UNISIST TO ASIA ELECTRONICS

During these two months, two challenging events occurred. These were: The First Steering Committee meeting of UNISIST at Paris in November 1973 and VIth Asia Electronics Conference at New Delhi in December 1973. The former was organised by UNESCO and the latter by the Department of Electronics, Government of India. The importance of these conferences gets enhanced manifold for any ‘computer-wala’ as both proved indicators for future.

UNISIST is an idea standing for World Science Information System. It aims to provide scientific information available anywhere in the world to any other place where it may be required through a global network utilising modern technologies. In this network concept computers are to play a leading role. The first Steering Committee meeting of the UNISIST was a business meeting and the current plan and medium term plan of the UNISIST were discussed and approved. The current plan included items like Broad System of Ordering; Manual for System Interconnection; UNISIST International Information Centres; Assistance Programmes in training and Education; UNDP financial projects; and Training Courses and educational activities. In this meeting the committee elected its Bureau whose members are Yugoslavia, USSR, Tunisia, and USA. From the trends of discussion it appeared that INDIA can play a very important and leading role for UNISIST among the developing countries in general, for whom it served as a spokesman, and South Asian countries in particular. As a matter of fact a request by INDIA for setting up an International or Regional Centre is most likely to be received very favourably by UNISIST. Of singular importance to ‘computer-walas’ is the ‘world concept of machine readable abstracting and indexing services’. This could be effectively developed as a means of providing efficient information service and access to world research literature in science. It is imperative for all concerned to see that the opportunity does not slip by default. The profession has to gear up to produce persons qualified in information retrieval as required by the modern computer, reprographic and communication technologies.
The Seventh Asia Electronics Conference was inaugurated by Hon'ble Minister Shri C. Subramaniam. The conference was organized into Symposia and Reports of the working group. The symposia included four invited talks by Mr. Frank Lee on Electronics System for Industrial Application; Prof. R. Narasimhan on Computers in Development; Hardware and Applications; Shri N.V. Shenoy on Telecommunication and Development; and Dr. A. Watanabe on Electronics in Medicine. (Text of talks may be available with the Department of Electronics). Prof. Narasimhan came out with four axioms:

1. No country can afford to economise on computing.

2. An efficient and coherent policy on the use of computers is indispensable to the growth of a country wishing to develop itself.

3. The computer industry is a major factor in the development of a modern economy.

4. Every country has a role to play in the world development of computing.

These axioms have a significant importance for the development of computer profession in India. The country reports on the development of electronics were very impressive.

The unique feature of this conference was an exhibition organized by Indian industry. One should have seen to believe that our country has progressed so much in such a short time.

### Technical News

#### New Range of Alphanumeric Printers

Bell & Howell has enlarged its range of low-cost printers with the introduction of a series of alphanumeric printers offering mobile printout facility for use in a variety of applications including: engineering testing, process control, inventory accounting and remote message printing. Four basic ASCII-compatible input systems are available. The HP-750 interfaces with typical minicomputers and modems. A variation of this model, the HP-752, accepts the current drive mode required by an ASR-33/35 teletype. A third version, the HP-753, accepts data in parallel, serial character form at relatively high strobe rates, and a variation of this model, the HP-754, accepts data continuously at 35 cps. The equipment incorporates a drum-type print mechanism and can print a total of 42 alphanumeric characters and assorted symbols in 21-character lines at 25 cps. Prices of the printers are from £441.

Bell & Howell Limited, Electronics and Instruments Division, Lennox Road, Basingstoke, Hampshire, Basingstoke 3681.

[Data Processing, May-June 1973, p. 178]

#### Scrapbook now operates at NPL

The National Physical Laboratory has installed a Computer Technology Modular One system for its "Scrapbook" project, which is basically a general purpose information retrieval system.

The project enables the user to enter, retrieve and edit his own records and also to consult common records by means of alphanumeric VDU's.

It is therefore virtually used as a scrapbook, and define its accessibility. There is also a glance records he has acquired and provides him with a ready means of returning to them.

The Modular One installation comprises a tape input and output and an exchangeable equipment by means of a one-line buffer with TTL logic levels, and it is also compatible with the present range of Centronics equipment. The communication system is basically parallel, but a serial option is available. Transmission rates are 100 to 28,000 bauds (serial) and up to 7,500 cps (parallel).

The print format is a maximum of 60 characters/line and six lines per inch. Core Computer Related Equipment Limited, Unit 15, First Floor, Airport House, Purley Way, Croydon, Surrey CR0 4RS. 01-695 9201.

