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REPORT BY THE

Comptroller General

OF THE UNITED STATES

Farmers Home Administration's ADP Development Project--Current Status And Unresolved Problems

In 1974 the Farmers Home Administration began developing a new computer-based information system. Today, its Unified Management Information System (UMIS) project is suffering from poor planning and management. It is at least 5 years behind schedule, and the development cost for UMIS or its alternative may reach $42 million.

Furthermore, the cost to operate the system, as now designed, may prove to be excessive, and it may not meet the basic needs it was intended to fulfill.

UMIS, as currently designed, is no longer a viable approach to meeting FmHA's information needs. The agency is studying alternatives to the system. Before making a final decision, the agency should first determine its information needs.

In developing a new system, the agency needs to improve its project management, including naming a full-time project manager having adequate authority. Also, top level management should increase their level of involvement.

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FEBRUARY 19, 1980

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-197778

The Honorable Jamie L. Whitten
Chairman, Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

In response to your November 26, 1979, request, we obtained answers to the following questions on the Farmers Home Administration's (FmHA's) computer-based systems project--the Unified Management Information System (UMIS).

--What is the current status of the project, the cost to date, and the estimated cost through project completion?

--Is the UMIS project still viable?

--Should alternatives to the UMIS project be considered?

--What factors are responsible for delays in implementing the project and what actions are necessary to eliminate these factors?

For background information on UMIS' development history see appendix I.

STATUS AND COSTS OF UMIS

UMIS was initially planned in 1974 to assist FmHA, a major Federal agency of the Department of Agriculture, provide financial assistance to rural Americans. At the time of our review, FmHA was servicing the accounts of approximately 1.25 million rural Americans. This represents a total outstanding loan balance of $36 billion, an increase of $13 billion, or 57 percent, over 1977.

In 1974, FmHA decided that serious deficiencies with its current computer system warranted its replacement rather than modification. Accordingly, FmHA began developing UMIS--to provide better management information at all levels within the agency to improve service to rural Americans seeking financial assistance. We found, however, that FmHA has not properly designed, documented, and managed the project. As a result, (1) the projected implementation date of the system will be at least 5 years later than planned, (2) the actual costs for UMIS development through December 1979 were $17 million, and according to our estimate the total cost to develop UMIS as designed may reach $42 million, (3) total development costs for any alternative to UMIS may range from $27.5 million to $42 million, including the $17 million already incurred, (4) the operational costs of UMIS, as designed, will be exorbitant, and (5) the system may not meet the basic needs for which it is being developed.

FmHA has not fully utilized a major computer system purchased to support UMIS. In addition, the agency may be required to provide additional computer equipment to extend the operational life of its computer center located in St. Louis. Operation of this computer center was scheduled to be discontinued when UMIS became operational. For a more detailed discussion of project status and costs see appendix II.

IS UMIS VIABLE?

A private consulting firm, Arthur Andersen & Company, reported that UMIS was a high risk project. It questioned the validity of the UMIS design and expressed concern about the project's management. Throughout the development of UMIS, USDA's Office of the Inspector General has informed FmHA management of serious technical problems with the system's design and about ineffective project management. A technical study of UMIS recently completed by FmHA reported that the UMIS Executive Control System (EXEC), a major software component of the system, as designed is not acceptable. It further stated that the EXEC is not salvageable nor will it meet FmHA's requirements even with extensive overhauling. The study also stated that even if all of the EXEC's deficiencies were known, salvaging the EXEC would not be cost effective.

Based on our current review and evaluation and our 1978 review, we have determined that the project as currently designed and managed is not viable.

The identified risks associated with the continuation of UMIS include: (1) the possibility that the system will not work effectively as designed, (2) the cost and time to develop a new system may be less than to complete the project, (3) UMIS, if completed, may not meet the requirements of the users it was intended to serve, and (4) the system, if completed, will present FmHA with major support problems throughout its operational life.

Recently a USDA Task Force was established to conduct a detailed review and analysis of the project to determine whether it is feasible to continue developing UMIS or if the agency could meet its needs more effectively by another alternative. The results of this evaluation, coupled with our review, should provide FmHA with a sound basis for making a final determination on UMIS or its appropriate alternative.

Notwithstanding that the purpose of UMIS is to provide managers with accurate and timely information, FmHA has not adequately studied and defined its information needs. Therefore, there is no assurance that if UMIS or its alternative becomes operational it will provide needed information or be cost effective. For a detailed discussion of the system's viability see appendix III.

ALTERNATIVES TO UMIS

Since continuing the development of UMIS is no longer viable, alternatives should be identified and evaluated. In appendix IV we have identified alternatives that the USDA Task Force studying UMIS should consider. These and other alternatives the Task Force may identify should provide new approaches to fulfilling FmHA's information requirements.

However, because FmHA did not adequately determine its information requirements prior to designing UMIS or adequately monitor changes to user needs during the last 5 years, we found that sufficient information is not available to identify all alternatives. We believe the Task Force addressing UMIS alternatives will encounter similar problems. Inadequate requirements information coupled with incomplete cost information preclude (1) identifying all alternatives

to UMIS, (2) determining the cost of each alternative, or (3) preparing a cost benefit study to determine the most effective alternative. We believe that if FmHA selects an alternative to UMIS without first conducting a requirements study, the selected alternative may also incur high risks.

In developing UMIS, FmHA did not adequately study and define the information needs of it managers. A consulting firm was hired to define the types of information that UMIS should provide; however, FmHA predetermined that all users required on-line services with information updates performed on a daily basis. Although the information elements to be collected and reported in the system are probably valid, serious questions exist as to whether all the information should be processed on-line with daily updates. Before deciding on the technical architecture of the system, FmHA should have required the project team to

--study data and information attributes, such as expected volumes of data and where in the agency the information will originate,

--determine how quickly information was needed to complete work assignments, and

--study how frequently information should be updated to keep managers adequately informed, and how critical the information is to agency managers in meeting borrower needs.

A more detailed discussion of alternatives to the UMIS design is contained in appendix IV.

PROJECT MANAGEMENT IMPROVEMENTS ARE NEEDED IN DEVELOPING AN ALTERNATIVE TO UMIS

To develop and implement a management information system that is both cost-effective and meets the basic requirements of FmHA management, it is essential that FmHA not only determine user requirements but assign a high priority to improving its project management capabilities. Although FmHA has attempted to improve its management and strengthen controls over the UMIS project, these efforts have not met their objectives. Most UMIS delays, cost increases and capability shortfalls resulted because FmHA did not (1) assign a project manager who would be dedicated to the project on a full-time basis with responsibility for managing the contractor and assuming full technical and administrative responsibility

for project completion, (2) prepare a comprehensive system development plan identifying milestones and critical decision points, and (3) use standard ADP project control measures, such as cost accounting and budget preparation procedures.

Any alternative selected by FmHA to replace UMIS will be a major software development project similar in scope to UMIS. Therefore, FmHA must address the project management issue of effectively planning, managing, and controlling a complex ADP development project. If the management issue is not appropriately resolved, any future development effort will in all probability result in further delays and excessive cost overruns.

Regardless of the alternative selected to replace UMIS, FmHA management should increase its awareness of the complexity of the software development project. Developing a sophisticated management information system represents a considerable investment of resources--people, money, and equipment. Therefore, a project control and cost mechanism to track and review each stage of the system's development is a prerequisite to responsible project management--both in terms of meeting development milestones and controlling costs.

Since 1977, FmHA has been aware of the need for a system for monitoring the development and cost of UMIS; nevertheless, an effective system has not been implemented. Because FmHA has not provided adequate management control over the project, it has not prevented or mitigated the effects of project slippages. For example, the agency lacks a cost collection system capable of providing the information needed for (1) controlling costs, (2) determining actual expenditures, (3) estimating the cost to complete the project, and (4) projecting the system's operational cost following the development phase. For further information see appendix V.

RECOMMENDATIONS

To assist FmHA in dealing with UMIS problems and to initiate corrective action, we recommend that the Secretary of Agriculture direct FmHA to:

--Redefine information requirements to meet agency (user) needs and express them in terms which are more specific and quantifiable to establish performance criteria for evaluating UMIS alternatives.

--Obtain from the Office of the Secretary of Agriculture approval of FmHA's information requirements study prior to continuing or beginning any new development effort. The study should also be submitted to the appropriate congressional oversight committees. Should the USDA Task Force uncover new information then UMIS should be reevaluated.

--Identify all alternatives to UMIS based on a complete functional requirements study and prepare a documented analysis of alternatives and a cost benefit study.

--Develop the most cost effective alternative to meeting FmHA's needs based on the above studies and the technical Task Force report.

--Develop and implement standard project control techniques. For example, establish documentation standards, hold documentation reviews, establish firm software test procedures, and improve System Change Request (SCR) controls.

--Intensify its effort in installing PAC II--a computerized project control mechanism for developing software. This is necessary to monitor progress of a development project, identify and analyze schedule and cost variances, and to better plan the use of resources.

--Install a cost accounting system, as part of a project control mechanism, to account for all costs incurred during the system design, development, and operational life cycle. Total life cycle cost estimates should be updated on a regular basis.

--Assign a full-time project manager to the project development team.

--Strengthen its ADP steering committee, increase top management involvement in the project, and provide for management continuity.

--Establish a budget for major software development projects to cover the development and operation phases, and note such projects as a separate line item in FmHA's budget justification.

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We have discussed this report with top management officials from (1) FmHA's Office of the Administrator and the National Finance Center, and (2) USDA's Office of the Director of Operations and Finance and the Office of the Inspector General. Although FmHA and USDA officials concurred with the thrust of our report and the corrective actions required for the successful completion of a computer-based information system, they took exception to our projection of development costs and the extent to which the UMIS project is viable. With respect to our projected costs USDA and FmHA officials offered no new information that would change our position. See appendix II for a more detailed discussion. Concerning our position on the viability of UMIS we disclosed that two critical components of UMIS, the EXEC and the data base are not viable, and further, the information requirements are not valid. Consequently, UMIS as designed is not viable. This is discussed in greater detail in appendix III.

During the final stage of our review, a USDA Task Force was established to address the issues contained in our report. We believe the objectives of the Task Force are consistent with our recommendations.

We also discussed the facts contained in our report with the consulting firms involved in the UMIS development. The firms agreed with the facts as they relate to their involvement.

This is the second report on the UMIS project we have issued to you in the past 2 years. The first report was issued to your subcommittee on February 27, 1978, and addressed many of the management and technical problems associated with UMIS. FmHA generally agreed with our conclusions and recommendations for corrective action at that time. However, we noted in this review that little action has been taken by the agency to implement those recommendations.

