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**EVALUATION REPORT
COMPONENT 5: MANAGEMENT
INFORMATION SYSTEM
PROJECT 522-0167
April 1986**

This report was prepared under Contract No. PDC-1406-I-00-4052-00, W.O. #80 between the United States Agency for International Development, Tegucigalpa, Honduras and the Academy for Educational Development.

Academy for Educational Development

AED
International Division

Twenty-five Years of Service: 1961-1986

May 24, 1986

Mr. Henry Reynolds
Office of Human Resources Development
U.S. Agency for International Development
American Embassy
Tegucigalpa, Honduras

Dear Mr. Reynolds:

The enclosed report is in fulfillment of the conditions of our Contract No. PDC-1406-I-00-4052-00, W.O. No. 80 for Project No. 522-0167. The report deals with an evaluation of the Management Information System, Component Five for the Ministry of Education, Honduras. In the report, combining the results of two on-site visits as well as research, background work and consultation in Washington and several other sites, we have attempted to present a balanced picture of the current progress and opportunities for the Ministry of Education computerization effort.

The report itself contains a four page Executive Summary which highlights the major elements of our findings, conclusions, and recommendations; and then a section document following including sections A through F. Appended to the document as Appendix A, and an integral part of the recommendation sections, is a supplementary conclusions and recommendation section which provides additional detail on managerial options for the project, software recommendations related to database implementation, and our recommendations after consultation with USAID/IRM on potential hardware configurations. While some details contained in Appendix A may change depending on the exact timing of the next phase of this project, the general outlines in terms of capacity, computer architecture, and implementation strategy will remain the same for at least the next two years. As noted in the Appendix section, Washington USAID/IRM personnel have indicated both interest and concurrence with the recommendations that we have made and have encouraged Mission personnel on appropriate areas to maintain contact with them.

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Mr. Henry Reynolds
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We at the Academy, including Mr. Bruce Newman and myself, have enjoyed very much our associations with the Mission and with this entire project. We trust the report aids the Mission in some very important decisions about future activities and that if any of the Mission personnel have a question on our conclusions or recommendations they feel free to call us.

Sincerely,



Kurt D. Moses, Director
Systems Services Division

Enclosure

EXECUTIVE SUMMARY

Evaluation Management Information System Component
Project 522-0167
18-22 March and 13-23 April, 1986

Background

Project 522-0167 ("Rural Primary Education Project") was authorized on 8 July, 1980 and amended on 28 July, 1983 to include an additional component, the second phase of the institutionalization of a computer based management information system (MIS) in the Ministry of Education (MOE) of Honduras. Earlier support, including the purchase of a WANG VS-80 computer system and the hiring of systems analysts and programmers, had been provided under an earlier Project (522-0119). The follow-on activities supported under the Project amendment were to fulfill four objectives:

1. Define the role of the MIS in the context of overall MOE operations.
2. Establish and leave operational a Management Information Systems Department in the MOE.
3. Continue to support and enhance subsystems already developed.
4. Carry out feasibility studies for priority subsystems.

Although the Project was scheduled to be completed in April, 1985, an extension was obtained with no change in funding level.

Results

Due perhaps to a combination of factors (MOE personnel turnover, the failure of the component in providing the MIS Advisor, etc.), the conceptualization of the MIS appears to have progressed little since the Amendment was written. The high-level acceptance of the MIS has also suffered from these constraints. In the absence of such acceptance, the Information Systems Department should have developed a plan for integrating subsystems over time in order to avoid haphazard and incompatible applications development. This has not occurred, and development activities have been subject to changing leadership, priorities and overall orientation.

Certain MIS management tools and documents (data element dictionaries, data collection plans, policy and procedures manuals, data review procedures, and forms control) were to be developed during Phase II. These tools have yet to be formally developed at a technical level sufficient to support the orderly

implementation of the MIS. Moreover, basic documentation of subsystems and applications was found to be, at the time of the evaluation, inadequate for most applications, and will likely lead to maintenance problems in the future. It should be noted, however, that the technical assistance team expected to complete documentation before their contracts expired.

The formal establishment of the Information Systems Department encountered certain difficulties, deriving mainly from the attempt to incorporate existing units, including the Statistics Department of the General Directorate for Planning and Educational Reform (DIGEPRE), into a new unit at the department level and depending directly from the Vice-Minister for Technical Affairs. This approach did not work out, and a new designation, the Information System, was created as a budgeted activity within DIGEPRE. The Automated Data Processing unit was created and assigned six permanent staff positions, and a Coordinator for the Information System provided for. The proposed Advanced Analysis Unit has not yet been created. Another difficulty is that the Coordinator and Data Processing Unit head positions are subject to instability because they are "cargos de confianza", or filled by the Minister under non-civil service conditions. Finally, the MOE's own lack of organizational clarity has caused problems in placing the MIS within the institutional structure.

Training of MOE personnel was considered in the Amendment to be key to the overall success of the Component. Repeated changes in higher level personnel have limited the impact of training and particularly visits to other educational MIS sites. Planned internships were not conducted, presumably for the same reason. Local training received considerable attention, although principally in programming and word processing topics. The programming courses were primarily focused at the Data Processing Unit staff. Insufficient training activities were provided for the Research and Statistics units in areas in which their skills need strengthening.

Under the current Coordinator, the organization and administration of the Information Systems Department has improved considerably. Additional technical support and training is required to enhance MIS guidance and management.

The principal subsystem which had been developed at the time of the Amendment was the Educational Statistics Subsystem, which was seen as a central element in the development of the MOE's MIS. Support was envisioned in the Amendment in order to rationalize data collection forms, data flow procedures, improve the timeliness of presentation of results, and develop subsidiary applications. Specific actions were taken, during the period financed by the Project Amendment, to improve efficiency at the machine level, to provide a more user-friendly, interactive interface to the data, and to revise data collection forms.

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Data collection forms have improved somewhat, although they still are cumbersome spreadsheets, for the most part, which require considerable effort for school directors to fill out. In addition, the relatively poor response rate from private schools, particularly in secondary, suggests that a separate orientation might be required for the private sector. More importantly, the data collection effort is redundant in the sense that data flow within the MOE for internal purposes which could and should feed the statistics system. Information is also repetitively collected, with the computer providing little more than "Adressograph" services of printing the school name, number and address on costly pre-printed forms.

The use of the data for policy setting or daily operational decisions is limited by the fact that the data are never less than a year old when published. An on-line information base, fed by routine information collecting activities of the MOE, could help to maintain more current data, and thus increase the use of the data. This is critical if, in fact, this subsystem is to be central to the MIS.

Substantial improvements have been noted in the turn-around time for publishing the Statistical Yearbook using the computerized system. At the same time, however, no major efforts have been taken to analyze the available data in ways more sophisticated than the Yearbook. Technical assistance, and applied research and statistics training, should be provided to the Statistics Department in the future.

A fair amount of systems development activity took place during the last few years. Some of the systems were not particularly well conceived (Institutions and Courses of Study, Educational Executive Menu, Secondary Student Registration), while others (particularly the Teacher Payroll System) suffered from political difficulties. The MOE budget system is being used on a regular basis, and new efforts have been made in the administrative area. None of the systems developed interface with one another directly, and this serious defect for MIS development probably is due to the lack of an overall technical conceptualization of the MIS or, at least, a detailed technical plan for MIS development. Without such a plan, human and machine resources will not be efficiently used.

The Human Resources Subsystem, currently under development, will require additional support both from outside technical assistance as well as from higher levels of the MOE. Given the overwhelming proportion of the MOE budget spent on personnel, this subsystem is critical to the enhancement of MOE efficiency in the future.

Recommendations

USAID and MOE should devise a follow-on project to capitalize achievements to date and redirect development efforts

for the future. Outside technical assistance will continue to be required, and should include assistance to user units as well as the data processing staff. Assistance to user units should be in their area of specialization rather than machine-oriented training courses.

An overall plan for the integration of existing and future subsystems into the MIS must be developed as soon as possible. The data management tools originally suggested in the Amendment should be implemented without delay, and as an integral part of the plan.

Additional support to other MOE units will require additional hardware acquisition, particularly with respect to main memory and peripheral devices. Disc usage should be carefully reviewed, but an additional large disc unit should probably be obtained. Peripherals (terminals and printers) should be distributed to user units. The current operation is unnecessarily centralized and is inconvenient for most user tasks. Adequate training in applied research methodologies and statistical analysis should be provided to the Research and Statistics units in order to enhance their utility and function within the Information System, or, alternatively, the functions of the Information System should be reviewed so as to place those units in a user mode, as any other unit of the MOE. The hoped-for integration of the units has not occurred as yet, and the administrative load and placement of the System within DIGEPRE is now leading to a less technical role for the Coordinator of the System. Direct technical assistance participation is recommended for the two units in the carrying out of research and analysis projects of a more professional level than that which has characterized such efforts to date.

In order to assist the integration of subsystems and to facilitate system development and maintenance, some form of data management software should be acquired. Any such software will require proper training of the MOE data processing staff, and outside design leadership will be required for at least the near future. System development may also be contracted to outside software developers as an alternative to in-house development.

In sum, efforts to date have suffered from insufficient planning and coordination due to a number of factors. Any future efforts should capitalize on the experience gained in the past few years by both the MOE and USAID staff. Detailed technical planning is now required in order to assure orderly MIS development, and more modest modules should be identified so as to have smaller projects implemented in a broader set of MOE user units. This strategy should reduce both technical and political risks, and provide more manageable units and greater system development training to MOE counterparts generally.

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A. INTRODUCTION

The present document is the product of Contract No. PDC-1406-I-00-4052-00 between the Academy for Educational Development, Inc. (AED) and the United States Agency for International Development (USAID). AED assigned Mr. Bruce Newman to conduct evaluation activities in Honduras in order to review the Management Information System (MIS) component of Project 522-0167, and to make recommendations to USAID regarding the nature and extent of support it might provide to assist future development of the MIS. The Project counterpart is the Honduran (GOH) Ministry of Public Education (MOE). Mr. Kurt Moses, AED's Director of Systems Services, is separately undertaking a review of available Data Base Management Systems (DBMS) which may be implemented on the MOE's WANG equipment.

A.1 PURPOSE

The primary purpose of this document is to inform USAID of the results of the evaluation activities undertaken during 18-22 March and 14-23 April, 1986. As a general basis for evaluation, the sub-goal and project outputs defined in the Project Authorization Amendment No. 1, dated 28 July, 1983, have been used as measures against which the MIS component's achievements may be compared.