#### Monarch 2000

Pitney Bowes Data Systems has announced the Monarch 2000 CODABAR encoding system. The Monarch 2000 prints bar-coded tags and labels at rates of over 1,000 per minute, the tickets produced being in a linear bar code. The machine, which is a freestanding self-contained printer, automatically prints the information in both readable and CODABAR form on tags, labels and turnround documents. The system comprises three units—the model 2001 printer, the model 2002 controller and the model 2003 tape transport. With the development of a proper communication interface, the 2000 can operate as a remote terminal for ordering and receiving information from a central processing unit. The system is designed for use in departmental stores, chains, and cash and carry outlets where a high volume of accurately printed labels is needed.

#### High-speed printer from Core

In order to fill the price/performance gap between slow-speed typewriters, and fast line printers, Core Computer Related Equipment has introduced a printer, the Centronics Model 306, which can print 1000 cps and 40 6-line character 1 line. The Centronics Model 306 is compatible with other equipment by means of a one-line buffer with TTL logic levels, and it is also compatible with the present range of Centronics equipment. The communication system is basically parallel, but a serial option is available. Transmission rates are 100 to 28,000 bauds (serial) and up to 7,500 cps (parallel).

The print format is a maximum of 60 characters/line and six lines per inch. Core Computer Related Equipment Limited, Unit 15, First Floor, Airport House, Purley Way, Croydon, Surrey CR0 4RS. 01-695 9201.

#### Editape 8021

This terminal, for use in phototypesetting applications, has been designed by Kingprint Limited, originally for its own use. The device comprises a virtual display screen with an editing keyboard attached and is used primarily for correcting paper tapes enabling phototypesetters to produce error-free setting. The basic Editape 8021 has full editing capabilities, together with a combined paper tape punch and reader. The unit, which can be programmed to suit most phototypesetting systems, displays all 64 codes on the tape in large characters. The command codes have an inverted format and the reducing line cursor gives immediate identification of the editing point. Each line on the screen is stopped at a space-bar code to avoid breaking words. A 15-code buffer is left clear on each line, and a 5-line buffer at the base of the screen, to allow additional copy to be inserted. The screen has a capacity of between 1045 and 1600 characters in 16 to 21 lines. Editing is achieved by adding, erasing, and overstrike. Options available include: an interface to customer's own punch and reader; upper and lower case characters; keyboard layout to customer's requirements; additional memory storage; electrostatic printout from the screen for instant proofs; and magnetic tape input/output. Kingprint Limited (Electric Division), Orchard Road, Richmond, Surrey TW2 0PD. 01-876 0191.

#### Fourth generation computing calculator

The Wang 2000 programmable calculator废松ke of the BASIC language, with the simplicity of calculator programming and operation. The machine is equipped with a high-speed CRT display with a capacitive line and, optionally, a cassette tape drive. The keyboard provides all common alphanumeric symbols, a full set of BASIC operators: trigonometric, exponential and mathematical functions and 22 special functions which can be programmed by the user. The 2000 also includes...
diagnostic and debugging features, comprising an error pointer, trace mode, halt/step operation, and continue, as well as a range of editing facilities. Memory capacity of the 2200 is a basic 4096 steps of memory, expandable to 32768 steps. For printout records, the Wang 2201 output writer may be added to the system. It is a modified IBM Selectric typewriter which types characters with full format control. Wang Electronics Ltd, 40/14 High Street, Northwood Middlesex Northwood 27677.

System 90 midicomputer.

UCC Computer Instrumentation has introduced the System 90, a midicomputer, with a 16-bit word, a cycle time of 650nsec, and an 8K word core memory expandable to 32K words. Hardware features include memory parity, direct memory access at a transfer rate of 1.45 million words/second, and a disk register. Four modes of memory addressing are available and optionally the system can have up to four DMA block transfer channels with data chaining capability, up to 12 priority interrupts, and up to 14 controllers for peripherals. Peripheral equipment includes disc memories, magnetic tape units, tape cassette, card and paper tape readers, digital printers, tape punches, line printers, visual and graphic display units, and a range of analog-to-digital and digital-to-analog converters and multiplexing equipment. Four basic configurations of System 90 are available—a mainframe, a mainframe and a disk storage, and the Data Acquisition System. All configurations are supported by a package of utility programs, and a centralised I/O control system.

A cross-assembler for System 90 programs on IBM 360, ICL 1900 and Univac 1100 computers is also available. In addition, the MIDDOS operating system is offered for use with tape and disc-based systems. Computer System Division, UCC Computer Instrumentation Limited, School Lane, Chandlers Ford, Eastleigh, Hampshire, Chandlers Ford 4677.

Disc-based file handling system.

