UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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HUMAN RESOURCES
DIVISION

B-164031(4) OCTOBER 16, 1979

Use title on form #115

The Honorable Patricia Roberts Harris
The Secretary of Health, Education, AGC00027
and Welfare

Dear Mrs. Harris:

Subject: The Social Security Administration Needs To Develop a Structured and Planned Approach for Managing and Controlling the Design, Development, and Modification of Its Supplemental Security Income Computerized System (HRD-80-5)

In our August 9, 1979, report "Flaws in Controls Over the Supplemental Security Income Computerized System Cause Millions in Erroneous Payments" (HRD-79-104), we disclosed that $25 million of erroneous payments have occurred because of control weaknesses in the Social Security Administration's (SSA's) Supplemental Security Income (SSI) computerized system. This system is used to help maintain beneficiary information and administer benefit payments to over 4 million needy aged, blind, and disabled individuals.

Weaknesses result because SSA lacks a structured and planned approach for managing and controlling the design, development, and modification of its computerized systems. Instead, SSA follows an unstructured, often hurried approach that results in

--incomplete computer program and system documentation;

--unvalidated and uncontrolled system modifications; and

--unmet field office users' needs.

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Furthermore, the Department of Health, Education, and Welfare (HEW) Audit Agency has neither participated in the design and development of the SSI computerized system to help assure that adequate automated controls and audit trails exist nor reviewed the automated controls that have been incorporated in the system since it went into operation.

These weaknesses can be corrected by (1) establishing better management controls over the system design, development, and modification process and (2) assuring their implementation. Although our observations deal primarily with the SSI computerized system, we have recently identified similar weaknesses in SSA's Retirement, Survivors, and Disability Insurance system redesign efforts. Consequently, we believe these weaknesses may exist throughout SSA. We are currently evaluating the impact of these weaknesses on the operation of the Retirement, Survivors, and Disability Insurance system for the Chairman of the House Committee on Government Operations.

BETTER COMPUTER PROGRAM AND SYSTEM DOCUMENTATION IS NEEDED

Computer program and system documentation has not been properly developed and maintained for the SSI computerized system since its implementation in January 1974. The HEW Audit Agency reviewed SSI program and system documentation and reported to the Commissioner of SSA in June 1976 that the "hurry-up environment" that existed before program implementation resulted in incomplete and inconsistent documentation of the initial system. Furthermore, the Audit Agency reported that, at the time of its review, existing documentation was often limited to program specifications, program listings, and incomplete operator instructions. Its report added that program documentation, such as narrative descriptions, flow charts, and test results, were often missing.

We have been reviewing SSA's data processing activities since December 1976, and we have issued a number of reports on this subject. (See enc. I.) During our work we have encountered similar problems in attempting to document the flow of data through the SSI system. For example, we could obtain program documentation on only 43 (28 percent) of the 155 computer files reportedly contained in the SSI computerized system.

Much of the computer file documentation we did obtain had to be written by SSA expressly for our review, and this process took several months. Furthermore, when we asked for a copy of the computerized system flowchart--a basic piece of system documentation--we were told that a complete, up-to-date flowchart was not available and that one would have to be developed for us. When we were finally given this documentation--over 2 months after our initial request--we were told that it was no longer accurate because of recent changes to the system.

In November 1976, SSA contracted with the MITRE Corporation, a systems engineering, research, development, and advisory services organization, to study SSA's data processing activities. In its September 1977 report, MITRE pointed out that documentation deficiencies such as those discussed above existed throughout SSA, and it recommended that documentation standards be updated and that documentation be reviewed periodically during the system development process.

Current, accurate documentation of all programs and the entire computerized system should be an integral part of the system design, development, and modification process. Good documentation is critical because it

--provides the primary communications channels among programers and analysts, system validators, users, auditors, and other management;

--increases the ease and accuracy of computer program maintenance; and

--provides for a continuity of programing/analysis support in the event of personnel turnover.