The Amendment funded a second phase in the institutionalization of the MIS through the provision of technical assistance, local and foreign training activities, and hardware and software purchases in order to accomplish four major objectives:

- a. Define the role of the MIS in the context of overall MOE operations.
- b. Establish and leave operational a Management Information Systems Department in the MOE.
- c. Continue to support and enhance subsystems already developed.
- d. Carry out feasibility studies for priority subsystems.

The evaluator was also requested to suggest alternatives for future support of the MOE's MIS.

A.2 METHODOLOGY

In the course of the evaluation, the following activities were employed:

- a. Interviews with principal project personnel in USAID/Honduras.
- b. Review of available project documents and products available in USAID/H.
- c. Interviews with MOE counterparts involved with the MIS.
- d. Review of subsystem design, implementation and documentation in the MOE.
- e. Review of data collection instruments used in the Educational Statistics subsystem.

Due to recent changes in MOE personnel at virtually all higher levels, as well as staff changes within the MIS, much useful information on the evolution of the MIS could not be obtained except by inference from available documentation or from continuing Project personnel. In a similar manner, this altered the environment in which to observe current use of the MIS in the MOE. The evaluator attempted to use other means of determining system use and functionality.

The terms of reference had originally included carrying out two visits outside of Tegucigalpa to MOE departmental offices and primary and secondary schools in order to review the functioning of the Educational Statistics data collection system. In consultation with USAID Project Officers, however, it was decided that the time reserved for these trips could be more usefully applied to a critical review of the data collection instruments. Part of this decision was based upon the recent completion of a field study of problems in the data collection system and the testing of new versions of the instruments.

A.3 REPORT ORGANIZATION

This document contains three major sections:

- a. Review of project outputs
- b. Other project achievements
- c. Conclusions and recommendations

A.4 ACKNOWLEDGEMENTS

Guidance, support and cooperation were kindly received from all personnel involved in the Project, both at the MOE and USAID/Honduras. Special mention is due to Cristóbal Rodríguez, Coordinator of MIS, Francisco Aguilera, Chief of Automated Data

Processing, and Gerardo Paz, Systems Analyst, all of the MOE. On behalf of USAID/Honduras, Henry Reynolds and Richard Martin, HRD/E, and Luis Coronado, Marco Tulio Mejia, and Fredy Flores, HRD, were individually and collectively of much assistance in providing documentation and orientation throughout the period spent in Honduras.

B. BACKGROUND

Efforts at introducing mechanization of MOE activities date to late 1976 when training was provided to nine primary school teachers in descriptive statistics and basic research and evaluation methodology, supported by the Non-formal Education Project (USAID Project 522-0108). Eight of these individuals were graduated as Technicians in Research and Evaluation, and a Research Unit was formally created within the General Directorate of Planning and Educational Reform of the MOE, where the graduates were incorporated under newly-created direct hire positions. Several of the new technicians gained proficiency in the use of the Statistical Package for the Social Sciences (SPSS), which was installed on the Ministry of Finance central computer.

As part of the Rural Education Project (522-0119), the need for a management system became more apparent in order to evaluate the project's other components. Hazy definition of the objectives of the Information/Evaluation component, plus internal changes within the MOE, did not permit much success. An interim evaluation, moreover, suggested that the scope of the component be expanded to include MOE activities, not just those related with the Rural Education Project.

Thus, in March, 1981, a study was undertaken to provide a conceptual framework for a computerized information system for the MOE. The consultant recommended the creation of a MIS department within the MOE and the purchase of a computer system with unused project funds. A WANG VS-80 system was purchased in September, 1981 and installed in January, 1982. Three PSC's were issued out of PD&S funds for an Information Systems Specialist, a Systems Analyst, and a Programmer in preparation for the new system.

From January, 1982, until February, 1983, the system was tested and configured, software was installed, potential users of the system were identified, MOE officials informed regarding the capabilities of the system, and training of staff and users begun. Two subsystems were developed: Educational Statistics (including data for 1981 and 1982) and a direct conversion of the RPG-language teacher payroll system from a rented IBM/3 system to the new WANG equipment. Importantly, The Department of Information was created within the General Directorate of

Planning and Educational Reform (DIGEPRE), and a Coordinator for the Department designated in August, 1982.

In February, 1983, an outside evaluation was conducted of the system. The evaluation consultant felt that the activities thus far had been successful, stressing the long term nature of MIS development and the clear need for continued USAID support of technical assistance and training activities. The evaluation report also stressed the need to expand MIS services to include support for MOE administration and management, in addition to being a research/evaluation tool. The need to support all MOE activities led the consultant to suggest the need to place the MIS at a level above or outside of the MOE's directorate structure, in order to avoid it falling into problems due to its inter-directorate rivalries or other political problems.

The Rural Primary Education Project (522-0167), which was authorized on 8 July, 1980, was amended in July of 1983 to provide support for the institutionalization of the MOE's MIS. The amendment reflected both the evaluation consultant's conclusions as well as the experience gained by the PSC staff. It was clear to both USAID and MOE officials that the development of a true MIS would be an effort that would easily take 5-7 years to complete, and thus the development effort should be conducted in stages. The stage chosen for the current project was called Phase II of the institutionalization of the MIS, would have an estimated duration of 18 months, and a total cost of \$ 842,000 (USAID: \$ 737,00; GOH: \$ 105,000). USAID funding was to cover the cost of technical assistance, additional computer hardware and software purchases, and foreign training activities. The component was extended with available project funds into 1986. The current evaluation is both to evaluate activities funded under the Amendment and to suggest the need and type of support required for continued development of the MIS.

C. EXPECTED PROJECT OUTPUTS

C.1 CONCEPTUALIZATION OF THE MIS

This activity dates from a report ("Propuesta Analitica para la Creación de un Sistema de Informática en el Ministerio de Educación de Honduras") produced in April, 1981 under a USAID-funded PSC. This document examined the flow and volume of information within the MOE, the institutional structures involved, and requirements and use of the resulting data. The report concluded that:

1. An Information Department be created with the MOE which would centralize information generated by all MOE units.

2. A centralized data bank be created for the MOE in general and for each data generating unit within the MOE.
3. Training of MOE personnel be conducted in the management and use of the information.
4. A computer system be purchased by the MOE in order to replace existing equipment in the Escalafón (Teacher Payroll Office) and services obtained through the National Information Center computer.
5. The Escalafón system be incorporated into the new Information Department and use the new computer system.

A year later, now equipped with a new computer system, a working document ("Sistema de Informática: Aspectos Generales de Gestación, Organización, Actividades y Requerimientos") was prepared which projected ideas regarding the users, organizational structure and rationale of the system, and activity plan for the short, medium and long term. Short term activities were strongly oriented towards producing educational statistics and training of personnel. The goal of integrating the different units of the system, both in a technical and bureaucratic sense, was included among short-term activities, as was the design of a study to incorporate the Escalafón system into the projected Information Department. The medium term activities would revise data collection instruments, bring the backlog of educational statistics up to date, finish training of personnel and introduce word processing throughout the upper levels of the MOE.

The critical elements of the conceptualization of the information system included the integration of research, statistics, data processing and advanced analysis units. This represented an attempt to avoid the traditional isolation of a stand-alone data processing department. Fundamental to the conceptualization was the reduction of barriers between the users of the system and the operators of the computer equipment. Thus, training was planned for personnel from all units comprising the system, and the operation of corresponding subsystems (data entry and maintenance, consultation, and output requests) would be conducted directly by the responsible unit. The new advanced analysis unit would provide analytical interpretation of data ~~per se~~, and act as a direct link to the formulation of educational strategies and policy development.

An evaluation report on the management information component of Project 522-0119 prepared in February, 1983 by AED reviewed the progress of the information system. Noting that, in general, the activity had been successful, several concerns were expressed

regarding the longer-term integration of the system into the MOE. For example, it was observed that, "until now, the MEP (MOE) has not been able to identify in totality what type of information is needed and which format is best to support operational decision-making (on a daily basis) or policy setting (long range)". Also, the concern was expressed that the placement of the information system with the General Directorate for Planning and Educational Reform could lead to conflicts of interests which potentially could limit the efficient provision of services to other MOE units. Among the consultant's recommendations were the need to clearly distinguish between the MOE's information system's objectives and those of a specific project. Thus, the information system would attend to the needs of, for example, four levels: educational institutions, departmental supervisions, General Directorates, and central level policy-makers (Minister, Vice-Ministers and the Technical Council).

Given the dangers and drawbacks of independent development of new subsystems, the consultant underscored the importance of arriving at a complete and detailed conceptualization of the MIS prior to the implementation of additional subsystems.

These concerns were clearly formalized in the Project Paper Amendment authorized in July, 1983. A preliminary conceptualization of the MIS, based upon the model used by the Florida State Department of Education, was presented as "an organized process of identifying information needs, collecting and processing data, and providing information for decision making". The educational information hierarchy (classroom, school, municipal, departmental and ministerial) of the MOE was seen as heavily burdensome on the lower levels, requiring the elimination of redundant data collection and the improvement of data management tools. It was suggested that a MIS plan for the MOE should first address the higher levels of data generation and use, but include long term strategies for dealing with information flow and information needs at the school level.

Most importantly, attention was drawn to need for the integrated development of the subsystems comprising the MIS. The design of each subsystem of the MIS would include careful attention to interfacing requirements: the ability of each subsystem to directly contribute information to and receive information from all other subsystems. The MOE's MIS was envisioned to eventually include six major subsystems: Educational statistics, Human resources management, Finance, Curriculum, Facilities, and Students. Feasibility studies were indicated as an essential step in all subsystems development work in order to properly manage the evolution of the MIS.

The Amendment identified four sub-activities necessary to achieve the foregoing:

1. Finalization of the MIS conceptual plan and obtaining approval from both USAID and the MOE.
2. Arriving at an organizational definition for the MIS and reassigning the Information Systems Department to the appropriate level within the MOE hierarchy.
3. Orienting key MOE personnel to the MIS conceptual plan.
4. Development of management tools and document which support the MIS concept.

It is important to note, at this point, that the Amendment had included the provision of 15 months of technical assistance from a MIS Advisor. This position was not filled as anticipated, and thus placed a greater, and perhaps inappropriate, burden upon the General Advisor and the Senior Systems Analyst.

The MIS conceptual plan would not, based upon documentation the current evaluation consultant was able to review, have formally progressed much from that contained in the 1983 Amendment. Clearly, however, discussions were carried out at upper levels of the MOE. In 1983, the Vice-Minister for Technical Affairs, the Coordinator of the MIS, and the heads of both the Data Processing and Statistics units visited educational MIS sites in Chile, Colombia, Paraguay and Florida, U.S.A. In 1984, the MIS Coordinator and Data Processing unit head visited educational MIS sites in Florida, Michigan, New Mexico, Ohio and Texas.