The System 4007, marketed by Terminal Display Systems, provides in-line computing and direct data entry at user department level. The system locates data entry/retrieval video terminals in user departments which allow access to disk-hold master files of up to 100 million characters. Records stored on these files may be interrogated and updated interactively, while additional records can be entered via the terminals. Hence the system can also function as a key-to-disc data entry system. Disk files are set up from magnetic tape on the 4007 disk and the tape transport also records all terminal to disk transfer, as back-up. The system comprises a 4007 controller, disk store, magnetic tape deck, and terminals. Terminals can be sited remotely from the controller and linked via telephone lines and Post Office modem equipment. Hard copy output can be provided at the terminals and, in addition, a common printer can be shared by all terminals. System 4007 incorporates an executive which provides facilities for foreground background tasks and system software includes a range of application packages. Terminal Display Systems Limited, 101, Hillside, Whelkgate, Blackburn, Lancashire Blackburn 46507.

[Data Processing, July-August 1972]

FROM THE CHAPTERS

BOMBAY CHAPTER

An Evening Lecture was delivered by Mr. P. J. Jaffari (Air India) on December 4, 1973 on "EDP is dead; Long live EDI!"

DELHI CHAPTER

Dr. Dieder Cramer gave a talk on "Data Transmission in Man-Machine Communication" on 29th December 1973. The talk was preceded by a film on computer graphics and an introduction to GMD.

POONA CHAPTER

Certificates/Medals were awarded to the successful students in the Apprenticeship Course on 17th December 1973. Mr. M. M. D. Forbes, Director, IIN Marshal Group of Companies was the chief guest.

Soon after the above program the first lecture in the series "USER'S LECTURE "Our Experiences with the Computers" was arranged. Mr. M. D. Forbes gave a talk on COBOL Programming from 25th January 1974.

The Chapter announces their first course in The leaflet announcing details will be out soon.

System Development and Computer Programming of Population Data

G. K. Mehrotra

[Office of the Registrar, General, India]

Introduction

1.0 In any large project of data processing, the twin aspects viz. System Development and Computer Programming cannot be isolated from one another. System development provides the broad framework and algorithms needed for completion of a project and plays an important role in effective utilization of Electronic Computer, where cost of operations is prohibitive. The implementation of a system is achieved through computer programming which provides necessary commands for the Computer. The importance of having a good system design is keenly felt when the volume of data is quite heavy and even a run of scanning may mean millions of cards records of computer processing. One may not insist for an optimum system design in case the volume of jobs is not heavy; but optimum system design is a must for massive jobs where time schedule for generation of reports is to be adhered to.

1.1 A system may be termed efficient compared to others if the following criteria provided it satisfies the following conditions:

(i) It results in minimum computer time utilisation.

(ii) Core capacity is gainfully utilised to the fullest extent possible.

(iii) It is operationally feasible.

(iv) It ensures necessary checks for accurate processing and guards against extraneous errors of power failure, voltage fluctuations etc.

(v) It permits reprojection of inaccurate results from the stipulated position.

* Views expressed in the paper are of the author and not necessarily those the Government. The author is greatly indebted to Shri. A. Chandrasekhar, Registrar General, India for granting permission to get this paper published.


Pre-requisites of an Optimum System Design

2.0 The broad frame work with all its constraints, for which an optimum system design is proposed to be developed, should be defined in an explicit manner and provided to the System Analyst, who may examine the details and supplement them through discussions. The specifications in terms of coverage, concepts, levels of presentation of result, etc., may be of great value in developing a system design.
Once the specifications of a job are settled, changes in them may not be a desirable feature as these may affect the overall system design. For an integrated system design, cessation of specifications after these are settled is a must.

Scope of the Paper

3.0 The present paper aims to illustrate some of the ideas of the preceding paras with reference to the electronic processing of the Population Data. It is important to highlight the fact that the computerisation of Population Data could be effectively planned, if the System Analyst possesses basic knowledge of the demographic variables and their distribution in the universe. Approximate information in respect of the distribution of population say by age, sex, marital status, fertility rates, migration and occupational pattern etc., could be of great help in planning as suitable system. The scope of the paper is limited in the sense that it pre-supposes that the input preparation viz., punched data cards would be available to the computer and the system developed is confined to the later stages of the work which include preparation, updating, processing, report generation, and storage of population data file. It may be interesting to analyse the various stages through which the population data could be processed on the computer for proper appreciation of system development.

Preparation and Updating of Population Data File

4.0 The raw data collected from the field in the form of filled-in schedules after manual editing for its logical errors is coded and punched in the form of holes on a punch card. The data in the form of punched card occupies huge storage media and is, therefore, not convenient for electronic data processing. Furthermore, punched cards as input media for the computer results into considerable processing time which may not be an acceptable feature for large scale Population enquiries. Where data cards run into millions, conversion of the information of punched data cards into another media viz., magnetic data tapes, therefore, becomes a matter of expediency. During card to tape operations, the system design should provide for all possible eventualities like power failure, wrong placement of data and validity errors etc.

