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(c) Data processing

TECHNICAL CO-OPERATION IN STATISTICAL DATA PROCESSING

Report of the Secretary-General

SUMMARY

The present document has been prepared in response to the request by the Statistical Commission to place the topic of technical co-operation in statistical data processing on the agenda for the twentieth session. It is based on the results of a survey of technical co-operation activities in data processing within the United Nations system. It outlines the roles of the organizations providing significant technical co-operation in this field (paras. 4-8), provides a description of current activities (paras. 9-40) and a quantitative profile, including budgetary resources involved (paras. 41-46), discusses some aspects of interagency co-ordination (paras. 47-58) and provides some concluding remarks (paras. 59-61).

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INTRODUCTION

1. The present document was prepared by the Statistical Office in consultation with the specialized agencies in response to the request by the Statistical Commission that the topic of technical co-operation in statistical data processing should be placed on the agenda for the twentieth session. ^{1/} A previous version of this document, which was based on a survey of activities in this field by the United Nations and the specialized agencies, was discussed by the Administrative Committee on Co-ordination (ACC) Sub-Committee on Statistical Activities at its twelfth session in February 1978.

2. Significant technical co-operation in statistical data processing is provided to some developing countries directly by a number of Governments through their bilateral assistance programmes. The present report is focused on activities in statistical data processing of the United Nations system and bilateral activities are dealt with only incidentally.

I. ACTION BY THE COMMISSION

3. The Commission may wish to comment on the present document, suggest further means for (a) transferring technology and know-how in statistical data processing to developing countries and (b) strengthening co-ordination in this field in the United Nations system, and request a further progress report for the twenty-first session.

II. OUTLINE OF ROLES OF ORGANIZATIONS

4. Data processing has become an essential tool for statistical agencies in both developed and developing countries. Computer technology is essential for processing the large volumes of data associated with census and survey operations, international trade statistics and other fields. It is necessary for the effective control of data storage and retrieval and it is essential for the effective integration of sectoral statistics. Many of the quantitative tools available to study and use statistical information for public policy purposes now depend upon use of computers. Almost all statistical offices are aware both of their dependence upon computer technology and of the enhanced benefits that it is capable of providing.

5. Both the nature and scope of technical co-operation in statistical data processing have shifted substantially over the history of its delivery. Much initial assistance was concerned with supporting the delivery and installation of the first computer in a country, providing initial training so that the computer could become operational, and assisting in the implementation of the

^{1/} Official Records of the Economic and Social Council, Sixty-second Session, Supplement No. 2 (E/5910), chap. XI.

first computer-based statistical data processing applications. In recent years, however, almost all countries have acquired at least one computer and their needs have broadened. Thus, while some assistance is still directed at initial introduction of computer technology, technical co-operation at present extends to support of, inter alia, systems upgrading, software development and acquisition, computer centre organization and management, implementation of large-scale software systems, data-base management systems, computer-based production control, and content and administration of computer-related training programmes.

6. The Statistical Office's programme of technical co-operation includes an active data processing component. Its activities include technical support of computer hardware procurement, computer software development, distribution and installation, provision of management advice, organization of educational and training arrangements, assistance in recruitment and in monitoring of data processing experts in the field, and promotion of co-operation and information exchange in the field of statistical data processing. In recent years, much of this activity has been directed towards support for censuses of population and housing as international programmes have focused upon establishing long-term viable census operations in all countries.

7. The regional commissions have also developed technical co-operation programmes in statistical data processing. These have included the provision of technical advice on the establishment of computer facilities, their application for processing surveys and censuses, and training courses for national data processing personnel. The Economic Commission for Africa (ECA), for example, established a regional advisory post in data processing as an integral part of the African Census Programme; the Economic Commission for Latin America (ECLA) intends to develop software for data-base management to assist member countries to implement statistical information projects; the Centro Latinoamericano de Demografía (CELADE) has developed software (CONCOR) for editing census and survey data and, during the past decade, the Economic and Social Commission for Asia and the Pacific (ESCAP) has maintained a data processing programme designed to improve member countries' computer capabilities.

8. Finally, the specialized agencies provide technical co-operation for the processing of statistics in their own particular spheres of interest. Thus the Food and Agriculture Organization (FAO) provides experts to help countries in processing agricultural censuses and sample surveys; the United Nations Educational, Scientific and Cultural Organization (UNESCO) provides data-processing experts in the field of education statistics; and the World Health Organization (WHO) maintains an extensive programme to assist countries in processing health statistics.