As agreed with your office, the initial distribution of this report is being made only to your committee for use during appropriations hearings on FmHA scheduled for March 4, 1980. Further, normal distribution of this report will be made to the agency and other interested parties following the hearings.

Sincerely yours,

Comptroller General
of the United States

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ABBREVIATIONS

BIOC	Basic Initial Operating Concept
EXEC	Executive Control System
FFS	Full Field Service
FmHA	Farmers Home Administration
GAO	General Accounting Office
KCCC	Kansas City Computer Center
NOC	National Operating Center
OIG	Office of Inspector General
OMB	Office of Management and Budget
SDC	System Development Corporation
UMIS	Unified Management Information System
USDA	U.S. Department of Agriculture

BACKGROUND INFORMATION

The Farmers Home Administration was established in 1946 as the successor agency to the Farm Security Administration and the earlier Resettlement Administration. It has grown from a credit agency for low-income farmers to a major Federal agency providing financial assistance for agricultural and rural development.

FmHA operates principally under the Consolidated Farm and Rural Development Act (U.S.C. 1921) and title V of the Housing Act of 1949 (42 U.S.C. 1471). FmHA provides services through 46 State offices, the National Finance Office in St. Louis, Missouri, and approximately 2,000 county offices. Of its approximately 11,030 employees, 575 are based in Washington and 10,455 in the field offices.

In fiscal year 1979, FmHA was servicing the accounts of about 1.25 million individual and association borrowers with a principal indebtedness of $36 billion. This is more than a $13 billion increase in principal indebtedness in 2 years.

PRESENT INFORMATION AND REPORTING SYSTEM

FmHA's current computer-based information and reporting system is supported by the computer center, located in FmHA's National Finance Office. The majority of the computer center resources are used to process loan accounting data for programs serving rural Americans. Other FmHA data processing requirements are provided by various U.S. Department of Agriculture (USDA) computer centers.

County offices prepare and forward information on program participants (the borrowers) to the National Finance Office. In turn, this Office usually mails information directly to the program participants. An exception is the County Office Inquiry Station located in the FmHA Finance Office. County offices may call the Inquiry Station for information on the status of a borrower's account. Inquiry Station terminal operators directly access computer files and orally provide county offices with the requested information on loan accounts.

FmHA's DECISION TO DEVELOP A NEW MANAGEMENT INFORMATION SYSTEM

Because of serious deficiencies in the current accounting and information system, in 1974 FmHA decided to replace, rather than modify, the current system. Accordingly, FmHA began developing UMIS--to provide better management

information at all levels of the agency. FmHA specified that the objectives for UMIS were to:

--Provide responsive, timely management information to managers at all office levels--county, district, State, finance, and national.

--Minimize office workloads required to provide basic input data.

--Improve the capability to serve loan applicants and borrowers in rural America.

--Provide an accounting system that meets General Accounting Office requirements.

To meet these objectives, FmHA initially specified that UMIS would provide remote computer capability in all county and State offices as well as the St. Louis Finance Office and the National Office. This concept, referred to as full field service (FFS), would provide for the immediate entry into the system and processing of transactions by county offices. The system would provide daily alerts on delinquent borrowers and immediate responses to individual inquiries.

Our earlier report on UMIS dated February 27, 1978, (CED-78-68) which addressed a number of issues and problems also questioned whether FmHA could substantiate the need for the immediate processing of all transactions. As a result, FmHA agreed to develop another version of UMIS, termed the national operating center (NOC) concept. It was also agreed that the possibility of converting NOC to FFS would remain open if it could be justified.

NOC is intended to provide remote computer capability in FmHA State, finance, and national offices but not at its county offices. Under NOC, most county office transactions would be mailed to the Finance Office in St. Louis where transactions would be processed. Borrower inquiries and check requests required by county offices are satisfied by telephone calls to the Inquiry Station at the FmHA Finance Office. This is essentially the current FmHA method of operation. Under UMIS, State offices will use computer terminals to obtain management information. The system will not provide daily alerts but information on delinquencies will be printed and mailed weekly from the Finance Office.

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HISTORY OF FmHA's
DEVELOPMENT OF UMIS

The following summary shows the relevant dates and decisions FmHA made in the development of UMIS.

--In October 1974, USDA established a Management Information System Task Force to study agency information needs and user requirements. This group in conjunction with Joint Financial Management Improvement Program personnel prepared and distributed an information requirements survey to FmHA personnel at all levels. Although the survey was completed by April 1975, the results were not summarized or evaluated.

--In July 1975, FmHA issued a Request for Proposal for the design (phase I of the project). On November 25, 1975, System Development Corporation (SDC) was awarded a contract to develop UMIS and the Director of FmHA's Management and Information Systems staff was appointed as UMIS project manager in addition to his regular duties. SDC developed an overall design for UMIS and broad specifications for the 13 subsystems which would make up the total system. At this point, it was estimated by FmHA and SDC that UMIS would be partially operational in October 1977 and fully operational in October 1978.

--In May 1976, the development and implementation of UMIS was begun under phase II of the project. FmHA modified its original development plan which was based on the early acquisition of a computer system to support UMIS. The computer hardware purchase for the Kansas City Computer Center (KCCC), the planned support computer for UMIS, was delayed. FmHA decided to develop a computer independent software system capable of operating on the equipment of any hardware supplier awarded the computer contract. FmHA's management recognized that the decision to proceed with development without knowing the target computer vendor might be a high risk decision. However, FmHA decided that a potential delay in development of 1 to 2 years was unacceptable and proceeded with the UMIS project.

--In January 1977, GAO briefed the House of Representatives Government Operations Committee on UMIS and questioned whether FmHA could substantiate the need for the level of support UMIS was designed to

provide. As a result, FmHA agreed to develop the NOC concept. Both the level of service and cost of NOC are lower than that provided by FFS.

--From March 1976 to June 1978, USDA's Office of the Inspector General (OIG), issued 24 informal reports called Systems Development Advisory Memorandums to FmHA on the UMIS project. This informal method was used by OIG to provide timely information to FmHA officials on problems as the system was under development.

--During January 1978, the contract to provide computer hardware for the KCCC was awarded to Honeywell Inc. Development and design of UMIS had been underway for 20 months at the time of the award.

--In February 1978, GAO reported to the Congress on the status of the UMIS project (CED-78-68). We reported that FmHA was encountering serious problems with its management and control of UMIS. Additionally, we stated that FmHA did not base its initial decision to develop UMIS on an adequate study of agency information requirements.

--In April 1978, SDC personnel obtained documentation on the operating capability and limitations of Honeywell's hardware and software. We were told that this was the first time the personnel responsible for designing UMIS were provided detailed information on the operating capabilities and limitations of the computer hardware and software purchased to support UMIS.

--In August 1979, SDC informed FmHA that it could not complete the UMIS Executive Control System (EXEC) by the revised completion date of September 1979. FmHA worked with SDC in developing a new contract and began a review of the project under the direction of the FmHA steering committee.

--In September 1979, SDC submitted a fixed-price proposal to complete the executive system software. SDC estimated that it could complete the work in approximately 9 months. FmHA rejected SDC's bid and terminated the contractor's work.

--In October 1979, FmHA contracted with Arthur Andersen & Co. for a review of UMIS. In November 1979, Arthur Andersen reported that UMIS was a high risk technical

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project and recommended that FmHA establish two review teams to determine if UMIS is viable. Arthur Andersen also questioned the ability of UMIS to meet agency needs and pointed out serious weaknesses with FmHA's management of the project.

--In November 1979, USDA's Assistant Secretary for Administration directed FmHA to take action on Arthur Andersen's recommendations. On December 17, 1979, USDA withdrew FmHA's authorization for UMIS development and established a USDA Task Force to study UMIS. On January 23, 1980, USDA issued guidelines to the USDA Task Force reviewing UMIS.

SCOPE

We primarily directed our review toward obtaining updated information on the UMIS project. In doing so we used considerable information that was developed during our previous review which resulted in a report issued in 1978. We also obtained information from FmHA's field offices and representatives from two consulting firms involved in the development and review of UMIS.

In addition, we visited the Farmers Home Administration's National Office in Washington, D.C., and the Finance Office in St. Louis, Missouri. We also visited the Department of Agriculture's Office of the Director of Operations and Finance, which is responsible for Department-wide ADP policy, and the Office of the Inspector General. Finally, we reviewed records and documents pertaining to UMIS at the various offices we visited.

STATUS AND COSTS OF UMIS

FmHA requires an improved and effective accounting and information system to deliver better management information to all offices and levels within the agency and to improve service to rural Americans seeking financial assistance. However, FmHA has encountered serious problems in developing the system. As a result, (1) the projected implementation date of the system will be at least 5 years later than planned, (2) the actual costs for UMIS development through December 1979 are $17 million, and according to our estimate the total cost to develop UMIS as designed may be $42 million, (3) total development costs for any alternative to UMIS may range from $27.5 million to $42 million including the $17 million already incurred, (4) the operational costs of UMIS, as designed may prove to be excessive, and (5) the system may not meet the basic needs for which it is being developed.

STATUS

FmHA initiated the UMIS project in 1974 to provide improved computer information support at all levels of the agency from the county offices through the national office in Washington, D.C. Based upon this decision, FmHA hired consultants to (1) assist in determining the agency's information requirements and (2) help design and develop the computer programs to provide this information. FmHA has invested considerable time, money, and effort in the project. However, technical and management problems have resulted in extensive project slippage, and FmHA and USDA are studying the best approach to complete the project.

When completed, UMIS may be 5-7 years behind schedule

In 1975, the UMIS software development effort was divided between FmHA personnel and the contractor. FmHA personnel were responsible for developing computer application programs. SDC contracted to develop the EXEC, a central software component of UMIS, required to perform many major system level tasks and assist in the development and design of the total system. The EXEC was scheduled for completion in 1978.

While developing the EXEC, FmHA and the contractor experienced numerous program slippages. FmHA has modified the development and implementation contract (UMIS-phase II) with SDC 11 times as of September 1978. One of these

modifications extended the EXEC completion date through September 1979.

When SDC recognized it could not complete the EXEC by the revised date, it notified FmHA that an additional 9 months were required to complete the EXEC. FmHA decided in September 1979 to discontinue the services of SDC and to complete the EXEC using FmHA personnel.

At the same time FmHA hired Arthur Andersen & Co. to review the project's technical and management problems. Arthur Andersen reported that:

--The EXEC is a high risk technical project and that completion might not be economically justified.

--UMIS may not adequately meet user needs when completed.

--Design problems raise serious questions about the system's efficiency and effectiveness, if completed.

Arthur Andersen believes that the projected completion date of December 1983 for UMIS is optimistic.