Methods of Card to Tape Conversion

5.0 Conversion of data from cards to magnetic tapes could be achieved through any one of the following methods:

(i) Punched card data file is loaded on magnetic tape without consideration of logical errors in the initial run itself. The data cards having validity errors are corrected in the course of card to tape operation. The tape file so obtained may be further processed in the second run for internal consistency check. Records carrying logical errors may be corrected with the help of certain imputation rules fixed in advance.

(ii) Entire card file is initially checked on computer for validity and obvious logical errors. When the card file is found to have a desired standard of accuracy, it is again loaded for card to tape conversion and intensive editing.

(iii) The card file is checked for validity and obvious logical errors and the data cards found free from such errors are put on a magnetic tape in the initial run of computer processing. Suspected data cards are checked for internal consistency and validity errors before putting them on another tape in the second run; the two are put together in the third run for the desired sequence. The Marginal file, so obtained, is subjected to intensive edit checks and the defective records are imputed in accordance with the set principles. A display of imputed records could also be made.

The flow chart for the above methods of card to tape operations is given on page 5 for ready reference.

Criteria for Selection

6.0 The choice of any one of the methods for card to tape conversion depends largely on the following factors—

(i) Volume of the job
(ii) Types of checks required on card file.
(iii) Method of reconciliation of errors.
(iv) Level of accuracy.

6.1 It should suffice to say that the Population Data are collected in the varied conditions through thousands of enumerators and as such the quality of data could have varied. The inter-processing stages of the data could also not be ruled out in a massive Population Enquiry. Therefore, greatly depends on the quality of the input and the types of consistency checks required during card to tape conversion.
6.2 Sometimes, a data card may not be independent by itself and the accuracy of its contents may be judged while the help of data cards which precede and follow it in the card file. For such situations, the check for the sequence of card file is a must. Before the same could be put on magnetic tape. Suppose for a Housing Survey, details of sample households are punched on a card with following considerations in view:

(i) All households of a selected house would have the same house number and details of say 3 households could be given on one card.

(ii) Punching of data for a house with new house number would commence from a fresh card.

(iii) As the data for sampled houses are punched, the two consecutive house number should differ from one another by their sampling interval.

If the above checks are applied on a card file, it is necessary that the entire file is first examined for the accuracy of the sample before it is put on tape. Along with the sequence check, additional consistency checks on the card file could also be performed for ensuring the quality of data.

6.3 For card files, where sequence of data may not be of immediate concern, one would prefer to have a system design in which manual handling of data cards is minimised. There could be two ways of achieving it as described in paragraphs 6.2 (i) and (ii) above, put the choice would be very much conditioned by the method of revalidation of errors. It should be appreciated that a reference to original documents for rectification of discrepancies in large Population Enquiries may not be practicable. Not only it delays the creation of tape data file but at the same time it introduce subjectivity in providing the information without the extreme conditions of card to tape conversion viz., dumping the card file on tape without any reference to source documents during the editing of the data may not work for jobs, where quality is desired and quantity is to be dominated. Under such situations, one has to take recourse of the midstream wherein card file could be subjected to preliminary scrutiny for gross errors and data cards which qualify this test may be admitted on the tape file.Rejected data cards could be used for another tape file after removal of its discrepancies, which is later on merged with the first tape file to produce the final data tape. The merged tape file could be put to an intensive edit checks and records which did not qualify the standards of editing, be imputed and displayed. A count of such records for each operational unit viz., tehsil/town, if provided, may help in judging the quality of data.

7.0 Classification of Edit Checks

- **7.0** The classification of edit checks for preliminary and intensive scrutiny should rest with (a) nature (required) and (b) method (of revalidation) of errors.

- **7.0** Errors in punched data may be a blend of numerous factors which may include in it faulty field enumeration, wrong entry, missing manual scrutiny of returns, vagueness of concepts and definitions, wrong coding, wrong punching etc. Computer editing of the data, which is consistent and efficient, should provide answers to all such contingencies. While preliminary scrutiny of the data should provide an opportunity of studying the nature of errors and suggest measures for minimising their recurrence in future after referring to the original records; intensive scrutiny on the other hand should provide an instantaneous solution to all contingencies by correctly data then and there with the help of imputation rules set in advance.

7.1 To illustrate with the help of Population Enquiry Schedule (see Appendix 2), one may like to put the following glaring tests under preliminary scrutiny:

(i) Fertility particulars like age at marriage, child born in the preceding year and only be recorded against currently married females.

(ii) Person below 5 years cannot be a worker and (b) a literate.

(iii) For non-migrants, details on birth place rural/urban, last residence, duration etc., are not to be shown.

(iv) Details of mother tongue and subsidiary language cannot be the same.

(v) Workers engaged in cultivation will not have details about their industry, occupation etc.

The list suggested above is not exhaustive, but goes to suggest that these glaring discrepancies in the data should only be reconciled after referring to the source data. The cause of error could be fixed and the genuineness of the corrections may be verified. It is likely that the rejection of data cards on account of obvious inconsistencies may not be very heavy provided the manual editing of the data through its various stages is carried out thoroughly.

