And by spreading

these new capabilities around the organization, considerable progress can be made towards fulfilling the objective which the Auditor General of Canada set long ago - allowing staff to use their imagination and creativity to apply the computer to improve their own substantive operations and effectiveness.

3. Technical co-operation

73. In its resolution 1978/43, ECOSOC observed that it and the General Assembly had been considering the application of computer science and technology to development for a decade. It reaffirmed the considerable importance of making better use of computers for economic and social programmes in developing countries and cited the need for policies and programmes in this area. While personal computers are still a relatively new phenomenon, it appears that United Nations system organizations and Member States are already moving to capitalize on the many new decentralized and smaller-scale development opportunities which they create.

74. A sampling of current activities includes the following:

(a) UNCTAD is currently assisting a project to provide some 100 personal computers, and the associated software and training, for a Trade Information System in 16 West African countries.

(b) The United Nations Centre for Human Settlements (UNCHS) has developed a Housing Finance Software package to assist small housing and site schemes with financial management and reporting, using personal computers.

(c) Increasing interest in health information has led WHO to expand its methodological and technical support to national health information systems, establish several centres for information applications in health, and organize seminars on the use of up-to-date systems - and particularly microcomputers - in health management systems. 21/

(d) The United Nations Department of Technical Co-operation for Development (DTCD) is placing particular emphasis on expanding use of microcomputer techology - in light of its widespread availability and inexpensive computing power - to many economic and social sectors, including minerals management and exploration, pre-investment activities, statistics, population programmes, and as part of broader administrative improvement and information systems projects at the national, ministerial and local levels. 22/ (The World Bank's World Development Report for 1983 also stressed the value of microcomputers and the "management information revolution" to help improve economic management, data quality, and programme performance in developing countries 23/).

(e) ECE is assisting a regional Statistical Computing Project (SCP) with UNDP and 19 countries, which is also intended for developing countries interested in adopting the SCP results.

(f) UNIDO has developed several software packages designed to facilitate investment promotion and run on personal computers, and in March 1984 it convened an expert meeting to discuss information issues for development, including in particular documents on microcomputer applications and software development for developing countries. 24/

(g) ITC held a workshop in 1983 on computerized trade information systems experience in Latin America 25/, and is presently developing project activities in trade telecommunications services using personal computers in Asia.

(h) In view of the growing relevance and impact of computer and communications technology, UNESCO has moved to strengthen its informatics activities, its support to non-governmental bodies in this field, and its activities through UNISIST and in its other fields of competence. 26/.

(i) Recent ILO technical co-operation activities have included personal computer use to manage research and train managers in management development, and (with the African Development Bank) development of a training package on personal computer selection and use in public enterprises.

(j) The ITU is helping install microcomputer systems at Training Centres in a number of developing countries.

(k) Among other international organizations, The Intergovernmental Bureau for Informatics (IBI) provides general advice and promotion for the development and diffusion of informatics, maintains four regional centres for training in information technology, and has held international conferences on informatics, most recently in Spain in October 1984. A 1980 publication, now unfortunately somewhat dated, provides an overview of still other international and non-governmental organizations active in international computer and communications work, including technical co-operation. 27/

75. This expanding use of small computers in technical co-operation underscores two major responsibilities for United Nations system activities. First, unlike the substantive analysis area where much packaged software is already available, the organizations will have to take on considerable responsibility for helping Member States to design appropriate software for small-computer development activities in their spheres of activity. Designing this software is much more challenging and time-consuming than merely providing the computer equipment, but is essential for good projects. If done well, it could have very significant catalytic value for use or adaptation in many developing countries. Second, the increasing use of computers will require that staff engaged in technical co-operation programmes themselves become much more knowledgeable about small computer uses and potentials. This knowledge should begin with personal experience gained from using effective computerized information systems and applications within their own organizations.

4. Communication

76. Communication is both the key element and one of the most challenging in office automation. The primary process in any office is one of "communicating": preparing, producing and sharing information among staff. An office in which more meaningful information is made available to more people, rapidly and efficiently, will be a more productive and effective one. The challenge is to develop a single, comprehensive, integrated, communications system for the organization which links all of its equipment and units.

77. Internally, modern office communication should integrate the internal telephone network and the computer terminal network. It should allow people to initiate and receive "electronic mail"; have appropriate access to status reports, databases, and other information located around the organization; and to incorporate or transfer information and texts into reports, copies, or correspondence. Externally, it should allow similar types of communications activities with other organizations, users, and computer networks, using various carrier networks, the proper software, and devices called modems which allow computers to "talk" over telephone lines.

78. Several of these processes are already beginning to be used in Geneva. Approximately 2,000 new publicly accessible computer databases have appeared worldwide since 1979, and many of them contain economic, financial, statistical, current events, research and even computer software information that is useful to the organizations in their operations. Scientists and researchers in many fields worldwide are also beginning to communicate with each other by computer, using "computer conferencing" or "networking" processes which allow them to exchange messages, stimulate new ideas, and carry out common projects, working through a central computer location in a flexible group dialogue conducted at their own pace and convenience.

79. The ICC has an important communications role to play as a "gateway" facility for the organizations it serves. In 1983 ICC began operating a single "tele-informatique" infrastructure which is intended to provide all types of communication and allow its users to communicate with, and transmit information to, organizations and users anywhere in the world. Under the generic name "CALL/ICC", the services currently available include electronic mail, data entry, access to the international telex network and network databases, text processing, and bibliographic and retrieval functions.

80. Use of such facilities is still fairly modest in Geneva, but ITC has perhaps been most active. ITC is presently exploring possibilities for low-cost uses of electronic mail and data communication in its own operations; the use of telecommunications networks and access to databases for technical co-operation work in trade promotion; and selective dissemination of market information to developing country correspondents by telex. ITC staff search on-line commercial databases for relevant trade, statistical and bibliographic material; are among the more active users of the ICC electronic mail system; and some 50 of them have already been trained in the use of these systems.

81. Harmonizing all these new computerized communication tools is a complex process: linking fast equipment with slow; analog with digital; teletex terminals with word-processing ones; personal computers with central systems; differing peripheral equipment, networks, signalling systems and protocols; and voice, text and data functions. It appears that the technical problems involved may be overcome sooner rather than later, given the rapid and continuous pace of developments in computer technology. The real problem for the organizations is a managerial one: successfully developing and co-ordinating these new communications capabilities within each organization, among them, and in their essential communications links with the outside world. This critical task is further discussed in section B. on networks and co-ordination, and in Chapter VIII on United Nations system computer-based communication efforts.

5. Records management and archives

82. In between the substantive databases and small operational files used by operating staff is a large area of information activity which has received little concerted management systems attention as yet: records management and archives. Using a well-conceived set of modern information handling techniques (telecommunications, computers, and reprographic methods), the organizations can establish an effective and interdependent internal information system. Such a system should include a documents registry, storage and dissemination system to fully control correspondence files and documents produced by or for the organization and used in its work; a library system to handle the documentation received and provide bibliographic control and user services; an archives to maintain historical records and documents; a system for administration and co-ordination of databases; and a clearly defined and well-functioning management information system.

83. Some of this type of work has begun: for instance, the ILO has a computerized records management system (MAILOG) which registers selected incoming and out-going mail for retrieval by subject, date, unit or sender, and provides access to the system for major users. Unfortunately, however, most organizations have not yet made much progress in such efforts, particularly in records management. A good information system depends on the quality of the staff which directs and operates it, and the many innovations in the information field require significant technical expertise and competence. But too often records management has been a low-priority, low-level clerical activity. As a result, internal information policy and practices tend to be incomplete, responsibilities are fragmented among many small groups, and the staff are a mixture of lower level registry, library, documentalist, archivist, mailroom, telecommunications, reproduction technician, programmer, administrative, buildings services, and clerical staff.

84. In addition, while demands for additional resources for any one of these functions are usually tightly controlled in budget submissions, they amount in total to a considerable cost because of the many personnel involved and the manual procedures generally used. Good records management, however, can cost much less than indifferent records management. A weak process can lead to inefficiencies which compound themselves through hours of unproductive time, deadlines missed, wasted materials and office space, duplication of effort, excessive photocopying and repetitive files, loss of important material, confused assignments, and deteriorating overall organizational performance.

85. The ACC has recently given attention to part of this area in its decision 1984/15, which recognizes archives as the institutional memory of the organizations, a primary source for research on them, and an essential element in their day-to-day life. The ACC also called attention to a recent study of 24 agencies

prepared for UNESCO 28/, which discusses the need for a professional records and archives management programme and system in each organization and the practical value of records management as a tool for operational effectiveness. The study analyzes experience and problems, and provides institutional, functional, technical and professional guidelines for improvement. In addition, the 1981 study for IOB on planning for new information systems analyses the way in which records management should fit within an organization's internal information system. 29/

86. Two conclusions should be added in the context of this study. First, the organizations need to ensure that the many people presently responsible for the various elements of information handling manage and co-ordinate their work much more closely and systematically, and that they possess up-to-date professional expertise. Second, the new computerized approaches provide overall information systems management strategies, database management software, and new equipment which, if intelligently and coherently applied, can significantly improve the quality, responsiveness and cost-effectiveness of the internal information system.

6. Word-processing

87. Word-processing is one of the "oldest" of the office automation elements, having already been used in some organizations for almost a decade. Basically, word-processing is typing, using computer equipment that makes the work easier, much faster, more accurate and better-looking. The computer and the associated software generally allow the user to view the work on a screen; insert, delete and move text; search and replace particular items; review, edit, and correct text; easily insert or re-run standardized or repetitive text or correspondence; and format, store, transmit and print the results.

