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PRELIMINARY COST/BENEFIT ANALYSIS OF THE INFORMATION SYSTEMS PLAN

FINAL REPORT

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EXECUTIVE SUMMARY

The Agency for International Development (A.I.D.) is responsible for assisting developing countries in increasing their productive capabilities, improving their quality of life, and developing their human and economic resources. The methods A.I.D. uses to meet its responsibility involve transfer of knowledge, expertise, and resources and the education and training of local populations in the application and use of these resources. Information plays a key role throughout.

The A.I.D. Office of Information Resources Management (FA/IRM) recently led the preparation of an Information Systems Plan (ISP) to begin a process of upgrading all of the Agency's information systems. Currently there are 66 separate systems maintained by FA/IRM, half of which are mainframe systems and another fourth of which are minicomputer based systems, and most of which are produced with antiquated programming languages. There is also an undocumented number of non-corporate systems, i.e., systems used by only one location or organization, and countless local spreadsheet applications that fill the systems voids. In addition, at many locations applications are developed and maintained even when there are no systems voids, but simply at the election of local managers so they have systems with which they are more comfortable.

A.I.D. has just begun implementation of the ISP; it is at a very early initiation stage in its ISP effort. It has started a Business Area Analysis (BAA) in one of the business areas identified through the ISP development process and will have to complete such analyses in each of the other Business Areas. This is necessary to determine how many automated systems will be needed under the ISP and to determine the requirements for each. The BAA process will be followed by Rapid Applications Development (RAD) projects to develop the needed systems.

At this juncture the Agency has officially published an estimate of the non-recurring development and five year implementation costs for hardware and software acquisition, systems development, security, installation, and training. That estimated cost has been termed ISP Development Costs and sometimes ISP Capital Costs. The Agency also estimated certain recurring operational costs for the purpose of sizing and selecting an appropriate technical architecture, but it has not officially published the recurrent cost implications to portray estimated full life cycle costs. In addition, A.I.D. believes that the reported cost of the current information management/information technology (IM/IT) program world-wide is not reliable and wants to better identify that cost.

The Agency needs information upon which to base decisions regarding the pursuit of ISP implementation funding through its budget process, and the further development of ISP implementation plans and actions. These decisions will in part be made based on the results of a cost/benefit analysis of implementation of the ISP. A.I.D. enlisted the assistance of OGDEN Government Services for preparation of a preliminary analysis during the BAA process. The analysis is preliminary in the sense that it is preceding completion of the BAA/RAD processes in order to obtain an early indication of the projected incremental costs of implementation and operation of the ISP, as well as an estimate of the impact on current IM/IT program expenditures and other benefits. The analysis should be refined and performed in greater depth and detail after the BAA process.

This report:

- Identifies and quantifies the expenditures of the current IM/IT program and projects these costs for the ISP life cycle period,
- Defines the full life cycle costs of the ISP systems, including validating the estimates of ISP development costs,
- Projects and analyzes the cost savings and cost avoidance impact on Agency IM/IT expenditures that may be expected through implementing the ISP,
- Defines and analyzes other quantitative and qualitative benefits likely to accrue to the Agency, including projected cost savings once the ISP is fully implemented, and
- Determines the benefit/cost ratio of implementation of the ISP and analyzes the period required to recoup the Agency investment.

Cost of the Current IM/IT Program

The beginning point of our data collection and analysis of current IM/IT expenditures was a report in which the Agency annually documents certain IM/IT costs. This is a report known as Exhibits 43-A and 43-B, Report on Obligations for Major Information Technology Systems, which are special exhibits required in the Federal budget process. In that report the Agency had identified $55.5 million in IM/IT expenditures; we updated that figure to $57.9 million. This amount represents:

- All the costs incurred within FA/IRM,
- Limited costs incurred or funded in other FA Directorate offices,
- Costs incurred in the Office of the Inspector General, and
- Certain Operating Expense (OE) funded costs incurred in the overseas Mission components of the Regional Bureaus.

In the existing reporting process the Agency had not identified:

- Program funded costs incurred in the overseas Missions or A.I.D./W,
- Any costs incurred in the Washington, DC offices of the Regional Bureaus, except for buy-ins to FA/IRM contracts,
- Any costs incurred in the Directorate for Policy, except for buy-ins to FA/IRM contracts.

Additional A.I.D./W IM/IT Costs

We reviewed the Agency's contract files and met with nearly two dozen people representing A.I.D./W units outside FA/IRM. We did this to identify additional IM/IT costs incurred by A.I.D./W units other than those that have reported in the Exhibit 43-A process. As a result we estimate the additional IM/IT expenditures to be $8.1 million for fiscal year 1993, a 33% increase to the recurring costs previously reported for A.I.D./W.

In some cases other A.I.D. units in addition to the sponsor organization bought into the contracts--and some of these were at significant levels of buy-in. Many units, including the Regional Bureaus for example, buy in to CDIE contracts. We observed that these units, in need of some IM/IT assistance, will by-pass FA/IRM and instead utilize services contracted for by CDIE. In these arrangements CDIE supplies contract staff members with systems analysis and related skills. Such contract employees usually bring contractor-owned equipment. One consequence of this is that there is a lack of coordination within the Agency regarding IM/IT planning and delivery.

Mission IM/IT Costs

We also discussed the IM/IT program with representatives of five Missions in an attempt to validate in a generalized fashion the completeness of the Mission portion of the Exhibit 43-A report. We have a number of concerns regarding the Mission submissions. The data call response rate from missions is inadequate and, in order to make a more complete report, there is a significant amount of extrapolation and estimating that must be done each year in FA/IRM. The instructions to Missions for preparation of the report are not clear and do not guarantee a consistent reporting methodology across the Missions. Also, the timing of the 43-A preparation and submission is not in synchronization with other budget planning. We believe the result is that the Mission reports are not reliable and do not represent IM/IT plans and progress. Our estimation is that the reports are understated; it appears they exclude much of the telephone communication costs, and IM/IT costs that are paid from Trust Funds or other program funds.

Including the requirement for planning and recording of IM/IT costs in the budget and accounting systems, as FA/IRM has proposed, would establish the discipline necessary to track IM/IT expenditures. Critical factors in implementing such a requirement include providing adequate education and training and demonstrating Agency executive level support for the requirement. We believe this needs to be done to enable A.I.D. to carry out the responsibilities assigned to it through OMB Circular A-130. This will be especially important as the Agency embarks on investment of the funds necessary for implementation of its ISP.

Summary of Current Program Cost

Our estimate is that the current Agency-wide IM/IT program spending level for Fiscal Year 1993 is $66 million. For purposes of this analysis, we excluded certain costs not relevant to the analysis, as follows:

Current IM/IT Program Cost Item	Amount in Millions
Total Agency-Wide IM/IT Costs, FY 1993	$66.0
Exclusions for Comparability with the ISP:	
AWACS Costs Funded Separately From the ISP	4.1
Direct Hire Personnel Compensation	8.6
Exclusion of Non-recurring Costs	15.4
Recurring Costs Used in Benefit/Cost Analysis	$37.9

The recurring costs will, over the next ten years, with inflation at 4% compounded annually, amount to $462.3 million.