7.2 There could be other detailed checks, which if introduced in the preliminary edit, may result in a large proportion of rejection of data cards than otherwise. The correction of such cards, through the help of source documents, would then introduce delays and subjectivity because of concepts and definitions. Perhaps the correction of such data cards on the basis of well considered imputation rules could provide the uniformity and consistency of treatment in remedying the errors. A few examples of field edit checks should suffice here.

(i) For migrants, duration of stay can never exceed their present age. If it happens, duration can either be made 'unspecified' or at best equal to the present age.

(ii) Educational level is expected to be consistent with age. For a person of say 10 years educational level as a primary may appear ridiculous. Computer edit would, therefore, analyse the entry with reference to other items of information and direct whether change in age is called for or educational level is to be altered.

(iii) Some occupational groups have their affinity with specified industrial category and age groups. To expect a shoe repairer in a plantation industry may appear incorrect. Similarly, Engineers, Doctors etc. in the age group 0-14 may be improbable. Full programme would decide for their imputation after ascertaining the degree of stability to be attached to the various items on the basis of their relative importance.

(iv) Persons classified under the industrial category 'Public Services - Government Sector' cannot have their employment status other than 'Employee'.

(v) 'Relationship' is expected to bear harmony with 'Sex' and 'Age'. Situations may arise where male relationship say 'Father-in-law' may be shown as 'Father' or 'Grandfather' may have age below 15 years. Of course, such combinations on their face value, appear absurd. The full edit programme has to make allowance for them as well and suggest imputations on the basis of the order of stability of the various items of the data card.

8.0 Development of Control Totals

8.0 Discussion of the computer edit checks would in itself constitute a separate paper and may amount divergent to the main theme of system development and computer programm ing. The few illustrative examples given above go to suggest that the possibility of existence of errors of the various types in a voluminous data cannot be ruled out and the system development should provide solutions to all such contingencies and see that the Master data tape which forms the plank for subsequent processing carries it the acceptable level of accuracy.

8.1 The system should provide for broad indicators at regular intervals during card to tape operations which could speak of the quality of Master tape file. For example, information in respect of the no. of persons by sex, total births, no. of workers, currently married women, no. of migrants classified by the nature of their movement into imputations by their nature etc., could be provided at tehsil/town/city/district level during card to tape conversion. A person with a perception about sex ratio, birth rate, general fertility rate, ratio of migrants to general population etc., could make a statement about the quality of the tape file which is very necessary for the subsequent processing. As the card file should be generally arranged tehsil/town/citywise within a district, the detailed totals of the nature listed above could be printed out at the change of each such operational unit.

9.0 Provision of Check Points

9.0 During long hours of continuous processing of a job on computer, it may sometime become essential to start the job a fresh from a specified position due to following factors, which are beyond human control:

(i) Abrupt power failure, voltage fluctuations, sudden rise of temperature from the optimum range, malfunctioning of cooling plant etc.

(ii) Replacement of old card/tape file by new one because of wrong sequence, poor quality, duplication, omission etc. of data.
Provision, therefore, should exist for such extraneous factors by providing 'Check Points' at regular intervals after processing, or of a specified volume of job by the computer, so that the abandoned job could be restarted. The introduction of checkpoints in the computer programs permit the recording of the status of the core on a scratch tape after a specified volume of data has been processed. With the help of check point identification card (punched soon after desired volume of data has been processed), it is possible to restore the desired status of the core. How frequent the check point should be written, depends upon as to how much job one may like to scrape-out in case the contingency of the nature of para 9.0 (i) and (ii) occurs. Generally, checkpoints are recorded after a few thousand records/cards are processed which may consume nearly an hour of computer processing time.

Integrated Approach in Computer Programming

10.0 Starting from the input preparation (i.e., data cards till the end of report writing) (i.e., dressed-up tabulation plan), the entire system of computer processing could be viewed as a closed knit operation, where the inaccuracy in any stage may be followed by the absur- dities in the subsequent stages. Computer is an idiot which accepts the philosophy of "Garbage in, Garbage out". As such, one has to be extremely careful while planning the various stages of computer processing and their inter- relationship with one another for providing accurate results. Broadly, the various stages of work could be categorised as under:

(i) Card to Tape conversion.
(ii) Reading of data tape for creation of summarised results, segregation of data of specified nature.
(iii) Sorting of summary and printing of reports.

10.1 A schematic diagram of the generation of flow of work is attempted at page 11.

Processing of Magnetic Data Tapes

11.0 Once the data tape gets created with an acceptable degree of accuracy, the next step would be to process it with minimum computer time. It may be of interest to mention that the processing of data is faster, if it is on magnetic tape than on card. Further, the data stored on magnetic tape reduces the storage and handling problems to a manageable form.