88. Word-processing equipment has evolved through three broad phases. Electronic typewriters have small built-in memories which permit some types of changes and the storage of short documents. "Dedicated" word processors generally have a keyboard, video screen, disc drive, software, and printers, joined with a micro-computer designed specifically for word-processing use. This equipment can either be "stand-alone"; "clustered" with several terminals around a central computer; or "distributed", using the cluster form but with "intelligent" terminals that can do some tasks on their own. More recently, the personal computer, either stand-alone or as part of a network, has become widely used for word-processing along with its many other applications.

89. This third stage has proven very important as a "base" for beginning the office automation process. Since word-processing is probably the most immediately useful, understandable, and productive component of office automation and is favourably received after people learn how to use it, it is an important initial step. The data in Chapter III confirm that word-processing is currently the largest single category of primary use of computer terminals in Geneva. While many of the organizations maintain relatively small central word-processing units for official documents and publications work, however, almost all have adopted a basic policy of decentralizing their computer equipment to make its word, data and information processing power available at every organizational level.

90. The personal computer's versatility allows it to serve as a multi-purpose work station for use by all types of staff for all types of office tasks, and to bring word-processing to its full potential by linking it with other office automation processes. Early word-processing software for personal computers was clearly more limited and difficult to use than that available on dedicated word processors. But new software is evolving so rapidly, and with so many useful new features, that the personal computer is rapidly becoming the more cost-effective and dominant form of equipment.

91. An essential but complicating element of word processing in United Nations system agencies is the use of multiple languages. However, recent innovations in this area illustrate the many useful software changes which are emerging:

(a) Much effort has been made by several organizations in Geneva to develop multi-lingual keyboard layouts, character sets and software for word-processing. At present, Arabic, English, French, Russian and Spanish are being

used in various organizations, with Chinese proving more difficult. The ease and extent of word-processing use in all the languages, however, will improve as demand becomes sufficiently strong to encourage further software development.

(b) New word-processing software comes with a dictionary of up to 80,000 words, plus smaller specially-chosen technical vocabularies that can detect spelling errors. Punctuation and style programmes also exist, including a "cliché hunter" feature. Such programmes should not only help simplify editing tasks, but also aid the many staff members who must draft or prepare material in a language which is not their mother tongue.

(c) Although the idea of automated translation has been pursued for many years without much success, it appears that some significant progress is finally being made. The key to new software packages, which can translate various languages at 20 to 30 words per minute or more, is that they produce rough translations which are then refined by a human translator.

7. Printing and publication

92. Printing and publication is an area in which very rapid technological changes are taking place. A 1977 survey estimated that some 50,000 scientific journals were being published worldwide, with a 50 per cent growth likely by 1990. In view of increasing costs, it is expected that standard print technology for such publications will eventually be joined by selective dissemination services, on-demand publication, microforms, videotext, new computer uses, and electronic journals. Meanwhile, technology already available includes such things as "teletex" for fast transmission of text between distant terminals through existing telecommunications networks, high-quality "laser printers" which are now becoming cheap enough for use with personal computers as well as centrally, and graphics equipment which can readily produce attractive graphs, charts and visual aids in colour and even in three-dimensional form.

93. A recent JIU report on publications 30/ observed that the United Nations system is one of the world's major publishing groups, with some 4,000 book and periodical titles produced annually, associated costs of as much as $150 million, and additional heavy flows of official documentation. Given the further fact that all of this material is the major vehicle for communicating with Member States, researchers and other users, these processes need to be as high-quality and cost-effective as possible. The report reviews current policy, practice and major issues in publications and notes that the organizations should take full advantage of the rapid changes in printing technology which have called many traditional printing assumptions into question.

94. In fact, organizations in Geneva appear to be progressing rapidly to use new technologies in their printing work. The data management-analysis-publications system (DMAP) of ECE was noted in Chapter IV. UNCTAD and WIPO have developed some computerized processes, including photocomposition from word-processing and computer input and the use of laser printing, for their substantive publications work. ITU began automating its extensive range of sales publications in the late 1970s, and uses a Computerized Composition System with an electronic photocomposer and on-line page make-up to provide faster publication, improved staff productivity, and lower publication costs.

95. The ILO Labour Statistics Data Bank (LABORSTA) is a machine-readable file which produces not only statistical publications by photocomposition and use of a laser printer, but some 40,000 pages of tables annually, trilingual instructions, questionnaires, address lists, and standardized correspondence. The IBE of UNESCO, although a very small organization, produces many of its publications using a computer programme to generate photocomposed text directly from its database, or its word-processing equipment to produce text which is then sent electronically to printers around Europe for photocomposition.

8. Administrative and management systems

96. Administrative processes were among the first areas to be computerized in many public and private organizations, because their manual processes and large volumes of data were most readily suited to computer batch-processing. Compu-

terization, however, was often ad hoc, leading to a complicated cluster of programmes in which, for example, perhaps half-a-dozen personnel programmes with differing formats and data requirements would exist side by side. In addition, the programmes were often poorly structured and documented, and used primitive and cumbersome programming languages. This required extensive subsequent use of staff time to maintain and "patch up" the old programmes as operations expanded and circumstances changed.

97. The administrative computerization effort also led fairly rapidly to the concept of management information systems (MIS), to provide selected information to decision-makers. Over time, however, as both users and analysts identified more and more ambitious and varied information "needs", these systems too often became cumbersome centralized processes, requiring managers to provide extensive data inputs in complex formats while receiving only a flood of late and largely irrelevant reports in return.

98. The United Nations system organizations have also encountered many of these problems, although their MIS efforts have been more modest. The Auditor General of Canada found in 1970 that most organizations had developed their administrative functions on a piecemeal basis and independent of one another, but hoped that programme budgets would help build integrated systems. The ACC agreed in 1974 that better information was needed in the organizations to meet carefully defined decision-making needs. In 1978, however, the JIU report on IOB observed the "radically different" nature and "widely unequal quality" of basic administrative systems in the organizations, as pointed out by several external auditors.

99. Recently, these problems appear to be lessening. Higher-level languages and new programming methods have been developed which strengthen the programming process. When combined with good management analysis, a streamlining and standardizing of administrative data files, and clear procedures, they permit gradual restructuring and modernization of administrative programmes to make them simpler and easier to maintain. Much more attention is being paid in the MIS area to working carefully and pragmatically with managers to provide only the limited information which they will actually use in their decision-making. And there is a growing recognition that organizations need to carefully plan and harmonize their overall information systems.

100. Among Geneva organizations, WHO has moved furthest in this area. In 1977, WHO began testing a programme management information system using a standardized method of project and programme "profiles" for use at all levels and a uniform administrative and financial information system to facilitate planning, forecasting, and oversight. Subsequently, these computerized systems have been further developed as tools for use in the total managerial process for WHO programme development, and are supported by two teams in the Division of Information Systems Support. ILO developed an integrated Financial Information System during the 1978-82 period, a fully computerized budget preparation system, and hopes to develop a new computerized personnel information system (PERSIS) as a priority item beginning in 1986. As noted in Chapter III, WIPO, ITC and UNHCR are other organizations which have also begun to analyze, better integrate, and streamline their administrative and management systems. Conference servicing is another area with much potential for more cost-effective methods in most of the organizations, through computer system use for conference planning, scheduling, and participant registration; helping prepare reports on meetings; and the whole area of teleconferencing. The United Nations in New York, for instance, has begun a related microcomputer project to streamline distribution charts, production control, and supply status processes in its Publishing Division, then to link them as a network and extend them to other printing and publishing functions.

101. The quality of administrative and management systems has long been of concern to governing and inter-governmental bodies. In 1973 ECOSOC emphasized the importance of good information systems to support development programmes, the medium-term plan and decision-making cycle, and information needs of member governments to facilitate decision-making in governing bodies. ECOSOC resolution 1981/63 reiterated the importance of harmonized information systems to strengthen the planning and delivery of effective United Nations system activities, and of

timely and accurate information on activities, resource use, results and findings to enable governments to participate more effectively in the programme planning and evaluation process.

B. Networks and co-ordination

102. Fitting all these areas of activity harmoniously together is a complex, long-term managerial task. Not only are there many interrelated applications competing for scarce resources and a great variety of hardware and software tools available, but the technology is constantly evolving and the organizations' programmes are also changing. If the information systems development and integration process is managed skilfully, the organizations should achieve much stronger operational capabilities with which to respond to Member State needs. But if the process is loosely planned, computerization may only fragment and complicate operations and waste the equipment's cost and potentials.

103. The organizations in Geneva are all largely at the initial stages of office automation, with only part of the many possible functions presently being computerized (and these vary from organization to organization). But they need to keep firmly in mind the eventual and desirable goal of full office automation, which would combine external telecommunications, central computer processing and co-operation, an internal communication network, a system of work stations readily available to most staff, and a support system of specialized peripheral equipment.

104. Such an integrated organizational network involves four areas of planning concern. First, technical attention focuses on local area networks (LANs) and private automatic branch exchanges (PABXs). An LAN is a way of connecting devices (large and small computers, terminals, printers, telephones, files, etc.), generally in a building and using power cable transmission, so that they can exchange "information" (data, voice, text, graphics and even images). A PABX is a telephone switching facility to link office equipment, office communications, and public telecommunication services. Many technical problems exist, including a vigorous debate on the LAN versus the PABX approach and among various LAN technologies, but the computer industry is moving aggressively to develop the necessary links and procedures. Thus the organizations need to carefully follow technological developments as they make long-range procurement, standardization and support equipment decisions.

105. A second important area is that of overall system strategy, particularly in blending decentralized computer work stations, video display terminals, personal computers, and peripherals with centralized computing facilities. Centralized systems provide integrated control, support and communication links, while decentralized small computers offer flexibility, easy installation, and ready availability for users. Centralized systems suffer from poor response time, slow system development, and vulnerability to failure, while decentralized small computers risk system and operational fragmentation. The arrival of powerful, new, multi-user small computers with enhanced disc storage is rapidly blurring the storage capacity and computing power advantages which central computing has traditionally offered. Each organization needs to develop an appropriate computer architecture that blends the best features of the centralized and decentralized approaches. Many of the organizations in Geneva rely largely on the ICC as their "central computer", and will need particularly to take its expanding telecommunications services into account in their planning.