FmHA and USDA are studying alternative methods for completing UMIS

UMIS design problems, identified in appendix III, caused FmHA and USDA to question the effectiveness of the system. Subsequently, USDA formed a Task Force to develop a project recovery plan. Pending completion of its work, the UMIS project team in St. Louis is continuing with the development of UMIS with a concentration on work which will be needed under any alternative to UMIS.

Original Design

The original UMIS design consists of three major components. These components are

--computer application programs,

--EXEC, and

--common use data base.

Approximately 1,000 application programs would process data and prepare reports to help user organizations carry out

FmHA program objectives. These programs would be called from computer memory and controlled by the EXEC.

The EXEC is comprised of approximately 70 computer programs designed to interact with the computer and the UMIS application programs. In essence, the EXEC would control the operation of UMIS including the processing of data and generating reports.

The EXEC programs operate as five major subsystems with each subsystem handling unique UMIS control functions. The subsystems are:

--Data Dictionary.

--Cathode Ray Tube (Display screen for users).

--Nightly Batch Update.

--Remote Batch Transaction.

--Background Batch Processing.

The UMIS data base would be the respository of nearly all data concerning FmHA's financial operations. It would also contain information to assist in other management functions, such as loan program planning. The data base, consisting of 1.25 million to 1.75 million borrower and other types of records, would be stored on 40 to 50 disk devices on the Honeywell computer system.

The UMIS components would operate on Honeywell hardware and software at the KCCC. The Honeywell hardware would consist of memory, multiple computer processors, and peripheral equipment such as tape and disk devices for storing data. Some of the Honeywell hardware is installed and operating at the KCCC. The Honeywell software, also called system software, would consist of the computer programs which (1) direct hardware components to operate as a unit and (2) process the UMIS application and EXEC programs.

FmHA believed that UMIS could be implemented in either the NOC mode or, with the addition of terminals and a telecommunications network, the FFS mode. Both NOC and FFS are totally dependent upon an operational Executive Control System. Nearly all NOC and FFS application programs written to date rely on the EXEC for their operational capabilities. Barring a major redesign and development effort, neither mode will operate without the EXEC.

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USDA TASK FORCE

Recently USDA established a Task Force to examine UMIS technical and management problems. This Task Force is led by an official of USDA's Data Services and consists of personnel from Data Services and FmHA. The Task Force plans to evaluate UMIS and recommend to FmHA actions to provide a cost effective management information system.

The Task Force will consist of a coordination group and three review teams. The coordination group will define tasks, set schedules, develop recommendations, and coordinate the three review teams' activities. Each review team will concentrate on one of the following areas:

--FmHA's functional requirements.

--UMIS technical issues.

--UMIS management and project control.

The Task Force is scheduled to begin work in early 1980 and plans to issue a final report within 60 to 90 days after the starting date. The final report will include the Task Force's findings and recommendations for a UMIS recovery plan.

The purpose of the Task Force is to evaluate the status of UMIS and recommend the direction to be taken and actions needed to provide FmHA with a cost effective and timely management information system.

St. Louis project team

A group within the St. Louis project office has studied the five major subsystems of the EXEC and on January 4, 1980, decided to develop a modified version of the UMIS EXEC. Under this modified approach FmHA would complete two of the five subsystems which make up the EXEC. It also plans to modify a third subsystem which is part of the EXEC's design. The remaining two subsystems will not be used.

The decision to continue working on the three EXEC subsystems is consistent with an earlier decision to implement UMIS in phases. FmHA initially believed that a phased development approach would make UMIS implementation easier to manage and provide users with some service more quickly.

Since the EXEC's capabilities are suspect, FmHA personnel in St. Louis believe that the phased approach will provide a quicker determination of the EXEC's effectiveness. The phased approach is a logical outgrowth of the methodology for developing UMIS functional requirements.

FmHA identified several UMIS functions that, if executed on a timely basis, could satisfy the agency's financial and management information needs. The loan application and tracking function is an example. This function is comprised of specific transactions that are handled by computer programs. Borrower/loan initiation, obligation of funds, and check requests are specific transactions within the loan application and tracking function. Each transaction requires one or more computer programs to perform data updating and processing tasks.

Under the phased approach, these functions and transactions would be implemented in the sequence shown on the following table.

UMIS Implementation Phasing By User Function

Function	Phase 1	2	3
Loan application and tracking	X	X	X
Fund control	X	X	X
Other controls	X	X	X
Check processing		X	X
Discrepancy processing		X	X
Program loan accounting			X
Investor accounting (partial)			X
Acquired property			X
Investor accounting (balance)			X
Management operating center			X
Program evaluation			X
General ledger			X
Appropriation accounting			X
Budget simulation			X

FmHA estimates that it will require 9 to 12 months of development effort to implement the first phase of the project. Under the phased approach to UMIS development, FmHA plans to develop the project as follows:

--Phase I, which will contain 3 user functions.

--Phase II, which will have 5 user functions.

--Phase III, which will include 14 user functions.

FmHA's project team in St. Louis believes that the phased approach will help in determining the effectiveness of the modified EXEC approach upon completing phase I. Also, having phase I up and running will provide the needed experience to help determine whether the KCCC computer has sufficient processing capability to support all UMIS functions when the entire project is complete. We believe, however, that FmHA could develop quantitative estimates based on known or identifiable constraints to make such a projection without completing phase I. FmHA recognizes that it would be forced to completely redesign UMIS should the first phase indicate that the approach is ineffective.

FmHA officials told us on February 14, 1980, that they are modifying their approach and plan to concentrate on work that would be useable under any alternative chosen for UMIS. Pending completion of the Task Force study, these efforts will concentrate on salvaging useable portions of the data base and application programs.

COST

Although available cost information for UMIS is rough at best, we estimate that the cost to develop the system as designed will exceed its initial estimated budget by $25 million, or 147 percent. This includes approximately $9 million in costs incurred because of delays in developing UMIS. Because of delays, FmHA has not fully utilized the Honeywell computer, a major computer system purchased to support UMIS. In addition, the agency may be required to provide additional computer equipment to extend the operational life of its computer center located in St. Louis.

We estimate that the total development cost of UMIS may reach approximately $42 million. This projected figure is based on the UMIS project being completed by 1985 as it's currently designed.

If UMIS is not completed and other alternatives are pursued, the estimated project costs, at minimum, would be $27.5 million. A more realistic projection would range from $27.5 million to $42 million. The $27.5 million ($17 million incurred through December 1979 and projected personnel costs of $10.5 million) projection is based on the following assumptions:

--The cost for personnel currently working on UMIS will remain constant.

--The system will be operating by 1983.

--There will be no additional costs for computer support during the development phase.

--No additional consulting or contractor expertise will be needed.

These assumptions as noted above are optimistic, especially the completion date of 1983. We envision considerably more time and cost would be required to effectively complete the needed information system. Further, because we did not include an allowance for inflation the cost of personnel services could be much higher.

Additionally, the UMIS initial completion date of September 1979 has not been met. Based on information obtained from the Arthur Andersen report and from FmHA, we estimate the most optimistic date for UMIS as designed to be fully operational is December 1983, and the most realistic date is June 1985.

UMIS development costs have increased because of project slippage

During our review in 1978 we developed an estimate of costs to complete UMIS development. This estimate was based on accounting information supplied by FmHA project officials. Our estimate of total initiation and development costs, based on UMIS being fully operational in 1979, was $16.6 million. At that time FmHA officials agreed with our estimate.

UMIS was not completed in 1979 and each UMIS delay has increased the system's development cost. Based on cost information furnished by FmHA and projected UMIS completion dates developed by Arthur Andersen and Co., we have developed actual development cost data for UMIS through

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December 1979 and estimated costs to complete UMIS as currently designed.

However, because of inadequate cost accounting and cost control procedures, precise cost data cannot be developed. Additionally, the cost estimates are dependent on the estimated completion dates for UMIS. If these estimated completion dates are extended the cost of the UMIS development effort will increase.

Contractor development costs

FmHA retained the consulting firm of SDC to develop the UMIS EXEC. From 1975 through 1979 amounts paid for contractor development represented the major development cost of the UMIS project. The original estimate to complete phase I (design of UMIS) was $289,757 and its actual cost was $294,747. The original estimate for phase II, development and implementation, was $2.5 million with additional cost increases of $4.3 million. In total the original cost estimate for contractor work increased from $2.8 million to $7.1 million, an increase of 154 percent.

Additional UMIS development costs

The following table shows the remainder of UMIS development costs through December 1979 excluding the contractor development costs.

UMIS DEVELOPMENT COSTS THROUGH DECEMBER 1979, EXCLUDING CONTRACTOR DEVELOPMENT COSTS

Resource category	Costs (millions)
Kansas City Host Computer	$1.4
St. Louis Computer Center	.1
Computer Terminals	.6 a/
Telecommunications	.4 a/
Personnel	5.3
UMIS subsystems	.9 a/
Travel	.3
Space	.2
Supplies and materials	.1
Site preparation	.2
National Operating Center and Management Operating Center	.2
Other	.1
Total	$9.8

a/Cost for the resource categories totals $1.9 million. FmHA feels that $0.8 million is attributable to UMIS operating costs under the development phase.

Total UMIS development cost as of December 1979

The total cost to develop UMIS as of December 1979 was approximately $17 million. The major cost categories comprising the development costs are shown below.

Total Costs for UMIS Initiation and Development Phases through December 1979

Resource category	Costs (millions)
Contractor costs	$ 7.1
Computer centers	1.6
Computer terminals	.6
Telecommunications	.4
Personnel	5.3
Other resource categories	1.9
Total	$16.9

Estimated time and cost to complete UMIS development

In November of 1979 FmHA discontinued SDC's work on UMIS. FmHA plans to complete the development of UMIS using its own personnel. Project officials believe there will be no significant costs for contractor assistance in the future. Completing the development of UMIS in-house will result in in-house personnel costs becoming the largest cost category in the UMIS development effort.

The project costs depicted in the following table show the cost to complete UMIS based on three projected completion dates. The first estimated date for UMIS to be fully operational is December 1983. This date is highly optimistic and the possibility of meeting it is very remote. We believe, however, that a completion date of September 1984 is feasible and that an estimated date of June 1985, in our opinion, is the most likely completion date.

The first estimated completion date was developed by Arthur Andersen and Co. on the basis of estimates developed by SDC in its September 1979 bid to complete the UMIS EXEC. We developed the other two completion dates based on information obtained from Arthur Andersen's report and additional information obtained from FmHA. Both estimates are dependent on FmHA's ability to complete development of the EXEC. Since the estimated completion dates of the UMIS system are rough estimates, the projected completion costs should be viewed in the same manner.