A document was prepared by the General Advisor in March, 1984 ("Manual de Organización y Procedimientos del Departamento/Sistema de Informática"). This document contains a discussion of the "system" vs "department" issue, reviews the evolution of the MOE's information system, and a rather theoretical presentation of the conceptualization of the system, more, it would seem, to establish its technical basis and service function within the MOE than to clarify its own direction. The document also details the structure and functions of the units of the system, service request procedures, system hardware configuration, software availability, and briefly describes several of the existing subsystems. It is not a MIS plan as conceptualized in the Amendment.

Political instability at the upper levels of the MOE during this period clearly inhibited progress towards gaining acceptance of a MIS plan. At the same time, the lack of the MIS Advisor probably was critical to the failure to formally develop the MIS plan. It must be understood that the MIS plan is, in essence, a

plan to reorganize the functioning of many of the MOE's structural units--this is a major undertaking in a highly volatile and politicized ministry. This fact is more critical given the position of the MIS within one of the General Directorates of the MOE. It is likely that an MOE-level MIS plan will be difficult to implement until the need is felt for a coordinated development of the information resource at the General Directorate level throughout the MOE.

In the absence of a politically acceptable MIS plan at the MOE level, it would seem appropriate to assure that MIS development continue to gain implicit acceptance through the provision of information systems services to MOE units, but clearly guided by long range planning so as to insure proper integration of subsystems over time. The upper-level management problems of the MOE may be such that effective management participation in MIS development cannot be achieved at this time. On the other hand, there would appear to be good potential for gradually mechanizing, as part of the MIS, sufficient functions throughout the MOE to achieve the desired data integration.

The organizational definition of the MIS and the location of the Information System Department within the MOE is discussed below.

The orientation of MOE personnel to the MIS concept has received considerable attention during Phase II of the project. As mentioned earlier, MIS site visits were made by the Vice-Minister for Technical Affairs and information system staff. At the upper levels of the MOE, unfortunately, constant changes in key officials has largely erased any gains in understanding and acceptance which were made. Under the current Coordinator of the MIS, however, lower (operational) levels have been pursued through training activities, even if no more advanced than the word processing courses. In a sense, this is perhaps the most direct way of increasing MOE awareness of the existence of the MIS and preparing for the development of subsystems outside of the information system group. It is questionable, however, if the MIS concept is accepted at executive levels to the degree necessary for restructuring of the entire MOE information base to be placed under the authority of the information system. It is more likely that careful nurturing of the relationship between systems services demand and integration into the MIS will lead to a view of the MIS as part of normal operations of the MOE units.

It is also worth noting that an informative bulletin was published in December, 1985 describing the objectives and structure of the Information Systems Department, the key functions of its units, and principal achievements to date. According to the MIS Coordinator, this bulletin is to be published four times a year. The second issue had not yet been published at the time of the current evaluation. Some additional

thought should probably be given to the appropriate target audience for this sort of publication.

The fourth sub-activity required the development of management tools and documents in order to support the MIS. These included data element directories (data dictionaries) to track data items across the proposed six major areas of the MIS, data collection plans, policy and procedures manuals, data review procedures (to control incorporation of new items into the MIS), and forms control. A major problem encountered by this consultant was the lack of a centralized documentation center within the information systems unit. The information system management tools were to have been developed by the General Advisor, the MIS Advisor and the Coordinator for the information system. The lack of a technical, rather than theoretical, MIS plan, the lack of the MIS Advisor and frequent changes in the Coordinator, have contributed to the inadequate development and formalization of these tools. The USAID-funded analysts are currently trying to finish up documentation of the existing subsystems, but this is not a substitute for effective management tools prior to the development of new subsystems. It should also be noted that virtually all existing subsystems are stand-alone applications. Future subsystems must be able to take advantage of existing data elements in order to fulfill the MIS concept and reduce data redundancy.

C.2 FORMAL ESTABLISHMENT OF THE INFORMATION SYSTEMS DEPARTMENT

The Project Paper Amendment noted in 1983 that, although not legally constituted, the Information Systems Department was recognized for operational purposes as an established entity within the General Directorate for Planning and Educational Reform. The functioning of the system had essentially been a USAID project, rather than an established activity of the MOE. Thus, concern had been expressed, both by consultants to the component as well as USAID officials, that steps towards the institutionalization of the information system be taken. In the February, 1983 evaluation report by AED, it was noted that the Data Processing unit, normally considered an administrative service placed within the overall organizational structure of an organization so as to avoid service bias to certain units because of conflicts of interest, was functioning within the General Directorate for Planning and Educational Reform, and should be observed with regard to bias in the future.

The Amendment itself suggested the relocation of the Information Systems Department to a higher level, as a staff office of the Minister or one of the Vice-Ministers. This strategy would have presumably provided the MIS with the necessary authority to implement changes in the MOE's data gathering and processing activities. The particular strengths and interests of the then Vice Minister for Technical Affairs,

Marco Tulio Mejia, led to a considerable campaign to locate the system in his office.

Despite occasional references throughout this document to the Information Systems Department, this designation was never formally achieved. In an evaluation of Project 522-0167 conducted with the assistance of the former Vice-Minister for Technical Affairs during January-April, 1985, it was noted that four major obstacles were encountered in the formal establishment of the department:

1. MOE failure to agree on the functions of the department.
2. Lack of clarity within the MOE of its own lines of communication and authority.
3. The problem of incorporating the Research and Statistics units into the new department.
4. Indecision regarding the emission of necessary legal statutes to create the department.

The first point reflects an awareness among MOE Director Generals of the potential inroads a MIS could make on their own territories. This fear could have and should have been dealt with on an individual basis, demonstrating how the MIS would serve each Directorate in its functions. The "globalizing" image of a new information system is a somewhat threatening vision. The globalizing function is a characteristic of the overall MIS, not the user-oriented subsystems which comprise the MIS. Acceptance of the MIS will occur as the information and services it provides are seen as reliable and useful to clients within the MOE--and these most certainly include the managerial and operational levels.

The second point reflects the general lack of organization within the MOE. This clearly affects efforts at institutionalizing the MIS, but suggests that indicators other than the achievement of a location on an organizational chart be used for evaluating those efforts.

The third point is one of the more difficult. The earliest conceptualizations of the MIS insisted on the incorporation of Research, Statistics and Analysis units in order to differentiate the MIS from traditional data processing units. A key problem, therefore, lay in how to incorporate an existing department (Statistics, a dependency of DIGEPRE) and an existing unit (Research, also a dependency of DIGEPRE) into a new department of information systems. Additionally, two new units (Data Processing and Advanced Analysis) and a Department head (the Information Systems Coordinator) needed to be created. Demoting

the Statistics Department to a unit level would obviously run into trouble, as would the removal of that department and the Research Unit from DIGEPRE.

The alternatives seen were to 1) create an Information Systems Department under the Vice Minister for Technical Affairs, and reforming DIGEPRE to eliminate the Statistics Department and the Research Unit; 2) create the Data Processing Unit under the Vice Minister for Technical Affairs, leaving Statistics and Research in DIGEPRE; or 3) create a Data Processing Department within DIGEPRE.

This first alternative was attempted and was not successful. Given the broader scope of services now contemplated to be provided by the MIS, the second alternative would now appear to have been the correct one, dealing with DIGEPRE's Research and Statistics units as among the users of the MIS. The third alternative would not, in fact, have been necessary to formalize, in that the Statistics Department is officially the Statistics and Data Processing Department.

The current situation is the following: an Information System exists within the budget of the MOE, and includes a Coordinator, and four entities comprise it: the Department of - Statistics, the Research Unit, the Educational Map Unit, and the Automated Data Processing Unit. Rather than achieving clarity in terms of the institutional position of the MIS, the pressures to formalize its institutionalization lead to the creation of, not a Department, nor a Unit, but a System, whose location within the hierarchy of the MOE can only be a mystery because of its uniqueness.

On the positive side, however, permanent positions for personnel (the Coordinator, the Data Processing Unit head, and five programmer positions) do exist within the budget. The DP head position is currently vacant, and the functions have been assumed by Francisco Aguilera, a member of the MOE programming staff. The Coordinator and Data Processing Unit head positions, however, are "cargos de confianza", or not subject to Civil Service rules and stability. These are key positions that will suffer greatly if they become transitory. This consultant does not find this situation in any way satisfactory for the long term development of the MIS.

The Advanced Analysis Unit has not been created as of this date, despite insistence of the General Advisor.

In summary of the foregoing, it would appear that efforts at formalizing the Information Systems Department have encountered considerable difficulties. These have been due to a lack of clarity of the organizational structure of the MOE itself, frequent changes at the upper levels of the MOE and a failure to

adequately deal with conflicts of power structures implicit in the proposed MIS department configuration and location within the MOE. With the exception of the proposed Advance Analysis Unit, permanent staff positions have been created (for the DP Unit), and thus lends a budgetary existence to the MIS effort. Two key positions (Coordinator and DP head) are inherently instable, and could lead to problems in management of the MIS in the future.

Staff training was indicated by the Amendment as "key to the success of the Phase II effort and to the ultimate attainment of the sub-goal of the project which is the institutionalization" of the MIS. Training was to be provided for the new Coordinator of the MIS in the areas of MIS concepts as applied to the Honduran educational system, MOE organization and structure and subsystems and applications developed to date. Information systems staff would receive training in computer programming and word processing, research methodology, descriptive statistics, and, for some members, educational MIS training in the U.S. Seminars and short courses would be provided to upper-level MOE officials. A detailed training plan had been developed by the General Advisor in May, 1982; the Amendment also detailed training activities to be carried out under the current project.

Training of the Coordinator of the MIS has been hampered by two factors: the lack of a MIS Advisor and repeated changes in the person occupying this position. Since the Amendment, there have been three Coordinators of the MIS. The former two received considerable orientation and training by the technical assistance staff, including site visits to MIS installations outside of Honduras. The technical analysis in the Amendment emphasized the importance both of the Coordinator's position and training of this person. It was also recognized that sufficient time needed to be reserved for both the General Advisor and the MIS Advisor to provide the desired training level. Additionally, the MIS Coordinator was to undergo an extended internship in the U.S.

The current Coordinator (on-board since May, 1985) has extensive administrative experience within the MOE, but does not have a strong background in information systems or analysis. Due to apparent personality conflicts and administrative burdens, most of his training has been on-the-job through consultation with the technical assistance staff and weekly staff meetings. Although his administrative abilities have stood him in good stead, and much necessary integration and organization of the units has been achieved, greater technical understanding of the MIS will be essential to guide its development in the next phase. Complex technical decisions will require outside guidance. It is also likely that, as the system expands in its scope, the need for a technical coordinator will become necessary. The administration of four units is a time-consuming task within the MOE.