Without proper documentation, it is difficult to understand how the system is actually operating and how the system will react to program modifications. Consequently, program modifications cannot be made quickly, effectively, and economically.

The Federal Information Processing Standards of the National Bureau of Standards provide generally accepted guidance for developing documentation during the system design, development, and modification process. SSA management should instruct SSI programers and analysts to follow this guidance. SSA management should also make sure the

standards are being adhered to through periodic documentation reviews.

BETTER VALIDATIONS AND CONTROL OF SYSTEM MODIFICATIONS ARE NEEDED

Since May 1976, SSA has attempted to begin validating the SSI system; however, as of August 1979, program and system modifications were still being incorporated into the normal operating environment without being properly validated. This occurred because adequate staff had not been assigned to the SSI systems validation group and because control procedures had not been established to assure that all program and system modifications were properly validated. Consequently, little assurance can be placed on the integrity of the SSI system.

Better system validations are needed

SSA's January 1976 SSI Study Group report stated that, except for the computations process or module, the SSI system had not been validated before implementation. The report added that this could be expected since SSI programs were continuously being modified. The Study Group recommended that "Validation of each module and of the whole new version of the SSI system should be a standard part of its development."

In conjunction with the Study Group report, SSA officials acknowledged that previous validation efforts had been fragmented and severely restricted by time and resource limitations, allowing for only limited validation of SSI functions on a post-adjudicative basis. The officials concluded that past validation techniques had proven inefficient in (1) identifying systems problems before public disclosure, (2) reducing the incidence of processing errors, and (3) improving overall processing. As a result, the Commissioner ordered that a high priority be placed on establishing an SSI validation system.

SSA began this effort in May 1976, with the development of performance requirements for establishing a pre-implementation validation technique. This technique was developed to evaluate requested program and system modifications before including them in the live production environment. In September 1977 the first test transactions were input into a partially completed pre-implementation validation

system. Because of staffing constraints, as of August 1979 the pre-implementation system had still not been completed, and only limited numbers of test transactions could be input for testing program and system modifications before implementation. Thus, as of August the systems validation group still could not validate program and system modifications before they were introduced into the live SSI computerized system.

A system is validated before implementation to make sure that it functions as required by the user and as designed by the systems analyst. Validation requires thorough testing of the system's performance, functional specifications, documentation, outputs, operating procedures, and user procedures. Even when the program or system modification is insignificant, the entire system must be validated before implementation in order to maintain its continuing integrity. The system validation group must therefore be the ultimate authority for certifying that the entire system performs in accordance with all functional and performance specifications. Consequently, the SSI validations group needs to be appropriately supported by SSA management--it must have enough staff to thoroughly evaluate all program and system modifications before implementation.

Better controls over system modifications are needed

SSA categorizes system modifications in general terms, such as major, minor, internal, and emergency. The distinction between major and minor modifications is essentially oriented toward resource commitments and budgetary impacts. By SSA's definition, a major modification results in large-scale resource commitments, whereas minor or routine changes result in minimum to significant commitments. Internal program modifications are those required for the normal maintenance of the system as determined by the programer. In addition, SSA is faced with emergency situations, which require immediate system modifications to correct problems and to allow production processing to continue.

SSA has established general guidance which provides procedures and processes to be followed in making major and minor modifications to the SSI computerized system. This guidance includes formal change requests and authorization procedures, approval processes, and testing procedures;

however, it does not indicate how the validations group is supposed to control these system modifications. Concerning internal program changes, the guidance allows these modifications to be made without prior validation. Thus, no control mechanism has been established to notify the systems validation group of these modifications. Emergency modifications, by their nature, cannot be validated before being placed into the normal operating environment, and again, no control mechanism has been established to notify the systems validation group of these modifications.

Regardless of the magnitude of the modification, procedures should be established to control all program changes to prevent unauthorized and potentially inaccurate modifications from being incorporated into the normal operating environment. Thus, the SSI systems validation group needs control procedures to make sure that all modifications have been authorized, certified for accuracy, and properly validated, thereby ensuring the system's continued integrity.