APPENDIX II

Projected costs to complete the UMIS Development (note a)

Resource category	December 1983	September 1984	June 1985
	----------(millions)----------		
Kansas City Computer Center (note b)	$ 5.2	$ 5.2	$ 5.2
St. Louis Computer Center (note c)	2.7	3.2	3.6
Fort Collins Computer Center	.3	.3	.3
Telecommunications	.6	.7	.8
Personnel (note d)	10.5	12.5	14.6
Training	.9	.9	.9
Total (note e)	$20.2	$22.8	$25.4

a/These costs were not adjusted for inflation.

b/This represents the KCCC cost for being underutilized from January 1, 1980, through the completion date.

c/These estimated costs represent the continuation of the St. Louis Computer Center through the completion of UMIS.

d/Personnel costs include a fringe benefit rate of 26 percent, obtained from Office of Management and Budget (OMB) Circular A-76 dated March 29, 1978.

e/USDA officials do not agree with our projected costs for the completion of UMIS as designed. However, they have not provided information that would result in modifying our estimate.

The following table shows our estimate of the total cost to complete UMIS based on the actual cost to date and the three estimates for completing the total system.

Total Costs for UMIS Initiation and Development Projected Through Three Completion Dates

Resource category	Dec. 1983	Sept. 1984	June 1985
	(millions)		
Contractor (SDC) costs	$ 7.1	$ 7.1	$ 7.1
Initiation and developmental cost incurred through December 1979	9.8	9.8	9.8
Development costs after December 1979 (estimate to complete)	20.2	22.8	25.4
Total	$37.1	$39.7	$42.3

We discussed our estimates to complete the UMIS development effort with the Office of the Inspector General. These officials indicated our estimates were reasonable and expressed the opinion that our figures could be on the low side.

UMIS DELAYS HAVE INCREASED HARDWARE SUPPORT COSTS

Because of delays in developing UMIS, FmHA has not fully utilized a major computer purchased to support the UMIS system. In addition, the agency may have to buy additional computer equipment to extend the operational life of the computer located in the St. Louis computer center which is supporting the current accounting and information system.

Underutilization of a major computer center

In 1978 a major computer center was established in Kansas City and equipment was purchased to support UMIS when it was completed. This equipment was installed in anticipation that UMIS would be implemented on the Kansas City computer in October 1978. To justify the purchase, it was estimated that UMIS would comprise approximately 50 percent of the available computer capacity. However, since UMIS has been delayed, the equipment is underutilized at this time. As a result, the Office of the Inspector General estimated that the KCCC will incur a deficit of approximately $255,880 a month until UMIS is completed and operational on KCCC

equipment. Other users will be required to pay higher costs to cover this deficit. USDA officials disagreed that the system is underutilized.

AGENCY COMMENTS AND OUR EVALUATION

USDA and FmHA officials took issue with the following segments in this appendix:

--USDA believes our projection of development costs is unlikely to occur because UMIS is unlikely to be completed as designed.

--The USDA officials believe the KCCC is fully and effectively utilized.

--USDA believes we did not adequately recognize the work planned by the USDA Task Force recently established to address UMIS management and technical issues contained in our report.

Although USDA and FmHA officials do not concur with our projected costs they have not provided new information which warrants our modifying these cost estimates. Potentially the cost to develop any alternative may amount to an additional $25 million. However, we believe any alternative to UMIS will cost at least an additional $10.5 million beyond the $17 million already expended. The additional costs only represent projected personnel costs through December 1983. The $25 million estimate includes personnel and hardware support costs.

In our opinion, it is imperative that FmHA and USDA recognize that UMIS or any alternative will require a large investment of time and money. We believe our cost estimates are conservative and include costs which are difficult to lower in the short run. For example, UMIS or its alternative will require large personnel costs, and the UMIS project team is already working. The KCCC computer expenditure has already been made and FmHA must support its current accounting system until an alternative is available.

USDA officials concur that a major use of the Honeywell computer operating in Kansas City was to be UMIS. We contend that since UMIS is not completed or even partially operational, the Honeywell computer is underutilized. We acknowledge, however, that other USDA user organizations have placed work on the Honeywell to partially use the computer's excess capacity. We also believe the KCCC is

underutilized and will not achieve effective utilization within the next two to three years.

We recognize that USDA has established a Task Force and developed an organizational plan. However, the Task Force has not yet started work and is still in the planning phase. As a result, it would be premature to evaluate the plan. We are also concerned that USDA and FmHA delayed taking corrective action until five months after Arthur Andersen reported that UMIS was in serious trouble and its viability was in doubt.

THE UMIS DESIGN IS NOT VIABLE

The UMIS project has serious technical design deficiencies that make the continuation of its development very risky. Further, the system as currently designed is not a viable approach to meeting FmHA needs. Specifically, the Executive Control System (EXEC) may not be effective and the data base design places severe limitations on the operation of UMIS. Also, the UMIS design was originally based on an inadequate information requirements study which has not been updated over the past 5 years. Therefore, there is no assurance that UMIS, if completed, would meet the current information requirements of its intended users.

DEVELOPING THE EXEC IS NOT AN EFFECTIVE APPROACH

The EXEC developed by SDC, the contractor, is required for overall control of UMIS's many components, including the data base, software, hardware, and application programs. FmHA has terminated SDC's work on the EXEC and was completing its development with agency personnel. As of February 14, 1980, FmHA informed us they are discontinuing work on the EXEC and would redirect their efforts to developing useable software for any alternative to UMIS. However, should the USDA Task Force later decide to salvage major components of the software developed by SDC and in-house, we submit the following for consideration.

An Arthur Andersen study estimated the size of the EXEC will be over 95,000 lines of programming code, when completed. The study also pointed out that Arthur Andersen was unaware of a business system as large as UMIS which operates on a similar basis. According to FmHA and Arthur Andersen the EXEC is not useable in its current condition and its size and complexity will make it difficult to complete.

The size of the EXEC coupled with its incomplete and untested condition after 4 years of development effort raises serious questions as to the likelihood of its ever being implemented. We also found that the EXEC has additional problems which further jeopardize its viability.

One problem results from inadequate documentation of the EXEC developed by SDC. SDC and FmHA officials said this condition resulted from an early agreement that formal documentation would not be required until the EXEC was completely developed. Because SDC did not complete the EXEC, the documentation was not completed. Further, the program

descriptions obtained by FmHA did not adequately reflect subsequent system changes. This lack of documentation contributes to FmHA's difficulties in attempting to salvage or complete portions of the EXEC.

Should FmHA succeed in completing the design of the EXEC and implementing the system, certain design limitations may preclude UMIS from processing data within reasonable timeframes. For example, the EXEC programs used during the nightly batch processing phase do not allow concurrent processing of data on the data base. This restriction significantly increases the time required to process data in the data base. FmHA is attempting to modify the data base update approach to provide for updates concurrently with other types of processing. If FmHA cannot modify this update procedure, use of the data base by FmHA field personnel needing information will be suspended during the update processing. Nightly batch processing is only one of several tasks which must be completed every day. The design limitation results in lengthy processing of 5 to 40 hours during the nightly batch update processing phase.

Although these nightly batch processing time estimates are based on rough calculations, we believe these processing times are unacceptable and illustrate the potential problems of continuing with the development of the EXEC design. For example, if the system requires 40 hours to update the data base, user organizations who need to use the data base daily would have access only every second day.

Limitations of UMIS
data base design

To significantly reduce the time required to access data from a data base, multiple access keys and a direct access method are commonly used. They allow computer programs to directly access only the data records from a data base which needs to be processed. However, the UMIS data base design lacks sufficient access keys to allow direct access to the data base by many UMIS computer programs. Further, rather than using the direct access method, UMIS computer programs in the EXEC and the computer application programs are restricted to using a sequential process. This results in a most time consuming task of examining data in the entire data base rather than selected data which needs to be processed. As an illustration of these limitations, UMIS is designed to sequentially process as often as four times each night the entire borrower file containing over 1 million data records.

Another limitation of the data base design contributes to the complex, difficult, and time consuming task of modifying the data base. Changes to the data base structure necessitate regenerating the entire data base including those data records which do not need to be changed. In addition, many of the computer application programs which use the data base must also be modified when modifying the data base. Further, these computer application programs must be recompiled (translated to the appropriate computer language) following a modification to the data base structure. This approach to designing the UMIS data base is inconsistent with the commonly accepted practice in which special computer programs are used to modify the data base without modifying the computer application programs. During the final phase of our review, USDA officials told us they believe the data base may be salvageable and they are studying it.

UMIS MAY NOT MEET USER INFORMATION REQUIREMENTS

In addition to the technical limitations and resulting problems with the UMIS design, we are concerned with the inadequacy of FmHA's user requirements data. It is imperative that FmHA better determine the needs of the user community prior to deciding how to resolve UMIS technical problems.

One of the most critical tasks prior to designing a computer-based accounting and information system is the determination of user requirements for information. Such requirements are the foundation for information systems and software development projects such as UMIS. In our recent report, FGMSD-80-4, issued November 9, 1979, we reported on a number of computer software development projects which resulted in unsatisfactory or useless software products. A primary cause was that agencies did not adequately determine the information requirements of their users.

About 2 years ago we reviewed the status of FmHA's ADP project--UMIS and reported on the inadequacy of the user requirements study conducted in 1976 prior to developing UMIS. In that report, CED-78-68, dated February 27, 1978, we disclosed that FmHA did not base its initial decision to develop UMIS on a detailed, documented study of the information needs of agency managers (user requirements). We also recommended that the agency, "Redefine agency (user) needs in terms which are more specific and quantifiable to provide performance criteria for evaluating UMIS alternatives." Today, 5 years after initiating the system, FmHA has still not adequately

determined its user requirements. FmHA is continuing the development of UMIS based on subjective and undocumented perceptions of user needs. Because it lacks firm requirements and objectives, FmHA is unable to effectively manage UMIS, evaluate alternatives, or prepare acceptable cost benefit studies.

In 1975 FmHA reviewed its existing accounting and information system during the first part of the UMIS design and development project. The purpose of this review was to (1) obtain an understanding of the agency's current operations and (2) determine the availability of the information collected by the system. The survey did not adequately determine why the system could not meet the agency's needs. According to an agency official, the decision to develop and implement UMIS precluded the need to define the problems with the existing system and analyze alternative solutions. We believe, however, that such an analysis would have provided a basis for either improving the existing system or designing UMIS.