106. A third major integration area is software. The centralized computer approach of the past created an infamous "invisible backlog": many computer services that end-users needed were never requested because of the slowness with which hard-pressed central computer staffs had developed previous requests. Personal computers, while increasing user demand, have also generated tremendous innovations in systems software and thousands of software packages for all kinds of office applications. While packages available through the ICC and specially-designed or adapted programmes will still be needed, these new software packages, and especially the newest "integrated software" for multiple office uses, will be increasingly important. The organizations need to continually examine software possibilities and select and standardize the best ones for use, as ITU, ILO, and WIPO have already begun to do.

107. Fourth, the organizations need to harmoniously integrate people and their various organizational responsibilities in the systems development process. This involves the planning and control process discussed in Chapter IV, and the participation of the various groups of staff discussed in the following Chapter.

108. Many officials in Geneva mentioned the need for better local inter-agency co-operation in computerized systems development. The Computer Users Committee was established for this purpose by the ACC in 1968 in Geneva, at ACABQ's request. It was phased out, however, when the ICC and IOB were established. Following the difficulties of inter-agency co-ordination experienced by IOB in the 1970s, the expert study for ACC in 1982 reiterated the need for the agencies to share experience and the best modern methods for developing their information systems. The Management Committee of ICC cannot fill this function, because it concentrates on the specific central services its users require, and because its membership is limited (most units of the United Nations in Geneva, for instance, are represented by a headquarters official from New York). However, among the tasks assigned to ACCIS by ACC, ECOSOC and the General Assembly are those of promoting improved information infrastructure and more effective operation of information systems and services.

109. An informal computer working group in Geneva, re-established under ACCIS auspices, serviced by the ACCIS secretariat, and with a practical and limited agenda, could provide a co-ordination mechanism at almost no cost but with real potential benefits to Geneva agencies (and perhaps other agencies elsewhere). Such a group could:

(a) most importantly, try to agree on and standardize key types of equipment - especially personal computers - to seek economies through common procurement and a united front in negotiations with suppliers;

(b) share or transfer equipment among agencies as their needs change (this already occurs to some extent);

(c) share information on good consultants, contractors, services, etc., local or otherwise;

(d) exchange general experience in systems development or in specific areas such as computerized printing;

(e) pool knowledge of all the changing technological developments which any one organization probably cannot follow on its own;

(f) consider possibilities for joint training and training methods;

(g) explore other mutually beneficial co-operative or co-ordinative opportunities.

C. Productivity

110. Underlying all the office automation activities discussed in this Chapter is the concept of improving productivity: achieving greater output of "goods" and services and higher-quality results from a given amount of resource inputs. While productivity gains have been steadily achieved in manufacturing, agriculture and some service industries, the office environment (in which United Nations system organizations primarily operate) has proven quite resistant to such efforts. Computerized systems have the potential to change this situation, but the process requires perspective, insight, and concentrated management effort.

111. To begin with, computers cannot magically improve office operations: the human factor is the critical one. The computer is no better than what is put into it, and computerized information is often given undue respect. Further, computer industry claims and promises have often proven over-enthusiastic, perhaps most notably at the moment the idea that "user-friendly" means that almost anyone can sit down, tap a few keys, and turn out meaningful computerized work.

112. A proper perspective must also consider full costs of the new computers. A personal computer might cost only $3,000-5,000, but it may be necessary to add an equal amount for expanded disc storage, basic software, and a printer. In

addition, the related demands for shared telecommunications, database management systems, and central computer power, storage and support might double or even triple this cost, suggesting a grand total of $20,000 or more. These costs underline the fact that personal computers must be placed where their power best meets real organizational needs, rather than applied to trivial tasks or left sitting unused in a corner.

113. It also appears that information technology will not provide the dramatic cost "savings" that some people expect. First, while computers can lower costs in many areas, the equipment must be purchased or leased, then maintained and supported, and eventually replaced. Second, more and more people will want to use the equipment once it is installed, so that while cost-per-unit drops, total costs may still increase. Thus, the most likely way in which computers will actually increase productivity (assuming good management) will be to raise the level of services provided significantly more than they raise costs, especially in providing new services that never would have been possible otherwise.

114. Determining computerization benefits is much more important (and difficult) than calculating acquisition and maintenance costs. This assessment should begin by ensuring efficient operation of the computer system. Information inputs and outputs should occur with a minimum of effort and delay, computer utilization rates and maintenance should be efficient, equipment should be chosen for its ease of use and to take continuing advantage of new and cheaper technology, and applications software packages should be used wherever possible. It should also be recognized that a computerized system often will not be really productive until it reaches a certain "critical mass" of workload, interrelated functions, and equipment, at which time costs should decrease and benefits accelerate.

115. Most importantly, however, computerization provides a very important opportunity for analyzing, re-thinking, modifying, enhancing, combining, or eliminating organizational operations and tasks to improve programmes and services to Member States (the "insight" aspect). In many areas, the newly "cheap" computer power can be substituted for expensive staff time now spent in tedious, repetitive, and error-prone manual tasks, and for the many types of routine information-handling which are central to office operations. Even where productivity improvement does not directly involve computers, this systems analysis approach can be a significant managerial aid.

116. Most office productivity attention to date has been devoted to improving clerical and secretarial productivity. Since word-processing and data handling applications have not yet progressed very far in Geneva, it appears that the organizations can still make significant gains here. However, the new technology has scarcely begun to be used by professionals. Various studies of office operations have shown that professionals currently spend considerable time trying to locate information or contact people, waiting, performing calculations, organizing and preparing and checking data, and arranging their activities. Often, the only technological items in their offices are a clock, a telephone, and perhaps a calculator. Office automation processes could greatly expedite and simplify many of these communication and information tasks, thereby freeing these staff (and then helping them further) to concentrate their skills on the real professional research, analytical and decision-making functions for which they were recruited.

117. Personal computers and terminals are thus basically "productivity-enhancing" devices for use in all the areas discussed previously in this Chapter. The justification for their use should be established by a sound analytical process, standardized and properly documented and carried out by end-users and systems people working in collaboration. This process should identify costs, benefits, alternatives and consequences of refusal for each possible application. The benefits to be identified should include: improved service to users, work eliminated, costs or recruitments avoided, time savings, greater accuracy, better quality of work environment, and better information for decision-making.

118. Since resources are scarce, the users, systems staff and top management then need to set priorities among these project requests and harmonize them within the overall computerization strategy. They should compare and rank them based on financial costs and benefits, intangible or qualitative benefits, their contribution to organizational objectives, and their technical importance (some projects must occur first to make others possible, or may be "test" projects with much wider use if they prove successful). This analytical process should be an essential and continuing part of computerized system development, and should include organized follow-up assessments to ensure that implementation occurs and results are achieved as expected.

119. These procedures and the new office automation technologies provide significant insight and means for improving productivity in the organizations. The critical dynamic factor to be added, however, is people: active staff participation, top-level guidance, and competent systems staff.

VI. HUMAN RESOURCES

120. Despite its connotations, "office automation" need not and should not be a mechanistic process. Instead of substituting machines for people, each organization needs to decide how best to combine people, machines, facilities and support equipment to meet user needs. When staff view the computer as a source of interest, challenge, and work support, and the organization is structured to allow their active participation in system development, significant advances in organizational effectiveness can follow.

A. Staff in general

121. There has been much speculation about the impact of technological change on office workers, ranging from utopian visions to despair. A recent ILO report provides a balanced perspective on expected impacts in the public service. 31/ It reviews the nature and extent of the structural and technical changes - computerization, telecommunications, mechanization - that are occurring; the effects they will have on employment levels, occupational structures, and career prospects; and their impacts on conditions of work. The report concludes that far-reaching positive and negative changes are taking place. It cites trends towards decentralization and rationalization to improve services, and a pattern of overall job transfers rather than massive unemployment. It stresses the need for greater consultation in introducing technological changes, and measures to eliminate, minimize or adapt their negative consequences.

122. Since the abilities and attitudes of people who work with computers are critical factors in their introduction and use, computerized system development puts increased responsibilities on organizations for responsive human resources planning and personnel management. These processes must pay close attention to changing educational and skill requirements and work force composition in recruiting new staff; training and re-training for current staff as tasks and responsibilities change; and better job analysis and design to enhance flexibility, productivity and staff motivation in a changing organizational structure.

123. Three aspects of these processes deserve special mention. First, the increased use of new technologies has generated much interest in "ergonomics", which is an approach to improving working conditions and work environment by adapting work to people rather than vice versa. Another recent ILO report, evaluating its PIACT programme, explores the growing recognition in developed and developing countries of the need for improving occupational safety, health and conditions of work, including the importance of technology as a tool to improve working environments. 32/

124. Ergonomic considerations have led to much current research on improving office environments, which the organizations will need to follow and utilize. The introduction of computers often requires office redesign so that electrical

systems, communications wiring, heating and ventilation systems properly support the new equipment and those who work with it. The layout of the office requires flexibility so that as organizational tasks and processes change, people with related tasks and their equipment are conveniently and efficiently located near each other, and have adequate light, air, space and acoustics (for example, control of loud printer noise). Much attention has already been devoted to the use of video display terminals in central word-processing pools where workloads are most concentrated, and to the elements - proper lighting, adjustable equipment, appropriate furniture, proper training and consultation, limitations on use, and periodic eye examinations - necessary to ensure that the terminals are a normal part of work rather than a discomfort or a health hazard.