While processing the data through magnetic tapes, the results of intermediary stages remain Greek and Latin so long as final product is not available in the printed form. For insuring confidence in the intermediary stages of processing, it, therefore, becomes necessary to print out control totals at regular intervals which should bear with the previous and succeeding stages of processing.

11.1 One important consideration for computer processing, which should receive attention is the volume of data involved. Sometimes even scanning the Master tape file only once may result into the processing by computer for hundreds of hours and as such maximum advantage in the form of generation of summary, extraction of specified type of data etc., should be taken especially from the run of Master tape file.

11.2 Extracted data tape need not have the same record format and block size as the Master tape, it should depend mostly on the purpose and available core size. For example, the simultaneous extraction of fertility data during the processing of master tape file for generation of summary for a set of tables may be a desir- able feature of an efficient system design. As the fertility data account for nearly 20% of the total records and all the details of the family population may not be needed for fertility tabulation, the extracted fertility data on a reduced record size and increased blocking factor could be more convenient and efficient for com- puter processing than otherwise.

Sorting and Truncated Summaries

12.0 Another consideration worth mentioning for system development is in regard to the use data. For tables having (a) multi-dimensional classification, and (b) large number of arrays and columns in a two dimensional tables, genetic tape almost becomes impossible due to limits- tions of core size unless the data are properly more time than mere processing, at a dividing before processing and the data to be processed would require a priori knowledge about the table. A study of subgroups with reference to persons who bear residence is outside the last place of residence will suggest that the state of enumeration may not account for more than 10% of the total migrants, while the
requirements of table (Refer Table A Appendix 2) suggest that more than 85% of the size of the table is lost due to outliers. To ensure the stability of the summary creation, an optimum system design would be necessary. Therefore, the sorting of the print data should be based on the standardization of the distribution of the summary data. This ensures that the quality of the output is maintained. The automatic checking of the quality of the output is exercised by the use of printed order data. These are given in the specification of the program. However, these checking procedures are not adequate for ensuring the correctness of the processing. Hence, the control totals generated at regular intervals of computer processing may not be meaningful and powerful in detecting the malfunction of the computer due to several external factors. Thus, ensuring the quality of the end-results. Like control totals, checkpoints are not to be considered in this heavy, checkpointing. For the new output in the form of printed sheets can itself be matched with the control totals of the previous stage.

System Development & Operational Convenience

15.0 Sometimes ideal conditions for system development may not be attainable due to operational difficulties. A system, designed towards absolute optimum is likely to be more complex operationally, than otherwise. Optimum system generally results in the programming work and also multiplies the no. of tape for storing the results of intermediate stages of processing. In an optimum system design point of view this may set part of data which need not be sorted and for summaries may have to be put together before procedure wherein sorting of data is necessary. It requires more operational vigilance and storage tapes.

16.0 Compared to the volume of data, the summary record is generally smaller. The local level at which summary is generated. Generally, the population level and hence the summaries could be generated at these levels in the order in which the data may be stored in the tape file. Since the card file is received, summaries generated from the print are adequate. The automatic checking of the quality of the output is exercised by the use of printed order data. These are given in the specification of the program. However, these checking procedures are not adequate for ensuring the correctness of the processing. Hence, the control totals generated at regular intervals of computer processing may not be meaningful and powerful in detecting the malfunction of the computer due to several external factors. Thus, ensuring the quality of the end-results. Like control totals, checkpoints are not to be considered in this heavy, checkpointing. For the new output in the form of printed sheets can itself be matched with the control totals of the previous stage.

Review of System Design

17.0 It would be ideal if the entire work relating to System Development and Computer Programming could be completed much ahead of the start of processing the Population Data. The entire system then could be experimented against a fraction of the Population data for selecting the deficiencies. It is likely that the end-products received from such a system design may be critical to the user and he may suggest for changes in the specifications. Generally, the system design should be flexible upon the card to tape conversion, as edit and imputation rules may change due to various conditions of the Population data which might not have been visualized in the earlier specifications. Changes in the system design from the stage of processing master tape file are generally not to occur except in the circumstances when the system runs out of space. The planning for computer processing is highly desirable, as alterations, after the processing of data is complete, are almost impracticable. Manual adjustment of the final population tables produced from computer are not desirable and if these are attempted at any stage, it is better that the consistence of computer produced tables does not get disturbed.

Conclusions

18.0 Data Processing on Electronic computer can be compared to a telephone factory where all types of products are being produced, tested and assembled according to given specifications before actually the end product gets ready. So long the end-products viz., the telephones are not delivered for use, the entire process appears to be a big hoax. It is likely that the variations in the specifications at any stage may upset the entire system and instead of telephone production, it may add to confusion.