MORE FIELD OFFICE USER INVOLVEMENT IS NEEDED

Field office personnel--the primary users of the SSI system--had only partially participated in the system's design, development, and modification process. Systems analysts modify the SSI system based on users' perceived needs, rather than soliciting their actual needs. Based on their own perceptions, systems analysts conceptually design a feasible system modification and detail the programing specifications to be completed by the computer programer. Only after this detailed design is completed are users asked to pilot test the system modifications. If field office personnel find difficulties in using the system modification, it is often too late to change it. Thus, with limited involvement by users, the system may operate without meeting their specific needs, and changes implemented may become hindrances rather than improvements.

We visited 15 field offices and interviewed 57 field office representatives who make extensive use of a major system output document--the Supplemental Security Income Record Display (SSIRD). This document gives field office personnel a complete description of an SSI recipient's computerized master record. All of the field office personnel we interviewed stated that they had not been involved in

developing and implementing this output document. Furthermore, 50 percent thought the layout of the SSIRD was confusing, 76 percent believed that it did not fully meet their needs because it wasn't received soon enough, and overall 86 percent felt that it could be improved in some manner. When we informed SSI systems analysts and programers of these observations in April 1978, they acted immediately to correct specific deficiencies and to allow the revised SSIRD to be accessed directly through SSA's telecommunications network. Thus, only during our review were field office personnel given the opportunity to initiate a system change that met their needs and objectives.

Additionally, in the first half of 1978, SSI systems analysts and programers designed a change to the SSI Claim Record Review Form (SSA-8080) which would allow it to be transmitted through SSA's telecommunications network rather than through the mail. Although field office personnel were receiving this information faster than before, many of those we interviewed complained that the new format was difficult to use and that many data elements needed to verify the accuracy of computer processing were omitted. Despite these deficiencies, the change was implemented in October 1978.

We reviewed this particular system modification and on September 18, 1978, recommended to the Commissioner of SSA that the revised SSIRD, which contains a complete description of the recipient's computerized master record and can be accessed directly through SSA's telecommunications network, be substituted for the new SSA-8080. This would also allow field office personnel to use a standardized form--which they were familiar with and had helped design--for reviewing SSI claim information. As of September 1979, SSA said it was considering implementing our recommendation.

It is commonly accepted that users should actively participate in the system design and modification process so that their needs and objectives can be met. Otherwise, systems can be developed that are cumbersome, and changes can be made that do more harm than good; as a result valuable time and resources may be wasted, and the system's ability to adequately and accurately perform its functions may be impaired. To avoid these problems, SSA should encourage and provide for its field office personnel to actively participate in the SSI system design, development, and modification process.

INCREASED HEW AUDIT AGENCY REVIEW AND PARTICIPATION ARE NEEDED IN DESIGNING COMPUTERIZED SYSTEMS

Since the SSI program began in January 1974, the HEW Audit Agency has evaluated the general controls concerning the accounting and other related financial subsystems, security controls over computer operations, SSI program and system documentation, and SSA field offices' claims processing policies and procedures. In addition, it has recently audited controls related to the central computer facility's tape library. However, except for reviewing SSI program and system documentation, they have reviewed neither the system's automated controls nor its design, development, and modification process.

GAO's 1972 publication, "Standards For Audit Of Governmental Organizations, Programs, Activities and Functions," in discussing the general role of the internal auditor, states that:

> "An evaluation is to be made of the system of internal control to assess the extent it can be relied upon to ensure accurate information, to ensure compliance with laws and regulations, and to provide for efficient and effective operations."

Thus, the auditor has a continuing responsibility to review both general controls and system controls to assure that systems are performing in accordance with management policy. Our August 9, 1979, report showed that the automated controls in the SSI system were weak and needed to be improved to help prevent erroneous SSI benefit payments as well as fraud and abuse. These deficiencies were found by auditing through the computerized system, using advanced audit tools and techniques to evaluate the system's internal controls and audit trails. Our review showed that the Audit Agency (1) has not been fulfilling its responsibilities as prescribed by GAO standards and (2) should expand its efforts to include the review of automated controls within the SSI system.