FmHA issued the UMIS design, development, and implementation Request for Proposal July 27, 1975, and SDC signed the contract on November 25, 1975. Subsequently, SDC subcontracted the task of studying FmHA's management information needs to a consulting firm. The results of this study were published in the "Unified Management Information System Phase I"--first interim report dated Feburary 2, 1976. The study concentrated on the information classes, representing data elements, required by the system's users but did not adequately define or quantify information attributes, such as timeliness, accuracy, volumes of data, and frequency of use.

For example, many classes of information will retain their usefulness and accuracy for a long period. Frequent updates of this information would not be required or help a FmHA field officer assist a borrower. There is no evidence that all information needs to be up-to-date at the close of each business day. Knowledge of such attributes (when and what information needs to be updated) is important because this information can and should serve as a baseline for evaluating system alternatives and performing cost benefit analysis.

We met with officials of the consulting firm responsible for the information requirements study. The officials agreed that the study was not intended as a user requirement analysis. Both the consulting firm and SDC explained that the primary user requirements were provided in the Request For Proposal. In this request FmHA predetermined that all users

required on-line services with information updates performed on a daily basis.

To confirm some attributes of FFS, we called 19 FmHA county offices in 1978. In regard to the FFS daily delivery of reports on delinquent borrowers, we were told that such reporting on a weekly or bi-weekly basis would be adequate because it would not be practical to service accounts daily while handling new applicants and other duties. In regard to immediate responses to inquiries, we found overall satisfaction with the current telephone Inquiry Station, although improvements are needed to make it more responsive. We were also told that the only transactions that required immediate turnaround or response were requests for final payment information.

In the county offices we surveyed, approximately 86 percent of the inquiries from county offices were made to obtain information on the number of months behind and/or the date of last payment for FmHA borrowers. County personnel told us that the occurrences of these inquiries indicated the extent the Inquiry Station was used to confirm information on delinquency reports. More accurate and timely delinquency reporting would reduce the number of requests for such information and thereby improve the Inquiry Station's ability to respond to other calls. Our current examination showed the same conditions prevail.

The UMIS design was essentially based on an inadequate information requirements study of agency needs. Assuming an estimated completion date of 1983-85, the UMIS design will be based on a 7- to 9-year-old "requirements study". Even though FmHA monitors some changes through the system change requests procedure, its scope is limited to a minor segment of the agency's overall information requirements. This situation compounds the technical problems associated with UMIS because the design does not adequately reflect the impact of such elements as new legislation, changing user needs at all office levels, and organizational changes.

For example, FmHA is conducting an experimental project which utilizes the services of banking institutions to handle the loan collection functions currently performed by the National Finance Office. Under this project called the Bank Collection System, contracting banks would also notify FmHA's county offices of the borrower's payment status. If this experimental project is successful and adopted, it could significantly impact on the UMIS design. More specifically, a revised UMIS design would not be required to process large volumes of payment documents or handle the problems associated with payment delinquencies.

Since a major function of the UMIS design could be deleted with the advent of the Bank Collection System, FmHA should assess the approach to payment processing and delinquency reporting that is currently envisioned for UMIS. Further, FmHA should not continue developing or implementing the FFS concept before evaluating the impact of the Bank Collection System. During the final stage of our review, USDA officials told us the Task Force has been instructed to study the effect of this system on FmHA operation.

Other possible changes that could impact on the original UMIS design are the Guaranteed Loan Program and the Home Owner Assistance Program. Although FmHA recognizes that such programs may eventually impact UMIS, it is not evaluating the need to change the UMIS design during the development phase. It is usually more economical and less disruptive to introduce design and system changes during the development phase rather than the implementation phase when users expect a useable and complete system. We believe that such programs could affect operations of the county offices and the manner in which they conduct business. Also, these new programs could significantly change the relationship and level of support UMIS would provide to the county offices, State offices, and other FmHA locations.

Government guidance

In recognition of the many problems agencies usually encounter in the planning, acquisition, and use of computer-based information systems, Government guidance has been developed and is available for use by Federal agencies.

General Services Administration, Federal Managemant Circular GSA-FPMR 101-35 and Office of Management and Budget Circular A-109 offer guidance for acquiring automatic data processing equipment and software (including a computer-based information system such as UMIS). Circular A-109 provides guidance requiring agencies to define system needs and objectives in terms of agency mission and purpose. The circular also stresses the importance of not defining new system needs in equipment terms.

We said in our 1978 report that FmHA did not adhere to prescribed Government guidance. In fact, the FmHA system design and development Request for Proposal, specified that UMIS would be processed by a computer system with computer terminals in each of FmHA's 1,750 county offices. By defining its system needs in equipment terms, FmHA precluded any objective consideration of system design alternatives.

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Furthermore, by not defining UMIS objectives in terms of agency mission and purpose, FmHA has little assurance that any completed system will meet the agency's short- and long-term information needs. Had the Request for Proposal specified the UMIS objectives in agency mission terms, FmHA would have provided the basis for developing an effective and economical management information system.

FmHA evaluated alternatives to UMIS/FFS and reported its findings in the "UMIS phase I--Final Report", dated April 19, 1976. The baseline for this evaluation included features which could be met only by the FFS version of UMIS. Consequently, the study concluded that FFS was the "best" alternative. This study should have used defined and quantifiable information attributes as a basis for evaluation. Since the baseline for comparison was FFS, none of the alternatives received an objective evaluation.

During the evaluation, FmHA developed estimates called effectivity ratings for the relative levels of service available with each of five alternatives. Since FFS was the baseline, it received an effectiveness rating of 100 percent. The ratings for the other four alternatives, including NOC, expressed the ability of each to meet the "level of service" provided by FFS. FmHA did not attempt to evaluate the level of service needed or the ability of each alternative to satisfy those needs.

Furthermore, the effectiveness ratings were based primarily on judgment. FmHA did not adequately document the effectiveness ratings assigned to each of the alternatives. Also, the agency did not identify the services which would be lost under each alternative.

COST BENEFIT ANALYSIS

Government guidance requires agencies to conduct a cost benefit analysis prior to developing a computer based information system such as UMIS. Although FmHA did conduct such an analysis, it was inadequate.

FmHA's cost benefit analysis compared the annual operating cost of each alternative to its potential annual savings. The potential savings for each alternative were determined as follows:

--FmHA computed the "potential" savings resulting from FFS.

--The overall effectiveness ratings were then applied to the potential savings under FFS to determine the dollar value of savings that would accrue under the alternatives. (For example, because NOC had an effectiveness rating of 28 percent, the agency believed NOC would realize 28 percent of the potential savings attributable to FFS.)

FmHA acknowledged that the anticipated savings for FFS were determined subjectively and that little documentation was available to support these savings. The UMIS project manager stated that these figures were developed to obtain some idea of potential savings and were not intended to justify implementation of FFS.

FmHA should have developed savings for each UMIS alternative independent of FFS. These "potential savings" should in turn be as objective as possible. As a result of the evaluation method used by FmHA, we do not believe that any of the alternatives received, or could have received, an objective evaluation.

CONCLUSIONS

UMIS as designed is not viable. UMIS has several basic design problems which will probably make the cost and time to complete the project highly questionable. The design problems may also prevent UMIS from ever being completed as it was originaly envisioned. USDA is currently performing a complete technical review of the project prior to making a final determination on how to proceed with UMIS.

If FmHA continues developing UMIS as designed and it is completed, the project's design problems may result in a system that will be (1) highly inefficient, (2) costly to maintain, (3) difficult to modify as information requirements change over time, and (4) ineffective in terms of meeting information needs. USDA officials told us on February 14, 1980, that the UMIS EXEC is no longer considered valid and this part of the UMIS system will be modified.

FmHA, in initiating UMIS did not determine its functional requirements and still has not adequately studied or documented its user needs. Because of poorly defined functional requirements, UMIS may be designed to deliver a higher level of service than is cost justified. Additionally, because FmHA has not monitored actual and potential changes to user requirements, the system may not meet new needs which have surfaced since 1975 when UMIS was initiated.

RECOMMENDATIONS

We recommend that the Secretary of Agriculture direct Farmers Home Administration to:

--Redefine information requirements to meet agency (user) needs and express them in terms which are more specific and quantifiable in order to establish performance criteria for evaluating UMIS alternatives.

--Obtain from the Office of the Secretary of Agriculture approval of FmHA's information requirements study prior to continuing or beginning any new development effort. The study should also be submitted to the appropriate congressional oversight committees. Should the USDA Task Force uncover new information then UMIS should be reevaluated.

On February 14, 1980, USDA officials told us that the USDA Task Force was directed to (1) redefine FmHA information requirements and (2) determine if the current UMIS design is still valid. This approach is consistent with our recomendations.

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In appendix IV, we discuss alternatives to UMIS. We note, however, that the identified alternatives and any alternative selected is dependent upon the completion of an adequate information requirements study by FmHA.

In appendix V, we make other recommendations concerning project management which are applicable to any alternative approach selected.

AGENCY COMMENTS AND OUR EVALUATION

USDA and FmHA concurred with our position that the EXEC, a most critical component of UMIS is not viable but took exception to our conclusion that UMIS is not viable. FmHA and USDA officials also concur that the data base has serious problems but believe parts of it can be salvaged. It is our contention that if two major components of UMIS--the EXEC and the data base are inviable, then UMIS is not viable. This is essentially a difference in semantics. In our opinion, these two parts of UMIS are so integral to the total system that for all practical purposes UMIS as a system is no longer viable. Further, we believe that the impact of redesigning these two parts

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of UMIS will require such major rewrites of the application programs that there is a high probability that only items such as program specifications and parts of the data base may be salvageable. In addition, we contend that FmHA's information requirements, a third component critical to UMIS is invalid. This further supports our position that UMIS is not viable.

ALTERNATIVES TO THE UMIS DESIGN SHOULD BE CONSIDERED

The deficiencies of the UMIS design warrant a new approach. We identified several alternatives for the USDA Task Force to consider. However, it is important to point out that these alternatives and any other alternatives the Task Force may identify are not necessarily the only alternatives to be considered in choosing a new approach to meeting FmHA's needs. Only when FmHA prepares an adequate requirements study and all alternatives to UMIS can be identified, will FmHA be in a position to evaluate alternatives. Therefore, prior to selecting an alternative and before initiating further system development actions associated with an alternative, FmHA should first determine its management information requirements. This study should then be followed by a detailed cost benefit analysis to determine the most cost effective approach.

Before proceeding with a discussion of the alternatives to UMIS, it is important that we address the approach the UMIS development team in St. Louis is pursuing. This team was continuing until February 14, 1980, with the development of UMIS as originally designed. Essentially, this approach attempts to salvage the data base structure and major segments of three subsystems of the EXEC. Completing the development of the two remaining subsystems of the EXEC would be deferred.