III. DESCRIPTION OF CURRENT TECHNICAL CO-OPERATION ACTIVITIES

9. The amount of technical assistance input in the field of statistical data processing that has been and is currently being supplied by the United Nations system is sizable. While the nature and mix of such inputs vary substantially

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between projects and agencies, most support is directed towards equipment procurement, expert services and training activities.

10. Equipment procured can include data entry equipment, integrated computer systems, training materials, telecommunications systems, electrical generation equipment, word generators, data loggers, circuit analysers, various test and maintenance tools, and auxiliary equipment. This function often spans the entire process of computer acquisition including identification of requirements, feasibility studies, preparation of specifications and requests for proposals, selection of vendors, analysis of proposals, preparation of requisitions and liaison with suppliers. Related important activities often include analysis of requirements for physical installation, including space and layout, floor loadings, air-conditioning, power supply and control systems, and procurement of supplies such as paper and magnetic tapes.

11. Both short-term and long-term experts in various aspects of statistical data processing are recruited and placed in field posts by the United Nations and the specialized agencies. The process of recruiting these experts consists of evaluating potential candidates, assessing their strengths, interviewing them or establishing and evaluating interviews by others, and matching their skills and availability to posts. Once the experts are in post, reports are solicited and analysed regularly, usually four times each year. Issues and problems raised in such reports can frequently lead to a concentrated interchange of technical correspondence by the substantive office that supports the expert's activities.

12. Training activities encompass evaluation and placement of fellowship candidates, planning and execution of training programmes, monitoring of the on-the-job training that field experts impart to their national counterparts and establishment and support of national and regional training centres. A training component is present in all computer technical co-operation projects in order to ensure that the recipient country develops sufficient human capital for continuing its activities in an independent and self-reliant manner.

13. Paragraphs 14-40, below, provide general descriptions of the current technical co-operation activities of a number of United Nations agencies. Following these descriptions, a quantitative profile of the activities of some of these agencies is presented in tables 1 through 4, together with a discussion of the figures contained in these tables (paras. 41-46).

A. United Nations Statistical Office

14. The United Nations has been extensively involved in the activities described above, working with national statistical offices and central banks in those countries in which the central bank is responsible for collecting and processing an important segment of official statistics for the country.

15. During the past several years, the Statistical Office has assisted in the procurement of more than 15 major computer systems. Currently, the Office supports 20 experts in the field and recruitment is under way for 14 new field

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posts. During the last two years, the Statistical Office has assisted in placing approximately 80 individual fellowship holders in programmes offering training in various phases of statistical data processing.

16. An interregional adviser in computer methods, attached to the Statistical Office, executes a continual round of short-term consulting missions on various uses of electronic data processing equipment, computing techniques and computer-based systems in statistics. The missions of an interregional adviser in demographic and social statistics in the Statistical Office are frequently related to computer use in national censuses and surveys. In addition, the Office has two technical advisers in computer methods and data processing, who are located at Headquarters and provide substantive backstopping for field projects and who carry out missions to project sites for planning and helping to solve implementation problems.

17. The current high level of activity in introducing computers for national population census activity deserves special attention. In many developed countries, the first significant application of a large-scale electronic computer was the processing of data from a census of population; for example, the first large-scale use of electronic data processing was for processing the 1950 United States Census of Population and Housing.

18. The introduction of digital computers into computer-poor countries to support population census activities has had an impact far beyond the area of this initial use of the equipment. The census computer has often provided the impetus for initial training in various aspects of computer technology. Population censuses place a heavy data processing load on the computer over a relatively short time span and it is often neither economical nor useful to retain the equipment for statistical data processing purposes alone after the census data processing has been completed. This creates the necessity of advising the Government regarding both the initial national policy for computer use and its evolution to new applications and new equipment. Thus the introduction of data processing equipment in a country for census data processing provides a unique opportunity to assist the country in initiating needed training programmes, building its statistical data processing programme upon the infrastructure provided by the population census data, establishing an explicit policy for computer acquisition and utilization and identifying computer applications in public and private sectors that will make effective contributions to development.

19. The collection and storage of national census data often provide the most comprehensive and current information infrastructure that is available to a country for economic development planning and information needed for financial and public administration. The statistics gathered in censuses constitute a comprehensive source of data upon which the exploration of many development policies can rest. Thus the effective execution of the census requires both an understanding of the potential uses of the resulting data and a knowledge of the data organization and computer tools required to use them efficiently. One indication of the recognition of such an approach is that an increasing number of requests from countries involve the methodology and technical tools required to

store and retrieve statistical data in an integrated set of machine-readable data files.