Presumably because of changes in Coordinators, the U.S. internships were not conducted. This consultant strongly urges this type of extended exposure to functioning systems, with a particular eye to the use of such systems for management and policy making by end-users. The mechanics of data processing systems should not be a focus.

Local training of MIS and MOE staff received considerable attention in the period of the current project. A list of formal training activities conducted follows (eight courses were given under Phase I in DP concepts, file structure, utilities, COBOL, programming techniques and word processing):

<u>Course</u>	<u>Date</u>	<u>By</u>	<u>Enrolled</u>	<u>Graduated</u>
FORTKAM	9/84	T/A	7	5
Intro. to DP	12/84	NCR	24	14
Intro. COBOL	12/84	NCR	14	7
COBOL Laboratory 1	2/85	NCR	4	3
COBOL Laboratory 2	3/85	NCR	3	3
Prog. Techniques	3/85	T/A	13	7
COBOL	4/85	T/A	13	7
Intro. Word Proces.	6/85	MOE	14	12
Intro. Word Proces.	7/85	MOE	12	10
Intro. Word Proces.	8/85	MOE	14	13
MS-BASIC & Graphics	8/85	T/A	12	8
Intro. to DP	10/85	T/A	24	20
Intro. to DP	12/85	MOE	29	27
Trajectories	1/86	T/A	15	N/A
Intro. to DP	1/86	MOE	25	22

*Note: T/A - USAID-hired technical assistance personnel
 NCR - Purchased course from NCR representative
 MOE - Ministry of Education personnel

The courses have been received by two basic audiences: Data Processing Unit staff (the programming courses) and MOE secretaries (the word processing courses). The COBOL courses given by the NCR representative cost a total of over \$ 10,000, and were generally felt to be deficient. As a result, the Senior Systems Analyst provided follow-up courses to enhance their utility to the MIS staff. Word processing courses have been used, in part, to enhance the visibility of the MIS within the MOE. Current equipment availability and location does not permit word processing to be widely used.

The clear emphasis on data processing courses has occurred at the detriment of the Research and Statistics units. While it conceivably might be advantageous to have COBOL programming skills in the Statistics Department, it would seem far more useful to provide training in applied statistics and research

methodology. The same would apply in the Research Unit. This consultant detected a sense of abandonment with regard to formal training among these units in general. The Senior Systems Analysts did give a course in micro-computer-based simple statistics, which was well-received, but shortly thereafter both the software and the hard disk micro-computer were removed to attend the needs of Component 3. Currently, in fact, not one of the statistical software packages obtained for the WANG VS-80 is on-line, and the license for the SCSS package has expired.

The Research and Statistics units, as do or will all user units of the MOE, require technical assistance and/or training in their own areas of operation. The original training plan devised by the General Advisor included some of these aspects, but has not been implemented in full. Given the changes in the system since that document was written (1982), a careful revision is probably in order.

Upper-level MOE training has suffered because of changes in key personnel. Expensive training abroad should be carefully considered in the light of personnel instability at this level. It would also seem wisest to orient upper-level training towards greater efficiency in management per se, in that virtually any such training would include the need for and use of a MIS. Later, it should not be difficult to introduce the MOE's MIS.

An interesting example of this latter point came up while reviewing the Budget Control system. Although the General Administrator had only recently assumed his post, he saw the clear utility of the Budget system, and sought out the systems analyst (Gerardo Paz) to see if he could obtain a system to control vehicles, fuels and lubricants. This system was rapidly developed, and it seems clear that more requests will come from this quarter. As indicated elsewhere, the danger is that many stand-alone systems will be developed without a master plan for integration. If, on the other hand, the demand for and utilization of services exists within a MOE unit, it should be used to further develop an integrated development plan for that unit.

Additional computer hardware and software were also acquired during the project with USAID loan funds, principally to aid in the analysis of information then available in the educational statistics data bank. In particular, a graphics terminal and dot-matrix printer were to be purchased for the production of management-level visual summaries of data for decision making. Additionally, a micro-computer was to be purchased in support of the school construction/renovation component of the project, and disk packs for the WANG VS-80 system to facilitate system backup. Additional equipment was purchased during the project, and the current hardware and software inventory includes:

A. Central devices

1. WANG VS-80 CPU, 384Kb memory
2. 1 - 75Mb disk drive
3. 1 - 90Mb disk drive
(75Mb fixed, 15Mb removable)
4. 1 - 288Mb disk drive
5. 1 - 1600 BPI, 9 track tape drive
6. 1 - 320Kb diskette drive

B. Peripheral devices

1. 1 - 600 LPM printer
2. 1 - 300 LPM printer
3. 1 - 200 CPS dot-matrix printer
4. 1 - 40 CPS letter-quality printer
5. 7 - serial workstations, 16Kb memory (DP)
6. 4 - combined workstations, 32Kb memory (DP, WP)
7. 3 - remote workstations, 48Kb memory
8. 2 - DP, WP and graphics capability workstations, 64Kb memory
9. 2 - WANG micro-computers:
 - 1 - 720Kb memory, 10Mb hard disk, one floppy disk, dot-matrix printer
 - 1 - 720Kb memory, two floppy disks, dot-matrix printer

C. Support devices

1. 1 - 15 KVA voltage regulator
2. 4 - 2400 BPS modems (Racal-Milgo)
3. 1 - 8 channel multiplexor

D. Software

1. COCENTS (not on-line)
2. SCSS (license expired, not on-line)
3. MATHPLANNER (for micro-computers)
4. MINITAB (license expired, not on-line)
5. CHARTER graphics package
6. Trajectories (for micro-computers)
7. COBOL, FORTRAN, RPG compilers, BASIC interpreter
8. DBASE-II (for micro-computers)
9. In-house developed software

The above list includes four serial DP workstations which will be installed in the General Directorate for Secondary Education in support of the National Secondary Student Registry system.

The equipment purchased for graphics support did not work out entirely satisfactorily. Whereas the CHARTER software is reputed to adequately handle graphics terminals, obtaining graphics output on the dot-matrix printer is an extremely slow

process. There was no evidence of routine use of this software or equipment for the original purpose.

Virtually all programming is performed in COBOL II. File access is handled either through sequential or indexed-sequential methods. Neither a data base management system nor programmer productivity tools (automated data dictionaries, simplified report generators, or fourth generation languages) are used in the Data Processing Unit.

As discussed elsewhere, the statistical software is neither on-line nor routinely used. Formal training in COCENTS, MINITAB or SCSS has not been conducted.

All equipment which had been installed remotely at the Escalafón was removed because of non-use and is installed in the central computer site at the MOE. This is discussed later in greater detail.

The Amendment sought to assist the newly formed MIS Department in terms of its internal organization and function. To this end the General Advisor and the MIS Advisor were to have provided guidance in the development of documents which would describe the functioning of each unit comprising the MIS, review and as necessary revise position description for the personnel, and develop basic administrative manuals.

The problems described previously also apply here. The General Advisor prepared the "Manual de Organización y Procedimientos del Departamento/Sistema de Informática" in March, 1984. This document provides adequate guidelines defining the functions inherent to the key staff positions and of the objectives and functions of each of the units. Given the somewhat "unusual" nature of the Coordination, attention is paid to inter-unit communications, as well as the link to the Coordination itself.

The degree to which these guidelines and descriptions have legal validity within the MOE will probably not be known until some major conflict occurs, but, since the current Coordinator has occupied his position, administrative matters, particularly the relationships between units, seems to have improved. The weekly meetings of the unit heads with the Coordinator do occur, aides memoir are prepared and circulated, and a rotating "sub-coordinator" is in effect. The impact, according to several unit heads with whom this consultant discussed the matter, has been to allow longer range planning and avoid constant changes of course in development efforts. There was general agreement that the current Coordinator has personnel management skills, regardless of his knowledge of the technical areas of the units.

It remains to be seen if the MIS Department can function without strong technical leadership in, or in support of, the Coordination. It would again seem wise to expose the Coordinator to reasonably advanced, consolidated educational MIS sites. Future efforts aside, it may be concluded that the management improvement activity was successful.

C.3 SUPPORT AND ENHANCEMENT OF EDUCATIONAL STATISTICS SUBSYSTEM

The educational statistics subsystem was the principal product of the USAID-supported activities prior to the Amendment. As a visible sign of its impact, the Amendment reported the publication of the 1981 school year Statistical Yearbook in May, 1983, a year ahead of past efforts which were performed manually. In the tentative conceptualization of the MIS presented in the Amendment, this subsystem was seen as a key unit to the eventually expansion of the MIS. At the same time, however, the need for significant improvements in the subsystem was observed, and recommendations were made to:

1. Rationalize and reorient field data collection forms to facilitate their use and entry of the data into the computer.
2. Reduce bottlenecks in data flow from the field to the MOE, from the MOE to the MIS Department, and within the MIS Department itself.
3. Produce data in a timely fashion for use by MOE decision makers.
4. Generate subsidiary systems to link existing data from other activities of the overall Project and of the MOE.

It should be added to the foregoing that the system was quite inefficient (due to design problems) in terms of machine resources, especially disc space and disc I/O, which limited the potential for new system development. A more serious problem was the appearance of inconsistencies among totals between different tables of the Statistical Yearbook, a factor which could lead to reduced acceptance of the subsystem.

The subsystem provides data, from the school level up, on enrollment, characteristics of the schools and classroom, and school furniture for the pre-primary, primary and secondary levels. The Statistical Yearbook is the principal product of the subsystem, and presents these data in a variety of breakdowns. The Yearbook, however, presents no data at a level below the department, thus automatically limiting its use by other than MOE central authorities. This was, and is, a major drawback of this and most other publications of this type. The subsystem, of

course, could aggregate data at the district, municipal or departmental level as required for operational use.

Ad hoc reports are also generated from the subsystem data bank upon request, although less sophisticated users probably assume that the Statistical Yearbook represents the limits of reporting possibilities. It would be interesting to see a supplement to the Yearbook containing analyses of some given issue, thus perhaps communicating the rich potential the data bank actually has. At the other extreme, the Statistics Department also publishes a pocket-sized bulletin, containing key educational statistics. One would imagine that these data are the most frequently cited because of ease of use and access. Perhaps a pocket-sized statistics series of mini-reports could be established in the future.

