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AUTOMATED MANAGEMENT INFORMATION SYSTEMS--AN ASSESSMENT

A Report

to

The Ministry of Science, Technology and Environment

prepared by

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EXECUTIVE SUMMARY

From August 21 through 31, 1984, Mr. Darryl N. Pedersen from Thunder and Associates, Inc., of Alexandria, Virginia, USA, visited Jamaica under contract to AID (the Agency for International Development) to assist the Ministry of Science, Technology and Environment (MSTE). His task was to determine MSTE's needs for automating its management information system in consort with the management information systems of the other agencies affiliated with the Ministry.

A survey was conducted of the information management needs of the various agencies involved, as well as the current status of the use of computers in those agencies.

It was found that the greatest need in all agencies is to increase the capability to organize and analyze the vast amounts of data generated, thus providing for timely access to information vital to the function of each agency. None of the agencies possess this capability at present. On the other hand, it was found that in the National Computer Center, the Statistical Institute of Jamaica, and the Ministry of Agriculture, large, "mainframe" computers have been installed with sufficient excess capacity to meet most of the needs of the other agencies.

It was concluded by this consultant that with little additional investment, the needs of the groups surveyed could easily be met.

Specifically, it is recommended that each agency with substantial technical data to handle be provided with small, inexpensive, expandable microcomputers with printers, and simple, off-the-shelf, user-friendly software programs to better meet the needs (a) that most agencies have in common, including word processing, accounting, data base management, and simple spreadsheet analysis, and (b) that are unique needs to each individual agency. Thus, all groups should be equipped with microcomputers (including floppy disk drives, monitors and printers) and a common set of software programs, while other groups should also be equipped with telephone modems (for linking the computers to other computers) and special devices, such as a plotters (for producing graphs). When greater capacity is required, rather than replacing the equipment with larger more expensive equipment, these same microcomputers can be linked by telephone to the larger mainframes at little additional cost, by attaching telephone modems with communications programs.

Given the fact that large investments have already been made in mainframe computers that these smaller microcomputers can access, and that the alternative solution to the problem of organizing data would be very expensive (i.e., increasing significantly the number of personnel in each agency), the installation of these inexpensive microcomputers would provide the most cost-effective solution to the problem.

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Selecting systems which are compatible with one another and with the larger systems already installed is also recommended, since it will reduce training costs (people will need to learn to operate only one system), and, equally important, the information generated by one agency in the government can be easily accessed and used by other government agencies as well.

Finally, it is recommended that funds for initial training, on-going support, maintenance and repair of the equipment, and telecommunications and data base subscription fees be included in the budget from the beginning.

The next step will be to be to prepare an installation and training schedule, based on a determination of needs and priorities, together with a budget adequate for undertaking this important effort. The emphasis in Phase 1 of the implementation schedule should be on organizing already existing data necessary for carrying out current functions, and supplementing this information with data and information inside and outside the country, such as NTIS in the U.S. and INFOTERRA in Kenya.

The result: More timely and accurate information that will contribute to better decision-making, better utilization of scarce resources, increased efficiency and effectiveness, and increased productivity at all levels in the government--all of which are essential if Jamaica is meet the development goals it has set for itself.

INTRODUCTION

The purpose of this consultancy was "to survey computer systems in use in the various agencies affiliated with MSTE, such as SRC, NRCD, BOS, etc., and also to survey the availability of computers and support systems locally. The consultant will also analyze computer systems for software compatibility, peripheral compatibility and storage size, among other things. The objective of this survey is to:

- a) "determine the most suitable system or network for the Ministry of Science, Technology and Environment for the several applications;
- b) "determine how computer systems can be applied to manual functions for enhancing work efficiency and manpower reduction, in the various agencies;
- c) "recommend structure of computer system(s)--whether central or distributed processing--and communications requirements for networking;
- d) "determine applications in the Ministry and its agencies which are to be computerized, including -

- General Accounting Systems
- Personnel Systems
- Record Keeping and Filing Systems
- Word Processing Systems
- Scientific Systems - Statistical Analysis

- Models
- Graphics
- etc.