Our position is that this approach is not viable and is based, in part, on the following summary of advantages and disadvantages. The primary advantage of this approach is that FmHA can benefit to some extent from prior development efforts. For example, the EXEC and data base have been designed and are partially developed. In addition, FmHA may receive another benefit in that one segment, phase I, may be operational within a year. While there are a few advantages, there are many disadvantages.

The disadvantages of this approach as discussed in appendix III are as follows: (1) the data base has design limitations which affect the performance of the entire system, (2) the effectiveness of the UMIS software including the EXEC and the data base is highly questionable, (3) the services of the contractor, SDC, that designed UMIS, have been discontinued, (4) inadequate documentation of UMIS software compounds the problem of completing the development of a highly technical and comprehensive ADP software project, (5) if FmHA completes the development of UMIS, design limitations affecting the system's flexibility may greatly reduce its useful life, and (6) there is no assurance that the total system

when completed will meet operational time constraints, such as nightly updates and data processing by many users on a concurrent basis. Based on these disadvantages this approach should not be considered a viable alternative to the present UMIS design.

ALTERNATIVE I--CURRENT ACCOUNTING SYSTEM

FmHA is currently operating an accounting system on Burroughs computer equipment. Although a detailed study and analysis of this computer supported accounting system has not been made, FmHA officials contend the system does not satisfy agency information needs. County office personnel complain that information produced by the system is often out of date, inaccurate, and generally unreliable.

A study of the Burroughs system's problems, prior to embarking on the UMIS project in 1975, could have greatly facilitated the upgrading of FmHA's management information to meet agency needs on an interim basis. The current system although limited, has been operating and will continue to operate for at least 5 to 7 years beyond its planned operational life. Although FmHA does not consider the Burroughs system a viable alternative to UMIS, the agency acknowledges that it will need to maintain the system until its replacement is available.

FmHA contends that the current Burroughs system will not have the capacity to process the agency's growing workload much longer. Consequently, the agency is considering requesting an interim upgrade to the Burroughs equipment. FmHA officials admit that they have not examined the current Burroughs capabilities vis-a-vis the workload. They told us, however, that the Burroughs system is currently not able to complete all scheduled work on a timely basis. We believe that FmHA needs to conduct an extensive study of the current system to determine its potential for meeting FmHA's information needs both today and as part of any future system.

ALTERNATIVE II--PRIVATE INDUSTRY SOURCES MAY MEET SOME INFORMATION NEEDS

OMB Circular A-76 requires Federal agencies to use the private sector to meet information needs wherever possible and when it is cost effective. FmHA is considering private industry programs which would replace some functions UMIS was designed to provide.

For example, FmHA is considering a project known as the Bank Collection System. Under the Bank Collection System,

contractors would handle the loan collection functions currently performed by the finance offices. FmHA officials base much of its justification for FFS on current problems with payment delinquencies. The FFS mode would theoretically provide each county office with borrower payment status as of the preceding day's close of business. If FmHA adopts the Bank Collection System, the contractors would notify the county offices of the borrower's status. Consequently, a major function of UMIS would no longer be required. FmHA plans to pilot test the Bank Collection System during the next 2 to 3 years and decide on extending the application by 1983.

This uncertainty involving a major function of UMIS, particularly the UMIS FFS version, requires a reassessment of the approach to payment processing and delinquency reporting. FmHA should not devote extensive resources to a payment and delinquency system that may be unnecessary when completed.

The Bank Collection System is one illustration of an approach that could affect the UMIS design. Other possible changes to the original UMIS requirements could result from the Guaranteed Loan Program and the Home Owners Assistance Program. FmHA recognizes that these programs may eventually affect UMIS but is not taking these programs into account at this time. We believe, however, that these programs could affect the manner in which county offices conduct business and the way UMIS would support county and other office levels in the agency. FmHA needs to study the affect of these programs on UMIS's design and development.

Potentially FmHA could obtain the services of the private sector to meet its information needs. Programs such as the Bank Collection System point up the possibilities of such an alternative. None of FmHA's current pilot programs would, if successful, eliminate all of the functions UMIS was intended to satisfy. However, if the pilot projects succeed, additional contracting in the private sector may satisfy the additional functions UMIS was designed to process.

ALTERNATIVE III--BASIC INITIAL OPERATING CONCEPT (BIOC)

In June 1978, FmHA officials in St. Louis believed that the EXEC under development by the contractor, SDC, would not be completed by April 1979 to conduct an operational test of the two UMIS modes of operation--the Full Field Service

concept and the National Operating Center concept. As a stop-gap measure, FmHA developed computer programs to implement 15 of the more than 600 UMIS transactions in total. FmHA refers to this group of transactions as part of the BIOC. These programs are currently in use at the Illinois State and county offices. Although these programs process transactions identified as part of UMIS, they do not use the EXEC software but use standard off-the-shelf software available from Honeywell, Inc. Consequently, the BIOC alternative represents no real progress toward implementing UMIS as originally designed. It duplicates capabilities which would be part of the UMIS EXEC.

Each BIOC transaction is a self-contained entity and each computer program is independent of other programs. Each program includes all display screen handling functions for each computer terminal, data validation, data editing, and subroutines that would be contained in the UMIS EXEC subsystems. Although each program may be placed in operation as it becomes available, each BIOC computer program contains processing routines that are repeated in other BIOC programs. Developing UMIS using this approach would result in considerable redundancy or duplication both in the effort to complete the system and the finished product.

There are a few advantages to the BIOC alternative. First, FmHA has successfully implemented a few types of transactions using this approach. Second, the Illinois county offices are using 15 transactions to conduct business. This successful implementation of some BIOC transactions is testimony to some measure of success with a computer-based information system. Third, the BIOC design permits transactions to be implemented as they become available. BIOC does not require an overall system structure like the UMIS EXEC to process transactions.

However, many of the disadvantages of this BIOC alternative stem directly from the features that provide its advantages. For example, the design approach which allows rapid implementation of each transaction also results in inflexibility. If a broad agency function, such as loan application tracking, were modified, all computer programs within that function would require modification (external reprogramming).

Redundancy is the price paid for independence among the transactions and computer programs. Each separate transaction repeats common routines or housekeeping steps performed by other transactions. This duplication results in excessive computer system overhead that increases computer storage and

processing costs. The combined overhead and inflexibility of the approach may severely hamper the system's viability. The computer hardware and software maintenance required to support such a system may exceed its benefits in economic terms.

Furthermore, considerably more resources may be required to completely develop UMIS under the BIOC alternative than under the UMIS EXEC approach. Building each transaction as a unique, self-contained entity would require considerable duplication of effort. The UMIS EXEC is designed to avoid such duplication and redundancy.

Finally, expanding BIOC to include the entire management information system does not solve the problems inherent in the UMIS EXEC alternative. Both alternatives would be dependent on and developed from the same inadequate functional requirements and would use a similar data base with similar limitations. BIOC was developed as a pilot study to evaluate operational concepts and principles incorporated in the design for the UMIS EXEC. Consequently, BIOC would be plagued with many of the shortcomings attributed to the UMIS EXEC. USDA and FmHA officials told us they concur with our position, and do not believe BIOC as designed is a viable alternative to UMIS. However, the underlying principles of BIOC may be a valid alternative.

ALTERNATIVE IV--REDESIGN THE MANAGEMENT INFORMATION SYSTEM

This alternative suggests performing steps in the system development process not adequately completed during the initial and subsequent stages of the ADP project UMIS. It also suggests discontinuing the development of UMIS as presently designed. In this context we have identified two possible entry points to restart the ADP project--the early functional requirements phase or the later system design phase.

A restart at the design phase would amount to discarding the current design, including the UMIS EXEC and other associated software. This appraoch assumes the requirements study used in developing UMIS has value and essentially this redsign would meet those requirements. The primary advantage to this approach is that it would save the time needed to prepare a requirements study and cost benefit analysis.

The major disadvantage to this alternative is that the redesigned system would still be based on functional requirements that were not adequately studied and may be

inaccurate. Further, significant changes which have occurred over the past 4 years, as evidenced by the 700 System Change Requests, have not been accounted for in the UMIS design.

Although the UMIS project has been very costly and time consuming, by restarting at the functional requirements stage FmHA would reduce the risk of losing additional money and effort in a new design that may not be viable. A decision concerning future development of a management information system for FmHA should not be constrained by expenditures to date for the UMIS project. Continuing with the present UMIS design and requirements is not cost effective.

Restarting at the functional requirements stage would be the most effective approach since (1) user requirements would be identified and brought up to date and (2) changes to FmHA's manner of conducting business would be considered; e.g., the Bank Collection System mentioned earlier. Further, FmHA would have the opportunity to develop quantitative information for designing the software, the data base, and the information delivery system. A design based on this information should enhance successful implemention of a needed and effective system. It would also assure an extended useful life for the system. Quantified information would also aid in testing the feasibility of various approaches and in designing software tests during the development phase.

Based on our review we believe that restarting at the functional requirements stage is an acceptable approach for acquiring a management information system. In our opinion, restarting at the requirements stage would not appreciably extend the completion date of a new system beyond the estimated 3 to 5 years to complete UMIS using the EXEC's original design. Since UMIS was initiated in 1975 extensive changes have occurred in the ADP industry. Today Data Base Management Systems are better understood and more extensively researched than in 1975. FmHA, in redesigning a new system would potentially be able to purchase already developed software readily available through commercial sources. By using this approach they would eliminate the need to develop much of the system in-house. Additionally, using available software may result in completing a new system faster and at less cost than it would take to complete UMIS.

In addition, restarting at this point would also provide FmHA with the opportunity to implement the following techniques and practices learned in developing UMIS.

--A workable project management organization.

--The development and enforcement of standards and procedures for project controls.

--The development and maintainence of adequate documentation.

--The use of previously developed tools, techniques, and software whenever feasible.

--The development and application of a phased implementation approach.

For years we have believed and reported that FmHA should have objectively identified and evaluated all possible alternatives. The current condition of the UMIS project supports our position and provides the agency with an opportunity to correct the current deficiencies of the project.

Restarting at the functional requirements stage suggests FmHA reassess its development efforts and decide on alternatives to the UMIS EXEC and BIOC alternatives. A restart may also identify possible improvements to the existing accounting system operated on Burroughs equipment. This system must continue to function until its replacement system is operational. Unfortunately, due to the 5 to 7 year delay in completing UMIS, the existing accounting and information system is also experiencing problems. FmHA contends that the Burroughs computer system operating the existing accounting and information system will soon lack the capacity and capability to process the agency's expanding workload. FmHA is considering an interim upgrade of the Burroughs computer which amounts to another costly item resulting from the incompleted ADP project--UMIS.