Major revisions of the programs and file structures employed were completed during 1984. Current documentation of the subsystem consists of program descriptions, all CRT screen layouts, examples of reports generated, file descriptions, coding manuals, and, specifically for programmers, a guide to the program structure and file and array handling procedures.

Data are entered interactively by personnel of the Statistics Department on CRT's located in the room adjacent to the WANG computer. Informal training was provided to these persons by the data processing and technical assistance staff. Double entry keying is not performed, thus keying errors are likely to occur with some frequency. Key entry was currently being performed for end-year 1985 data at the time of this evaluation. All data collection activities, responsible parties and production plans are managed under the Annual Activities Plan of the Statistics Department.

Data coverage has apparently declined in recent years. The private sector, especially in secondary, is not particularly cooperative in filling out and returning the forms. On the one hand, the private sector may suspect an eventual use other than the mere reporting of aggregated statistical data; on the other, the forms themselves are designed for the public sector. This consultant would suggest a careful review of the forms in order to streamline them for the private sector (probably in a separate formac) and reduce the level of anxiety produced among private school directors.

A study was conducted by the Research Unit in order to identify problems related to the data collection forms and information flow procedures. As a result, revision was performed of the data collection instruments by the technical assistance team and the Statistics Department. The resulting forms were modified mostly in order to make them easier to enter into the computer. Most, however, are still large spreadsheets with far

too many rows and columns to fill out with ease or accuracy. Secondary initial enrollment is a particularly cumbersome form: breakdowns are requested by year of study (and totals), age (from 14 to 27 and totals), sex, shift and course of study! This would appear to require a computer to fill out, as well as to analyze. It must also be remembered that all school statistics forms are filled out by the director of each institution, who must obtain and collate, at the necessary level of detail, all information from each teacher. At the least, such forms should be broken down into several forms, so as to provide, say, one form for each year of study, shift or course of study. The choice of the first break should be made on the basis of an analysis of how records are normally kept and reporting routinely performed within the institution.

Secondary final reporting is, in fact, now to be done with a one-form-per-course-of-study format. Primary enrollment has been simplified as well, although primary final has been complicated (with questionable utility) by the inclusion of an additional section containing counts of students by final score groupings in the four major evaluation areas. Aside from the difficulty of collating this information, this consultant questions the usefulness of such data for any purpose, given the subjective nature of student evaluations at the present time.

Forms are also used, at both the primary and secondary levels, to obtain information on the age, sex, nationality, position, load, and preparation of teaching staff. While this information is clearly needed, it is questionable whether it should be routinely collected as part of the educational statistics subsystem. Indeed, it is a poor reflection on the MOE if it has to ask the directors of institutions about who and how many persons teach there (except for the private sector). Moreover, it is planned to continue asking directors this information. The MOE should, through its information system, already know this information. If it does not currently know where it has assigned what teaching resources, then it should take steps to find this out in a manner which will, in the future, allow it to so know. The information being collected by the educational statistics subsystem will not provide that capability as currently conceived.

A similar comment should be made with regard to the information requested on the physical characteristics of the school itself. Particularly if this is thought to become a reasonable inventory system for the state of Honduran schools, then it must be rethought. It is, for the moment, one way to obtain information regarding current conditions of the schools and their furnishings, but this does not make it a "school maintenance" subsystem. Is it more appropriate to determine maintenance activities from a MOE unit in charge of maintenance or from the director of a school? Furthermore, no objective

guidelines are given directors as to how to judge, for example, whether a desk or chair is in "good, fair or poor" condition.

An additional point with regards to the forms in general is that all available data should be "pre-printed" on the forms, subject to correction as required. It is frustrating, at the least, to be continually asked for information already provided earlier in the year or in prior years when that information is not likely to have changed. Given the low level of feedback the system provides to the level of the source of the data, this would seem a minimum effort which should improve the feeling of usefulness of the data generating activity. Currently, continuous forms, which are costly, are used, with the computer performing little more than an "Addressograph" function in printing the name, address and number of the school.

What this consultant sees, in general, is the need to capture information which already flows through the MOE structure in one form or another. It may be necessary to improve many aspects of the way in which those data are collected, processed and aggregated, but it is not acceptable within the MIS concept to add yet another data collection effort by an external source, in this case the Information Systems Department. This will in no way reduce the need of, say, the maintenance section, to fill out its reports and process them through the MOE system. It is essential that the sources of data for the statistics activity increasingly be those routinely generated by the operational level of the MOE, complemented only where necessary by special field studies conducted by the Research and Statistics units.

It should also be noted that the educational statistics subsystem is not effectively used in the MOE because it is not current. This is the principal reason all Directorates continue to maintain their own reporting systems. The computerization effort has achieved substantial gains in reducing the delay in producing the Statistical Yearbook: 1981 was published in July, 1983, while 1984 was published in November of 1985 and 1985 is expected to be published no later than in September, 1986. But at the managerial and operational level, these data are already "dead", and, as previously noted, are at too high a level of aggregation. Future efforts should, again, be directed at providing data management services to the Directorates and "capturing" data for research and statistical purposes.

An auxiliary system was developed on the hard-disc micro-computer for Component 3 (Maintenance) of the Project. Although not reviewed, this system is COBOL based and performs a number of control functions with regard to vehicles, materials, salaries and per diems of maintenance staff. The system was developed by USAID technical assistance staff.

As indicated above, the graphics software, terminal and dot-matrix printer are not used to produce visual summaries of key indicators from the educational statistics subsystem. Because of the overhead graphics systems place upon the system, it is probably more reasonable to develop micro-computer based graphics applications in the future. Data could be down-loaded from the WANG VS system (given sufficient disc space on the micro-computer), or extracted from published sources.

C.4 OTHER SYSTEMS DEVELOPMENT ACTIVITIES

The Amendment suggested the possibility that additional systems development could occur during the life of the current project. In order to assure orderly implementation of the MIS, however, it called for the execution of feasibility studies prior to the development of new subsystems. Careful guidelines were presented for the carrying out of the feasibility studies, based largely upon the recommendations of a STC MIS expert. Based upon the preliminary MIS model identified in the Amendment, three potential subsystems (educational facilities, human resource management and secondary education) were slated as candidates for feasibility studies.

Once again, the lack of an accepted MIS plan and numerous - shifts within the MOE (and especially within the MIS Department) caused some problems in fulfilling this plan. While a great deal of new systems were developed, it is difficult, from the available documentation, to detect the careful planning called for in the Amendment. In particular, it is not clear that the new systems were designed as part of a functional whole, but rather each system functions as a separate, "stand-alone" unit. Preliminary documents were prepared for several of the systems, but they do not have an overall plan to interface with, and thus tend to be oriented towards implementation on the hardware, rather than within the MOE. A review of the principal systems developed will clarify this judgement.

The Amendment foresaw the need to access educational statistics data through some mechanism more agile than the Statistical Yearbook. A system was visualized with which decision makers could rapidly access data in an intelligent fashion. It was assumed that such a system would solve the problem presented by conflicting data within the MOE, which often led decision makers to not use any data in their planning and policy setting activities. A document was prepared (no author, no date, but probably mid-1984) to justify the creation of an "executive menu" subsystem, and provided technical guidelines and system requirements for its implementation.

This system is completely menu-driven, and permits the user to select areas of interest and proceed from a general presentation to greater levels of detail (breakdowns) of

information from one screen to the next. Data from areas other than the educational statistics system are incorporated, as well. The types of data included were apparently based upon meetings with upper-level MOE personnel, although the document does not indicate what these individuals actually requested. The document simply presents the design of the system.

The system was originally implemented as a word processing application but was rewritten in COBOL. There is now complete documentation for the system (for both the user and the maintenance programmer), although this documentation has not been distributed to potential users of the system. The system is on-line on the WANG VS machine.

Perhaps one of the most important features of the system is its ability to look at data across time. The system is designed to handle a decade of information, which is a clear advantage over trying to handle ten (difficult to locate) Statistical Yearbooks. It also easily provides a printed copy of the screen on request. Its inclusion of data from other sources (census, other ministries) makes it somewhat more useful while also susceptible to reporting changes or delays by those other organizations.

There are two major flaws in the system. One, access to CRTs is extremely limited at the MOE, as they are all in use throughout the day for data entry and programming. Thus, our theoretical executive would have to sign up days in advance and walk up to the third floor of the MOE in order to make his quick review of relevant data. Second, the system requires programming staff in order to maintain the data. All data, even those from the educational statistics subsystem, must be manually input to the system. This is an example of a "stand-alone" system that really should not have been. An interface should have been written to extract data from the educational statistics system.

Another system which was developed was the Institutions and Courses of Study subsystem. A design document was prepared for this system, which was supposed to be a user-operated inquiry system for determining the available courses of study in secondary and higher education levels within the country. The original concept provided for a public access terminal on the first floor of the MOE which students could consult in order to make their educational plans. The system was originally designed in word processing mode, and was later converted to a COBOL-run data processing mode.

The system is currently on-line, but is not up to date. At a user level it is self-documenting. The system is flow-charted, but maintenance procedures are not documented at this time. The proposed first floor terminal was never installed, and the other output product was to have been a yearly directory provided to

the approximately 6,500 primary and 400 secondary schools: with a document of some 300 pages, the printing and distribution costs are prohibitive. Because the system does not have an identified user unit within the MOE, the Data Processing chief requests change reports from the General Directorates at the beginning of each year. Updating is then performed by the programming staff from January to April.

The economic analysis section of the Amendment listed the savings due to the transfer of the teacher payroll system from Escalafón's rented (and obsolete) IBM System 3 as a significant financial justification for the added component. Considerable effort was invested by MOE and technical assistance staff in the transfer of the system to the WANG VS-80 equipment. Problems in obtaining dedicated (leased) lines were finally overcome, modems and multiplexors installed, and software converted (initially this was an RPG-II to RPG-III conversion, later more COBOL programming was employed). The chaotic DP situation at Escalafón was studied in considerable detail ("Situación actual del procesamiento de datos en la Oficina de Personal y Escalafón del Magisterio", March, 1984), and the need for redesign and reimplementaion was seen. New applications were required in the areas of budget and accounting, teacher personnel records, etc., and it was strongly recommended that data security and integrity be attended to. It was proposed that this work be undertaken by the MIS staff while the Escalafón personnel underwent training. Three DP options were examined: keep the IBM/3, reworking the programs; use the WANG system via teleprocessing; or obtain a new system for the Escalafón. Teleprocessing was viewed as the best short term solution, and the purchase of a new system in the long run.