- e) "Provide guidelines for a technical information management system, which will be part of a national network and also of the US National Technical Information Service, and possibly other international networks.

SURVEY RESULTS . 4

Findings

Survey of present computer use in twenty nine institutions (public and private) including the NRCD, SRC and BOS, and analysis of the findings revealed the following:

1. The National Computer Center, the Ministry of Agriculture, The Statistical Institute of Jamaica have large, mainframe computers. Most of the other systems in use are small microcomputers.
2. The large, government systems are IBM. The National Computer Center has an IBM 4341, the Statistical Institute of Jamaica has an IBM 38, and the Ministry of Agriculture will also have an IBM 38 by the end of this year.
3. With the exception of several IBM microcomputers, few of the small systems currently in use are compatible with one another, or upwardly compatible with the larger IBMs. On the other hand, the large systems are compatible with one another.
4. The large IBMs have been installed with excess capacity--intentionally, so that they can be used by many different agencies, not just the institution in which they are located. Nevertheless, none of the other agencies surveyed is taking advantage of this excess capacity at present.
5. Most systems, both large and small, are underutilized. In the case of the small systems, underutilization occurs for the following reasons:
 - Few people have been trained or given the opportunity to use them.
 - Some small systems have required minor repairs, but the money for repairs has not been available.
 - The assistance required to design--on paper first--the structure of the data bases that will be computerized has not been provided.
6. In addition to the need to organize and analyze large amounts of data, greater efficiency in the three administrative areas common to all agencies (personnel, accounts and office management) can be achieved with the installation of microcomputers.
7. There has been a disproportionately high investment in large systems (mainframes and minis) and, conversely, a disproportionately low investment in small systems (microcomputers). The latter can meet most of the needs of most agencies, and also be linked to the large systems when the limits of their

capacity is reached.

8. Good technical support, including repair facilities and spare parts, is available commercially in Kingston for several systems (IBM, NCR, ICL, Burroughs), and from the National Computer Center.

Conclusions

1. Jamaica already has an impressive, state-of-the-art capacity for managing large amounts of data. The investment has already been made. To the extent to which that capacity remains underutilized, the return on the investment will not be fully realized.
2. Given this situation, there is no present need for additional large-scale investment, nor should there be for several years. But there is a critical need for small investments in microcomputers to more fully take advantage of, and complement the resources already in place.

GENERAL GUIDELINES

1. Only microcomputers should be considered, since larger systems already exist within the government. Most work can be performed as easily on a microcomputer as on the larger, more costly mini or mainframe computers. Since the government has already made a considerable investment in large systems, the microcomputer should be the system of choice. When greater power, speed or memory is required, the microcomputer can be used to access the larger computers at the NCC, the Ministry of Agriculture and the Statistical Institute of Jamaica. The microcomputer can be connected to these larger systems over the phone by using simple, inexpensive modems and communications software. Once connected, all of the power, speed and memory of the larger computer is available to the microcomputer.
2. New installations should be expandable. A "minimum" system should consist of a CPU, two double-sided, double-density 5 1/4 inch drives, a monitor, cables and a printer, plus a minimum set of software programs including: a word processing program, such as WordStar; a simple, upwardly expandable data base management program, such as Friday (which is upwardly expandable to dBase II, dBase III--also available on the microcomputer--and whose data files are upwardly compatible with data files on the IBM 4341 at the NCC; and a spreadsheet program, such as Multiplan.
3. New systems should be compatible with other small systems in use, and with the larger systems already in place. Since the NCC already has an IBM 4341, the Ministry of Agriculture will be installing an IBM 38 before the end of the year, and Statistical Institute of Jamaica already has an IBM 38, the smaller systems should be IBM or IBM-compatible.
4. The microcomputers should be able to communicate with each other, with microcomputers in other agencies or at geographical locations within the same agency, with the already installed IBMs in the institutions listed above, and with data bases in other countries in the Caribbean and around the world, such as the National Technical Information Service and Dialog in the United States, and INFOTERRA in Kenya.