Additional internal audit responsibilities were described in the 1974 GAO publication "Internal Auditing in Federal Agencies," which provides a "revised statement

of basic principles, standards, and concepts of internal auditing in Federal Agencies." This document states that the internal auditors should be kept informed of proposed program changes in methods, systems, and procedures. It further directs that the auditors be involved in designing new systems, particularly automated ones, so that they can make suggestions to incorporate adequate controls and audit trails in the systems before installation.

Furthermore, GAO's March 1979 supplemental standards detail internal audit's responsibilities with respect to computer-based systems. Specifically, an audit agency, in its responsibility for reviewing the system design, development, and modification process, must make sure that all systems

--carry out the policies management has prescribed for systems;

--conform with applicable legal requirements;

--are efficient and economical to operate;

--are documented in a manner that will provide an understanding of the system, as required for maintenance and audit needs;

--include controls to protect against fraud, abuse, and error; and

--provide audit trails for management, operational, and audit review.

To prevent the problems that have beset the SSI computerized system--as discussed in our August 9 report--the Audit Agency should begin reviewing and participating in the design and development of new processing systems, and significant modifications thereto, as a normal part of its audit function.

IMPROVEMENTS ARE NEEDED IN THE SYSTEM DESIGN, DEVELOPMENT, AND MODIFICATION PROCESS

No structured approach exists which provides management controls and organizational standards to facilitate the design, development, and modification process for the SSI

computerized system. Furthermore, organizational responsibilities and interactions required for effective planning and coordination of the system's life cycle have not been established.

Both HEW and SSA have attempted to provide some form of guidance concerning the system design, development, and modification process. In December 1977, HEW published guidelines concerning the life cycle management process for automated systems. This guidance, however, deals primarily with the acquisition of automated systems; it does not contain specific standards for or controls over the system design, development, and modification process of automated systems. Proposed SSA Administrative Directives System guidelines, dated January 15, 1979, attempt to further define a system's management process. But these guidelines also lack specific standards and controls and do not adequately address all aspects of the system's design, development, and modification process. Furthermore, in its April 1978 report, the MITRE Corporation noted the lack of SSA-wide system development standards and recommended that a framework of specific standards be developed for each phase of SSA's system development cycle. As of August 1979, this recommendation had not been implemented.

Every computerized application--whether it is a new system or a modification to an existing system--goes through essentially the same process of being conceived, developed, and implemented. This basic development process must, however, be carefully planned, managed, and controlled to ensure the accuracy and completeness of computer processing. The diagram on page 5 of enclosure II shows the major stages needed on a system development life cycle and the personnel who should be responsible for completing them. Enclosure II also contains a detailed description of this process.

Because a structured, management-controlled approach to the system design, development, and modification process has not been established by either HEW or SSA, the SSI computerized system is neither fully documented nor thoroughly validated, does not always meet users' needs, and is not properly controlled. As a result, erroneous payments have occurred--as discussed in our August 9 report--and will continue to occur, unless more management controls and standards are established over the system design, development, and modification process.

CONCLUSIONS

SSA has followed an unstructured approach in designing, developing, and modifying the SSI system. As a result, the system has weaknesses:

--Computer program and system documentation has not been properly developed and maintained.

--System modifications are placed into the normal operating environment without being adequately validated.

--Field office users' needs are not always met.

Furthermore, HEW audit agency review and participation are needed to help ensure that adequate automated controls and audit trails are designed into SSA computerized systems.

These weaknesses can be overcome by implementing a structured, management-controlled approach to the system design, development, and modification process.

RECOMMENDATIONS

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We recommend that you direct the Commissioner of the Social Security Administration to:

--Establish a structured, management-controlled approach, such as the system development life cycle technique discussed in enclosure II of this report, to the system design, development, and modification process.