The RPG-III conversion was performed, and the effort documented ("Sistema automatizado de procesamiento de la nomina de pago para primaria, June, 1984"). Parallel operations were conducted during several months. Personnel at Escalafón continued operations as usual, and indeed made programming changes that eventually invalidated the parallel runs. The extremely poor response time on the remote terminals, plus apparent poor quality of the dedicated lines, lead to the virtual abandonment of the remote equipment. Despite rather clear communications from personnel at Escalafón regarding their desire to stay on the IBM/3 system, the data entry and file management routine were rewritten by the MIS staff for the WANG VS system.

Realistically, the WANG system was in fact rather limited in terms of disc space at the time, and probably could not have kept both this system and the then disc-inefficient educational statistics system up at the same time. Clearly, also, a large number of personnel in the Escalafón were anything but comforted about losing control over 1) their computer, 2) their application, and quite possibly, 3) their jobs. The work done by

the MIS staff in terms of design considerations and implementation plans was of excellent quality compared to the existing system, but these efforts did not address the issues of power and control operating in the background.

In the end, IBM donated the equipment it had been renting for \$ 101,000 a year, and thus Escalafón continues to operate its payroll system--with no enhancements and still an uncoordinated mix of mechanized and manual procedures, and the implementation on the WANG is unused. The human resources subsystem, described below, is in its final development stages at the time of this report. Although it easily could, it does not handle teachers. It should be noted that a functional personnel system is, after all, the basis for an accurate payroll system. Escalafón does not have an automated personnel system.

In the final analysis, it is unfortunate that so much effort was put into the Escalafón system. It was rightly recognized that attention would have to be placed upon administrative systems, and the only mechanized system at the time was the Escalafón. Perhaps, in retrospect, it would have been better to have chosen another area for the first development effort. There is still a sense of bitterness among MIS staff who were participants in this period. It is also true that perhaps not enough high-level backing of the conversion effort was obtained, or perhaps it was lost before completion. Careful analyses should always be conducted, as well, of the fears and sensitivities of MOE units before designing and implementing systems for them. Inertia is more than enough resistance; adding friction does not help.

A Central MOE budget control system was implemented in 1984. This system is designed to permit better control over balances available for execution in an up-to-date fashion: it handles transactions (purchase orders, credit reserves, partial and full payment orders, both direct and indirect), budget transfers, etc., and is designed to produce biweekly reports for each MOE unit of its current budget condition, as well as all modifications which have occurred during the current semester. The system has been maintained to incorporate budget code changes since implementation.

Documentation consists of all codes, data formats, program descriptions and program use instructions for the user. One person, from the General Administration Office, is in charge of all budget checks, transaction posting, etc. This person received informal training in the operation of the system, which is menu-driven and self-explanatory. This person is also capable of maintaining the budget codes in case of future change, and can generate listings for distribution to MOE units. The system is in daily use, sharing the CRTs located in the user's area adjacent to the WANG VS system. Procedures are those documented

within the General Administration Office for budget authorizations.

The system has replaced manual budget balance checking system in the Administration. The recently named General Administrator requested, and has received, a new system to handle vehicle control, fuels and lubricants, which would tend to indicate that the Administration is a fertile area for future systems development if a general plan can be developed to insure orderly implementation. It would seem wise to place a CRT and a printer in the Administration. The training of a second person to operate the system is also indicated.

The budget control system should be integrated with the general accounting system. It should also be enhanced with functions such as producing valid purchase orders, etc. Attempts should be made to encourage the routine distribution of current budget listings to MOE units.

It is recommended that the success of the budget control system, and the demand for further services that it has created, serve as a guide to efforts in other MOE units, if a general plan for development can first be achieved. It is to be noted that no major political decisions were required up front, thus keeping the project with a relatively low political profile. A modular phasing in of applications within a unit will also reduce initial anxiety and reaction of the unit's personnel. Ideally, a minimum number of personnel should have to confront the system, giving time for gradual reassignment of tasks to occur. And finally, good follow-up with key personnel in the unit will suggest other areas for development. An additional point that this consultant would like to make is that technical assistance should be a part of almost all systems development, not just to the Data Processing Department, but to the client unit. It is not correct to assume that systems analysts are the best technical assistance agents to offices with quite different problems and orientations.

At the end of 1982, a request was received from the Director General of Secondary Education to develop a project to create a secondary student identification and academic records system. This request apparently resulted from a scandal involving false graduates from a number of secondary institutions in the country. A technician was hired to develop this project and evaluate the programming effort, file structures and machine requirements for the effort. The resulting study ("Estudio de factibilidad para el registro estudiantil y el sistema de calificaciones del nivel medio") was deemed inadequate and eventually led to another study, by the USAID-funded analyst, which was finished in November, 1983 ("Estudio de factibilidad, sistema de información de estudiantes de nivel medio y tecnico"). This feasibility study is a fair technical document, and enters into a good deal of detail about implementation phases, data structures, codes,

system requirements, etc., as well as a cost-recovery strategy for the system. It was not designed to be a document for a management decision regarding the system.

System development proceeded on phase one, the secondary student registry system. This system basically assigns a unique ID number to each student, controlling for duplicates through a series of alternate key algorithms. A newly created unit of the General Directorate for Secondary Registration will handle the operation of the system, and additional CRTs have been purchased to allow use of the system in their own offices in the MOE. These individuals have been informally trained in data entry on the new system. Procedures will be those provided for by the legal creation of the Registry Unit.

Available system documentation consisted of CRT screen designs and file structure. Remaining documentation was being written at the time of the evaluation.

Data entry had recently begun, covering some 60,000 first-entry students from the entire country. Even though the system uses data compression techniques, it is calculated that when there are 300,000 students in the system, over 300 Mb of disc space will be required. Most fields will require continued maintenance: there are address fields for the student, his mother and his father, for example. Good techniques were used for off-loading graduated or inactive students to tape, but even so this is a frighteningly large system for what it does. It is also likely that maintenance of the indexed sequential key structure will be a problem, given the frequency of power outages and system failures. The USAID-funded analyst in charge of the system felt that a move to a DBMS design would be necessary in order for the MOE to handle maintenance, given the current access method complexity and the data compression involved. The file structure was designed to facilitate such a move.

Another issue is that about half of Honduran secondary students are in private institutions. This system is an expensive and cumbersome way for the MOE to demonstrate its "control" over the private sector. A serious look should be taken at the future of this system. Controlling for unique ID numbers is a relatively simple matter (a nicely complex algorithm) and may be a valid use of the machine, but knowing the address of every student and his mother and father would not seem to be the best use of expensive machine resources.

WANG equipment has long been known for its word processing software. The Spanish language WANG word processing system is implemented on the current hardware at the MOE. There are now a total of six workstations with word processing capability, although these terminals are used more heavily in the data processing mode. Output devices include one 40 CPS daisy wheel

printer, one 200 CPS (draft mode) dot-matrix printer, and the 600 LPM system printer. Most output is produced on the daisy wheel printer. A separate disc area (15 Mb) is reserved for word processing files. Problems observed include the system being very loaded at times, the lack of supplies, and the glossary function is inoperative.

There is a word processing administrator, who is also (besides programmers for documentation) the principal user of the WP system. The WP administrator is responsible for maintaining the disc area and backing up files to tape. There is one copy of the original WANG (Spanish) manual, and a training manual has been produced in-house for courses given to MOE secretaries.

Four courses have been given to date by MOE personnel to groups of 12 MOE secretaries. Given the awareness of the importance of word processing technology, these courses have been well received. The WP administrator feels she should attend an advanced WP course in order to be a better instructor and WP manager.

Despite all the training (which, as mentioned before, has also had a public relations role), there is no real opportunity for the MOE's secretaries to access the system on any regular basis. Large documents are occasionally channelled through the Coordinator's office for production on the WP system, and most internal documents are also so produced, but the limitation of CRTs and the centralization of them will continue to limit use within the MOE. It would be a major and costly move to provide WP services for even the principal offices of the MOE.

The human resources administration subsystem was originally designed to cover only central MOE employees with permanent positions. It has been redesigned and now will include all technical, administrative and service personnel with the exception of teachers. General data on employees, and their academic formation, degrees held and courses received, professional experience, and data for payroll purposes will all be maintained in the system.

Data entry and operation of the system will be in the hands of the Personnel Office. Personnel from that office were currently entering the employee master file (machine readable records were denied by the Ministry of Finance, so data are being copied from computer listings) in two shifts of three persons per shift. The master file should be finished in less than a month.

The basic programs are functional, but it would appear that outputs, such as reports, remain to be finished. Documentation consisted at the time of the evaluation of draft versions of activities, scheduling, and some on program use. Three members of the MIS staff are involved in the development of the system.

Training was provided to the Personnel Office staff in data entry for the employee master file creation effort.

The MIS staff reported that initially there were some fears in the Personnel Office that the system would replace many positions in that office. The head of the Personnel Office reassured the staff that, to the contrary, he expected a greater workload in the near future.

Although it is too early to judge this system, it would seem that, again, access to CRTs will be a problem. CRTs and at least one printer should be located in the Personnel Office.

It would be difficult to conclude that feasibility studies have been conducted according to the guidelines mentioned in the Project Paper Amendment. Much of the development work has occurred in a stop-start, management by crisis mode. Few subsystems enjoyed anything similar to a normal systems development life cycle. It is also valid, however, to note that there have been, in the period since the component was initiated under the Amendment, three Coordinators and five data processing unit heads. The MOE has suffered constant change at key positions: Minister, Vice-Ministers, Directors General. The Information Systems Department is not immune to MOE political - turbulence: technical arguments for or against a subsystem will not always prevail.

What is also notable is the fact that all systems development work, and most of the training activity, was performed by the USAID-funded technical assistance team. There are no signs that the MOE MIS staff, despite training in programming, could initiate any new subsystems without outside help. Nor is it likely that the MOE will be able to retain personnel at the level required to develop and maintain systems of the complexity required: pay levels within the MOE cannot compete with the private sector computing market. Much training occurred under the project which has already walked out the door.

A key problem with virtually all subsystems is their near total independence from one another. Haphazard development has led to non-intercommunicating systems that function for given purposes, but are quite distant from the "globalizing" ideal which gave them their start. A lack of overall planning has also contributed to a condition in which some systems justify themselves, rather than contribute to the solution of some larger problem. It is necessary that these "modules" be reviewed to redefine their position in the overall MIS solution.

C. CONCLUSIONS

It would seem, to this reviewer, that the implementation of the Project Paper Amendment did not succeed as planned. Of the

four planned outputs, only the support and enhancement of the educational statistics subsystem was really achieved as planned. This is not to say that there were no unplanned successes. But clearly, the project somehow changed its course from that point to by the philosophy contained in the Amendment. It may also be the case that the outputs contained in the Amendment were not realistic probabilities, given the volatile and complex nature of the MOE. This reviewer would not expect a successful introduction of a management information system in an organization with serious management instabilities.