The Information Systems Plan

The ISP clearly defines the Agency's mission, objectives, and current situation. Major improvement initiatives are defined, particularly those recommended by the OMB SWAT Teams. In developing the ISP A.I.D. used an industry accepted approach known as Information Engineering (IE). This methodology calls for studying the entire organization's information needs and carefully defining a number of "environments": the information, systems, technology, and organizational environments. Each of these is a necessary element in understanding the needs of the organization, and ultimately in devising the total plan or "architecture" for meeting these needs. Both private sector and public organizations are finding the IE approach effective in dealing with productivity and budget issues.

The IE approach relies on extensive user involvement in defining the organization's needs. In A.I.D. over 100 managers from across the Agency were involved in one way or another. IE also attempts to shift the focus of information management from technology per se to the business impact of using available technology. In addition, IE places an emphasis on data sharing, which in turn requires common data structures, definitions, and standards across systems and organizations.

ISP Development Costs

ISP development costs were estimated by the Agency at $46.3 million. The ISP identified eight Business Areas, the major categorization of activity in an organization that is used for construction of an information systems plan design. We found that while A.I.D. followed IE principles and, in general, followed the principles well, there are some which were not explicitly followed. We believe a more in-depth technical analysis would have led to the

definition of a larger number of more narrowly defined Business Areas and systems. We concluded that the number of Business Areas should probably be increased to 11; an approximate 40% additional effort costing an additional $4.9 million will be required to accomplish the Software Development effort than had been forecast in the ISP. This estimate should be revised after some of the key ISP Business Area Analyses are completed.

The original estimate for security from unauthorized access to A.I.D. information was $10 million, but this was a preliminary estimate of potential security costs of fully meeting all Federal security requirements and was estimated without the benefit of complete analysis. FA/IRM recognized that more study would be necessary to provide a reliable price tag, but had the foresight to include an estimate for this extremely important item in the ISP. Since the ISP report was completed, a detailed analysis of security requirements and costs has begun within A.I.D. Preliminary indications from these studies are that the original estimate may be substantially higher than is necessary to accomplish A.I.D./W and Mission security. The non-recurring cost estimate for LAN and WAN security is about $3 million for a five year period. Given that Federal requirements are not currently being met, a similar security program would have to be implemented even if the ISP were not to be implemented. Even though this cost is not generated by the ISP, we have included it as a resource need because it is unfunded in the current program.

The increased development cost we estimated, $4.9 million, is more than offset by the $7 million downward adjustment in security costs. The net change is a decrease of $2.1 million, from $46.3 million to a new estimate of development costs of $44.2 million.

ISP Life Cycle Costs

As mentioned above, A.I.D. has published the ISP development costs for the five year implementation period, but not the estimated full life cycle costs. General practice over the past five years in analyses of this type has been to project an eight to 10 year system life. Our recommendation is that a 10 year life cycle period be used.

We estimated the 10-year total of ISP incremental recurring costs to be $66.6 million. The bulk of the amount is comprised of two items--equipment maintenance and network communications. In summary, the full life cycle cost estimate is:

ISP Life Cycle Cost Item	Amount in Millions	
ISP 5-Year Development Cost		$44.2
10-Year Equipment Maintenance Cost	$23.3	
10-Year Network Communications Cost	30.5	
10-Year Software Maintenance Cost	6.0	
All Other Recurring Costs	6.8	
Total Recurring Costs		66.6
Total Life Cycle Costs		$110.8

Benefits of the ISP

Implementing the ISP will result in benefits (including cost savings) to A.I.D. While some of the benefits can be quantified in dollar terms, others cannot be quantified, but can be identified and described in narrative form. Quantitative benefits will result from operation and maintenance of the ISP systems and also from use of the system by non FA/IRM personnel and users outside the data management organizations in Missions. Nonquantifiable benefits will also accrue to Agency managers, decision makers, and analysts through the use of the information maintained in the ISP systems.

IM/IT Cost Reductions

The major areas in which the cost of the current IM/IT program can be positively impacted through implementation of the ISP are:

- Reduced Hardware Maintenance Costs - Hardware maintenance costs should be reduced as a result of conversion to more modern, efficient hardware.

- Reduced Software Maintenance Costs - Software maintenance costs will be reduced through the elimination of redundancy and through modernization and standardization of software.

- Reduced Communications Costs - The ISP will provide a world-wide telecommunications network that will permit the daily uploading and downloading of data. It will provide an effective telecommunications system that will achieve long-term savings.

- Reduced Cuff Applications Costs - Cuff systems, or unofficial records and automated applications currently locally developed and maintained by individuals and offices can be eliminated or reduced through the ISP systems.

We estimated the IM/IT cost reductions to be $183.1 million over the life cycle.

Other Agency Cost Reductions

Implementation of the ISP will provide opportunities for achieving savings in the cost of labor in A.I.D./W outside the FA/IRM organization and, at Missions, outside the data management organizations. A reduced level of effort will be required by ISP systems users, e.g., data entry personnel, other administrative personnel, and other A.I.D. personnel, including managers, who currently spend significant amounts of time using corporate data in their work. These benefit opportunities will not be "automatically" achievable. While the benefits can be real, A.I.D. managers around the Agency will have to take actions (such as reorganizing staffs, reassigning personnel, or eliminating direct hire or contract positions) in some cases in order to take full advantage of the opportunities and capture the benefits. We identified a number of such opportunities and then met with a panel of informed A.I.D. experts to test our ideas, obtain additional ideas and perspectives, and develop bases for quantifying these benefits.

The panel addressed these areas:

- **Single Source Entry** - Data will be entered at its origin eliminating the need for it to be passed through many hands before getting into the automated system. Its entry into the automated system will be done only once for all systems, rather than once for each system as is required now. This will make available currently unavailable data and information.

- **Reformatting and Modifying Automated Output** - Even when data are available in the current environment, people have to spend time rearranging data to make it useable and meaningful. The benefit from the ISP will be that the ISP systems will allow report modification or tailoring to the specific user's need. The expectation is that the user will be able to structure the report format at his or her desk.

- **Reconciliation of Data** - This item focuses on the currently required task of integrating across multi-systems to report, i.e., comparing data from one system or source with data from the other involved systems and sources to achieve some level of consistency, even before attempting to put it into a useable and meaningful format.

The panel estimated that as many as 700 of the direct hire people in grades GS-7 through GM-14 and the Foreign Service equivalent could save 5% - 10% of their time from single source entry, 5% - 7% on reformatting, and 5% - 15% on reconciliation and integration.

Another item the panel addressed is:

- **Unnecessary Monitoring, Coordinating, and Validating** - Supervisors spend too much time reviewing subordinates' products and consume too much time holding and participating in meetings to do this. It is conceded that some of this practice is the result of poor supervisory skills and inappropriate management styles (such as an unwillingness to empower people), but much of it results from a basic mistrust of systems and the data from them.

The panel's conjecture was that 20% of the time of three quarters of the people in grades GS/GM 13 through the SES and the Foreign Service equivalent could be saved.

We estimated other Agency cost reductions for the 10-years to be $219.2 million.

In summary, ISP benefits are estimated as follows:

Benefit Area	Amount in Millions
IM/IT Cost Reductions	$183.1
Other Agency Cost Reductions	219.2
Total	$402.3

Benefit/Cost Ratio

When benefit/cost analysis is used as the technique for economic analysis of program proposals, future costs and benefits are to be reflected in present value terms by using an appropriate interest discount rate. Following OMB Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, we discounted estimated costs and benefits by 7%.

Benefit/Cost ratios provide an indication of a proposal's value by measuring the financial benefit per dollar spent. The ratio is the fraction of the total present value benefits over the total present value incremental costs. A ratio of 1.0 represents break-even; the higher the ratio, the more cost effective the proposal is considered to be. The higher the ratio, the larger the dollar return per dollar spent.