--Use existing program and system documentation standards and procedures provided by Federal Information Processing Standards of the National Bureau of Standards.

--Provide management support to ensure that the systems validation group has enough staff to thoroughly perform the systems validation function.

--Establish control procedures for the validations group so that they can have an effective means for controlling program and system modifications.

--Establish procedures to ensure that users actively participate in the entire system design, development, and modification process.

We further recommend you direct the Inspector General to have the Audit Agency: PLG 00258

--Expand its efforts to include the review of automated system controls.

--Actively participate in reviewing the system design, development, and modification process.

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As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the four above-mentioned Committees, the Senate Committee on Finance, the House Committee on Ways and Means and its Subcommittee on Public Assistance and Unemployment Compensation, and the Senate Appropriations Subcommittee on Labor and Health, Education, and Welfare. Copies are also being sent to the Director, Office of Management and Budget.

We appreciate the cooperation and assistance of Social Security personnel and would like to be periodically informed of the progress made to implement our recommendations.

Sincerely yours,

Gregory J. Ahart
Director

Enclosures - 2

ENCLOSURE I

GAO REPORTS ON THE SSI PROGRAM'S COMPUTERIZED SYSTEM ISSUED BETWEEN FEBRUARY 1978 AND FEBRUARY 1979

February 21, 1978, Report to the Acting Commissioner of Social Security (HRD-78-73)

We reported that, although SSA had recently spent about $500,000 to install a new security system for its central computer facility, the facility was still not secure. Adequate security procedures had not been established, and SSA had not made an in-depth study of the facility's security needs.

We recommended that (1) security guards be positioned to have full view of their assigned area, (2) the security system be modified to allow only one temporary authorization badge to a person at any time, (3) emergency exit wiring and exits be secured to prohibit tampering. Further, to improve overall security procedures, we recommended that SSA (1) complete a formal risk analysis to determine security procedures needed at the facility, (2) make background checks on employees who work within the facility, and (3) establish proper security for the facility based on the risk analysis. SSA has taken steps to implement all of the recommendations.

May 26, 1978, Report to Russell B. Long, Chairman, Senate Committee on Finance, and Al Ullman, Chairman, House Committee on Ways and Means (HRD-78-114)

We reported that substantial overpayments to SSI recipients occurred because SSA determines eligibility and benefit amounts on a prospective quarterly basis. Requiring SSI recipients to to estimate future changes in their income has resulted in inaccurate monthly benefit payments and administrative difficulties. SSA estimates that, in 1976 alone, the current accounting methodology resulted in at least $39 million of overpayments.

We recommended that many problems associated with the accounting methodology could be resolved if benefits were determined on a retrospective monthly basis, with a 1-month lag between the month used for eligibility determinations and benefit calculations and the month payments are made to recipients.

ENCLOSURE I

June 5, 1978, Report to Congressmen John E. Moss and Charles Rose (HRD-78-116)

We identified several management problems leading to possible misuse, abuse, or destruction of SSA beneficiary records. SSA did not have an ongoing centrally directed program to protect its records. Further, many problems existed in the design and management of SSA's telecommunications system which threatened the security of automated records maintained by the system.

We recommended that SSA (1) restrict the ability to create records or access the national data base to only those data necessary for each specific class of office, (2) restrict the ability to create records or make changes to existing records in accordance with employee and maintenance personnel duties and responsibilities, (3) provide a personnel identifier on input documents for the person who performs the interview, prepares the input documents, and reviews the input documentation, (4) restrict knowledge of the password used to lock and unlock a terminal to the office manager, assistant supervisor, and security officer, (5) require the password to be changed at least monthly, and whenever any employee knowing the password is no longer employed at that office, and (6) conduct a risk analysis to determine the full extent of security weaknesses.

September 18, 1978, Report to the Acting Commissioner of Social Security

We reported that in the SSI program SSA was using two computer-produced forms--one for reviewing initial claims and the other for performing redeterminations of eligibility and benefit payment amounts--that could be eliminated. SSA had recently designed an SSI record display that could be used for both purposes and provided more up-to-date information in a standardized format.