125. Second, training is an obvious but essential key to computerized system development. Technical training in direct equipment use is not enough. "Computer literacy" training is also needed to introduce staff to computer terminology, how programming languages work, different applications, current hardware and software, computerized information systems, and how they can identify (and specify requirements for) cost-effective new applications. This training is very important to make successful use possible, overcome fears and hesitation by building understanding of computer functions and planned use, build a perspective on how particular work tasks fit into the total computerized system, and encourage staff to develop sound programmes and applications on their own to improve their work.

126. Unfortunately, the need which the Auditor General of Canada identified in 1970 for staff training in basic computerization concepts, substantive programme uses, and software packages has not yet been met in Geneva. Most of the organizations conduct regular training in word-processing, but only for secretaries. The ICC has a variety of on-line courses to familiarize users with its CALL/ICC services and packages, and a few organizations have several computers set aside which staff can use along with "tutorial" software packages to learn on their own. However, officials of many of the organizations agreed that these ad hoc training efforts, necessitated by the press of other operational and systems development tasks, are insufficient, and that structured staff training programmes are much needed.

127. The only well-rounded computer training programmes in Geneva at present are those of ITU and ILO. Recognizing the need to develop staff computer skills, keep them abreast of new technology, and encourage them to develop their own applications, the ITU conducted over 100 staff training courses and seminars in the late 1970s and early 1980s. In early 1984, it established a computer training room where Computer Department staff train users, in groups of 8, in "hands-on" computer applications. More than a dozen different general introductory courses, workshops, and software use sessions were offered in English, French and Spanish to more than 800 ITU participants between February and September 1984. The ILO began computer courses for professional and general service staff in 1970 which trained 400 people, and it has also given basic and advanced text processing training to 380 participants. In addition, in 1984 the ILO Training Centre trained 330 participants in eight different courses covering basic personal computer operation, use of several software packages, and text processing.

128. Finally, one must recall the basic purpose of computerization: to provide powerful tools to help people carry out their work. The leadership and support functions discussed in the following sections are essential. Ultimately, however, it is the individual secretary, professional, and manager who must be trained, developed and supported as the main agents of creative, positive organizational change. Management should thus make computerization a participative process with regular consultations between management/computer systems staff and users. This is important to utilize a staff member's knowledge and experience in the work area where he or she is the expert, improve system development decisions, make better use of staff skills and abilities, build a commitment to organizational improvement, and increase overall productivity. Officials in several Geneva organizations cited ways in which secretaries, the group which presently uses computer work-stations most, had developed productive new routines on their own to improve office efficiency.

B. Top management

129. The management literature on computerized systems in organizations provides many lessons of experience from unsuccessful computer systems. Common problems have included computerizing because it is "modern" rather than because clear needs have been established, buying the wrong or excessive equipment or software, underestimating costs and development time involved, confused development because of a failure to establish priorities, a lack of co-ordination leading to competing and incompatible systems, flooding the organization with unnecessary computer data, confining development to one unit rather than sharing it organization-wide, creating duplication and overlap because computerized and manual systems run side by side, or establishing computer systems which conflict with organizational styles because staff were not first consulted.

130. The literature attributes most of these problems to the indifference of top management to computerization, or its acceptance of the process as a "necessary evil" for which they need only consider financial requirements. In fact, the quality of top management leadership, involvement and firm direction is considered just as important for successful computerized systems as the competence of the computer systems development staff and the sophistication of the equipment itself.

131. The new emphases on decentralization and personal computers allow much more flexibility and adaptation than the old monolithic computer systems, but can result in very disruptive fragmentation if they are not carefully handled. Top managers need to guide this process, not as computer experts themselves but through the application of sound management techniques and oversight to assure an orderly systems development process.

132. Each organization needs some form of a top management committee to periodically set systems development directions; examine and question critical choices, progress and results achieved; and resolve conflicts. These functions would include providing a high-level perspective to ensure that system development fits with and supports overall organizational objectives, re-thinking old assumptions and methods of operation and leading a sustained improvement process, balancing tensions between creative innovation and system control and between central systems staff and users, setting priorities for allocation of scarce computer resources and applications among competing units, and ensuring a professional, orderly, well-documented systems development process.

133. In Geneva, the Director-General and top management of WHO were extensively involved in developing the first WHO technological master plan and in its current updating. The Information Systems Advisory Committee of ILO is chaired by a Deputy Director-General, and the ITU computer programme is reviewed and guided by the top-level Coordination Committee. The central computer units in these three organizations also have relatively high organization status, being respectively a Division, a Bureau, and a Department. Some smaller units are also rather highly placed; the Data Systems Unit of ECE is in the Office of the Executive Secretary, and the new Computerization Section of WIPO is directly under the Director-General. In some other organizations, however, the central unit is still buried at a rather low hierarchical level, and a direct top management guidance role has not yet been established.

C. Administrative support units

134. Many of the most significant decisions to be made in computerized systems development arise in areas of office management and general services which are still considered to be very routine. Integrated information systems, however, will require much more carefully prepared decisions with due regard to longer-term impacts. Among the major areas affected are:

(a) Procurement Procurement officers and contracts committees will need to go well beyond lowest unit price in deciding on supplier contracts for personal computers and other key equipment. Their decisions must also emphasize the longer-term versatility (multi-purpose uses) of the equipment, compatibility with other systems and equipment, quality and availability of software, diverse product lines,

the best mix of complex lease/purchase/rental/replacement/upgrading provisions, and the strength and reliability of system consultation, technical support and training services to be provided. Procurement also involves much more than just "buying a computer": it has recently been noted that a typical catalogue of parts for office work-stations can include up to 4,000 items.

(b) Cabling and telephone New computer equipment cannot just be plugged into a wall socket. The eventual goal of integrated systems must be a critical consideration. Management should not only carefully plan the long-range computer architecture and requirements, but also recognize that running new cable is an expensive proposition, cope with the complex and unresolved LAN versus PABX technical disputes (see paragraphs 104 and 76-81), and work to ensure that the communications wiring solutions they choose help resolve, rather than add to, the miles and miles of different cables already clogging their walls and ceilings.

(c) Data security Decentralized information systems with thousands of potential users in Geneva raise new security problems of access to organizational information. There has been much recent progress in the technologies for safeguarding computer data, but management policies and controls in this area are often still very casual. Managers must devote very serious attention to policies and practices to determine authorized users and the data they need, protect individual privacy, guard against tampering with computer data or its loss through technical malfunctions, and prevent computer crime.

(d) Equipment security The table in the Annex indicates that millions of dollars worth of new computer equipment is being put into use in Geneva during the 1984-85 period. Microelectronics and decentralized use make this equipment a tempting target for thieves, since most of it is easily carried and some items - such as floppy discs - are even easily concealed. The organizations have had very few incidents of theft thus far, but rapidly expanding use will require that building security forces develop new protection measures in the future.

(e) Office organization Most organizations still do not plan ahead for changes in office operations. As discussed earlier (paragraphs 123-124), they will have to provide much more careful and professional analysis and management of operational flows, office layouts, ergonomic factors, and integrated patterns of equipment use in the future.

135. An important trend in coping with all these new demands is the possibility of contracting out routine office functions to specialized contractors who can do the work more cheaply, rapidly and effectively than could the organization itself. WHO contracts out its computer programming work wherever possible, several organizations use contract printers, and several have technical service contracts for office equipment, management and maintenance. Other information services - even including accounting, payroll, training, and recruitment - are increasingly being contracted out, and some such applications might prove cost-effective for United Nations system organizations as well.

D. Management systems staff

136. Chapter IV of this report identified control as an essential element of systems development planning and management, and Chapter V.C. cited the potentials for productivity improvement through computerization. Good management systems staff in the organizations can provide a focal point to formalize these concepts as a sustained force to improve organizational operations and services.

137. In 1981 JIU reported on management services in the United Nations system. 33/ The report observed that the organizations must continually examine their operations and how to make them more effective, which requires a well-defined and adequate management services function. The JIU found, however, that achievements had been modest. Most organizations appeared not to give management services a high priority, so that opportunities for improving effectiveness were being missed. Management service units were either quite small or non-existent, and spread their work quite thinly over many areas, with an emphasis on "problem-solving". The report urged a greater commitment to management improvement func-

tions, and made recommendations to better define and strengthen these functions at minimum cost, including a participative management approach, greater use of systems analysis, and involvement in the introduction of new office technologies. The organizations' comments agreed in general terms with the JIU recommendations, but cited resource limits to further progress.

138. Subsequently, however, the organizations have become increasingly concerned with assuring Member States and the public that the United Nations system functions effectively in practice. The ACC, in its 1982 overview report 34/, reviewed the economic and social crisis in development and international economic co-operation and the erosion of the structure of multilateralism. It concluded, as concerned the United Nations system's role, that the growing gap between expectations of system performance and modest resources provided poses "serious problems of credibility and effectiveness", and that

> "... while improvements can always be made, [the activities of the organizations responsible for operational activities] have a proven record of effectiveness and efficiency. While many of the charges of waste, inefficiency, duplication, etc., are not accurate, it will be necessary to refute these charges by clear evidence to the contrary."

139. Progress has been made throughout the system in the evaluation of project and programme results (the JIU is currently preparing another status report on this subject), but it appears that management services functions are still very limited and ad hoc. The Inspector believes, however, that the computerized systems development process discussed in this report provides a major new opportunity to make management improvement efforts much more dynamic. This is based on the facts that:

(a) computers are essentially "productivity-enhancement" tools (see paragraphs 35, 110, 128);

(b) sound systems development demands analytical methods and actions throughout an organization to identify promising computer applications, assess their costs and benefits, and follow up on results achieved (paragraphs 53-56, 114-118);

(c) direct participation of staff users is an important element in this process (paragraphs 54(c), 55(c) to (h), 119, 120, 128).

140. Systematic identification, analysis and follow-up of computer-related projects to improve operations must be done to give top management the necessary information to set priorities among projects, assess progress and results achieved, and decide on further resources needed. The spread of computer use to all types of substantive, administrative and support functions provides an organization-wide scope for these efforts. The active involvement of users can enhance management improvement efforts by adding much additional creativity, experience, and commitment to the process.