18.1 Data Processing on electronic computer follows the same principles as are needed for a telephone factory. The processing of the job has to proceed in the manner indicated in the system design. The instructions in regard to optimum run, accuracy of processing for the intermediary stages through interlinking process have to proceed in accordance with the rules framed in the system design.
APPENDIX 1

Population Enquiry Schedule

1. Identification Particulars
2. Name
3. Relationship to Head
4. Sex
5. Age
6. Marital Status
7. For currently married females only
   (i) Age at Marriage
   (ii) Any Child Born in the Last One Year
   (iii) Birth Order
8. For migrants only,
   (i) Place of Last Residence
   (ii) Whether Rural or Urban
   (iii) District
   (iv) State/Country
9. Duration of Residence at the Place of Enumeration
10. Level of Literacy
11. (i) Mother Tongue
    (ii) Subsidiary Language
12. Worker/Non-worker
13. If Worker, give details
    (i) Place of Work
    (ii) Nature of Industry
    (iii) Description of Work
    (iv) Class of Worker.
14. If Non-Worker, classify as
    (i) House hold duties
    (ii) Students
    (iii) Dependents
    (iv) Retired
    (v) Others

APPENDIX 2

A. Migrants Classified by Sex, Educational Level and Place of Last Residence

<table>
<thead>
<tr>
<th>Last Residence</th>
<th>Rural Urban</th>
<th>Total Migrants</th>
<th>Illiterate Literate Literate Without Educational Level</th>
<th>Primary</th>
<th>Middle</th>
<th>Matriculation or Equivalent</th>
<th>Graduate &amp; Others</th>
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</tbody>
</table>

Total Population

A. Born in India
   R
   U
   Un

I. Within the State of Enumeration
   R
   U
   Un

(a) Born in place of Enumeration
   R/u

(b) Born elsewhere in the district of Enumeration
   R
   U
   Un

(c) Born in other districts of the State
   R
   U
   Un

II. States in India beyond the State of Enumeration
   R
   U
   Un

   State
   1
   U
   Un

III. Countries outside India
   1
   2

IV. Unclassifiable
### Short Communications

**SYMPOSIUM ON**

**COMPUTERS IN DEVELOPMENT: HARDWARE AND APPLICATIONS**

**THE SYSTEM DESIGN FUNCTION: ANALOGY WITH ARCHITECT'S ROLE**

Mr. Chairman, Sir and members of this Symposium, I would like to emphasise in my statement the importance of the system design function for effectiveness and economy in the matching of computer capability to development oriented applications. This is best seen by analogy. When a hospital building is to be planned and then constructed, architects who design the buildings bear the responsibility for the buildings and all other related facts. His other sources of information are in the building industry and in structural engineering, interior decoration, acoustics, etc.

Next, through a series of iterations, the architect first sketches, and then details and models the buildings and other environmental factors he has designed as a solution to the problem. We may suggest modifications but, in general, as clients we are interested in getting fullest advantage of the architect's thinking. The architect may involve others, such as engineers and other professionals, who have an additional responsibility for the fullness of the design. It is the architect's responsibility to ensure that the end products are complete and cohesive, even when the architect is dealing with contractors and builders. Very seldom does a client invite a builder, the contractor, to design and plan as well as construct a better plan that may not be as good as a well-designed plan.

The point of any analogy must be clear by effects as well as man properties. Each possible priority application has ancillary prerequisites as well as the conditions that come easily to mind. We must understand that neither the clients, nor the suppliers, nor even an allocative agency in between, can be expected to do cost-effective system design. I do not wish to take the time to list what I know we all feel are the priority areas in which computers should be applied to aid in development-areas such as the logistics of food, fertilizer, fuel, steel and other essential raw materials; such as the management of public utilities and capital intensive industries such as foreign trade and revenue collection. Each of these areas requires professionally tailored, designed advertised computer systems. These design skills are expensive today. They will remain so for a long time. That is because they are not in demand! Let us look around this room at the various government departments represented here — the railways, the Post & Telegraphs, the meteorologists, the airlines, the planning commission, the ministry of finance — of which I am sure have commissioned a computer systems designer to draw up the plans for a computer investment?