20. In order to support the substantial level of census and other statistical data processing activity that currently exists, the Statistical Office has begun development work for supporting computer-related technical co-operation activities. A project, financed by the United Nations Fund for Population Activities (UNFPA), to develop computer software for small machines to support census data processing activities in countries having relatively limited computer configurations has been initiated and an IBM System/32 is currently being leased to support software development activity. This software development project has already distributed and installed a system called XTALLY for easily performing cross-tabulations to a number of census projects in a dozen developing countries. Within the past year, the initial version of UNEDIT, a user-oriented programme for specifying data error-detection rules and applying them to census and survey data files, has been completed. Distribution of this version of UNEDIT to projects supported by the Statistical Office is now under way and it is expected that the programme will be enlarged in scope. Other software packages to be developed by the project are in the areas of census or survey data-base organization and use and logistical support of census/survey operations.

B. Economic Commission for Asia

21. Current technical co-operation activities at ECA have focused mainly on helping countries that have taken their censuses and that have been having problems with the processing of their data. For those countries that have not yet taken censuses but that are in the preparatory stages, technical co-operation has focused mainly on helping them to devise a good and realistic data processing plan, to prepare the necessary flow-charts and also to give the necessary backstopping to the local programmers and to United Nations experts in preparing the programmes for the processing of the census data. So far, two main software packages have been used in the African censuses (CENTS and COCENTS) but two more are being introduced (the United States Bureau of Labour Statistics' TPL and XTALLY). There is the possibility of a fifth package, the Swedish National Central Bureau of Statistics' TAB-68, being introduced in the near future and technical co-operation in this area is being geared towards helping the countries to use effectively the particular software packages they have opted for.

C. Economic Commission for Europe

22. The Economic Commission for Europe (ECE) has backstopped two large computer-based projects, the Computing Research Centre (CRC) at Bratislava and the International Computer Education and Information Centre (ICEIC) at Budapest. CRC has established a comprehensive programme of research in statistical data processing and currently, under the sponsorship of the Conference of European Statisticians, is acting as host for the yearly Integrated Statistical Information System (ISIS) seminars on statistical data processing. ICEIC, while not directly

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focused upon statistical data processing, is now offering a substantial repertoire of courses to students from developing countries, many of whom work in national statistical offices.

D. Economic Commission for Latin America

23. From 1974 to 1976, ECLA provided to the countries of the region technical co-operation that was centred upon the socio-demographic field. This assistance was delivered primarily by the regional adviser in computer methods, who was financed by UNFPA, and by the staff of CELADE's Computing Service, which includes technical co-operation activities as part of its work programme. In 1977 the post of regional adviser in computer methods was eliminated from the regional population programme financed by UNFPA, so that for 1978-1979 the only advisory services available will be those that the CELADE staff can provide.

24. With these joint resources, ECLA provided assistance to the countries in the region in processing (a) those population censuses of the 1970 round of which the results were not yet available, (b) multipurpose household surveys and (c) surveys being carried out as part of the World Fertility Survey. The objective of this assistance was not only to help countries to make available the results of their statistical investigations in the socio-demographic field but also to help their statistical offices in building up a sound computing capability.

25. Systems development for ECLA is carried out in CELADE, in support of this technical co-operation with the countries. The CONCOR system for editing and correction of census and survey data has been designed and implemented for IBM 360/370 computers and work is under way, in co-operation with the United States Bureau of the Census, to improve it and make it portable. Until now, assistance to the countries has included adaptation of CONCOR and CENTS to the computing facilities existing in those countries. During 1975 and 1976 technical co-operation efforts were centred upon training courses on EDP and statistical applications, provided by CELADE to technicians from the national statistical agencies, but these courses are being phased out because of UNFPA financial constraints. Finally, it must be noted that on-the-job training constitutes an important component of almost every mission carried out in the field.

E. Economic and Social Commission for Asia and the Pacific

26. In ESCAP, the programme comprising statistical data processing activities has included advisory services in data processing, financed for the most part by UNFPA, but it has also included a funds-in-trust arrangement from 1973 through 1975 financed by the Federal Republic of Germany. Additionally, a COCENTS regional workshop was held in 1974 and a regional workshop on census data-editing procedures and programmes was held in 1977. The post of regional data processing adviser at ESCAP is expected to continue through 1978 and beyond.