The benefit/cost ratio calculated for the ISP is 3.10, a very high ratio compared to that often found in similar analyses. For example, one analysis we reviewed that had been completed for another Federal agency, showed that the cost of replacing its financial systems would exceed benefits. Only after sensitivity analysis that subjected the data to cost reduction assumptions was a benefit/cost ratio above 1 achieved. In another analysis we reviewed, several alternatives were considered for integrating financial and program systems containing financial data. Most of the alternatives yielded benefit/cost ratios above 1, but less than 2.

The results of the analysis are a function of the assumptions we made in this report. We are aware that the assumptions related to other quantifiable benefits, although based on the opinions of informed agency managers, are speculative. Therefore, we performed a series of sensitivity analyses by successively lowering the estimates of savings to identify the impact (or relative risk) of changed assumptions in that regard. In addition, there are individuals in the Agency who suspect that cuff applications can never really be totally eliminated. We modified that assumption also, again to measure the impact on the benefit/cost ratio of the changed assumption.

The sensitivity analyses reduced the ratio dramatically, but the lowest ratio attained was 1.44. Furthermore, we found that the benefit/cost ratio did not decline as steeply as the decline in estimated benefits. For example, when other quantifiable benefits were reduced by 50% the ratio declined 27% and when the other quantifiable benefits were eliminated the ratio declined only 54%.

The investment that would be required by the Agency to implement its ISP would be paid back within 4.2 years. Based on the assumptions in our analysis, implementation of the ISP will be a very worth while investment for the Agency.

1. INTRODUCTION

1.1 BACKGROUND

The Agency for International Development (A.I.D.) is responsible for assisting developing countries in increasing their productive capabilities, improving their quality of life, and developing their human and economic resources. The methods A.I.D. uses to meet its responsibility involve transfer of knowledge, expertise, and resources and the education and training of local populations in the application and use of these resources. Information plays a key role throughout.

The A.I.D. Office of Information Resources Management (FA/IRM) recently led the preparation of an Information Systems Plan (ISP) to begin a process of upgrading all of the Agency's information systems. Currently there are 66 separate systems maintained by FA/IRM, half of which are mainframe systems and another fourth of which are minicomputer based systems, and most of which are produced with antiquated programming languages. There is also an undocumented number of non-corporate systems, i.e., systems used by only one location or organization, and countless local spreadsheet applications that fill the systems voids. In addition, at many locations applications are developed and maintained even when there are no systems voids, but simply at the election of local managers so they have systems with which they are more comfortable.

A.I.D. has just begun implementation of the ISP; it is at a very early initiation stage in its ISP effort. It has started a Business Area Analysis (BAA) in one of the business areas identified through the ISP development process and will have to complete such analyses in each of the other Business Areas. This is necessary to determine how many automated systems will be needed under the ISP and to determine the requirements for each. The BAA process will be followed by Rapid Applications Development (RAD) projects to develop the needed systems. FA/IRM enlisted the assistance of OGDEN Government Services for preparation of a preliminary cost/benefit analysis of the ISP during the BAA process. The cost/benefit analysis is preliminary in the sense that it is preceding completion of the BAA/RAD processes and is being done at an ISP-wide, high level for purposes of obtaining an initial view of the cost/benefit analysis picture. The analysis will need to be refined and performed in greater depth and detail after the BAA process.

At this juncture the Agency has officially published an estimate of the non-recurring development and five year implementation costs for hardware and software acquisition, systems development, security, installation, and training. That estimated cost has been termed ISP Development Costs and sometimes ISP Capital Costs. The Agency also estimated certain recurring operational costs for the purpose of sizing and selecting an appropriate technical architecture, but it has not officially published the recurrent cost implications to portray estimated full life cycle costs. In addition, A.I.D. believes that the reported cost of the current information management/information technology (IM/IT) program world-wide is not reliable and wants to better identify that cost. Given that, OGDEN's task is to:

- Identify and quantify all current IM/IT expenditures and project these costs for the ISP life cycle period.

- Define the full life cycle costs of the ISP systems, including validating the estimates of ISP development costs.

- Project and analyze the cost savings and cost avoidance impact on Agency IM/IT expenditures that may be expected through implementing the ISP.

- Define and analyze other quantitative and qualitative benefits likely to accrue to the Agency, including projected cost savings once the ISP is fully implemented.

We provided three incremental reports to the Agency previously as we completed each phase of the analysis. This report brings the results of all the analyses addressed in the previous reports together, provides our overall conclusions, and finalizes the cost/benefit analysis and payback period analyses.

1.2 SCOPE

The Agency needs information upon which to base decisions regarding:

- The pursuit of ISP implementation funding through its budget process, and

- The further development of ISP implementation plans and actions.

These decisions will in part be made based on the results of a preliminary cost/benefit analysis. The analysis is to provide an early indication of the projected incremental costs of implementation and operation the ISP as conceptually designed, as well as an estimate of the impact on current IM/IT program expenditures and other benefits.

For purposes of this analysis, current IM/IT program expenditures were defined by the Agency to include Information Resources Management (IRM) costs incurred throughout the Agency, not just those IRM costs generated or controlled by the A.I.D. Directorate for Finance and Administration component organization known as the Office of IRM (FA/IRM). It was also meant to include certain IRM activities outside the ADP arena in conformance with the spirit and intent of the Paperwork Reduction Act. This properly carries the scope of IM/IT beyond the traditional view held by some and, thereby, also includes information management activities, whether or not they are automated. We followed this concept and definition in identifying and quantifying the cost of the current IM/IT program.

We revalidated the estimates of ISP development costs and defined the full life cycle costs of the ISP systems. The scope of our analysis for this part of the study included:

- Evaluating the assumptions made to prepare the ISP,
- Reviewing the previously estimated costs for soundness of methodology and for accuracy, as deemed necessary, and testing them against current reality for validity,
- Determining an appropriate projected life cycle for the ISP systems for purposes of a cost/benefit analysis, and
- Estimating the recurring costs to be experienced over the life cycle.

Our focus for completion of that part of the study was principally on two segments of the ISP documentation, the "Action Plan" for completion of the implementation of the ISP, and the analysis of the "Technical Architecture."

The Action Plan for implementation of the ISP is organized into fourteen major initiatives which include eight business areas and six other initiatives directly related to ISP implementation. We reviewed all of them and the Agency's application of the Information Engineering (IE) methodology to develop them. A listing of the initiative areas follows:

- Annual ISP Planning
- ISP Start-Up
- Development Coordination
- Open Systems/Worldwide Network
- Core Accounting
- Procurement
- Annual Budgeting
- Operations
- Property Management
- Workforce Management
- Guidance
- Communications
- Small Mission Software

- Special Projects

"Core Accounting" through "Communications" represent the Agency's eight business areas.

The Technical Architecture analysis performed by the agency addressed the technology needs and several alternative telecommunications, hardware, and software configuration solutions. Four models, three of which were based on a UNIX operating system open systems environment, were selected for final comparative analysis. We reviewed the strategy of each of the four final models and the cost/benefit analysis that was done to select an architecture. The four final models are:

- Global Mainframe,
- Distributed Client/Server,
- Distributed Terminals, and
- Regional Centers.

The selected architecture is the Distributed Client/Server model.