CONCLUSIONS

Although UMIS is not an effective or viable approach to meeting FmHA's needs, this has not removed the information needs the system was intended to meet. UMIS was one approach--an approach that did not succeed--now FmHA must select another approach to meet its needs. A primary reason for FmHA's problems with UMIS was the agency's lack of firm information requirements. Any attempt to choose another alternative without determining user needs will have a high probability of experiencing the same problems as UMIS.

FmHA has a number of alternatives available as potential replacements for UMIS. However, the agency in developing the system has not adequately studied its information needs. Without detailed information requirements FmHA can not

--identify all feasible alternatives to UMIS,

--determine whether each alternative can meet user needs,

--justify the cost of service needed by its users, or

--estimate the cost of each alternative or perform a cost benefit study.

Until FmHA conducts a complete, detailed, and documented study of user requirements, management will lack the information needed to decide on what alternative to UMIS would be the best approach to meeting agency needs. Because of the importance of this study we believe USDA needs to provide continuous oversight of this activity and formally review and approve each major step of the study's: (1) methodology, (2) actual field work, (3) analysis, and (4) conclusions and recommendations. See appendix III for a more detailed discussion of requirements and recommendations for corrective action.

RECOMMENDATIONS

We recommend that the Secretary of Agriculture direct Farmers Home Administration to:

--Identify all alternatives to UMIS based on a complete functional requirements study, and prepare a documented analysis of alternatives and a cost benefit study, and

--Develop the most cost effective alternative to meeting FmHA's needs based on the above studies and the technical Task Force report.

AGENCY COMMENTS AND OUR EVALUATION

On February 14, 1980, USDA officials told us that the Task Force was directed to, among other items (1) identify all alternatives to UMIS, (2) prepare a cost benefit analysis

of each alternative, and (3) identify the most cost effective system for meeting FmHA's needs. We note that this step is consistent with our recommentations. For additional information on the Task Force see appendix II.

IN DEVELOPING AN ALTERNATIVE TO UMIS, PROJECT MANAGEMENT NEEDS TO BE STRENGTHENED

To develop and implement a management information system that is both cost effective and meets management requirements, it is essential that FmHA assign a high priority to improving its project management capabilites. Although FmHA has attempted to improve its management and strengthen controls over the UMIS project, these efforts have not met their objectives. We found that most delays, increased costs, and shortfalls in meeting objectives resulted from FmHA's inability to (1) develop a workable project organization, including the assignment of a full-time project manager responsible for managing the contractor's work and having full technical and administrative authority for project completion, (2) effectively plan the project's development, and (3) use standard ADP project control measures, such as a cost budgeting system.

Contracting ADP software development has aggravated FmHA's problems with UMIS development. FmHA did not implement effective quality control measures to insure that contracted work was tested thoroughly and fully documented prior to acceptance. Without such procedures, FmHA has brought software in-house that does not function properly and will require extraordinary efforts to correct because documentation is lacking.

After terminating UMIS, preparing a requirements study and selecting an alternative, FmHA must manage the new development project if it is to succeed. In developing an alternative to UMIS, FmHA will be faced with similar problems of managing, planning, and controlling a major software development project. We believe the following management related problems were major causes of UMIS delays and cost overruns.

FmHA's PROJECT MANAGEMENT IS WEAK

Many UMIS problems have occurred because FmHA did not establish an effective management organization for completing the project. Although the agency attempted to improve its management of UMIS, its efforts were not effective. For example:

--The project management organization does not provide a clear focal point for authority and responsibility which resulted in extensive communication problems.

--A full-time UMIS project manager was not assigned to the ADP project. Further, part-time project managers were not vested with sufficient authority to exercise effective management control over the project.

--An effective ADP steering committee has not been in operation to insure continuity of top management involvement in the project.

Because the use of an outside contractor greatly increases the difficulty of project management, these problems have contributed to an incomplete and costly system. Traditionally, the development of original software which meets user needs has inherent managerial and technical difficulties even when the programmers, analysts, and managers developing the software work for the same organization as its users. The task becomes more difficult when the software is developed by an outside organization, as is the case when Federal agencies contract for software development.

The additional problems presented by using an outside contractor placed even more importance on the need for effective FmHA management. The traditional contractor problems of coordination and authority can be minimized by effective communication through one source of authority and responsibility. Without extensive coordination and one individual clearly in charge, the various groups responsible for the project, worked in a counter productive manner. FmHA in developing UMIS did not establish an effective project management organization capable of coordinating and controlling the development of UMIS. Because of management control problems, the contractor and in-house personnel often worked at cross-purposes under unclear lines of authority and responsibility.

Project organization: Decentralization created serious authority and communication problems

FmHA adopted a two-team approach in organizing its UMIS staff with one team in Washington, D.C., and the other at its Finance Office in St. Louis, Missouri. The Washington team consisted of the UMIS project manager, FmHA steering committee, and a Virginia contractor who was responsible for developing the EXEC, a major portion of UMIS software. Extensive coordination and communications problems resulted among the participants in the project because authority and responsibility for the project was not clearly assigned.

APPENDIX V

The separation of the UMIS staff in Missouri and the contractor in Virginia did not provide for effective coordination and information updates on the project. For example, the contractor was responsible for keeping the St. Louis staff current on the development of the EXEC by issuing System Development Memos. However, FmHA officials said that memorandums prepared by the contractor contained potential design options rather than methodologies and procedures for development. This resulted in misunderstandings and substantial delays in developing UMIS because the St. Louis staff was required to research design changes and reprogram work.

The major shortcoming of the two-team approach as adopted by FmHA was its inability to provide a focal point for decisionmaking. SDC officials told us that throughout the project's development they had major problems with identifying a single source within FmHA with authority to make final decisions. In a recent GAO report issued in 1979 we reported on this problem to the Congress (FGMSD-80-4). The report cited ineffective software project management as a cause for system development failures. We reported that a focal point for decision making was needed to:

--Shorten communication lines.

--Provide the contractor one source to obtain answers.

--Reduce duplication of effort.

--Provide one group within the agency an overview of the entire development effort.

In developing UMIS the contractor often had to consult with both the project manager in Washington and the St. Louis team to obtain answers to technical questions and project design decisions. Additional communication problems surfaced because the St. Louis team often received second-hand and incomplete information on major design decisions made between the contractor and the project manager in Washington.

FmHA's two-team approach also resulted in personnel management and administrative problems. In February 1978, FmHA approved a reorganization plan which transferred project management administrative responsibility from Washington to the St. Louis Finance Office. This reassignment of the 33 UMIS staff stationed in St. Louis was made with the provision that the project manager in Washington would remain responsible for the technical direction of the project. FmHA officials

indicated that this reorganization was necessary because of (1) the lack of organizational security, (2) informal supervisory channels, and (3) difficulties in rewarding and promoting employees. However, we found that splitting control over the UMIS development team between the Finance Office and the project manager in Washington resulted in FmHA's inability to control and manage the UMIS staff. In our report, CED-78-68 dated February 27, 1978, we recommended that FmHA conduct a formal, analytical study to evaluate the impact of this and other proposed organizational changes on the UMIS project. We note that FmHA did not adequately evaluate the impact of these changes.

A full-time project manager is needed

The UMIS project manager was responsible for overseeing and coordinating the work of over 100 FmHA personnel and 35 contractor employees. Concurrently, the project manager continued performing his duties as the Director of FmHA's Management and Information Systems staff. Furthermore, FmHA did not establish a special management staff located in the same geographical location as the project manager.

In our discussions with the project manager, the contractor, and FmHA's St. Louis staff, the absence of a full-time project manager was the most frequently cited cause of UMIS problems. In 1979 the OIG reported ineffective project management as a problem. Also a recent Arthur Andersen study cited this as a major cause of UMIS problems. We note that on December 17, 1979, USDA directed FmHA to establish a full-time project manager for UMIS.

Steering committee needs to be strengthened

A more effective steering committee could have resolved the many problems resulting from the UMIS organization and could have served as a focal point for decisionmaking. The committee should have made key decisions for UMIS and coordinate the work of the various groups working on the project. In our 1978 report (CED-78-68), we recommended establishing this committee. FmHA established the committee in 1978--4 years after the start of the UMIS project. Although the committee has met and taken some action on UMIS problems, we believe the committee has been reacting rather than leading the project's development.

The committee's primary functions should be to periodically review and evaluate the work of the various FmHA offices having responsibility for carrying out the management of computer resources. The committee should also recommend to the Administrator of FmHA ways to improve the efficient and effective use of computer resources. Specifically, the committee should (1) review and recommend policies for the effective use of computer resources throughout the agency, (2) establish measurable objectives so that progress toward their achievement can be measured, and (3) regularly monitor the development and implementation of UMIS.

Because of FmHA's dispersed organization and the length of time required to develop a major software project such as UMIS, the establishment of a steering committee is essential to effectively involving top management in directing software development projects. UMIS development has involved every major organization in FmHA and the various management levels within each organization. Since the program's inception, the FmHA has had two Administrators which has contributed to the leadership problem.

We believe an approach which FmHA can use to involve top management and provide direction to the many units responsible for UMIS and maintain continuity of management is through an effective steering committee. In our 1978 report and during our current review we noted that no single office or person assumed full authority or responsibility for UMIS. The decentralized management of the project has led to a lack of accountability for UMIS.

FmHA HAS NOT ADEQUATELY PLANNED FOR UMIS

FmHA has not effectively planned for the UMIS project. Project managers, in our opinion, have relied on the contractor not only for technical support but also for basic management decisions and oversight of the project. Planning was essential for the successful development of UMIS because of its size, long development time, complexity, and heavy reliance on an outside contractor. Contracting for software development as noted earlier adds to the complex problem of managing a development project.

Developing a sophisticated management information system represents a considerable investment of resources--people, money, and equipment. Therefore, a project control and cost collection system to track and review each stage of the project's development is a prerequisite to responsible project management and planning both in terms of meeting development milestones and controlling costs.

Since 1977, FmHA has been aware of the need for a system for monitoring the development and cost of UMIS. Nevertheless, an effective system has not been implemented. Because FmHA has not provided adequate management control over the UMIS project, the agency has not prevented or mitigated the effects of project slippages, including controlling costs. In addition, FmHA has not developed a system for (1) determining actual costs expended in developing UMIS, (2) estimating costs for completing the project, or (3) projecting the system's operational costs. Without adequate information, FmHA cannot realistically plan for and manage UMIS.

FmHA needs to develop long range plans and milestones

FmHA management did not use standard planning techniques in developing UMIS and coordinating the work of the different groups responsible for its component parts. Milestones and specific completion dates for major work steps were not developed. A regular and controlled reporting system to communicate information to all project personnel was not put in place. Detailed development and implementation plans were not used throughout the project. The effect of serious project slippages on overall project development were not used in changing priorities to meet new problems created by the delays.