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RECOMMENDATIONS

1. Small, compatible systems should be provided to each agency. They should be small because (a) they are capable of handling most needs, (b) they can be linked to one other, (c) they can be linked to the already installed larger systems, (d) they are easy to use, and (e) they are inexpensive.

A "small system" will fall within a range from a computer (CPU) with 128k of RAM (random access memory), two 5 1/4 inch floppy disk drives, a monitor, and a printer, to a computer (CPU) with 256k of RAM, one 5 1/4 inch floppy disk drive and one 10 megabyte hard disk drive, a printer, a monitor, a plotter, and a modem.

2. With one possible exception "off-the-shelf" software programs which are readily available commercially should be used; there should be no need for developing expensive, custom-made programs. Each agency should be provided with a set of software programs such as: WordStar, for word processing; Friday, for data base management; and MultiPlan, for simple statistical and spreadsheet analysis.

The possible exception is for a program for government accounting. Someone intimately familiar with the government accounting system, at the Ministry/Agency level, should be sent to Washington, D.C. where they can look at all of the off-the-shelf accounting programs available for microcomputers. If one of these programs can be used by each of the agencies, that program should be selected and included in the basic set of software described above. If not, a program will need to be written.

To that end, a person knowledgeable about government accounting should be sent to Washington, D.C. to survey the commercially available accounting software programs to determine if one already exists that can meet the needs of the agencies. If none such program exists, a custom program should be written. Washington, D.C., is recommended because there is a facility there where all commercially available software programs for microcomputers can be reviewed.

The basic set of software programs mentioned above has been recommended, in part, because it is easy to use. As many people should be trained to use it as possible, since this will increase their productivity as well. Since the same set of software is recommended for all of the agencies, moving personnel from one agency to another will not be a problem.

3. Everyone should be trained to use the minimum set of programs recommended above.

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4. The telephone system should be used to link the microcomputers to one another, to the mainframes, to computers located outside Kingston, outside Jamaica, or outside the Caribbean. The Jamaica Telephone Company should be encouraged to make Telenet, Uninet, TYMNET, or some similar system available in Jamaica (and perhaps throughout the Caribbean). This will provide subscribers in Jamaica with direct access to many of the major data bases throughout the world, (eg., NTIS, Dialog, and INFOTERRA) without the additional expense of a long distance call.
5. An office of Automated Information Management Support should be established within the Ministry. This office would provide the initial training and on-going technical support required to establish and operate the microcomputers, including how to design and structure data bases.
6. A Technical Information Clearinghouse on science, technology and the environment should also be established. Among its functions, the Clearinghouse would maintain a list of all ST&E data bases in operation throughout the government.

In general, data bases should be operated by the agency that need them most, not by some other agency. They are also in the best position to determine what their needs are. Nevertheless, they should be provided with the means (telephone modems and communications software) to access the data bases maintained by other, related groups.

On the other hand, several data bases should be automated centrally for the use of everyone. Among those that should be considered:

- o A data base on R&D projects undertaken throughout the government. A survey should be conducted and updated annually of science and technology research institutions engaged in research and development work. As a basis for this study, the survey published in 1974 should be used.
- o A data base on equipment appropriate to R&D activities, its location, and its repair status.
- o A data base on technical information (journals and other published works) available in libraries throughout Jamaica.
- o A data base of people currently engaged in R&D and/or qualified to participate in R&D efforts should be developed and maintained. (This example provides an illustration of the desirability of linking microcomputers together. The JNIP, with its own microcomputer and modem, could access this data base directly when it needed to respond to a potential investor's request regarding, for example, the number of electrical en-

gineers in Jamaica. There are many other examples.)

7. Funds for training, technical support, repair and maintenance should be included in the budget, in addition to capital investment items for acquisition and installation of the systems recommended.
8. Donors should be encouraged to provide systems that are compatible with systems already in use.