In the preliminary cost/benefit analysis, while the entire ISP is the focus, the analysis is being done at a high, ISP-wide level, not by Business Area or by automated system. To analyze the costs of the current IM/IT program and estimate the impact on those costs through implementation of the ISP, we identified several cost categories. The categories identify Federal Information Processing (FIP) activities, based on the guidance for cost/benefit analysis documentation contained in FIP Standard Publication 64 (FIPS PUB 64), Guidelines for Documentation of Computer Programs and Automated Systems for the Initiation Phase. The cost categories we included within the scope of our analysis were drawn from the FIPS PUB 64 guidelines, but were modified to reflect the A.I.D. activities and to adjust to the availability of information and data within the Agency.

Cost categories included are:

Nonrecurring Costs

- Site or Facility setup
- Mainframe and minicomputer hardware purchases
- PC/LAN purchase and installation
- Telecommunications hookup
- Software applications development

- Off-the-shelf software purchases

Recurring Costs

- Program Direction
- Space
- Supplies
- Mainframe and minicomputer operations
- Mainframe and minicomputer maintenance
- PC/LAN operation and maintenance
- Telecommunications operation
- Software applications operation and maintenance
- Security
- Travel
- Training

1.3 APPROACH

We utilized a variety of approaches to obtain information and data for analysis, including:

- Interview of numerous FA/IRM personnel responsible for current program activities,
- Review of much published material regarding the Agency, its mission, organization, and current information management program and strategic plans,
- Review of the field input and completed "Report on Obligations for Major Information Technology Systems", known as Exhibits 43-A and 43-B,
- Interview of Agency direct hire employees and contractor staff most deeply involved in the analytical and developmental work of designing the ISP and its conceptual framework, and

- Careful review all the pertinent ISP documentation and other related documentation,

We also solicited data through interview from 20 A.I.D. people outside the FA/IRM area in 15 separate interview or group meeting sessions. Those interviews provided us extensive insight into the organization, management, and culture of the Agency and into many of the everyday problem and issue areas in information management. Many of the interviewees, however, were not the individuals who had first hand knowledge of IM/IT costs and cost elements, and therefore, the sessions yielded little data for cost analysis. To build on those sessions and obtain needed data, we performed an extensive review of contract files. That review provided us with data sufficient to estimate, for reporting in this document, additional costs in A.I.D./W not previously identified in IM/IT program cost reports. In addition, we spoke by telephone with representatives of five Missions from three Regional Bureaus to obtain additional information regarding the current program at overseas locations.

During a meeting with the ISP Cost/Benefit Analysis Steering Committee we participated with Committee members in a brief discussion of other, non-system generated, quantifiable and nonquantifiable benefits that could result from implementation of the ISP. We then held a discussion with the Agency Budget Officer, members of his staff, and another Senior Executive, where we identified specific bases for estimation of other quantifiable benefits.

In analyzing the documentation and interview results we drew upon our personal experiences in previous, similar consultant engagements and through serving as operating officials overseeing automated systems implementation in Federal Government and private sector field structures. We also drew upon the resources in our firm with extensive experience in systems development and implementation and cost/benefit analysis.

We have organized our report into six major sections. One addresses our estimate of the current IM/IT program expenditures and its subsections provide a summary of the previously documented costs, a discussion of our revised estimates, and a schedule of estimated costs.

The second section reports on our revalidation of ISP development costs and its subsections provide a summary of the estimates and the results of our review of the components of the estimates. The next section addresses our estimate of the full life cycle cost of the ISP, including our revised estimates of development costs, and a discussion of the life cycle methodology we used, along with the cost definitions and categories and schedules of costs.

The fourth section discusses the estimated quantitative and qualitative benefits of implementation of the ISP and the remaining sections provide the results and conclusions of the cost/benefit analysis.

2. ESTIMATED CURRENT IM/IT EXPENDITURES

2.1 INTRODUCTION

The Agency believes that, though it has made steady improvements in accounting for the cost of the Agency-wide information management/information technology program (IM/IT), it still does not have an accurate picture of the program's cost. We interviewed numerous direct hire and contractor personnel and examined voluminous contract files to obtain a better picture. We describe the previously documented costs and our refined estimates in this section of the report.

2.2 PREVIOUSLY DOCUMENTED COSTS

The beginning point of our data collection and analysis of current IM/IT expenditures was a report in which the Agency annually documents certain IM/IT costs. This is a report known as Exhibits 43-A and 43-B, Report on Obligations for Major Information Technology Systems, which are special exhibits required in the Federal budget process.

In the existing reporting process the Agency had identified:

- All the costs incurred within FA/IRM,
- Limited costs incurred or funded in other FA Directorate offices,
- Costs incurred in the Office of the Inspector General, and
- Certain Operating Expense (OE) funded costs incurred in the overseas Mission components of the Regional Bureaus.

It had not identified:

- Program funded costs incurred in the overseas Missions or A.I.D./W,
- Any costs incurred in the Washington, DC offices of the Directorate for Operations, except for buy-ins to FA/IRM contracts,
- Any costs incurred in the Directorate for Policy, except for buy-ins to FA/IRM.

The costs it had identified and reported in Exhibit 43-A as projected for Fiscal Year 1993 are summarized in Figure 2.1

COST ITEM	FY 1993 – $ in Thousands		
	A.I.D./W	MISSIONS *	TOTAL
Personnel Compensation	$6,414	$2,927	$9,341
Capital Investments			
Purchase of Hardware	$4,521	$7,127	$11,648
Purchase of Software	$1,395	$1,341	$2,736
Site or Facility	$289	$250	$539
Operating Costs			
Lease of Hardware		$11	$11
Lease of Software	$92	$1	$93
Space	$1,457	$293	$1,750
Supplies	$473	$1,401	$1,874
Commercial Services			
ADPE Time	$179	$81	$260
Voice Communications	$572	$1,535	$2,107
Data Comunications	$20	$136	$156
Operations/Maint.	$7,263	$2,057	$9,320
Systems Programming	$7,671	$38	$7,709
Studies and Other	$1,307	$86	$1,393
Interagency Services	$6,536	$2	$6,538
Totals	$38,189	$17,286	$55,475

* Missions includes RIGS

Figure 2.1
Previously Reported A.I.D. IM/IT Program Costs

For A.I.D., the "Interagency Services" line shown on Figure 2.1 represents the cost paid by the Agency to the State Department for telephone costs not included in the voice and data communications lines. This cost includes long distance and local calls, lease and purchase of equipment, and charges for work orders and maintenance, along with shared system costs, shared overhead costs, and Working Capital Fund overhead charges for the State Department's contract billing and administrative infrastructure.

Through our work on this project we identified additional IM/IT expenditures and constructed revised estimates for the current year and then projected the revised estimates for the out-years, i.e., over the 10 year period of the ISP life cycle. The revised estimates are presented and discussed in the following subsections of this report.

2.3 REVISED ESTIMATES

For purposes of documenting a baseline for use in measuring the impact of the ISP on the current system, we used the Exhibit 43-A data as a starting point. We made several substantive adjustments, as follows:

- We deducted the cost of personnel compensation in order to make the data comparable with the ISP data which excludes the cost of direct hires.
- We deducted the cost of AWACS because, though it is an ISP initiative it is separately funded program and not part of the ISP.
- We reformatted the data to more closely align with federal information processing activities in FIPS PUB 64, including segregating recurring and nonrecurring costs. This was completed with the assistance of FA/IRM.