Management did not plan for the logical sequence of events in the execution of the project which led to the system being developed and designed concurrently. This created the necessity for extensive rework during the project as system changes occurred. At the time of our review there were some 710 System Change Requests. As the project now stands, a major modification of the EXEC is very likely and would require a major rewrite of most of the application programs already written. This could have been avoided if system development had been delayed until after SDC developed the EXEC and it was in place and working.

A lack of planning in the execution of the project was evidenced by FmHA's decision to develop the NOC concept of UMIS and the FFS concept simultaneously. The OIG, in November 1977, recommended that FmHA concentrate on developing UMIS under the NOC concept because it could reduce the time to complete the system and reduce cost overruns. FmHA ignored this recommendation and went ahead with the development of two concepts concurrently. Recently FmHA initiated the development of another system, the Bank Collection System which has similar objectives as UMIS. We believe FmHA has overextended its management and technical capability

by working on two approaches at one time, resulting in a diversion of resources away from UMIS.

FmHA needs a cost accounting and budgeting system for UMIS

Costs throughout UMIS development should be collected, reviewed, and updated to effectively help plan and control the development and operation of UMIS. Consistent with the Federal Information Processing Standards Publication (FIPS Pub 38) the life cycle of an ADP software system is subdivided into three major phases: initiation, development, and operation. Over this life cycle, the agency should assign responsibility and accountability for all costs, both estimated and actual. The significant investment of effort, time, and resources coupled with the complexity of designing, developing, installing, and operating the UMIS software warrant financial and management reviews at regular intervals. At each check point, major phase, or task in the process, management should review actual-versus-estimated cost information to help decide on future plans for the project.

Prior to initiating UMIS development, FmHA did not prepare cost estimates to develop and operate UMIS. FmHA has still not developed a budget for costs to complete UMIS development, costs of design alternatives to UMIS, or an estimate of the operational cost of the system.

We recommended in 1978 that FmHA:

--Intensify its effort to install PAC II--a computerized project control mechanism. This is necessary to monitor progress of the development project, identify and analyze schedule and cost variances, and to better plan the use of FmHA's resources.

--As part of a project planning and control mechanism, install a cost accounting system to account for all costs incurred during the system design, development, and operational life.

In 1977 FmHA acquired the use of a software project control package called PAC II for use in monitoring and controlling UMIS. The acquisition was made in response to OIG concerns over FmHA's inability to provide actual and budgeted costs for UMIS. We found in our 1978 review that PAC-II had not been fully implemented. Today, 2 years later PAC-II is still not useful or fully operational.

Because PAC-II has not been adequately implemented, FmHA cannot accurately provide information on:

--Actual costs for developing UMIS.

--Estimated costs to complete the development effort.

--Estimated costs to operate or maintain UMIS.

In managing UMIS, FmHA has not effectively held managers accountable for budgeting and estimating the effect of project slippages on development or operating costs. We believe this lack of adequate cost information has seriously reduced the ability of UMIS managers to plan and control the system. For example, the OIG reported in 1979 that FmHA officials relied solely on SDC figures for payment to the contractor. We believe FmHA's reliance on SDC figures was due to PAC-II not being fully implemented. Because of its lack of an effective cost collection system, FmHA could only rely on SDC's cost data.

INADEQUATE PROJECT CONTROL

Effective project control measures are a prerequisite for quality software development, especially for a project of UMIS' size and complexity. In managing UMIS, FmHA did not fully use accepted project management techniques. FmHA did not follow Federal guidance in managing the contractor responsible for a major part of the systems software. Specifically, FmHA in managing its contractor did not

--require monthly cost performance reports,

--establish a work management system,

--require system documentation reviews,

--establish test procedures for software delivered by the contractor, or

--test completed software delivered by the contractor.

Additionally, FmHA did not adequately use project control techniques, such as feasibility studies and economic analysis tools. We also found that FmHA did not take appropriate actions on recommendations made by USDA's Inspector General on controlling UMIS and responding to problems, as they occurred. Further, FmHA's budget procedures do not adequately provide congressional committees with sufficient information to discharge their responsibilities.

Contractor monitoring was weak

FmHA has not effectively monitored the progress of the contractor. Commonly accepted management practices and procedures, such as PERT, Program Evaluation and Review Techniques, or CPM, Critical Path Method techniques, were not used to track the contractor's efforts. Requirements for monthly quantitative cost performance reports were not established for the contractor. A work measurement system was not implemented to link the efforts of specific individuals to project activities. Furthermore, system documentation reviews on the products delivered by the contractor were not held, even on the limited documentation required by the informal agreement between FmHA and the contractor.

FmHA did not establish testing requirements to ensure that contractor-delivered software would work as designed. Project planners did not develop firm milestones for software delivery by the contractor. As a result, problems were not surfaced until a product was due and the contractor failed to deliver as scheduled. As time passed, the contractor continued to miss target delivery dates with resulting slippages to UMIS overall completion. As delivery dates were missed, new estimates for project completion were often not established. Further, FmHA was unable to reschedule new priorities for work which depended on the availability of the delayed software.

FmHA and the contractor adopted the approach of a joint and shared effort in developing UMIS. This resulted in a contract that lacked specific assignment of responsibility to each party. Any attempt to evaluate the contractor's performance was handicapped by a lack of clearly defined specifications and responsibilities for project deliverables.

USDA's Office of Data Services, in an August 4, 1979, report, stated that such a contract arrangement does not benefit the Government in any way but that it has the potential of the Government paying for problems that are beyond the Government's control.

FmHA should act on the Office of the Inspector General's reports in controlling UMIS

The OIG has provided indepth reviews of the entire UMIS effort from its inception in 1975. From May 1976 to June 1978 the OIG issued 24 System Development Advisory Memorandums intended as informal reports on UMIS problems for FmHA management action.

As we reported to the Congress (FGSMD-77-82, Sept. 28, 1977), a frequent problem with Federal software projects has been inadequate involvement by internal audit or involvement only after the project completion. Early and continued review of UMIS by USDA's OIG has been an exception to internal audits traditionally limited involvement with ADP software projects.

We note that FmHA's response to the OIG's concerns and recommendations have not been adequate. FmHA did not respond or has not satisfactorily implemented about 25 percent of the recommendations. The OIG's reports have noted deficiencies in project mangement, software security, inadequate justification for development, and underutilization of standard economic analysis tools. Had FmHA responded more effectively to the OIG's concerns many of UMIS problems could have been mitigated and the project's internal controls improved.

FmHA budget practices do not provide sufficient information on UMIS

FmHA does not budget or request funds for all phases of UMIS as a separate line item in FmHA's budget justification. As noted in the table below, budget requests primarily relate to costs associated with the contractor and exclude the higher personnel costs of the FmHA staff.

UMIS Budget for Development Contractor

Fiscal year	Requested	Approved
	(millions)	
1977	$2.3	$2.3
1978	3.2	2.7
1979	4.2	4.0
1980	4.1	4.1
1981	-0-	-0-
Total	$13.8	$13.1

These requests do not include the cost of FmHA employees assigned to the UMIS development team, supplies, travel, or floor space. For example, FmHA appropriations for UMIS through fiscal year 1979 were $9.0 million, but costs incurred were approximately $17 million for the same period. The estimated total development costs (including initiation phase costs and assuming a completion date of June 1985) may approximate $42 million.

We believe FmHA should establish a budget for the entire UMIS project and the alternatives it develops to replace UMIS. Incurred costs should be measured against this baseline on a regular basis. In addition, with knowledge of total development costs, an adequate cost benefit analysis can be performed and FmHA decisionmakers would be better informed in determining future courses of action.

An additional problem with FmHA's budget approach is the inadequate information provided to congressional oversight committees. For example, since the remainder of UMIS development is to be completed in-house, the UMIS project will not appear in FmHA's budget from 1981 forward. We believe that in light of the additional estimated costs to complete UMIS ($25 million) FmHA should report all UMIS development costs as a separate line item.

CONCLUSIONS

FmHA in its development of UMIS did not properly manage and control the project. The project was leaderless in that FmHA did not assign a full-time project manager and did not establish a steering committee to insure top management involvement until 1978. Further, the committee has not been as effective as it should have been in the area of directing the project.

FmHA did not effectively use standard control techniques such as (1) establishing milestones, (2) holding documentation reviews, (3) controlling system change requests (4) establishing test requirements, or (5) testing completed software as delivered. FmHA did not effectively manage the contractor responsible for much of the UMIS software development. The contractor was not given documentation standards or test requirements and FmHA did not monitor the contractor's progress or revise completion dates when product delivery deadlines were missed.

FmHA has not established a cost accounting, budgeting, or planning system for UMIS. Because of the lack of an adequate control system, FmHA cannot (1) accurately determine

operational costs or (2) adequately evaluate the effect of project slippages on completion dates. FmHA needs to establish a budget for UMIS or its alternative system to cover the developement and operational phases, and note UMIS as a separate line item in FmHA's budget justification. Because UMIS is not a separate line item, it will not be shown in the budget starting with 1981 even though estimated costs to completion could amount to an additional $25 million.

RECOMMENDATIONS

Consistent with accepted project management practices, the following recommendations apply to any alternative FmHA selects to replace UMIS. (See appendix IV for our recommendation on discontinuing UMIS.) We recommend that the Secretary of Agriculture direct Farmers Home Administration to:

--Intensify its effort in installing PAC II--a computerized project control mechanism. This is necessary to monitor progress of the development project, identify and analyze schedule and cost variances, and to better plan the use of its resources.

--Establish a budget for UMIS or an alternative system to cover the development and operational phases and note the project as a separate line item in FmHA's budget justification.

--As part of a project control mechanism, install a cost accounting system to account for all costs incurred during the system design, development, and operational life cycle. Total life cycle cost estimates should be updated on a regular basis.

--Assign a full-time project manager to the project development team.

--Strengthen its ADP steering committee and use the committee to insure top management involvement and management continuity.

--Develop and implement standard control techniques. For example, FmHA should establish documentation standards, hold documentation reviews, establish firm software test procedures, and improve its System Change Request controls.

Agency comments and our evaluation

USDA and FmHA officials agreed with our statement of the UMIS problems identified in this appendix except for our statement that FmHA's ADP steering committee needs to be strengthened. We believe the steering committee has recently initiated some actions to correct certain problems. However, it would have been more responsive and effective if it provided stronger direction and guidance in anticipation of the many management and technical problems which occurred.

During the final phase of our review, FmHA and USDA officials said the USDA Task Force and FmHA plan to initiate actions consistent with our recommendations.

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