141. Computer system development thus provides a basic mechanism for sustained productivity improvement that has been lacking in most of the organizations, but which they must now develop as they further computerize their operations. This process requires critical thinking about operations and tasks, their relationships and sequences, and how to combine resources to best perform them. It can apply basic methods for identifying information needs, documenting requests, and analyzing costs and benefits. This process can thus provide the close control over performance and costs which is essential to good management (see paragraphs 115-118). It should also include incentives for staff who initiate reforms which result in improved services or cost reductions. The Secretary-General of the United Nations recently proposed new activities aimed at streamlining structures, improving systems and procedures, and reducing costs to increase operational effectiveness (including a staff incentive programme). Computerized systems analysis and controls can be a powerful tool for accomplishing such aims.

142. A critical part of these management improvement efforts is the establishment of clear-cut staff responsibilities for management analysis, systems co-ordination, and support. Three basic possibilities exist. The management systems func-

tion and information systems function can be combined. This is already done in WHO, where management services are a component of the Division of Information Systems Support, including responsibilities to assist users to specify requirements, to develop conceptual designs, to make necessary cost benefit/effectiveness analyses, and to strictly monitor computer use on a cost-effectiveness basis.

143. Second, the responsibility can be given to management services units working closely with the computerized systems development process: this pattern is beginning to occur in ILO, where the Management Advisory Services unit participates in all the various computer system working groups. The third alternative, less desirable but probably inevitable in smaller organizations, is to add this function in more modest form to the tasks of the computer systems unit (see following section).

144. Chapter IV also noted that reporting to governing bodies on information systems development has been rather limited. Reporting on specific management improvement results seems to have been even more limited, and confined largely to general statements on the importance of efficient and effective operations or to extremely scattered comments on individual actions proposed or underway. In view of the emphasis which governing bodies have placed on high-quality operations and better reporting on the use made of resources provided, they might wish to request that periodic reports on computerized information system development policy and progress also include summarized but specific information on services which have been improved, processes which have been simplified and streamlined, and costs savings which have been achieved.

E. Computer systems units

145. Computer systems units are mentioned last in this discussion of responsibilities, not because they are least important but to emphasize that the many burdens involved will fall most heavily on them. Staff users, top management, and administrative support and management systems units all have essential roles to play, but ultimately it is the computer system staffs which will bear the day-to-day responsibilities for harmonizing activities, providing needed support, and maintaining forward momentum.

146. These responsibilities involve a change in central unit roles. Formerly, EDP units were both the central controllers and sole dispensers of computing to remote users. Now, however, they must become a database, services, and communications utility supporting organization-wide operations and user group needs.

147. In this changing role, the computer unit becomes a facilitator and an orchestrator, concerned as much with organizational development as with technical processes. The change is reflected in new unit titles - away from the old "EDP unit" and towards "information systems" units - and in unit placement at a high enough level to serve the entire organization and interact with top management. The units, whether in large or small organizations, need to perform several major functions;

(a) Systems planning As emphasized in Chapter IV, the unit must have clear-cut responsibilities and adequate staffing to help plan, analyze, and implement information systems development. Particular attention must be given to harmonizing hardware, software and applications to build an integrated network, and to providing top management with adequate information to ensure that major decisions on system development closely support organizational objectives.

(b) User services The many new users and areas of office computerization will greatly increase demands on central units. Nevertheless, it is essential that the units provide responsive computing services, general and specific training, technical advice and informal support to help users to do their own computing, and end-user access to organizational databases.

(c) Systems control The unit must help manage the implementation process, ensuring that scarce computer resources are applied to priority applications and maintaining a firm management focus on productivity improvements and the costs and benefits involved. This requires working closely with users to support legitimate needs and initiatives while maintaining overall system integrity, quality and standards.

(d) Maintenance The unit must efficiently manage the computer and internal communications networks and central computer operations. An important part of this effort is to reduce direct programming and programme maintenance efforts through modernization of existing programmes, greater use of applications software packages and system consultants, and the contracting out of programming work wherever possible so that day-to-day maintenance activities do not crowd out longer-term system planning, development and service functions.

(e) Foresight The unit should help identify new technologies of value to the organization and inform prospective users. Among other things, this requires that unit staff regularly read at least a few of the 200 periodicals which presently report on new developments in organizational computer systems, personal computing, and software.

148. As these tasks indicate, computer unit professional staff need a good mix and continual updating of technical, managerial and interpersonal skills. New requirements for training and experience in computer science, information systems, systems analysis, and database management have started to appear in the last few years in vacancy announcements for computer staff and librarians in the United Nations system, but will be needed all the more by computer systems staff (and the related management services, information management, and database administrator staff) as computerized systems expand. The information systems in the organizations can be no better than the people who manage them, and their professional skills, leadership and initiatives will be a crucial development factor.

149. These changing requirements for multi-disciplinary skills are discussed in a recent study done for UNESCO 35/. The study found that computer science education, in developed and developing countries alike, will have to keep up-to-date on key developments in mini- and microcomputers, word-processing, distributed systems and networks, and systems design applications stressing user participation. In addition to a technical grounding in mathematics and programming, the modular university curriculum stresses knowledge of how organizations operate, the use of computerized information systems in organizations, systems analysis and design, social and cultural considerations, telecommunications, database design and management, and the performance and evaluation of data-processing systems.

150. The computer staffs in Geneva generally appear to be doing a good job thus far in adapting to their changing roles, but many of them are beginning to struggle as they attempt to meet all the above new responsibilities. It has been estimated that, in addition to adequate separate staffing for systems planning and for normal programme maintenance, a central computer unit staff should have about one professional to support every 30 professional staff users. As the number of personal computers and users increases in Geneva (and the data in Chapter III show how quickly this has occurred and the expectation that the rapid pace will continue), computer unit staffing must also expand to avoid system breakdown.

151. At present it appears that UNHCR and ITC in particular are very thinly staffed, and need to strengthen their computer unit professional staffing in order to sustain and continue the significant systems development progress they have made thus far. The problems and needs in UNOG are discussed separately in the following Chapter.

VII. SYSTEMS DEVELOPMENT IN THE UNITED NATIONS

152. The Inspector believes, as stated in Chapter IV, that the single most important element in effectively managing changing computer use is a coherent, specific information systems development process in each organization. In the course of the study of United Nations system agencies in Geneva, it was found that the United Nations Office at Geneva (UNOG) has not made as much progress in this important area as have most of the other Geneva organizations. This Chapter briefly summarizes the current situation in UNOG, the status of the policies and

responsibilities at United Nations headquarters in New York which guide UNOG operations, and actions needed for (a) the United Nations as a whole, (b) major United Nations duty stations, and (c) UNOG itself.

153. UNOG provides administrative support and secretariat facilities for United Nations units in Geneva, and extensive conference services for United Nations and other meetings in Geneva and other locations. Within the UNOG Division of Administration, the Management Systems Section (MSS) is responsible for assisting all organizational units in Geneva with studies and systems for management control and operational efficiency, identifying and analyzing possible computer systems applications in UNOG, and for data processing for users.

154. The need for effective computer services in UNOG was first recognized by the Auditor General of Canada in 1969. His study called for greater EDP education for key UNOG management personnel and more interest and initiative in developing EDP applications. In a 1976 report on EDP and information systems in the United Nations, the Secretary-General further reviewed expanding user needs in Geneva and the parallel need to increase staff to ensure sufficient systems analysis and programming resources in UNOG 36/.

155. In 1977 the Administrative Management Service (AMS) made a detailed review of UNOG administrative and financial services. It found that "client units" were not satisfied with services and support provided (especially for EDP), future workloads were not properly anticipated, and staff and equipment were inadequate to provide the EDP services expected. The report recommended strengthening management improvement functions, computerizing UNOG library operations, modernizing and improving administrative information systems and EDP services and capabilities, and establishing a separate systems design and analysis unit. A follow-up process was initiated, and in 1981 UNOG established a Computing Centre and installed its own computer to complement the terminals linked with ICC.

156. UNOG has subsequently made progress in installing some word-processing terminals for users, establishing an interactive link with New York headquarters including electronic mail possibilities, and has undertaken a number of systems development projects. Unfortunately, however, systems development problems continue to increase as computer equipment begins to spread to more and more user offices. The UNOG problems fall into three inter-related areas: over-burdened data processing services, very limited systems development activities, and unclear systems development policies and responsibilities.

157. A JIU survey of UNOG common services in 1983 found agreement among users that the services provided were too slow, and agreement among UNOG administrative units that the solution required was increasing computerization to improve efficiency and responsiveness. Meeting these demands, however, is difficult. The MSS computer staff is scarcely larger than it was in the mid-1970s despite the considerable increase in workload, with only four professional programmers, two lower-level vacancies, and sporadic temporary assistance. It is thus the most thinly staffed computer unit in Geneva, with only about one professional staff member for each 400 staff in UNOG. The staff must currently attempt to maintain, update, and develop about 20 projects involving some 150 computerized programmes, often cumbersome and in several different programming languages, for UNOG and other units, in addition to their major system control, operational, liaison and support functions.

158. Although the AMS recommended a separate systems design and analysis unit with four professional staff, this task is presently only one among many MSS responsibilities. As a result, the heavy day-to-day operational responsibilities inevitably crowd out new systems development work for administrative processes and for other UNOG users. Several development projects do exist, but, as user units confirmed, the MSS staff can only work on them in a slow and makeshift fashion because on-going programmes must be maintained as a first priority.

159. Similarly, although AMS stressed the need for a strong management improvement programme in support of users' work programmes, there is presently only one professional staff member to fulfil this function. Since UNCTAD, ECE, Human Rights and UNDRO do not have their own management services staff, this means that the

single officer is expected to systematically analyse and improve the operations of some 2,500 other staff, a clearly impossible task.