Much of the efforts at defining the role of the MIS were oriented at gaining understanding and acceptance of the MIS concept at the upper levels of the MOE. Some degree of success was clearly attained, but these efforts were lost when the positions were vacated and refilled. This experience should probably suggest a different strategy for eventual MIS implementation and acceptance which does not require top management support in order to survive.

Efforts at creating a Department of Information Systems, in order to guarantee its stability and permanence, also did not succeed as planned. A "System" was created as overseer of the Statistics Department, the Research, Data Processing and Educational Map units. It is not at all clear what this new organizational device is, nor where in the MOE hierarchy it really fits. Permanent positions, however, were created for the Coordinator and six data processing slots. The "system" does have a budgetary existence, and this, within the MOE, is probably as good evidence of formal establishment as anything else. The "carga de confianza" nature of the key Coordinator and Data Processing head positions is a most worrisome condition for overall system development and stability.

The educational statistics subsystem underwent some evolution and maintenance during the life of the project. Data collection forms were revised and enhanced, but this reviewer would have enjoyed seeing the results of fieldwork in, say, the General Directorate for Primary Education rather than the survey of directors who fill out the forms. The overall goal of the MIS should be to use existing information sources to provide management information, and thus the improvement of a secondary information gathering system, while helpful in the short term, does not conform to the MIS concept.

Perhaps due to the absence of the MIS Advisor, the planned feasibility studies were, for the most part, not undertaken according to the original guidelines. Also, most documents reviewed were not of the nature that management of, for example, a General Directorate, could use as a basis for decisions regarding implementation or modification. The feasibility study

is intended to aid all parties in agreeing, in advance, what is to be done, when, by whom, and with what resources.

Given the lack of an overall plan for the development of the MIS, the fact that the subsystems developed under this project are not integrated is not surprising. Machine constraints and the lack of a data organization and retrieval system and associated development tools has not encouraged this integration, either. Those systems which have been developed are generally of quite good quality technically, but often are more rigid than they should be in an environment like the MOE. It remains to be seen how well they stand up to maintenance.

The technical assistance personnel hired under the project have clearly done a good job at a difficult and demanding set of tasks. Various roles such as directional, instructional and operational roles is not easily achieved by most single individuals. What should be made clear, however, is that their talents were concentrated on the data processing unit, and there is no question that the Research and Statistics units were not attended as planned. Short term technical assistance should have been used to strengthen these units, as well as to assist end-user units of the MOE during subsystem implementation.

This reviewer found many documents used to guide the MIS project to be too "theoretical" to be useful as a tool for MOE managers during the implementation process. A more "grounded" presentation would be easier to follow, especially given shifts in MOE personnel. It should also be reiterated that it is not easy to gain acceptance of large scale plans and projects within the MOE; this would suggest partitioning these elements into smaller packages which are either more easily accepted or accepted at lower levels of decision.

With regards to the sub-goal of the MIS activity, "to institutionalize within the MOE a system of information management with the capability to provide information in a timely manner for decision making and to support administrative and technical activities of the MOE", the project has clearly had a fair degree of success. As the Amendment predicted, this sub-goal would not be fully achieved within the life of the project. But a considerable advance has occurred. The computer system is now firmly entrenched within the MOE. There are practical applications functioning in various parts of the MOE, and there is a demand for new applications. It is now necessary to consolidate these advances, and to carefully plan their integration into a true management information system. In a ministry plagued by inefficiency, this will be a rewarding area for continued development.

E. RECOMMENDATIONS

1. In order to firmly establish the MIS within the structure and daily operations of the MOE, USAID and the MOE should devise a follow-on project which will capitalize on achievements to date and redirect development efforts in the future. Such a project will necessarily require technical assistance for the design and implementation of new subsystems, but should also contemplate technical assistance to the target units within the MOE of each subsystem. It is not believed that computer systems analysts are the most effective change agents in areas such as personnel systems, primary education supervision, curriculum development, etc. An important point to remember is that the mechanization of deficient manual systems will only result in deficient mechanized systems.
2. An overall plan for the integration of existing and future subsystems into the MIS must be developed as soon as possible. The goal of the plan should be to identify the generators and users of each data element to be contained in the system, including observations on the mechanisms whereby data capture will occur as subsystems are put into place in the data generating units. The need for the data management tools identified in the Project Paper Amendment continues. Automated data dictionaries would be very useful in both system management and development.
3. Any additional development of the MIS will require the acquisition of additional hardware. The main memory of the system is extremely limited if it is to support multi-user interactive systems: far too much swapping is occurring now. Disc storage should also be increased, probably via a single large additional disc, for economic reasons. The greatest limitation to the use of the system now is the lack of remote terminals and printers.
4. The Research Unit should receive formal training in research design and methodology, including sampling, and in applied statistics, both descriptive and lower level inferential. The Information Systems Department should decide on which statistical software package they will support (and budget license renewals if required), and practical training should be provided in the use of that package. An option is to provide a hard disc micro-computer, file transfer software, and a quality statistical software package, such as SPSS-PC. The training should be given to the nine members of the unit and last approximately three months.

This reviewer also recommends that approximately 2-3 months of technical assistance be provided by a qualified social science researcher or similar person to participate in a research project

with the unit. This "shirtsleeves" person should guide the unit through each phase of the research project, from proposal to final report. Possible areas for this project would include primary school desertion, effects of repetition, textbook impact on teaching styles, etc.

The person or persons who conduct both the formal and in-service training must master the Spanish language, have demonstrated research/evaluation competence, preferably in the area of education, and necessary computer skills.

5. The Statistics Department should receive the necessary inputs to move beyond the data entry and compilation of the educational statistics activity. This unit received some degree of technical assistance under the current project in terms of administrative organization, forms design, etc. The group would seem to be in a perfect position now--a computer, lots of data, etc.--but not know what to do with it all.

Training in the basics of research methodology and a serious course of applied statistics seems to be in order. This group must also become competent in the use of a statistical software package. Such a course should use real MOE data in laboratories. It would also seem wise to try to increase the demand for analytic services from other units of the MOE. Perhaps if the Coordinator made contacts with the other units in order to discover areas in which support was needed, the demand would increase. The goal should be to convert the Statistics Department from being the "keepers of the data" to a service unit of the MOE for research and evaluation.

We would probably see the need for 3 months training for eight members of the Department. USAID should review current offerings from the U.S. Bureau of the Census' training program, but recall the Spanish language requirement. It is also important to avoid statistical theory courses, and to focus on the proper application of relatively simple statistics, available in packages, to real-life sets of situations. The possibility of short-term (two weeks to a month) of technical assistance in a real research application would be a useful addition.

Finally, a projection software system should be evaluated for potential acquisition. These systems are mathematically quite complex, and are not as "canned" as are statistics packages. If acquired, a thorough training of 2-3 members of the Department should be provided.

6. This reviewer is not clear why the units are grouped together in the Information System Department. They seem to have relatively little interaction, except administratively, and their grouping would seem a fair administrative load on the Coordinator. Data processing services would seem better placed

as an administration support unit, and the information system, with all its data providers and data users, served by it. As the services are gradually extended throughout the MOE, its current location will prove troublesome. Serious thought is needed here.

7. Some sort of data management software will be required if the system is ever to become truly integrated and efficient. Far too much effort is currently being spent on designing file structures, access methods, etc., and the proliferation of programs is remarkable, each performing one task. A data base management system (DBMS), which is one possibility, must be understood to be merely a tool for designing a data structure and "transparently" permitting access to it. Good data base design is not a simple matter, and bad data base design has tremendous implications for system, and application, performance. If additional tools are provided with the DBMS, certain types of applications development are very much simplified, as are ad hoc requests that do not merit the development of an application.

There is another issue which bears upon this matter. If past use of purchase software is any indication, one might very well expect to see low levels of use of the DBMS. How rapidly would existing systems be moved to a DBMS-based design? Would proper planning occur of the new data base? Would all applications be developed using it? Would there be a (stable) data base administrator?

This reviewer is therefore undecided: on the one hand, I am aware of the benefits of a DBMS in this type of environment; on the other I am uncertain to if and how well this tool will be used. If a major system upgrade (more memory, disc, terminals) is done, I would probably opt for purchasing some sort of data management software under the assumption that it would sufficiently speed up the software development process to merit it.

8. Systems software development will require outside leadership for the foreseeable future. Software can be developed by personnel hired under PSC's, as is currently done, or by contract. The former provides some upgrading of personnel, the latter merely training in the use of a "turn-key" system. The qualifications for this personnel will depend largely on the acquisition or not of the DBMS. It is not likely, given MOE pay scales, that qualified personnel can be hired to develop systems, and if in-house training is provided, it is questionable that such personnel can be retained. PSC's would require a minimum of 18 months each for 2-3 persons in order to develop a reasonable number of systems to support major MOE functions. It would be preferable if these individuals were not burdened by instructional, operational or administrative burdens.

9. The need for strengthening the analytic capability of the MOE is evident. There are three options: the creation of the Advanced Analysis unit within the Information Systems Department, the creation of an analytic user interface (virtually a "technical" Coordinator, in addition to the present one), and developing "analytic users" in the appropriate MOE units. My own bias is towards the third option, possibly in combination with the second. This would require in-service training provided by technical assistance during perhaps 15-18 months.

10. A documentation center should be set up within the Information System Department to centralize all system support documents. This should not be the same as the regular files of the Coordination.

11. The existing MOE structure should be analyzed to see if the structure exists for decentralizing data capture while providing support functions for the remote unit. As an example, micro-computers might be located in the Departmental Supervisions if their use was necessary for the regular functions of the Supervision and data required elsewhere in the information system could be captured. Transfer of data would have to be low technology (diskette). Cost estimates should include an uninterruptible power supply (UPS), printer, and locale conditioning.

12. If micro-computers are acquired, they should be 100% IBM-PC compatible, and they should all be the same. There is a tremendous amount of software (including SPSS-PC) which will not run on the WANG-PC machines.

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APPENDIX A
SUPPLEMENTAL CONCLUSIONS AND RECOMMENDATIONS

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SUPPLEMENTAL CONCLUSIONS AND RECOMMENDATIONS

This section details supplementary conclusions and recommendations to the main report on the Ministry of Education, Management Information System for Honduras. It is divided into three basic sections: Management, Software, and Computer Hardware. While all three sections are related, each provides a separately implementable decision affecting the efforts of the Management Information System and the Ministry of Education.