We recommended that the redesigned SSI record display be used for reviewing both initial claims and performing redeterminations, thus eliminating the other two forms and saving $200,000 in administrative costs annually.

ENCLOSURE I

February 6, 1979, Report to the Commissioner of Social Security

We reported that, to remove the redundancy of processing, better protect a claimant's filing date, and provide a method for detecting claimants who falsify eligibility information, the oral and written inquiry process should be incorporated into the existing SSI computerized system.

We recommended (1) eliminating the new oral inquiry questionnaire and using the formal application appropriately identified as an oral inquiry rather than a formal application, (2) entering the information obtained into the SSI computerized system, (3) allowing the SSI computerized system to issue the written notice of denial, and (4) developing an automated methodology for field offices to obtain information on oral or written inquiries and any prior reasons for denial.

February 16, 1979, Report to the Secretary of Health, Education, and Welfare (HRD-79-4)

We reported that millions of dollars are being erroneously paid to SSI recipients annually because of the lack of adequate filing systems, processing procedures, and management controls to ensure that posteligibility changes are promptly and accurately processed.

We recommended that (1) procedures and provisions for monitoring the processing of post-eligibility changes be established to insure that prompt, effective action is taken on these changes, (2) a uniform records management program be developed and implemented to ensure that recipient files are effectively and efficiently maintained, (3) controls be established in the computerized system to assure field offices that all changes are either posted to the record or rejected, and (4) controls be established over rejects so that the system can notify field offices when information in reject messages has not been corrected.