160. The major systems development activity in UNOG at present, separate from the functions of MSS, is the establishment of centralized word-processing units in the UNOG Conferences Services Division. In 1983 the Secretary-General reported 37/ that the introduction of word-processing in Geneva, initially planned for 1979 but then delayed by problems in introducing it in New York, would proceed in 1984 for the English, French and Spanish typing units in Geneva. A total of 103 work stations and 26 printers would be installed at a total cost (non-recurring plus 1984-85 recurring costs) of about $2.25 million, with, however, significant cost savings to be achieved in 1984-85 and beyond. The project would proceed in three phases: recruitment of a co-ordinator, site preparation, and equipment installation, with installation expected to begin in the early spring of 1984.

161. UNOG systems development is of course dependent on and guided by overall United Nations policies and mechanisms, but these are presently unclear. The Inspector did not review in detail the systems development situation in New York. However, the United Nations Board of Auditors reported in 1984 that the Electronic Data Processing and Information Systems Division (EDPISD), established in 1971 in New York to be a focal point for control, management and direction of EDP activities in the Secretariat, had not developed and documented adequate policies and procedures to establish its management function and clearly define its responsibilities. The Auditors cited an urgent need for the United Nations to issue standards and guidelines for all phases of EDP and related information system activities, to serve as a basis for adequately identifying and assessing user needs and as consistent tools for effective and co-ordinated planning. 38/

162. An Information Systems Board of senior officials was established in the late 1970s as recommended by ACABQ 39/ (and endorsed by the General Assembly in resolution 31/208 III) to develop a comprehensive plan for information systems development and user working groups to guide it. However, Secretariat officials confirmed that it has been dormant for the past few years. They also acknowledged that standards and guidelines for obtaining and using personal computers do not yet exist. Officials in several major user departments also cited delays in providing systems design services and analysis from EDPISD, and slow response times for the central computer services presently on-line.

163. Subsequently, in October 1984, the United Nations issued medium-term plan proposals for servicing activities for the first time. The programme for EDP and Information System Services in Chapter 29 40/ cites the basic objectives of co-ordinating implementation of governing body policies in this area and providing systems design and operational support and guidance. It cites the growing requests and large backlog for new systems services; the present policy of central control of computer facilities provided to users; and general measures to be taken to monitor and co-ordinate systems development.

164. An additional programme on Introduction of Technological Innovations states that the United Nations still needs to develop techniques and methodologies to apply new technology to programme activities; to assess current information systems and relationships; and to consider centralized versus decentralized computer services, the use of microcomputers (in pilot projects), and policies and standards for hardware, software, and communication linkages and development. However, because both these programme narratives are written in the passive voice, they do not state who is responsible for all these actions or how or when they will be taken during the 1984-89 period.

165. United Nations policies and responsibilities for computerized systems development thus remain unclear. It appears, however, that they still emphasize centralized computer services and central word-processing applications, in contrast to the policy and practice which almost all the organizations in Geneva have adopted of spreading computer resources and multi-use applications throughout the organization in active consultation with users.

166. In UNOG the pressures for new computer services will not wait for new policies. Although UNOG was something of a computer "wasteland" in mid-1984, with very few personal computers and not many terminals actually installed when compared with other Geneva organizations, requests for more than 100 workstations, personal computers, terminals and printers were received in the fall of 1984 as part of the 1986-87 programme budget process. In the absence of guiding policy, methods, priorities, standards, and staff resources, these were analyzed as time permitted. Most requests were approved by budget and MSS people in Geneva, and this approval process will be repeated by budget and EDPISD staff in New York. Unfortunately, however, this means that the computerization process concentrates on ad hoc approval of new equipment requests submitted, rather than working closely and continuously with users to systematically identify and analyze those activities and overall systems which computerization can best support, and setting priorities accordingly.

167. This combination of data processing burdens, limited systems development activities, and unclear United Nations policies and plans has clearly hampered orderly systems development for United Nations units in Geneva. Among the current problems are the following:

(a) Although installation of the centralized word-processing units was expected to begin in early 1984, this major project has fallen well behind schedule. The equipment has been procured and delivered, but site preparation only began in October 1984. More seriously, although recruitment of a project co-ordinator to guide this process and further technological innovations in the Conference Services Division was considered a top priority, the post had still not been filled as of January 1985.

(b) The centralized word-processing equipment procured includes 28 personal computers. Although this decision was made on financial grounds because they are currently cheaper than word-processing workstations, it is awkward from a systems development point of view to procure multiple-use personal computers for typists when professional staff who need them must do without (the same problem exists to some extent in UNCTAD).

(c) Despite the importance of carefully co-ordinated computer systems development, responsibilities and relationships are presently unclear and fragmented. UNOG provides basic "administrative support" and facilities for the other units, including time-consuming EDP services and development projects for payroll, accounting, and other financial services, such as a computerized payroll system for some 90 UNHCR field offices using multiple currencies. At the same time, most of the other United Nations units (as shown in the Annex table and in Chapter IV) have their own computer staff units devoted primarily to meeting their substantive programme needs. However, only ECE presently has a well-established systems development staff, a database administrator and an overall computer system network. Additional fragmentation occurs because the UNOG Conference Services Division will have its own "technological innovations" co-ordinator separate from the MSS unit. (This fragmentation may also exist in New York where, as the Board of Auditors found, EDPISD responsibilities are unclear while UNDP, UNICEF, UNFPA and other organizations have their own computer systems activities, and the Department of Conference Services also has its own separate "technological innovations" co-ordinator).

(d) At present, there is no established users' committee or other mechanism in UNOG to co-ordinate activities and discuss experience in UNOG or among United Nations units, nor any regular, organized consultations with client units to identify and assess their needs. There is also no top management committee to guide and oversee systems development.

(e) UNOG computer training for staff has been limited thus far to a few small scattered courses in word-processing for supervisors and EDP as a management tool, self-training, and plans to make some video tapes available. The importance of establishing proper familiarization and training for staff in the new central word-processing units and elsewhere has been duly recognized, but staff groups have expressed concern at the slow progress made thus far.

(f) The United Nations has been considering plans to modernize or replace the old telephone system in the Palais des Nations. However, in light of the complex LAN versus PABX technical decisions required (see paragraphs 76-81, 104, and 134(b)) and the present lack of a plan for integrating the future UNOG computer architecture with a future UNOG communications network, any such decision could prove to be a premature and costly one.

(g) AMS reports in 1971 and again in 1977 urged the need to modernize and computerize the UNOG Library, which is the largest library in the United Nations system. The January 1984 JIU report on libraries 41/, however, found that the UNOG library was not meeting user needs and had undertaken no computerization except to begin gradually introducing the UNBIS bibliographic system from United Nations headquarters in 1983. JIU recommended prompt action to improve library operations and services and the Secretary-General acknowledged the problems that exist. However, the only subsequent action has been a decision by UNCTAD to join ECE in withdrawing its staff working in the library. UNOG officials stated that the single EDP terminal now in the library will be supplemented by five others by 1986-1987. But at this pace it may take until the 1990s for the UNOG library to achieve the computerized bibliographic services and operations which other system libraries such as the ILO have provided to users since the 1970s.

(h) Finally, the considerable potentials for joint systems development actions among agencies in Geneva were discussed earlier (paragraphs 108-109). However, the lack of United Nations plans, policies and standards for its own systems development hinders any such co-operative actions, the more so since the United Nations and its various entities comprise by far the largest organization in Geneva.

168. The Inspector believes action is needed in three areas. First, the 1976 reports of the Secretary-General and ACABQ identified the need for a comprehensive and consultative planning and review process for information systems development, including top-level management guidance, but the 1984 report of the Board of Auditors and the relevant new medium plan sections show that this has still not been achieved.

169. The Committee for Programme and Co-ordination has scheduled an in-depth evaluation study of EDP and information systems for 1987, but in view of the tremendous changes that have already occurred since 1976 the Inspector concurs with the Board of Auditors that urgent action is needed now. Therefore it is recommended that the Secretary-General take action to ensure a clear-cut and consultative process for orderly information systems development in the United Nations overall (as outlined in paragraphs 54-56 of this report), with particular attention to specifying and co-ordinating information systems management responsibilities; re-establishing a representative top-management committee to oversee systems development; ensuring an adequate, separate systems development staff in EDPISD (as AMS recommended for UNOG in 1977); and issuing policies, standards and guidelines for systems development and operation, especially for the acquisition and use of personal computers.

170. Second, decisions on decentralization are also needed. Chapter 26 of the medium-term plan, for instance, states that United Nations financial management functions are decentralized organizationally, combining local financial services with overall direction and management from Headquarters. In contrast, however, the 1984-85 programme budget states that the Office of the Director, EDPISD, provides system planning and oversight for Headquarters and other office locations, but it allows for only three two-week trips per biennium to assist in defining major user systems, determining operational costs, and providing implementation assistance to the five regional commissions and Geneva, Vienna and Nairobi offices. ACABQ noted in 1976 that this process of separate discussions with users provides no opportunity for setting priorities. The Inspector would add that six weeks seems hardly sufficient to work closely with the many user units and programmes around the world to develop and implement significant new computerized support opportunities.

171. It does not appear that present local computer staffs can fill this systems development gap, because the inadequate computer and management systems resources found in UNOG may exist in other United Nations offices as well. A 1982 JIU report on the Economic Commission for Africa (ECA) 42/ found serious management and administrative problems. It recommended that the Secretary-General establish a provisional management services unit to develop an effective management system to meet ECA's new operational responsibilities. The Secretary-General responded that as a matter of principle the services recommended and required were the responsibility of the AMS (which is in New York). Later in 1982, however, the Secretary-General stated 43/ that the roles and effectiveness of AMS and EDPISD were being reviewed as part of the measures to improve the administrative effectiveness of the Secretariat.