F. Food and Agriculture Organization of the United Nations

27. In 1975, the FAO Conference and the FAO Statistics Advisory Committee of Experts made recommendations regarding the need to provide technical assistance in data processing to countries, particularly in connexion with the 1980 World Census of Agriculture. As a result of these recommendations, additional emphasis is currently being given to this aspect of the work, as illustrated below.

28. The existing computer packages for use in census and survey data processing were reviewed and a report was prepared with a summary of the findings. In this connexion the computer package COCENTS was installed at the FAO computer in order to provide experience to FAO staff in its installation, in its application to facilitate technical backstopping of field applications and in its use for the preparation of model tables related to agricultural censuses and surveys for dissemination to developing countries and for training centres.

29. A chapter on the data processing methods used in the 1970 World Census of Agriculture (WCA), with particular reference to computer data processing, will be included in the report on the 1970 World Census of Agriculture. A publication on guidelines for taking a census of agriculture will contain a chapter on data processing.

30. Assistance to national surveys of food consumption, nutrition and food expenditure has involved both short-term and long-term missions to deal with statistical data processing. This phase of the survey activities often causes considerable difficulty, primarily because of the limited capacities of the local staff, of computer facilities and of finances. The special problems associated with the processing of data from food consumption surveys and the dearth of package programmes for handling these data compound local inadequacies. A manual alerting planners and users of food consumption survey data to the use, benefits and demands of data processing is in preparation.

31. In Brazil two experts are advising the Government on the cleaning, processing and tabulation of data from a large-scale National Food Consumption and Budget Survey conducted in 1975 among 55,000 families. FAO assistance began in November 1973 with a feasibility study and a pilot survey. The data - anthropometry, food consumption, nutrient intake, food expenditure and various socio-economic factors - are now organized in a data bank. A computer programme developed in Latin America and tested in FAO headquarters and found particularly well adapted for this type of survey data is being used and further developed in Brazil. Two senior officials from the Tunisian Planning Ministry are visiting the project under the auspices of FAO to study the approach used in Brazil in the treatment of survey data.

32. Another computer package (SPSS), installed in FAO, has been used in a joint project (a) with the Government of Tunisia to analyse the data on food consumption from the National Survey 1975, (b) with Sri Lanka on data from a Socio-Economic Survey and (c) with Peru in the treatment of regional data from the National Food Consumption and Budget Service.

33. Similar co-operation was given to the Zambian Food Consumption/Nutrition Status Survey of 1969-1972. Here the treatment of the data was made through an ad hoc programme. Similarly in Nepal an FAO consultant assisted the Ministry of Food, Agriculture and Irrigation in developing a system of processing data from a National Food Consumption Survey of 1973-1976.

34. An activity specific to agricultural statistics is the carrying out of pilot studies on crop forecasting using meteorological data and based on multiple-regression models. A method for calculation on the basis of field measurements was developed together with the related software. The use of this method is being promoted since it is suitable for desk and pocket programmable calculators as a substitute for the cumbersome traditional method of using planchettes and planimetres.

35. A generalized system for processing forest inventory data has been developed in FAO with the objective of assisting forestry institutions in developing countries in processing data collected in different types of forest resource surveys. This system is written in FORTRAN IV and designed for small and medium-sized computers. The Pulp and Paper Development Programme has made use of an optimization model developed jointly by FAO and the World Bank in the identification of potential investments in this sector in developing countries and also in the optimum scale for such investment taking account of location factors, markets and resource availability.

G. United Nations Educational, Scientific and Cultural Organization

36. At UNESCO, there are currently four technical co-operation activities related to statistical data processing. A programmer/systems analyst has been working in Ivory Coast since January 1977, sponsored by UNESCO and funded under a World Bank loan. An expert in data processing is currently assuming a post in Saudi Arabia within the framework of the project entitled "Centre for Statistical data and educational documentation" at the Ministry of Education. It is expected that the post of expert in data processing and educational statistics will be filled in Afghanistan; this post is financed by the United Nations Development Programme (UNDP) within the framework of the Integrated Educational Development project. Finally, a three-month fellowship in computer applications to educational statistics will be awarded to a national of Saudi Arabia.

37. There are no activities at UNESCO headquarters specifically designed to assist member States in data processing. However, the idea that such activities may become possible in the future has not been excluded.

H. World Health Organization

38. At WHO, the programme of Development of Health Statistical Services, providing direct assistance to countries, is currently concerned with the implementation of more than 50 national statistical projects. These include the improvement of vital and health statistics, the strengthening of national health information systems for evaluating health and medical services and for formulating health plans, the promotion of personnel training through seminars, workshops and fellowships etc. Generally, the improvement of data processing services constitutes an element in these country projects and is dealt with by statistical experts within the over-all framework of their assignments. However, in projects in which statistical data processing is the main area of co-operation specialists in data processing are recruited.