AN APPROACH TO USING A

SYSTEM DEVELOPMENT LIFE CYCLE TECHNIQUE

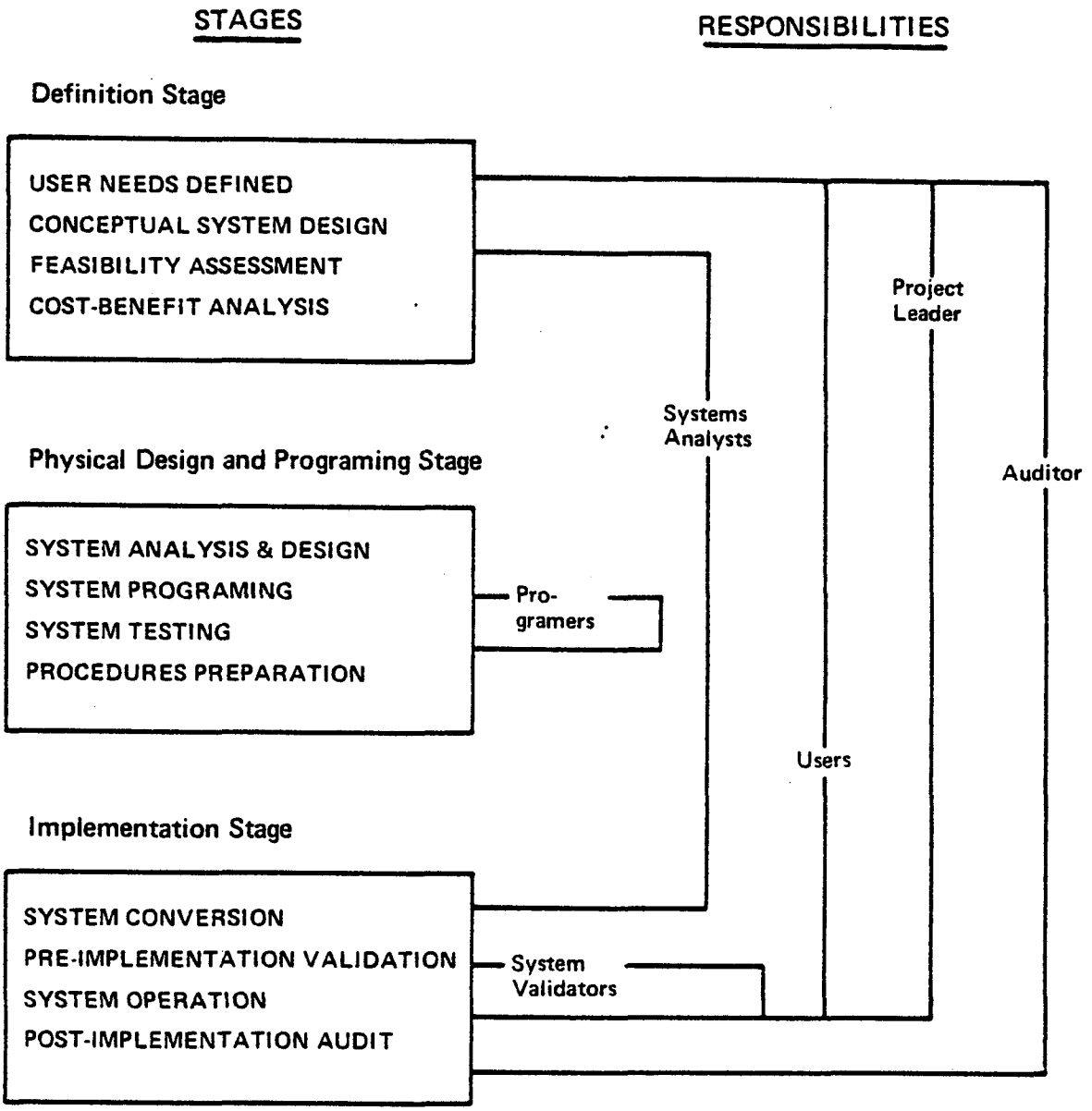
The System Development Life Cycle (SDLC) concept is a commonly accepted management control technique that may be used to divide the automatic data processing system development process for significant production applications into distinct phases so that mangement can review the process at appropriate decision points. The characteristics of the SDLC approach may vary, depending on such circumstances as organizational differences or management philosophy. However, in any event, the approach will encompass periodic reporting to management and surfacing, analysis, and resolution of problems encountered. This technique is as applicable during initial system design as it is during the modification process; thus, it should be used whenever changes are made to a system. Additionally, SDLC is particularly advantageous because it promotes responsible communications among programers and systems analysts, system validators, users, auditors, and management. Furthermore, when properly structured and controlled, SDLC is generally believed to be the best technique currently available to aid in developing significant production applications.

The following diagram and description of SDLC represents a composite approach we developed using several authoritative sources. 1/

1/Gordon B. Davis, "Introduction To Computers" (New York: McGraw-Hill Book Company, 1977), pp. 59-64; Stanford Research Institute, "Systems Auditability and Control Study" (Altamonte Springs: The Institute of Internal Auditors, 1977), Control Practices Report, pp. 99-109; U.S. Department of Commerce, "Guidelines for Documentation of Computer Programs and Automated Data Systems," FIPS No. 38; U.S. Department of Commerce, "Guidelines For Documentation of Computer Programs and Automated Data Systems for the Initiation Phase," Proposed FIPS.

ENCLOSURE II

THE SYSTEM DEVELOPMENT LIFE CYCLE



ENCLOSURE II

System development life cycle stages

SDLC is divided into stages containing various activities. Each activity, or step, must be completed before the next can be started. At the completion of each step, all previous work is reviewed, and a "go/no go" decision is made. This progression through the stages and appropriate steps thus provides a structured approach to the development process.

At the beginning of the definition stage, the user defines the needs and objectives he expects to achieve from the proposed project. The user's needs are used to develop a conceptual system design. This design is used to make a feasibility assessment to determine the system's technical and operational feasibility. Finally, a cost-benefit analysis is performed to make sure that the project will produce the desired results economically.

In the physical design and programing stage, the detailed system design is created. The detailed design is then used to prepare required computer programs. Once the programs have been completed, each program, and then the entire system, is tested to make sure that the system is fully operational. Later, processing procedures--both manual and automated--are prepared for implementation of the system.