172. The present process of slowly developing selected major projects only at Headquarters illustrates further problems. The centralized word-processing units, begun in New York in 1978 and planned for extension to Geneva in 1979, will actually only be established in Geneva in 1985. Thus the significant cost savings which could have been realized in Geneva (and other offices) every year since 1979 will only begin to be realized six years later. As another example, the fully-computerized bibliographic system (UNBIS) which began in New York in the mid-1970s and became operational there in 1979, is only now being gradually extended to Geneva and a few other offices. While staff users in New York have the UNBIS system available on-line (with access currently being developed for other agencies, Member State missions, and individual researchers there), the many potential staff users in Geneva in 1985 still have almost no access to this important working tool.

173. In a 1982 report to a group of experts evaluating United Nations administrative structures, the Secretary-General stated with regard to the "extremely important issue" of centralized-decentralized balance that:

> "An organization with 20,000 staff members and experts in eight major duty stations and a multiplicity of smaller ones cannot adequately perform unless the decision-making process is sufficiently decentralized to permit prompt and effective solutions to be found in the day-to-day operational life of the Organization." 44/

174. The Inspector concurs with the need for responsive local services, but is concerned that the present slow and centralized systems development process and very modest EDPISD, AMS and major duty station systems staff resources are not sufficient for this task. Action now is all the more important to achieve the Secretary-General's new management improvement programme, which includes re-assessing administrative, management, communications, and EDP systems as a long-term priority effort to improve Secretariat performance 45/. The Inspector therefore recommends that the Secretary-General re-assess the adequacy and centralized-decentralized balance of management services and computer systems staffing in New York and at the other major duty stations in light of the cost savings, management improvement, and programme and service needs and opportunities in those offices.

175. Third, within this overall reassessment, the problems in Geneva require urgent action. Geneva is not just an "other office": the more than 3,300 staff and $1.2 billion in biennial expenditures engaged in Geneva in the programmes of UNCTAD, UNDRO, ECE, UNHCR, Human Rights, ITC, and other smaller units, as well as the operation of the world's largest and busiest conference centre, are of great importance to Member States and deserve the best possible computerized management, substantive and administrative support systems and services.

176. Many opportunities exist to achieve significant cost savings and productivity improvements in these programmes, particularly since so many UNOG processes still rely on manual procedures which have not even reached the EDP batch-processing stage. To cite a few among many examples, it was only in mid-1984 that a project began to computerize the 12,000 medical insurance files handled by UNOG, with a consultant's help. The tedious manual processing of coding sheets in user units could be eliminated through a gradual shift to data entry through terminals in user offices. And based on MSS analysis of contracts for EDP and

word-processing equipment, UNOG has been able to take actions to achieve potential cost savings of 680,000 Swiss francs for the 1984-1987 period. UNOG officials stated that much more of this type work could be done. However, such opportunities cannot be identified, developed and implemented without strong top management leadership and support, active and continuous consultation with users, and sufficient professional staff systems expertise. Alternatively, if systems development functions and staffing are not clarified and strengthened, UNOG and the programmes it supports run the serious risks of haphazard computer systems expansion, loss of control as systems sophistication and workloads continue to increase, missed opportunities for significant cost savings and service improvements, and programmes and processes which are unable to respond to changing user needs.

177. The Inspector therefore recommends that AMS, as a matter of urgency, follow-up on its 1977 study of computer and management systems activities in UNOG. using systems consultants from outside the United Nations as part of the team, to determine the present manpower resource requirements of the MSS unit based on a detailed survey of present and projected user requirements, both administrative and substantive. This study should also consider making the Conference Services Division technological innovations co-ordinator part of MSS to better co-ordinate UNOG computer activities and share scarce systems development staff, and should clarify the systems responsibilities of, and co-ordination and consultation mechanisms among, the MSS unit of UNOG and other United Nations units in Geneva.

VIII. COMPUTER-BASED COMMUNICATIONS

178. Although this report is basically concerned with changing computer use within the organizations, the essential role of computerized communication tools in linking offices, organizational units, and users worldwide has already been stressed (paragraphs 76-81) but requires further mention. The communications needs of the United Nations system organizations have received growing emphasis in the past few years, but the rapid spread of computerized systems makes concerted action even more important.

179. Telecommunications and computing are increasingly moving towards integration in a worldwide information network. Most data traffic is presently carried on facilitites designed for voice telephone service. But many new public and private digital communications services and data networks are now available or planned to utilize an Integrated Services Digital Network (ISDN), communications satellites, and bundled optical fibres. These developments will greatly enhance the worldwide information infrastructure and make cost-effective information services and massive information exchange much more widely available to organizations and individuals.

180. In recognition of the importance of these developments, the General Assembly declared 1983 as World Communications Year and designated ITU as the lead agency. Training and awareness projects were initiated worldwide, especially in developing countries. In addition, in 1982 the Plenipotentiary Conference of ITU established an Independent International Commission for World-wide Telecommunications Development, which has recently delivered a report to the Secretary-General of ITU calling for measures to improve telecommunications development, including the establishment of a Centre for Telecommunications Development.

181. ACC discussions on the future of the IOB in 1981 and 1982 had already focused on possible co-ordinative activities to develop computer-based communication networks, in view of their importance in revolutionizing office work methods and their value for organizations operating worldwide. In addition, a 1982 JIU report on communications in the system 46/ noted that the organizations spend about $US 100 million a year on communications, and concluded that more attention was needed to longer-term planning of communications needs, the use of new technologies, and efforts at a rationalized common communications system to provide effective services and keep costs to a minimum.

182. In its work programme for 1984-85 47/, ACCIS has given "the highest priority" to examining the impact of new communications technologies on the handling and transfer of information in the United Nations system; to the possibilities, problems and benefits of establishing data communication links between offices of the organizations; and to opportunities for Member States to use such links to access system information. A Technical Panel on Computer-Based Communication Services was established to review present telecommunications use, plans and resources, and consider the cost-effectiveness of alternative solutions.

183. During 1984 the work of the Technical Panel disclosed great interest in computer-based communications. It appears that the problems are not so much technical questions of linkage as management questions of defining and establishing communications services and making more effective use of existing resources in a period of tight budgetary restraints. The Panel plans a final report for late 1985 to explore more coherent and mutually-advantageous arrangements for computer-based communications in the system and to outline basic practical requirements for communications services.

184. The Inspector would emphasize once again the importance of inter-agency co-operation to improve communication arrangements and thereby programmes and services. Most organizations, including the United Nations itself 48/, are now introducing or planning new communication networks and are concerned about devising common facilities. The time is therefore most opportune for a common effort to increase efficiency and reduce costs. This opportunity should not be missed.

185. The Inspector also wishes to call attention to a further co-operative and cost-saving aspect: extension of the telecommunications rights granted by the ITU to the United Nations but not to the specialized agencies. The International Telecommunication Convention of ITU outlines the desirability of having an efficient worldwide telecommunication network, the need for co-operation between states to achieve it, the organizational structure within which this co-operation can take place, and the fundamental rules dealing with telecommunications in general. The original Convention of 1946 accorded the United Nations the same rights as Members of the ITU for operating telecommunications services and allowed it to establish and maintain an independent United Nations telecommunication network. The Agreement between the United Nations and the ITU also cited the responsibility of the United Nations, under its Charter, to make recommendations for the co-ordination of the policies and activities of the specialized agencies, and the ITU's policy of co-operating in whatever further measures would be necessary to make co-ordination of the activities of the United Nations family fully effective.

186. In 1952 the United Nations requested that the ITU sanction the carriage of the traffic of the specialized agencies over the United Nations point-to-point telecommunications network at charges equal to pro rata operating costs. However, the Plenipotentiary Conference of the ITU disapproved this request, stating that the United Nations network should not be used to carry specialized agency traffic in competition with existing commercial telecommunication networks, except in cases of emergency. Subsequent Plenipotentiary Conferences of ITU in 1959, 1965, 1973 and 1982 reiterated this position, although the 1982 resolution further instructs the Secretary-General of the ITU to continue to co-operate with United Nations system bodies including the JIU in the study of matters relating to communications in the United Nations system. Another resolution of the 1982 Plenipotentiary Conference stated that specialized agencies could seek special telecommunications treatment for urgent or important cases through the Administrative Council of ITU.

187. The scale of activities and the related telecommunications needs of the agencies of the United Nations system have of course grown tremendously in response to Member States' wishes since 1947. In particular, there has been a drastic shift from modest central research and conference activities to a decentralized worldwide structure of regional, national and field activities in direct support of operational activities for development. The system's total estimated expenditures of $100 million a year for communications, a significant portion of

which is for telecommunications, reflect this change. However, while difficult international economic conditions make budgetary stringency and cost savings essential in all the organizations' operations, the new computer-based communications technologies and services are becoming ever more essential to effective operations and improved services.

188. The Inspector believes that the basic rationale which made it important that the United Nations benefit from special telecommunications rights in 1947 applies to the specialized agencies as well. If all agencies of the system were given access to common facilities for data transmission, very significant co-operative benefits and cost savings could be realized. The Inspector believes that the ACC should carefully assess the current situation in the light of the work of the ACCIS Technical Panel, develop the best possible proposal to extend telecommunications common use rights - and obligations - to the specialized agencies, and present this proposal to the ITU Administrative Council, which meets annually. He would also hope that Member States of the Union, and of other governing bodies in the system, would support such a proposal as a part of their commitment to economy and common activities in United Nations system operations and the facilitation of the system's technical co-operation activities worldwide.

IX. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

189. Computer use and computerized systems are spreading throughout the substantive, administrative and support activities of the United Nations system organizations in Geneva, against a background of extremely rapid and continuing changes in office technology. Many of the organizations have made a good start to pursue the opportunities - and confront the problems - which this new technology presents.