We then reviewed the Agency's contract files to identify additional IM/IT costs incurred by A.I.D./W units other than those that have reported in the Exhibit 43-A process. We also discussed the IM/IT program with representatives of five Missions in an attempt to validate in a generalized fashion the completeness of the Mission portion of the Exhibit 43-A report. We discuss the results of this in the following subsections.

2.3.1 A.I.D./Washington Costs

As mentioned above, we adjusted the Exhibit 43-A data. Figure 2.2 on the next page details the A.I.D./W portion as adjusted.

COST ITEM	FY 1993 – $ in Thousands				
	FA/IRM	FA/IRM BUY–INS	OTHER FA	IG/W	TOTAL
Figure 2–1 Total, A.I.D./W					$38,189
Adjustments:					
Deduct Pers. Comp.					($5,637)
Deduct AWACS					($4,105)
Add Net Budget Adjs.					$2,457
Adjusted Total					$30,904
Nonrecurring Costs:					
Site/Facility Setup	$347		$231	$194	$772
Hardware, Sys. Software:					
Purchase Mainframe	$2,527				$2,527
Purchase PC's	$1,472				$1,472
Purchase LAN/UNIX	$24				$24
Install LAN	$1,315				$1,315
Software:					
Applications Devel.	$269				$269
OTS Purchases	$15		$34	$40	$89
Subtotal, Nonrecurring	$5,969	$0	$265	$234	$6,468
Recurring Costs:					
Program Direction	$530				$530
Client Support	$1,591				$1,591
Project Support		$420			$420
Site/Facility:					
Space			$1,456		$1,456
Supplies	$87		$358	$25	$470
Hardware, Sys. Software:					
Operate Mainframe/Minis.	$1,089	$326			$1,415
Maintain Mainframe/Minis.	$2,304				$2,304
Maintain PC's	$1,727				$1,727
Operate LAN	$167	$659			$826
Maintain LAN	$417				$417
Telecommunications:					
Timesharing	$174			$24	$198
Telephone	$7,129				$7,129
Cable Room Operations	$302				$302
Network Communs.	$756				$756
Software Appl. Ops./Mtce.	$3,864	$70	$31	$252	$4,217
Directives Support		$76			$76
Security	$222				$222
Travel	$40				$40
Training	$30		$310		$340
Subtotal, Recurring	$20,429	$1,551	$2,155	$301	$24,436
Totals	$26,398	$1,551	$2,420	$535	$30,904

Figure 2.2
Selected A.I.D./W IM/IT Costs by FIP Activity

In Figure 2.2 we separated out expenditures not made directly by FA/IRM from those made by FA/IRM. The column labeled "FA/IRM Buy-Ins" represents the use of FA/IRM's contracts for professional services (principally the Executive Resources Associates contract) by other A.I.D./W units for IM/IT costs those units budget, manage, and pay for their own work programs. The organizations are:

Office of External Affairs
Office of Administrative Services
Office of Financial Management
Office of Procurement
Office of Human Resources Development and Management
Bureau for Research and Development
Bureau for Food and Humanitarian Assistance
Bureau for Private Enterprise
Bureau for Africa
Bureau for Europe
Bureau for Latin America and the Caribbean

The column labeled "Other FA" represents IM/IT costs budgeted, managed, and paid by other FA units, through their own contracts or other mechanisms, in support of the FA/IRM program of work. Specifically these are for the cost of IM/IT occupied space and IRM training.

Two relationships that are rather immediately apparent from Figure 2.2 are:

- 43.1% of FA/IRM's budget for recurring costs goes to pay the Agency's phone bill and other communications costs.

- An amount equaling an additional 10.5% of FA/IRM's recurring costs are administered by other FA units; FA/IRM has limited control or influence, no resource management responsibility, and little incentive for cost management.

A.I.D. maintains a high reliance on contractor support for carrying out its work program, currently having nearly 3,000 predominantly multi-year contracts open. Most of these contracts are for products or services for use in direct, portfolio-related, development projects and for evaluations and other studies. Several hundred of the total are for computer and information management-based needs, but again, most are directly related to development projects, not for internal management needs of the Agency. About 100 are for IM/IT related activities. We examined the Agency's contract files, using the inventory in the Contract Information Management System (CIMS) as a guide, and the data base of a commercial firm that maintains a Federal contract information system. We examined all appropriate contracts that were classified in six Standard Industrial Classification codes encompassing computer and automation services, and searched for contracts with firms in the information management industry throughout all the other Classifications. We attempted to locate those contracts through which we could identify areas of IM/IT expenditure not reported in the Exhibit 43-A process--especially for A.I.D./W units.

We found that most automation contracts are for other than IM/IT, i.e., they are for development of data bases and systems for host countries and for other purposes not related to internal management of the Agency. We found that many contracts are mixed, i.e., the contracts are awarded for one activity or another, but might also contain an IM/IT component. As an example, a contract for a Science and Technology/Education, Narcotics Awareness and Education Project (involving technical assistance in 10-15 countries, information dissemination, operations research in 5-10 countries, and other such activities), includes the following:

> " In addition to these formal evaluations, the contractor's project staff will develop an on-going management information system which will provide information regarding fulfillment of interim objectives and the functioning of the systems created to meet these objectives."

While FA/IRM perhaps has an oversight responsibility for such activities, and though the ISP, especially in the Operations Business Area, strives to meet program management information system needs, the qualification of this contract item as IM/IT is debatable and the proportion that it represents of the total level of effort in the contract is minute. We have not added estimates covering this type of activity into our revised estimates.

We also found, however, that there are a number of contracts that are largely or totally for IM/IT purposes. Examples of statement of work items representative of IM/IT activities that we found in these contracts are:

- Establish an information center
  - Examine hardware and software requirements and implement
  - Construct a data base from the A.I.D. mainframe data base
  - Input data
- Develop application modules and analytical software and provide technical assistance on microcomputers
- Provide information systems management
- Develop and operate a computerized data base, perform analysis of user requirements and analysis of hardware and software requirements
- Provide computer programming
- Provide systems administration
- Maintain a data preparation and retrieval procedures manual
- Conduct reverse engineering sessions with developers and users of existing systems

- Develop integrated system design
- Develop system implementation strategy
- Reorganize data, prepare worksheets and coding sheets to facilitate ease of data entry
- Prepare programs to use for querying the data base
- Perform file maintenance and track usage of system
- Participate in systems interface and conversion meetings
- Analyze data discrepancies and user, hardware, and bad software problems
- Analyze proposed programming tasks and consult with FA/IRM to resolve hardware and software problems
- Provide the capability to design, implement, operate, and maintain large-scale computer-based information systems
- Provide the capability to design, implement, operate, and maintain automated support services

We located contracts for the following organizations:

Finance and Administration Directorate:
Office of Financial Management

Policy Directorate:
Center for Development Information & Evaluation (CDIE)

Operations Directorate:
Bureau for Food and Humanitarian Assistance
Bureau for Research and Development:
Office of International Training
Women In Development
Health
Environment and Natural Resources

The above listed organizations are the ones that sponsored contracts. In some cases other A.I.D. units in addition to the sponsor organization bought into the contracts--and some of these were at significant levels of buy-in. Many units, including the Regional Bureaus for example, buy in to CDIE contracts. We observed that these units, in need of some IM/IT assistance, will by-pass FA/IRM and instead utilize services contracted for by CDIE. In these arrangements CDIE supplies contract staff members with systems analysis and related

skills. Such contract employees usually bring contractor-owned equipment. One consequence of this is that there is a lack of coordination within the Agency regarding IM/IT planning and delivery.