Management

External review of the draft report as well as familiarity with the basic Ministry situation in Honduras suggest that for the conceivable future, a reasonable level of external assistance will be required to make this particular MIS effort fully effective. External assistance is required to provide continuity in the development of complex custom systems, to train lower level personnel within the Ministry in new development techniques for software and for maintenance, and for "rationalization" of the present system so as to reduce substantially the software maintenance burden which the Ministry is about to become involved in. We believe this external assistance may provide a somewhat more rapid response to the ongoing requirements of the Ministry and as well create, on a stable basis, a "critical mass" of personnel necessary to fully implement the systems.

In our recent experience, the Academy has had considerable success with a mixture of overseas or expatriate assistance combined with a private sector firm which is locally based. Typically the locally based firm provides language, cultural, and local linkages which an external group firm would have a great deal of difficulty in establishing, while the external provides a slightly more advanced level of understanding of systems development and new systems tools as well as the requisite ability to train trainers and transfer technology in a systematic and long-term fashion. This particular mixture of skills often is what is required for major computer systems which a donor agency like USAID hopes to become institutionalized. Typically, public sector Ministries and even some parastatals are unable to provide the necessary incentives either in terms of money or working environment to attract and retain the necessary top level people to maintain complex systems. Accordingly such groups often, particularly through the introductory stages, turn to outside vendors on a contract basis to install and then maintain for a period of time the necessary large systems. Under these conditions, institutionalization takes the form of learning how to manage effectively external contractors, and then as the special technical requirements are reduced--both because of simpler operating techniques as computers become more sophisticated and because of the rising sophistication of professional personnel within a Ministry or Parastatal--lower level personnel are able to take on some of the functions previously assigned to expensive and scarce technical personnel.

Some mixture of appropriate foreign or expatriate assistance, local assistance, and a program of institutionalization, we believe, will be necessary for the Ministry of Education in Honduras. With carefully defined roles and the proper complementarity of skills, a project as complex as the present MIS development for the Ministry can be accomplished within a reasonable of time. Lacking this establishment of a critical mass

and the proper mixture of personnel, the MIS effort will remain a series of isolated implementations which will be used for as long as the leading figure in a directorate finds them useful. In some situations that is the best that can be hoped for, but in a situation like that of the Ministry, more can well be expected.

Software

The software situation at the Ministry has two components to it: one related to the present mixture of software used anywhere on the VS 80 computer system, and one related to the future implementation of a database. A review of page 15 of the main report indicates that at least four major software packages are not on line and in some instances are not directly useable since their license for use has expired. This includes SCSS, and Minitab, both general purpose inquiry type statistical packages. The result of these packages not being used is that personnel cannot get "ad hoc" or inquiry type reports without special programming efforts on the part of the present data processing staff. The result of this must naturally be that fewer ad hoc requests are made, and therefore the policy usefulness of the software installations lessens. Several of the packages available are useful only on microcomputers, and may in fact be some of the most useful software which the Ministry maintains. A lot of prior experience has shown that microcomputers frequently get more sustained use particularly by user departments than a minicomputer simply because of accessibility and in some cases ease of use.

We recommend that for the Ministry installation, the data processing center purchase a generalized inquiry package like EZ Query which is supported by Wang and which is used as a general purpose statistical and reporting package. The advantage of this program, which can be purchased outright without the need for annual license renewal, is that it can access almost any type of data file regardless of structure. As a result, ad hoc reports and reports not contemplated in the original design can be quite readily generated. In addition, the inquiry language is very "English like" which allows a variety of less trained users access to information within the data structures. In the training sequence which we have proposed for a number of the user departments, use of a package like EZ Query should be encouraged since this would reduce the immediate load on a number of the programmers in the computer center, and enhance the usefulness of data already captured within the system. It is possible with a package like EZ Query to lock out certain data elements so as not to allow corruption of the database, and in addition to control in a selected fashion access to data which users may not wish to be shared throughout the Ministry.

On the matter of the database, we do not concur with previous suggestions that a major, CODICIL Hierarchical database be implemented for the Ministry of Education. Such databases would include TOTAL, ADABAS or the IBM version called the IDMS. We believe such databases are not required for the type of information which the Ministry routinely collects and more importantly would be extremely difficulty to support in the present Ministry environment. Such databases require a substantial amount of computer overhead (up to 1 Megabyte of RAM storage simply to operate effectively) and as well require a level of ongoing technical sophistication to keep them running effectively. The advantages to be gained from such databases including relatively painless addition of data elements and a certain freedom in specifying file structures we believe would be overshadowed by the complexities of implementing and maintaining such a system.

Rather, we recommend a somewhat simpler relational database employing index keys and certain relational approaches which are quite straightforward to design and to maintain. A database such as SPEED also supported by Wang or Wang's own proprietary relational

database could quite effectively meet the requirements of the Ministry without incurring the substantial computer overhead and the technical sophistication which a major database installation would demand. The relational database packages we are recommending are capable of operating typically with .25 megabytes of RAM storage and will only marginally slow down the current access programs. The effective use of these databases will require a retroactive software rewrite for all of the present programs to ensure that the data variables are accessed according to the proper names. An additional action study would be required to determine the exact amount of time necessary to do the rewrite but a period of approximately four months with two programmers should be sufficient to modify present programs to meet a relational database requirement.

Relational database packages of the type we are suggesting typically cost about \$25,000 and do not require an annual license fee. Separate arrangements can be made for periodic updates to such databases and the Wang distributor in Tegucigalpa should be competent to provide this level of support.

The only additional training necessary for users to have ready access to the database is an understanding of the EZ Query language and some understanding of the resource constraints at particular times of day. For example, since the database tends to run somewhat slower than a straight "flat file" the type presently being used in the Ministry, it will be necessary to ask some users not to make major inquiries late in the afternoon when other programs may be running. Aside from this, there should be no obvious impact for the Ministry users because of an alteration to a relational database of the type being proposed.

Hardware

Based on on-site visits, a review of potential Wang configurations and a consultation with a number of project leaders who have conducted similar projects to that of the Ministry of Education, we find that the present Wang configuration suffers from major limitations in terms of RAM memory, the fundamental speed of the central processing unit, and also from disk limitations. Although with most installations certain changes could be made to make the machine run faster, operate more efficiently and use less disk space for the functions being performed, the future implementation for the Ministry clearly indicates that the present computer hardware is too small for the projected demands. While in principle we support the upgrade recommendation suggested by certain Ministry personnel, and included as Exhibit I in this Appendix, we suggest that several alternate equipment configurations be considered--both for performance and for cost reasons. Specifically we suggest that a VS 65 series machine be considered, with a trade-in of the VS 80 or alternatively the VS 80 set aside as a dedicated word processing device, that the 600 LPM band printer be replaced by two more high density dot matrix printers--since we doubt that another centralized printer would serve as well as a decentralized printer station in certain divisions, and we recommend that careful attention be given to the present maintenance contract. Exhibit II, attached, contains our alternate recommendation for a Wang configuration. The final decision on keeping the VS 80 in a dedicated mode or turning it in for a CPU upgrade will depend upon the prices that might be obtained locally for a trade-in of the 80, and alternatively the changes in the cost of maintenance for this admittedly aging machine.

It should be noted, that over the next five years, the major limitation on new equipment purchase will not necessarily be the initial cost, the capital investment, but rather the cost of ongoing maintenance. Newer machines tend to have lower initial prices and also more reliable components both of which tend to lower the annual maintenance cost. As a

result, newer machines will sometimes pay for themselves more rapidly and in fact be a better investment than simply keeping an older device which has a large annual maintenance contract. Maintenance fees vary substantially country to country and in fact region to region. A detailed comparison of such costs will be necessary before we could recommend a specific strategy on change over.

None the less, it is clear that a CPU and a RAM memory upgrade on the order of a VS 65, particularly if other VS 65s were in the country, as well as additional disk capacity much as originally recommended will be necessary for the effective functioning of the Ministry's operation.

As usual, and as importantly, such equipment must have leadership within the computer center which is committed to its effective operation and which can provide the first level training necessary to keep it going. One advantage of the VS 65 and similar series of computers is that it has a comparatively simple, yet effective operating system, and a simple, yet effective machine configuration which is quite robust. The result is that operators do not require an extraordinary amount of training in order to keep it working effectively and both backup and recovery of the system is comparatively simple. We recommend a system of this sort within the Ministry for obvious reliability and training reasons.

Summary

We believe that the Ministry of Education, Management Information System Project is at a water-shed in its history. Enough investment and commitment has been made to provide a solid foundation for institutionalization of the effort within the Ministry. What is required is the next stage of conceptualization, provision of technical services, recruitment and retention of trained staff, and development of the necessary level of recommitment to the project. There is clear evidence, as noted in the report, of such a commitment within selected user departments. It will be necessary to capitalize on that interest and commitment and provide the proper level of technical and equipment support.

EXHIBIT I
INITIAL HARDWARE REQUEST

- 1 - WANG VS100 CPU with 4 Mb memory, VS128GT5 diskette (double and single sided, IBM compatible) handling console
- 1 - 2265V-3 fixed magnetic disc, 640 Mb
- 8 - 4210VS-1 workstations, DP, WP, graphics capability
- 2 - 5577V high density dot-matrix printers
- 1 - 5574 600 lpm band printer
- 1 - 22V25-2 Mag tape I/O processor
- 2 - 22V88-2 Mag disc I/O processor
- 2 - 22V27-2 Serial workstation/printer I/O processor, capacity for 32 devices minimum

EXHIBIT II

PROPOSED HARDWARE REQUEST

- 1 - VS65-4BN with 4 MByte of memory, 147 MByte fixed disk.
VS128GTE diskette (double and single-sided, IBM compatible) handling console
- 1 - 2265V-3 fixed magnetic disk, 640 MByte
- 1 - 2265V-2 fixed magnetic disk, 288 MByte removable drive (redundancy for current drive)
- 8 - 4230VS 64KB DP/WP Workstations
- 4 - 5577-V High Density Matrix Printers, with bin feeder and forms tractor
- 1 - 22V25-2 Mag tape I/O Processor
- 2 - 22V88-2 Mag disk I/O processor, or equivalent 25V50-2A
- 1 - VS 65I/O 32 Additional port controller
- 2 - 22V27-2 Serial Workstation/printer I/O Processor
- 2 - Interface connections for VS and Wang PC workstations
- 2 - PC-PM101 Wang/IBM Emulation Boards, for present Wang PCs to emulate an IBM microcomputer.

This configuration makes use of a small cabinet machine and provides both additional disk capacity as well as disk redundancy based on current VS80 configuration.