In conclusion, let me say that rapid development will come only from effective collection and dissemination of information. For this reason, Computer systems hardware and software must be put together to achieve this. That will require more than the skills of the economist, the mathematician, the computer scientist or the specialist; it needs the overall view of the computer systems designer, what they sell in Europe, the information.
B. Occupational Classification by Sex of Persons at Work

<table>
<thead>
<tr>
<th>Division/Group/Family</th>
<th>Total Workers</th>
<th>Persons</th>
<th>Males</th>
<th>Females</th>
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<td>N.C.O.</td>
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<td>Family 000 of NCO</td>
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<td>Industrial Category</td>
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<td>IX</td>
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</tbody>
</table>

Family 001 of NCO

Industrial Category

| I | II | III | IV | V | VI | VII | VIII | IX |

Short Communications

SYMPOSIUM ON

COMPUTERS IN DEVELOPMENT: HARDWARE AND APPLICATIONS

THE SYSTEM DESIGN FUNCTION: ANALOGY WITH ARCHITECT’S ROLE

Mr. Chairman, Sir and members of this Symposium, I would like to emphasise in my statement the importance of the system design statement for effectiveness and economy in the function of computer capability to development matching of computer capability to development. This is best seen by oriented applications. When a client, a hospital, a telephone analogue, when a client, a hospital, a telephone analogy, when a client, a hospital, a telephone analogy, when a client, a hospital, a telephone analogy. We must understand that neither the clients, nor the suppliers, nor even an allocative agency in between, can be expected to do a cost-effective system design. I do not wish to take the time to list what I know we all feel are the priority areas in which computers should be applied to aid in development areas such as the logistics of food, fertilizer, fuel, steel and other essential raw materials, such as the management of public utilities and capital intensive industries such as foreign trade and revenue collection. Each of these areas requires professionally tailored, designed, and constructed, systems. These design skills are too scarce today. They will remain disarmingly scarce. That is because they are not in demand. Let us look around this room at the various government departments represented here — the railways, the P & T, the meteorologists, the airlines, the planning commission, the ministry of finance — which of them have commissioned a computer systems designer to draw up the plans for a computer investment?

Next, through a series of iterations, the architect first sketches, then details and then designs and other environmental models the buildings and other environmental models. The architect has designed as a solution to the problem. We may suggest modifications, but in general, as clients, we are interested in the final design. This is the network of the architect’s work, the final product. The client does not have to worry about the type of hospital building, the type of hospital building, or the type of hospital building, or the type of hospital building. All that is left to the architect is to design and construct a facility any larger than a cowshed.

The point of any analogy must be clear. Computer capability is not a homogeneous mass to be served up in spoonfuls. Each piece of hardware and software has side effects as well as many properties. Each possible priority application has ancillary prerequisites as well as the conditions that come easily to mind. We must understand that neither the clients, nor the suppliers, nor even an allocative agency in between, can be expected to do a cost-effective system design. I do not wish to take the time to list what I know we all feel are the priority areas in which computers should be applied to aid in development areas such as the logistics of food, fertilizer, fuel, steel and other essential raw materials, such as the management of public utilities and capital intensive industries such as foreign trade and revenue collection. Each of these areas requires professionally tailored, designed, and constructed, systems. These design skills are too scarce today. They will remain disarmingly scarce. That is because they are not in demand.

In conclusion, let me say that rapid development will come only from effective collection, collation, analysis and presentation of information for use by decision makers. Computer systems and hardware and software must be put together to achieve this. That will require more than the skills of the economist, the mathematician, the computer scientist or the salesman; it needs the two-sided view point of the computer systems designer, who can see the computer systems designer, what they all in Europe, the information.

J.K. Krishnamurthy
Training & Career

ANDHRA RECOGNISES CSI

Andhra Government has agreed to consult CSI before giving recognition to Courses.

CSI CONVENTION

We regret the delay of the November issue of newsletter. Convention papers may be sent even after the cut-off dates.

Personalia

Dr. Narsingh Deo had been appointed as the new Head of the Computer Centre, IIT Kanpur.

Dr. Janardan G. Negi, Head of Theoretical Geophysics and In-charge of Computer Co-ordination Group at the National Geophysical Research Institute, Hyderabad 500007, has been awarded the KRISHNAN MEDAL of the Indian Geophysical Union for the year 1973. The award is given to him in connection with his outstanding contributions in the field of Theoretical Geophysics, more particularly in Geoelectromagnetism.

Dr. Negi is member of the

1. International Geodynamics Project’s Working Group on Physical Processes in the Earth’s Interior, and

2. Consulting Editorial Board of European PHYSICS.

Literature Window

[These articles have been published in journals available in Libraries especially in Nat Sci Lib, Jawaharlal Nehru University, Campus, New Mehrauli Road, New Delhi, photocopies may be obtained on payment from INSDOC, Hiltide Road, New Delhi-110012].

GENERAL


Users will be losers with IBM fracture. Infosystems 1973, 20(4), 50-1.

PATTERN RECOGNITION


TECHNIQUES


HARDWARE


PROGRAMMING


DATA STORAGE


INPUT/OUTPUT


DATA TRANSMISSION

SPECIFIC DIGITAL COMPUTERS


APPLICATIONS

Business


Education


Information Retrieval


ROMBERG B W : Data bases: there really is a better way to manage your files. Infosystems 1973, 20(5), 56-8.

Legal Profession


Medical Science


Music


Physics


Printed at Printograph, Karol Bagh, New Delhi 110005.