39. In dealing with problems of computerized processing of health statistics, the experts take into account a wider range of computer application, namely, (a) computerized statistical data processing in general that may be available or under development in central statistical services of the country and (b) computer utilization by the health services of which statistical data processing may form a part. In fact, there is a growing tendency for countries to request WHO's collaboration in the development of computerized systems for the management of their health services, which covers much wider computer applications than statistical data processing.

40. The programme of Health Statistical Methodology not only provides for a sound statistical and mathematical basis for the planning, execution, analysis and modelling of epidemiological investigations and the improvement of health service delivery systems; it also provides for methodological principles to be followed in the use of computing facilities to support medical, epidemiological and health service applications. The data processing work is undertaken by the Electronic Data Processing Services. Both the statistical and data processing services are available to assist WHO headquarters, regional offices and countries.

IV. A QUANTITATIVE PROFILE

41. In addition to the descriptive material outlined above regarding the technical co-operation activities of the various agencies involved in statistical data processing, quantitative information was made available by the United Nations, FAO and WHO. This information consists of expenditure estimates by type of expenditure for the years 1972-1975, 1976 and 1977. Tables 1-3 contain these expenditure estimates for each of the above three organizations respectively, while table 4 contains the total expenditures for the three organizations.

42. In requesting the quantitative information that appears in tables 1-4, the following definitions were used:

(a) Advisory services include experts assigned to individual countries and regional and interregional advisers assigned to meet requests for short-term assistance:

(b) Training includes international training centres for data processing personnel, fellowships for training and observation at national statistical offices, at computer centres, at headquarters or regional offices of international institutions or at ad hoc training courses, and workshops and seminars;

(c) Data processing equipment, software and services include the provision of data processing equipment, computer software or methodology, or services or use of equipment;

(d) Technical guidance includes the preparation, publication and application of technical manuals and other documents designed for the use of developing countries, as well as working groups and other technical meetings;

(e) Programme formulation, support and evaluation includes: (i) assessment of the national, regional and interregional requirements for technical co-operation in statistical data processing, (ii) aid in the recruitment and technical supervision of technical co-operation experts in statistical data processing and (iii) review of the implementation and evaluation of the results of technical co-operation projects in statistical data processing.

43. The total expenditure estimates for technical co-operation in statistical data processing for 1977 were \$4,158,000 of which the United Nations share was \$2,865,000 or about 70 per cent, FAO's share was \$234,000 or about 5 per cent and WHO's share was \$1,059,000 or about 25 per cent. For the entire United Nations system, the average yearly expenditure for the period 1972-1975 was about \$2,650,000 and for 1976, \$3,882,000.

44. For the United Nations in 1977, including the regional commissions, five advisers backstopped the work of 26 experts, participated in the placement of 42 fellowship holders and assisted in the procurement of equipment valued at over \$1,800,000 for 30 computer installations. Funding for these activities came both from UNDP and UNFPA and it is anticipated that this pattern will continue.

45. Expenditures by FAO in statistical data processing in 1977 were \$234,000. These expenditures supported, inter alia, two full-time experts, a number of part-time advisers and a variety of short-term fellowships.

46. The estimated expenditure for all forms of technical co-operation in statistical data processing by WHO for the years 1972, 1975, 1976 and 1977, covering activities organized or co-ordinated from both headquarters and regional offices, is shown in table 3. The cost of all relevant activities was estimated for 1977 at \$1,059,000. Of this sum, only about 14 per cent, namely \$145,000, came from extrabudgetary sources; the remainder came from regular budget funds. The headquarters contribution for 1977 consisted of about \$474,000 for data processing services and \$152,000 for statistical advisory services, totalling \$626,000, plus \$8,000 for training (institutes and centres). The remaining sum of approximately \$425,000 was contributed by the six regional offices.