Though our search was extensive, we cannot attest that we located all applicable contracts.

We estimate the IM/IT expenditure by A.I.D./W units through these contracts to be $8.1 million for fiscal year 1993, a 33% increase to the recurring costs previously reported for A.I.D./W. For those contracts that do not appear to be totally IM/IT, we conservatively estimated the proportion of each contract that we believe is for IM/IT activity. We based the estimate on our professional judgement of the level of effort that would be required for IM/IT activities relative to the total level of effort expressed in the statement of work for each contract. These estimates ranged from 20% to 75%. Most of the contracts are multi-year ones. We estimated the value for fiscal year 1993 by analyzing the budgets for the contracts as well as the past year experience documented in the commercial data base.

We found several other contracts like these that had expired at the end of fiscal year 1992--and most of them had been multi-year contracts also. Therefore, in the cost/benefit analysis, we are assuming that the bulk of this $8.1 million dollar level will be a continuing, recurring cost.

Figure 2.3 on the following page shows the revised estimate for A.I.D./W for fiscal year 1993.

COST ITEM	FY 1993 – $ in Thousands		
	PRIOR A.I.D./W ESTIMATE	ADDITIONAL ESTIMATES	REVISED TOTAL
Nonrecurring Costs:			
Site/Facility Setup	$772		$772
Hardware, Sys. Software:			
Purchase Mainframe	$2,527		$2,527
Purchase PC's	$1,472	$120	$1,592
Purchase LAN/UNIX	$24	$110	$134
Install LAN	$1,315		$1,315
Software:			
Applications Devel.	$269		$269
OTS Purchases	$89		$89
Subtotal, Nonrecurring	$6,468	$230	$6,698
Recurring Costs:			
Program Direction	$530		$530
Client Support	$1,591		$1,591
Project Support	$420		$420
Site/Facility:			
Space	$1,456		$1,456
Supplies	$470		$470
Hardware, Sys. Software:			
Operate Mainframe/Minis	$1,415	$842	$2,257
Maintain Mainframe/Minis	$2,304	$1,072	$3,376
Maintain PC's	$1,727		$1,727
Operate LAN	$826		$826
Maintain LAN	$417		$417
Telecommunications:			
Timesharing	$198		$198
Telephone	$7,129		$7,129
Cable Room Operations	$302		$302
Network Communs.	$756		$756
Software Appl. Ops./Mtce.	$4,217	$5,950	$10,167
Directives Support	$76		$76
Security	$222		$222
Travel	$40		$40
Training	$340		$340
Subtotal, Recurring	$24,436	$7,864	$32,300
Totals	$30,904	$8,094	$38,998

Figure 2.3
Revised A.I.D/W IM/IT Costs by FIP Activity

2.3.2 Mission Costs

In Figure 2.2, above, we redistributed A.I.D./W IM/IT costs from the Exhibit 43-A format and made certain adjustments. Figure 2.4, below, shows the overseas Missions and Regional Inspectors General previously reported costs as redistributed.

COST ITEM	FY 1993 – $ in Thousands	
	PREVIOUS	REVISED
Figure 2–1 Total, A.I.D./M	$17,286	
Adjustments:		
Deduct Pers. Comp.	($2,927)	
Adjusted Total		$14,359
Nonrecurring Costs:		
Site/Facility Setup		$250
Hardware, Sys. Software:		
Purchase PC/LAN/UNIX		$6,468
Install LAN		$2,000
Subtotal, Nonrecurring		$8,718
Recurring Costs:		
Site/Facility:		
Space		$293
Supplies		$1,401
Hardware, Sys. Software:		
Operate Mainframe/Minis		$650
Maintain Mainframe/Minis		*
Maintain PC's		$395
Operate LAN		$150
Telecommunications:		
Timesharing		$81
Telephone		$1,671
Software Appl. Ops./Mtce.		$1,000
Subtotal, Recurring		$5,641
Totals		$14,359

*Budgeted by FA/IRM

Figure 2.4
A.I.D. Mission IM/IT Costs

We made this distribution on our own as we had no reliable basis to do otherwise. We discussed the IM/IT program and related financial documents such as the Annual Budget Submission and the Exhibit 43-A report with representatives of five Missions, but did not obtain a better basis for estimating Mission costs. The Missions we spoke with are:

- Latin America and the Caribbean
  - San Salvador, El Salvador
  - Guatemala City, Guatemala
- Africa
  - Nairobi, Kenya
  - Maputo, Mozambique
- Asia
  - Manila, The Philippines

In all cases we spoke with the people most knowledgeable about the program and the 43-A report (heads of the data management organization/system managers) as well as, in some cases, the Executive Officer or representative of that office. Through the discussions, which averaged three phone calls each and one or more E-Mail communications, three of the five Missions provided us with a new distribution. One Mission's revised figures were very close in total to that reported previously. The other two were radically different:

- One increased from $163,000 per year to $290,000 because it previously had reported only hardware and software costs.
- The other was decreased from $516,000 to $354,000, a net adjustment including decreasing capital investments from $465,000 to $94,000 and adding in $197,000 of personal services contractor costs not previously reported.

The people we spoke with conveyed the impression to us that the purpose of the 43-A report and most of its preparation instructions are not understood by them. In addition, it is not treated as a live document or a plan. As a matter of fact, two of the five Missions we spoke with could not locate their own 43-A data so we provided it back to them before the discussions began. This is significant because the 43-A report is the single document A.I.D. annually produces reporting the cost of its information management program.

For purposes of the cost/benefit analysis we are using the Mission figures from the Agency's existing data as shown on Figure 2.4, but wish to provide the Agency with related information we obtained in the phone calls.

- Many Missions do not report any costs for telecommunications in their 43-A reports. We cannot estimate the omitted amounts. We have learned, however, that these costs have been excluded because telecommunications is not considered an IM/IT (Data Management Branch) role and is managed elsewhere in the Mission.

- System Managers rarely expect budgeted amounts for hardware purchase to actually be available for that purpose.

- Some Missions contract locally for system managers at about $35,000 per year, while others employ American Personal Services Contractors sometimes at a total cost over $100,000 per year.

- Some Missions apparently fund Data Management Branch staff from trust funds, for an undetermined reason, and these costs do not get reported as IM/IT.

- Many missions find OE funds drained more and more each year as the data management people have to support program personnel personal computers and related hardware and software without reimbursement. We have heard that some Missions have set up a program overhead account to effect reimbursement. We would recommend that approach at all Missions where needed.

- At least one Mission has contracted for and received a voluminous report that, in effect, is an ISP for the Mission and does not seem to recognize the existence and impending implementation of the Agency ISP.

2.3.3 Schedule of Estimated Costs

Figure 2.5 is a sum of the previous two figures and portrays our revised estimate of Agency-wide IM/IT costs for the current year, excluding personnel compensation and AWACS.