190. The tools and the process of computerized information systems development can be a very important means to help the organizations and their staffs attain their programme objectives, increase office efficiency, and provide more responsive services. As noted in Chapter I, the ACC has recognized that the organizations "are in the information business", and governing bodies have long emphasized the great value of the information resource, the need to rationalize and co-ordinate computer use, and the importance of effective information services to meet Member State needs.

191. Although the organizations are still in the early stages of widespread computer use, the decisions taken now will have major impact on their future operations. As the ACC has also observed, information activities are a major function for which the organizations already expend hundreds of millions of dollars annually. New funds for computerization are now being invested and more will be required in the future to enable the organizations to fulfill their international information and operational responsibilities in the midst of the "information revolution".

192. This report can provide only the briefest overview of the many new technologies, processes, applications and techniques now in use or becoming available, but it does indicate the scope and complexity of the total task which the organizations face. Each organization must develop systems which best support its own pattern of programmes and priorities. But there is a common, essential element which each organization must have to make this development process cost-effective: sound, sustained and professional information systems management.

193. Planning and control of systems development Effective application of the new technologies requires a carefully developed and well-defined planning and control process, with clear-cut responsibilities for coherent information systems development and operation. This includes adequate central staffing and expertise, a guiding policy and strategy, an organization-wide creative and participative process, and firm management oversight of implementation (paragraphs 34-52, 102-107).

194. Computers are essentially a productivity-enhancing tool. The process of identifying, analyzing and implementing computerized systems and applications thus provides a significant new basis for organization-wide productivity improvement, cost-savings, and management improvement programmes. The organizations in Geneva have taken various initiatives to launch these planning and improvement activities, but they need to ensure that they are well-established and responsive to continuing rapid change. Periodic governing body review and informal inter-agency co-operation have as yet received little attention, but would strengthen this work (paragraphs 57, 110-119, 136-144).

RECOMMENDATION 1 Each organization should establish clear-cut central responsibilities for the orderly planning and control of overall information systems development, with sufficient high-level stature and adequate management and technical staff expertise and time made available for this purpose (paragraphs 53-56).

RECOMMENDATION 2 To support orderly and cost-effective systems development, governing bodies of the organizations might wish to request periodic reports on systems development policy and progress, and on specific services improved, processes simplified and streamlined, and cost savings achieved (paragraphs 58, 144).

RECOMMENDATION 3 The Advisory Committee for the Co-ordination of Information Systems (ACCIS) should establish an informal inter-agency computer working group in Geneva to share information, ideas and experiences on computerized systems development, and explore mutually-beneficial opportunities for co-operation (paragraphs 108-109).

195. Human resources The new small personal computers and "interactive" terminals are being increasingly used for all types of activities in Geneva. This trend will surely accelerate as the organizations apply computers to more and more services and office processes and move gradually towards the long-term goal of integrated office automation (paragraphs 23-33, 59-107).

196. The essential dynamic and creative element in this process is people. Top management guidance, active staff participation, and knowledgeable administrative support decisions are important elements, but the training needed for these groups to participate in an informed and effective way has scarcely begun. In addition, while Geneva computer system staffs have generally done well in the initial stages of information system development, further expansion will place heavy planning, co-ordinative, analytical, foresight, and user-support demands on them. Future professional staff recruitments for information management posts thus need to provide a high degree of up-to-date knowledge and skills in computer science, information science, and management systems (paragraphs 63, 70-71, 83-86, 120-150). Among the Geneva organizations, UNHCR, ITC and UNOG are presently the most thinly-staffed for these tasks (paragraphs 26-27). The United Nations systems development process and staffing overall do not appear adequate to ensure sound and responsive systems development and control, or to attain realizable management improvements and cost savings (paragraphs 153-177).

RECOMMENDATION 4 Each organization should establish and maintain a well-rounded programme of computer training, not only in procedures for computer use but to provide basic "computer literacy" training and understanding for all staff who will be involved in computer system development and operations (paragraphs 125-128).

RECOMMENDATION 5 Each organization should ensure a high degree of computer systems and management systems skills in future professional recruitments for information management posts, not only for central computer and management systems or services staff but for database administrators, records management staff, librarians, archivists, and related staff as well (paragraphs 63, 86, 148-149).

RECOMMENDATION 6 The High Commissioner for Refugees and the Executive Director of the International Trade Centre UNCTAD/GATT should strengthen their computer unit professional staffs in order to sustain and further the significant systems development progress that they have made (paragraphs 27, 44-47, 150-151).

RECOMMENDATION 7 The Secretary-General of the United Nations should take urgent action to (a) ensure a clear-cut process for overall United Nations information systems development; (b) re-assess the adequacy and centralized-decentralized balance of management services and computer systems staffing in major United Nations duty stations; and (c) have the Administrative Management Service determine UNOG systems development staffing needs based on a detailed survey of present and projected user requirements (paragraphs 168-177).

197. Computer-based communications Many new computer and telecommunications technologies and services are becoming available to better support the worldwide operations of the organizations. A technical panel of ACCIS is currently exploring mutually-advantageous arrangements and practical requirements, and inter-agency efforts to develop common facilities are approaching a critical stage. Significant co-operative and operational benefits and costs savings are also possible if the specialized agencies would be accorded the same telecommunications arrangements presently granted by the International Telecommunications Convention only to the United Nations (paragraphs 173-182).

RECOMMENDATION 8 The Administrative Committee on Co-ordination (ACC) should develop the best possible proposal to extend to the specialized agencies of the system telecommunications arrangements which are presently granted only to the United Nations, and present this proposal to the earliest possible meeting of the Administrative Council of the International Telecommunication Union (ITU) (paragraph 183).

COMPUTER RESOURCES AND USES IN GENEVA, JUNE 1984

Organizations	Total 1984-85		1984-85 estimated computer resources ($US mill)				Number of computers c/				Terminals c/ d/									
											Use of terminals d/									
	Estimated expendit. ($US mill)	Staff posts	Central systems/ EDP Unit costs	Equipment and related costs	Share of ICC costs	Total computer costs	Central systems/ EDP Unit posts	Personal computers	Other computers	Total Computers	Word processing	Administr. and Management	Substantive data bases	Substantive Research	Communications	Training	Software development	Multi purpose	Total terminals	of which, linked with ICC
International Labour Office (ILO)	492.1 a/	1,396	4.99	1.35	.65	6.99	35	29	5	34	120	80	60	60	10	4	-	10	344	100
International Telecommunication Union (ITU)	142.2 a/	823	7.65	3.84	-	11.49	45	165	2	167	79	25	68	1	-	6	69	95	343	-
UNITED NATIONS: Office at Geneva (UNOG)	175.6	1,631	1.52	3.64	.85	6.01	16	36	10	46	173	19	-	-	-	-	-	22	214	41
UN Centre for Human Rights	11.0	80	.01	.02	.01	.04	-	-	-	-	7	-	-	-	-	-	-	-	7	2
UN Children's Fund Europe (UNICEF)	22.5	106	.46	1.10	.40	1.96	6	5	1	6	13	12	10	5	5	3	-	3	51	28
UN Conference on Trade and Development (UNCTAD)	57.8	484	1.35	.80	1.25	3.40	17	43	3	46	80	5	3	13	-	2	-	30	133	51
UN Economic Commission for Europe (ECE)	28.0	251	.80	.10	.50	1.40	9	3	3	6	15	-	-	18 e/	-	-	7	3	43	25
UN Environment Programme (UNEP)	7.2	56	.30	-	.32	.62	3	1	-	1	20	-	3	-	1	-	-	1	25	25
International Trade Centre UNCTAD/GATT (ITC)	55.0	237	.50	.12	.38	1.00	4	7	-	7	17	2	3	2	3	1	1	26	55	50
Office of the UN Disaster Relief Co-ordinator (UNDRO)	7.0	54	.69	.01	.01	.71	8	-	-	-	2	-	2	-	2	-	-	1	7	7
Office of the UN High Commissioner for Refugees (UNHCR)	836.9 a/	413	.76	.91	1.29	2.96	8	31	4	35	68	34	11	-	5	2	-	10	130	56
UNESCO - International Bureau of Education (IBE)	1.8	34	.03	.04	.10	.17	1	7	-	7	10	2	2	-	-	-	-	1	15	4
World Health Organization (WHO)	979.7 a/	1,431	4.38	.50	2.60	7.48	38	28	6	34	112	52	11	14	3	10	-	40	242	111
World Intellectual Property Organization (WIPO)	43.4	266	.65	.20	.90	1.75	8	4	3	7	64	7	50	1	-	-	-	-	122	49
World Meteorological Organization (WMO)	76.5	303	.72	.04	.09	.85	7	23	6	29	94	8	3	-	-	-	-	1	106	9
Advisory Committee for the Co-ordination of Information Systems (ACCIS)	1.3	7	-	-	.04	.04	-	-	-	-	-	-	-	-	-	-	-	6	6	6
International Computing Centre (ICC)	13.0	43	-	-	-	(13.00) b/	42	-	2	2	1	2	1	1	-	-	-	19	24	24
TOTALS:	2,951.0	7,615	24.81	12.67	9.39	46.87	247	382	45	427	875	248	227	115	29	28	77	268	1867	588 f/

a/ Because project costs cannot be easily allocated among headquarters and field components, the ILO, ITU, UNHCR and WHO total cost figures are organization-wide (however, ILO, ITU and UNHCR computer resources and central units in Geneva presently serve the entire organization, although in WHO both central and decentralized computer resources and units exist). All other figures in this table are for Geneva only.

b/ ICC costs are shown in parentheses to avoid double counting, since most of them are already included as each agency's share under the "Share of ICC Costs" column (the remainder is provided by agencies located outside Geneva).

c/ In use or on order as of June 1984.

d/ Numbers shown for terminals include personal computers.

e/ Substantive research work and substantive data base work are very closely interrelated functions in ECE.

f/ In addition to the 588 terminals shown in this column, 56 other terminals in small agencies in Geneva were linked with the ICC.

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