Table 1. Expenditure estimates for technical co-operation in
statistical data processing,

UNITED NATIONS (including regional commissions)
(Cost in thousands of US dollars)

Description of activities	1972 - 1975	1976	1977
(a) Advisory services			
(i) Experts			
(No. of positions) ...	37	33	26
(Total work-months)...	420	212	126
Cost*	1 464	813	545
(ii) Advisers			
(No. of positions) ...	4	5	5
(Total work-months)...	145	50	54
Cost*	506	192	272
(b) Training			
(i) Institutes and centres			
Cost*	-	-	-
(ii) Fellowships			
(No. of positions) ...	99	48	42
(Total work-months) ...	327	129	104
Cost*	369	177	146
(c) Data processing equipment, software and services			
(i) Provision of equipment			
No. of installations .	45	33	30
Cost*	3 131	1 248	1 885
(ii) Provision of software and methodology			
No. of installations .	8	4	8
Cost*	-	-	-
(iii) Provision of services			
No. of installations..	-	-	-
Cost*	-	-	-
(d) Technical guidance			
(i) Preparation of manuals			
Number	-	1	2
Cost*	-	2	3
(ii) Technical meetings			
Number	1	1	-
Cost*	-	-	-
(e) Programme formulation support and evaluation			
(No. of positions) ...	1	1	1
(Total work-months) ...	12	3	3
Cost*	48	12	12
(f) Miscellaneous			
Cost*	112	109	2
GRAND TOTAL			
No. of staff positions	42	39	32
Total staff work-months	577	265	183
Total technical co-operation cost*	5 630	2 553	2 865

* Estimated. - Negligible or zero.

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Table 2. Expenditure estimates for technical co-operation in
 statistical data processing

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
 (Cost in thousands of US dollars)

Description of activities	1972 - 1975	1976	1977
(a) Advisory services			
(i) Experts			
(No. of positions) ...	7	4	2
(Total work-months)...	119	38	24
Cost*	417	168	105
(ii) Advisers			
(No. of positions) ...	7	5	5
(Total work-months)...	15	13	17
Cost*	45	46	67
(b) Training			
(i) Institutes and centres			
Cost*	-	-	-
(ii) Fellowships			
(No. of positions) ...	50	8	13
(Total work-months)...	500	71	22
Cost*	100	16	29
(c) Data processing equipment, software and services			
(i) Provision of equipment			
No. of installations .	3	1	-
Cost*	58	20	-
(ii) Provision of software and methodology			
No. of installations .	-	-	-
Cost*	-	-	-
(iii) Provision of services			
No. of installations .	7	1	4
Cost*	200	8	23
(d) Technical guidance			
(i) Preparation of manuals			
Number	16	6	4
Cost*	41	15	10
(ii) Technical meetings			
Number	-	-	-
Cost*	-	-	-
(e) Programme formulation, support and evaluation			
(No. of positions) ...	-	-	-
(Total work-months) ...	-	-	-
Cost*	-	-	-
(f) Miscellaneous			
Cost*	-	-	-
GRAND TOTAL			
No. of staff positions	14	9	7
Total staff work-months	134	51	41
Total technical co-operation cost*	861	274	234

* Estimated. - Negligible or zero.

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Table 3. Expenditure estimates for technical co-operation in statistical data processing

WORLD HEALTH ORGANIZATION
(Cost in thousands of US dollars)

Description of activities	1972	1975	1976	1977
(a) Advisory services				
(i) Experts				
(No. of positions) ...	20	22	22	21
(Total work-months)...	91	84	93	90
Cost*	174	171	227	243
(ii) Advisers				
(No. of positions) ...	6	5	11	9
(Total work-months)...	44	20	22	30
Cost*	110	52	66	93
(b) Training				
(i) Institutes and centres				
Cost*	18	8	8	8
(ii) Fellowships				
(No. of positions) ...	40	45	34	30
(Total work-months)...	170	235	144	132
Cost*	166	238	132	135
(c) Data processing equipment, software and services				
(i) Provision of equipment				
No. of installations .	2	3	1	-
Cost*	150	158	49	-
(ii) Provision of software and methodology				
No. of installations .	1	1	-	-
Cost*	25	5	-	-
(iii) Provision of services				
No. of installations..	1	1	5	2
Cost*	184	406	454	479
(d) Technical guidance				
(i) Preparation of manuals				
Number	5	1	1	-
Cost*	2	-	-	-
(ii) Technical meetings				
Number	4	3	5	3
Cost*	43	28	37	44
(e) Programme formulation, support and evaluation				
(No. of positions) ...	2	2	1	1
(Total work-months) ...	15	13	12	12
Cost*	44	39	36	36
(f) Miscellaneous				
Cost*	12	21	46	21
GRAND TOTAL				
No. of staff positions	28	29	34	31
Total staff work-months	150	117	127	132
Total technical co-operation cost*	928	1 126	1 055	1 059

* Estimated. - Negligible or zero.