COST ITEM	FY 1993 – $ in Thousands WASHINGTON	MISSIONS	TOTAL
Nonrecurring Costs:			
Site/Facility Setup	$772	$250	$1,022
Hardware, Sys. Software:			
Purchase Mainframe	$2,527		$2,527
Purchase PC/LAN/UNIX	$1,726	$6,468	$8,194
Install LAN	$1,315	$2,000	$3,315
Software:			
Applications Devel.	$269		$269
OTS Purchases	$89		$89
Subtotal, Nonrecurring	$6,698	$8,718	$15,416
Recurring Costs:			
Program Direction	$530		$530
Client Support	$1,591		$1,591
Project Support	$420		$420
Site/Facility:			
Space	$1,456	$293	$1,749
Supplies	$470	$1,401	$1,871
Hardware, Sys. Software:			
Operate Mainframe/Minis.	$2,257	$650	$2,907
Maintain Mainframe/Minis.	$3,376	*	$3,376
Maintain PC's	$1,727	$395	$2,122
Operate LAN	$826	$150	$976
Maintain LAN	$417		$417
Telecommunications:			
Timesharing	$198	$81	$279
Telephone	$7,129	$1,671	$8,800
Cable Room Operations	$302		$302
Network Communs.	$756		$756
Software Appl. Ops./Mtce.	$10,167	$1,000	$11,167
Directives Support	$76		$76
Security	$222		$222
Travel	$40		$40
Training	$340		$340
Subtotal, Recurring	$32,300	$5,641	$37,941
Totals	$38,998	$14,359	$53,357

* Budgeted by FA/IRM

Figure 2.5
Revised Agency–Wide IM/IT Costs

To project the recurring portion of the current program costs over the ISP life cycle period, we made the following assumptions:

- The Agency's strategy for financing IM/IT initiatives in the future years will continue to be two pronged as indicated in the IRM Strategic Plan:
  - Funding for initiatives related to the ISP will be sought as budget increases, and will be treated as ISP costs, not costs of the current program.
  - Non-ISP initiatives will continue to be financed from the FA/IRM base and will not add to the cost of the current program.
- The Agency will complete acquisition and installation of PC's in A.I.D./W and PC's and LAN servers at Missions in 1994, as planned. These acquisitions, along with the expiration of warranties, will give rise to increased maintenance costs (50% for field and 16% for A.I.D./W) beginning in 1995.
- All continuing costs will be subjected to 4% inflation, compounded annually.

Figure 2.6 illustrates the projected cost of the current program over the 10-year period.

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COST ITEM	($ In Thousands) FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Recurring Costs:											
Program Direction	$530	$551	$573	$596	$620	$645	$671	$697	$725	$754	$6,363
Client Support	$1,591	$1,655	$1,721	$1,790	$1,861	$1,936	$2,013	$2,094	$2,177	$2,264	$19,102
Project Support	$420	$437	$454	$472	$491	$511	$531	$553	$575	$598	$5,043
Site/Facility:											
Space	$1,749	$1,819	$1,892	$1,967	$2,046	$2,128	$2,213	$2,302	$2,394	$2,489	$20,999
Supplies	$1,871	$1,946	$2,024	$2,105	$2,189	$2,276	$2,367	$2,462	$2,561	$2,663	$22,463
Hardware, Sys. Software:											
Operate Mainframe/Minis	$2,907	$3,023	$3,144	$3,270	$3,401	$3,537	$3,678	$3,825	$3,978	$4,138	$34,902
Maintain Mainframe/Mini	$3,376	$3,511	$3,651	$3,798	$3,949	$4,107	$4,272	$4,443	$4,620	$4,805	$40,533
Maintain PC's	$2,122	$2,207	$2,808	$2,920	$3,037	$3,158	$3,285	$3,416	$3,553	$3,695	$30,199
Operate LAN	$976	$1,015	$1,056	$1,098	$1,142	$1,187	$1,235	$1,284	$1,336	$1,389	$11,718
Maintain LAN	$417	$434	$670	$696	$724	$753	$783	$815	$847	$881	$7,020
Telecommunications:											
Timesharing	$279	$290	$302	$314	$326	$339	$353	$367	$382	$397	$3,350
Telephone	$8,800	$9,152	$9,518	$9,899	$10,295	$10,707	$11,135	$11,580	$12,043	$12,525	$105,654
Cable Room Operations	$302	$314	$327	$340	$353	$367	$382	$397	$413	$430	$3,626
Network Communs.	$756	$786	$818	$850	$884	$920	$957	$995	$1,035	$1,076	$9,077
Software Appl. Ops./Mtce.	$11,167	$11,614	$12,078	$12,561	$13,064	$13,586	$14,130	$14,695	$15,283	$15,894	$134,072
Directives Support	$76	$79	$82	$85	$89	$92	$96	$100	$104	$108	$912
Security	$222	$231	$240	$250	$260	$270	$281	$292	$304	$316	$2,665
Travel	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$480
Training	$340	$354	$368	$382	$398	$414	$430	$447	$465	$484	$4,082
Total Recurring Costs	$37,941	$39,459	$41,768	$43,439	$45,176	$46,983	$48,863	$50,817	$52,850	$54,964	$462,259

Figure 2.6
Current IM/IT Program Recurring Costs Projected Over 10–Yr ISP Life Cycle

3. THE INFORMATION SYSTEMS PLAN

3.1 INTRODUCTION

In developing the ISP, A.I.D. used an industry accepted approach known as Information Engineering (IE). This methodology calls for studying the entire organization's information needs and carefully defining a number of "environments": the information, systems, technology, and organizational environments. Each of these is a necessary element in understanding the needs of the organization, and ultimately in devising the total plan or "architecture" for meeting these needs. Both private sector and public organizations are finding the IE approach effective in dealing with productivity and budget issues.

The IE approach relies on extensive user involvement in defining the organization's needs. In A.I.D. over 100 managers from across the Agency were involved in one way or another in developing the ISP. IE also attempts to shift the focus of information management from technology per se to the business impact of using available technology. In addition IE places an emphasis on data sharing, which in turn requires common data structures, definitions, and standards across systems and organizations.

The ISP Volume I: Report to Management presents the total ISP capital costs of $46.3 million associated with roll-out of the ISP from Fiscal Year (FY) 1993 through FY 1997. This total was derived based on a methodology for estimating costs for 14 separate "Initiatives" from the bottom-up. The methodology and actual schedule of costs are discussed below.

3.1.1 Assumptions and Methodology Used

The Action Plan for the ISP is presented in Volume II: Part 6. It describes the assumptions which underlie the software development costs. Some of the key assumptions for resourcing the BAA and Rapid Applications Development (RAD) projects are:

- Business Area Analysis (BAA) projects will vary in duration from two to six months
- Key User Staff will be available for participation on the effort
- State-of-the-art Development Tools will be used
- Templates for staff resources will be calibrated against BAA/RAD work unit ratios determined by the ISP Team
- Business Area (BA) initiative RADs will begin in parallel after completion of BAA
- At the end of the last RAD within a BA, software will be beta tested in A.I.D/W over a two month period, involving three users at 25% of their time and two contractors at

100% of their time

- Source code will be generated by a CASE tool and will require less resources than traditional methods
- Candidate systems will be maintained at the CASE tool model level thus requiring fewer resources than traditional maintenance methods
- A maximum of five concurrent BAA's and/or RAD projects will be allowed to better control the process
- BAA's are staggered with no more than two concurrently except in the later years
- Only Contractor Work Years (CWYs) are priced. IRM and user direct hire resources are identified but not priced. The CWYs are priced at $74,000 in FY 93 and inflated at 4% in each of the outyears.