The implementation stage begins with the preparation of needed procedures for converting to the newly designed programs and for building new files. This would also include parallel operations of both the old and new systems, if applicable. After necessary conversion procedures have been completed, the entire system is validated to make sure that it performs in accordance with all functional and performance specifications, meeting user needs and objectives. Once the system has been certified to be accurate and complete, it is placed into operation. The system is allowed to operate for several months before the final step in the implementation stage--the post-implementation audit--is undertaken. The post-implementation audit is a review of the entire system--both the manual and automated processes. This review ensures that the system (1) maintains the necessary internal controls to consistently produce reliable results and (2) operates in accordance with applicable agency and Federal standards and approved design specifications.

SYSTEM DEVELOPMENT LIFE CYCLE RESPONSIBILITIES

In addition to providing decision points for the various activities in the system development process, SDLC defines specific responsibilities for the various personnel involved in the process. These responsibilities and associated duties are established at the outset of the project and provide for performance and management accountability. Thus, management gains the control mechanism needed in the development process.

The user identifies the need for a new system or a modification to an existing system and is responsible for making sure that his needs and objectives are achieved by the final operational system. To do this, the user must actively participate in all phases of the system development life cycle until the system is operating satisfactorily. In all cases, the user must be the final authority on whether the system meets its intended purpose. Thus, the user has the responsibility for making the "go/no go" decisions, including the final decision to place the system into operation.

The project leader, who represents top management, is responsible for the control and coordination of the system development project. The project leader is normally given the authority for making decisions on personnel resources, scheduling, cost and budget, and most technical project matters. As the leader of a team comprising persons with mixed skills, he must provide a well-defined and structured environment within which system development can progress in an orderly manner. The project leader must also serve as the interface between users, systems programers and analysts, system validators, and top management.

The systems analyst is responsible for translating the user's needs into a conceptual system design. This conceptual system is then used by the systems analyst and user to make sure that the system is technically and operationally feasible and can produce the desired results at a minimum cost. Then the systems analyst:

--Creates the detailed system design specifications used for detailed programing.

--After programing has been completed, reviews program documentation to make sure that the detailed design specifications have been followed.

--Reviews program test procedures and results to make sure that each program has been thoroughly tested and that each program and the entire system is fully operational.

--Completes preparation of accurate system documentation, including instructions for users, control personnel, and operating personnel.

--Finally, prepares procedures and documentation for system conversion so that the system can be validated and, once validated, begin operation.

The programer is responsible for preparing computer programs in accordance with the systems analyst's design specifications. After programing has been completed, the programer must test each one to make sure that it is fully operational. Finally, the programer prepares documentation for each program and for all testing performed. This program documentation must be accurate, complete, and up to date because it is critically important to the persons responsible for all other phases of the system development life cycle.

The system validators are responsible for performing comprehensive pre-implementation tests of all new systems and all modifications to existing systems. This testing evaluates whether the entire system--both the manual and automated processes--is performing and functioning as specified by the user, and designed by the systems analyst. No system should be placed in operation without the system validators' written certification that the entire system performs in accordance with all functional and performance specifications. For these reasons, the system validators must control all planned system changes so that no changes can be made to any program without their prior approval. Emergency modifications to existing systems must also be so validated, although conditions may result in such validation being performed after the fact. Thus, all changes, both planned and emergency, are subject to review and approval by system validators.

The auditor is responsible for assuring top management that all systems contain the needed internal controls to produce consistently reliable results and operate in conformance with management standards and approved design specifications. Furthermore, the auditor must act as a user to make sure that all systems contain necessary audit trails to trace

all transactions processed. Thus, the auditor must actively participate in the system development process by reviewing each step as it is completed. Then, once the system is operational, the auditor has a continuing responsibility to review both general and application controls to assure that the system continues to perform in accordance with management policy and produce consistently reliable results.