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Table 4. Expenditure estimates for technical co-operation in statistical data processing

UNITED NATIONS SYSTEM
 (Cost in thousands of US dollars)

Description of activities	1972 - 1975	1976	1977
(a) Advisory services			
(i) Experts			
(No. of positions) ...	128	59	49
(Total work-months)...	889	343	240
Cost*	2 571	1 208	892
(ii) Advisers			
(No. of positions) ...	33	21	19
(Total work-months)...	288	85	101
Cost*	875	304	432
(b) Training			
(i) Institutes and centres			
Cost*	18	8	8
(ii) Fellowships			
(No. of positions) ...	319	90	85
(Total work-months)...	1 637	344	258
Cost*	1 277	325	310
(c) Data processing equipment, software and services			
(i) Provision of equipment			
No. of installations .	58	35	30
Cost*	3 805	1 317	1 885
(ii) Provision of software and methodology			
No. of installations .	12	4	8
Cost*	60	-	-
(iii) Provision of services			
No. of installations .	11	6	6
Cost*	1 380	462	502
(d) Technical guidance			
(i) Preparation of manuals			
Number	28	8	6
Cost*	45	17	13
(ii) Technical meetings			
Number	15	6	3
Cost*	142	37	44
(e) Programme formulation, support and evaluation			
(No. of positions) ...	9	2	2
(Total work-months)...	68	15	15
Cost*	214	48	48
(f) Miscellaneous			
Cost*	178	155	33
GRAND TOTAL			
No. of staff positions	170	82	70
Total staff work-months	1 245	443	356
Total technical co-operation cost*	10 599	3 882	4 158

* Estimated. - Negligible or zero.

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V. CO-ORDINATION WITHIN THE UNITED NATIONS SYSTEM

47. An electronic digital computer may be introduced into a country for one specific purpose but its availability generally provides both the opportunity and the resources for other purposes and for use in other government sectors. For many years, the fact that computers had such broad applicability, together with the fact that the larger the computer the more effective it was per unit of cost, provided the basis for the argument that the most efficient choice for a country was a central computation facility shared by most or all potential users. More recently, the economies of scale inherent in computer hardware construction have lessened considerably and, with the overhead and managerial complexity that are part of many current large-scale systems, there has been a strong trend towards decentralized computing using a variety of large and small computers, both in many of the developed countries and in some of the developing countries that already have basic skills in using computer technology.

48. In a number of developing countries, however, the dearth of trained staff - programmers, analysts, operators, service engineers and managers - makes it inefficient to fragment them over more than one facility. Both the professional growth of the existing staff as well as training opportunities for new entrants are enhanced by having a "critical mass" of trained professionals; in some developing countries, such a critical mass is possible at only one or a very few locations.

49. To the extent that developing countries have not achieved self-reliance in the utilization of computers and can provide only a very limited number of counterparts to participate in computer technical co-operation activities, it is desirable that there be co-ordination in the assistance given to them by both multilateral and bilateral sources. Co-ordination in advice and resources given for statistical data processing is also desirable since this co-ordination will assist countries in formulating a structured and coherent approach to their statistical data processing activities.

50. The United Nations system has been alert to several possibilities for co-ordination in the installation and use of computer facilities and in statistical data processing. In October 1975, UNDP sponsored a meeting to discuss problems arising from the execution of its projects in the field of computer science and technology, including computer use for substantive projects. UNDP had become increasingly concerned, in particular, with problems of assigning executing responsibility in connexion with projects for which agency competence was unclear or overlapping (especially multi-purpose projects) and also with co-ordination in the broad computer technology survey and programming missions.

51. At the meeting, a very wide-ranging discussion brought a number of issues into focus and a substantial consensus was achieved. Agreement was reached on guidelines to major areas of agency competence, for programming and survey missions and for multipurpose projects. Agreement was also reached on the need for improved co-ordination and consultation and on the formation of an Advisory Committee on Computer Technology Projects to advise UNDP and provide a forum for discussion in this field. The Advisory Committee, chaired by UNDP, has met twice;

in addition, computer-related project material as well as information on planned survey and programming missions have been exchanged on a regular basis by members of the Committee.

A. United Nations

52. In October 1976, the Statistical Office sponsored a meeting at Headquarters on census data processing software for the 1980s. Participants included representatives of organizations that were actively constructing and/or using software related to processing population census data. The meeting achieved an exchange of views, an understanding of the relative strengths and weaknesses of the existing set of census data processing tools and an understanding of the software development strategies and plans of the various groups represented at the meeting. It is hoped that there will be future such meetings and that these will include participants not represented at the first meeting. It would be highly desirable for such meetings to lead to a global awareness, among organizations and individuals active in census data processing, of the products and work of others and thus to a more co-ordinated, coherent over-all development strategy in this area.

53. Some co-ordination and joint activity is occurring on statistical data processing projects within the United Nations. For the two major computer-based projects backstopped by the Statistical Division of ECE, substantive assistance is given from Geneva while more technical support is given from Headquarters. The Statistics Division of ECA has had effective co-operation with the United Nations Statistical Office and, through it, with the United States Bureau of the Census. Communication between United Nations Headquarters and the African regional census adviser and the regional census data processing adviser has been frequent and effective. During a period of eight months in 1976/77 when the ECA regional census data processing adviser's post was vacant, the Statistical Office sent a number of missions into the field in the region using its own technical advisory staff. ESCAP and the United Nations Statistical Office have co-ordinated the selection of experts for data processing training posts. The United Nations Statistical Office has maintained close co-ordination with CELADE, the International Statistical Programs Center of the United States Bureau of the Census and Statistics Canada regarding the development of census software and it has aided in the distribution of software to countries. At the request of the United Nations Statistical Office, the national statistical offices of Canada, the Federal Republic of Germany, Japan, Sweden, United States of America and other countries have acted as host to UNDP-funded study tours for data processing staff from the less developed countries.

B. FAO

54. Although FAO does not currently have any organized co-operation with other United Nations agencies in the field of statistical data processing, the need is felt for such co-operation. Several areas of co-operation can be identified in which United Nations agencies' efforts could complement each other.

55. One area would be the evaluation, promotion and possibly development of software packages for statistical data processing. FAO has already benefited from efforts made by the United Nations by using the computer package CENTS and COCENTS in about 10 countries for agricultural census data processing. In all these countries, the packages had already been installed for population census purposes. The benefit would probably have been considerably greater if timely co-operation had been established.

56. Another area of interest to FAO would be the exchange of information on small computers suitable for statistical applications. The enormous technological progress being achieved in the manufacture of small computers and the not always reliable information provided by manufacturers make the task of giving advice to countries on the choice of small computers very difficult. The exchange of information between United Nations agencies on their experiences with different makes of small computers could be of great benefit.

C. WHO

57. At WHO, it is expected that the programmes for the Development of Health Statistical Services and for Health Statistical Methodology will become progressively more integrated. In particular, increased attention will be given to the needs of developing countries and to the means of transferring to them, in an appropriate form, the methodological advances established elsewhere in applied statistics, operational research, systems analysis and medical computing. The Electronic Data Processing Services will continue to provide, on request, such services to all WHO programmes and echelons.

58. Increasing awareness of the interrelatedness of many other sectors besides health, such as economics, agriculture, environment, education etc., is expected to result in greater efforts to link statistics from many different sources and to investigate the behaviour of the resultant systems in an effort to achieve greater social control of the phenomena involved. It is felt by WHO that these endeavours could benefit greatly from improved co-ordination within the United Nations system.

VI. CONCLUDING REMARKS

59. Data processing has been and will continue to be an essential tool for national statistical offices. The statistical capital of a country is part of an essential information infrastructure for national planning and for formulating social and economic policy. The increasing awareness of the importance of statistics, combined with continuing technical progress in the computer industry and the consequent rapid decline in hardware costs, will make automatic statistical data processing increasingly attractive and potentially more effective.

60. In this context, the role of technical co-operation in statistical data processing is to assist in transferring this complex, multifaceted technology to

the developing countries. One facet of this technology is computer hardware. Although the rapidly declining costs of computer hardware make the transfer feasible, this kind of transfer will become less important over time. More important is the transfer and generation of software and the investment in human capital that is essential for eventual self-reliance and participation in the international statistical system as an equal, contributing partner. The limited resources available to the United Nations system require that a co-ordinated programme of co-operation in statistical data processing be executed and maintained. In this way it will become possible to use advancing technology to satisfy the developing countries' aspirations by building the capital necessary for them to take advantage of it.

61. Of special importance is the task of acquainting statisticians with the rapid advances taking place in both hardware and software technology and enabling them to use the new computer-based tools directly without unnecessary dependence upon computer technicians. Such new tools are often intended for the user of computers but their power and utility may be unrecognized and therefore unexercised when statisticians delegate direct use of the tools to a cadre of technical intermediaries. The technology currently exists to narrow substantially the gap between user and computer and, to the extent that this technology is utilized, significant qualitative and quantitative benefits can result.