The estimation methodology used templates for two different sizes of BAA's and for six sizes of RADs as follows:

IE Activity	Contractor	Direct Hire	User	Duration (Months)	Total Effort (Months)
BAA(3.0)	2.5	1	2	6	33
BAA(1.0)	2.5	1	2	2	11
RAD(3.0)	5	.5	2	7	52.5
RAD(2.5)	5	.5	2	6	45
RAD(2.0)	5	.5	2	5	37.5
RAD(1.5)	5	.5	2	4.5	33.8
RAD(1.0)	5	.5	2	4	30
RAD(0.5)	3	.5	2	3	16.5

Figure 3.1
BAA and RAD Templates

The numbers in parenthesis above relate to the calibration used by the ISP Team to indicate relative complexity of each IE activity.

Each of the eight BAA's and 26 RAD projects was analyzed to determine the scope and

35

complexity required for analysis, design, construction, testing and implementation. The projects were then matched to one of the above templates for purposes of estimating staff resource requirements.

3.1.2 Schedule of Costs

The costs of the ISP Development effort have been rolled-up to show major categories of spending for FY 93 through FY 97. This table is presented as Figure 3.2.

It is important to note that the recurrent cost implications of the ISP are not shown in this figure.

COST CATEGORY	FY 93	FY 94	FY 95	FY 96	FY 97	TOTAL
FTEs:						
FA/IRM	8	9	7	7	4	35
Users	9	17	72	35	29	162
Contractor WYs	23	34	43	35	16	151
Costs: ($000)						
Contractor Staff	1,686	2,646	3,450	2,912	1,370	12,064
Hardware/Software	996	4,912	9,836	4,968	0	20,712
Travel	240	429	1,677	605	595	3,546
Initial Est. of Security Reqs.	0	2,000	3,000	3,000	2,000	10,000
Subtotal	2,922	9,987	17,963	11,485	3,965	46,322
Related Ongoing Costs:						
AWACS Project	3,496	2,500	700	700	300	7,696
Complete Installation of PC/LANs	10,200	7,900				18,100
(A.I.D./W and Missions)						
TotalAgency Capital Investment	16,618	20,387	18,663	12,185	4,265	72,118

Figure 3.2
ISP DevelopmentCosts

The ISP costs for "Contractor Staff" of $12,064,000 have been further divided into their component costs for each of the 14 ISP Initiatives. Figure 3.3 presents this breakdown of costs.

INITIATIVE	IRM FTE	USER FTE	CNTR WY	TOTAL YEARS	CNTR COST
Annual ISP Planning	0.44	1.32	0.66	2.42	$51,940
ISP Start Up	0.52	0.01	2.13	2.66	$157,901
Development Coordination	14.1	2.98	24.72	41.8	$1,994,748
Open Systems/WW Network	1.88	1.71	9.58	13.17	$764,754
Core Accounting	0.43	22.38	8.09	30.9	$645,188
Procurement	1.41	24.3	16.1	41.81	$1,253,377
Annual Budgeting	0.57	8.24	6.25	15.06	$491,053
Operations Mgmt	1.3	23.86	15	40.16	$1,200,926
Property Mgmt	1.32	10.89	12.42	24.63	$1,034,600
Workforce Mgmt	1.5	24.65	16.98	43.13	$1,428,239
Guidance	0.35	7.72	5.62	13.69	$477,836
Communications	0.26	7.19	2.09	9.54	$175,771
BAA/RAD Sub-Total	7.14	129.23	82.55	218.92	$6,706,990
Small Mission Software	0.19	16.6	3.62	20.41	$296,572
Special Projects	10.89	18.3	26.12	55.31	$2,091,358
GRAND TOTAL	35.16	170.15	149.38	354.69	$12,064,263

Figure 3.3
Contractor Staff Development Costs by ISP Initiatives

3.2 ASSESSMENT OF THE ISP DEVELOPMENT

In this subsection, we provide a review and evaluation of the major ISP cost estimates. Since the ISP utilized the Information Engineering (IE) methodology of James Martin & Co. to produce the ISP deliverables and to estimate costs, we focused this evaluation heavily on the nature and degree to which that methodology was followed.

The IE methodology as applied to an ISP typically addresses four main areas:

- Business Strategy
- Information Architecture
- Business Systems Architecture
- Technical Architecture.

Each of these main products of the A.I.D ISP is assessed individually in the following four parts of this subsection. In the remainder of this subsection we discuss six other ISP initiatives in addition to the eight business area initiatives.

3.2.1 A.I.D. Business Environment

The ISP clearly defines the Agency's mission, objectives, and current situation. Major improvement initiatives are defined, particularly those recommended by the OMB SWAT Teams. In November, 1991 A.I.D. also published an update to its Strategic Information Resources Management Plan for FY 1992-1997. While the ISP does support the Strategic Plan, the existence of two separate documents tends to blur the clarity of the information management/information technology objectives and initiatives to some agency employees. FA/IRM recognizes this and plans to meld the two plan publications.

3.2.2 Information Architecture

The Information Architecture (IA) consists of three primary models:

- Function Model (Business Activities)
- Entity Model (Entity Relationship Diagram)
- An Interaction Model of Functions/Entity Types.

Function Model

The Function Model in an ISP, using Information Engineering methodology as practiced by James Martin, typically consists of:

- Function Definitions
- Function Decomposition Diagram
- Function Dependency Diagram.

The A.I.D ISP Function Model contains 110 lowest level functions. Given the size of A.I.D, and based on similar organizations, an ISP containing between 70-120 lowest level functions would be expected.

Function Definitions

In general, the function definitions are adequate to meet the purposes of the ISP. However, more than three-fourths of the definitions are only one sentence in length. This brevity may make it difficult in some cases for subsequent BAA participants to understand clearly what business processes are actually being referred to and where the boundaries are between two or more processes.

Function Decomposition Diagram

The purpose of Function Decomposition is to systematically analyze and identify business activities and their sub-components and thereby understand them well. One of the guiding principles of decomposition in an ISP is to achieve, at the end of the analysis, a situation where each of the lowest level functions is of approximately the same size in terms of business activity, complexity, usage of data, etc. This principle is important since:

- It permits the ISP team to devote its effort to where it will have the most benefit in terms of identifying discrete and understandable functions

- It serves as the basis for sizing and grouping functions together to form Business Areas of approximately equal size and scope.

It appears that this principle was not explicitly recognized nor followed. Consequently, we believe many of the lowest level functions in the current Function Decomposition Diagram are significantly large relative to other functions.

Function Dependency Diagram

The purposes of the technique of Function Dependency Diagramming in the ISP are to:

- Confirm that the function decomposition of each "parent" function is correct
- Identify any missing or redundant functions
- Assist in sizing the "children" functions so that they are of approximately equal size
- Confirm that the Entity Model is complete, i.e. that all Entity Types are identified

This technique was not applied during the ISP. This may contribute to somewhat less confidence in the correctness of the Function (and Entity) Model along the factors listed above.

Entity Model

The Entity Model of an ISP consists of:

- Entity Definitions
- Entity Relationship Diagram

Entity Definitions

The Entity Type definitions are adequate to meet the purposes of the ISP. The "Index of Terms Used" lists 105 different Entity Types and includes Entity Subtypes and Supertypes.

Entity Relationship Diagram (ERD)

The ERD is depicted in 15 separate diagrams in Volume II, Part 2. There are a number of Entity Types defined which do not appear in any of the ERD diagrams. This inconsistency should be examined.

In general, the Entity Model is adequate to accomplish the key objectives of the ISP, namely to identify Business Areas and communicate to subsequent BAA teams.

Interaction Model

The Interaction Model of the ISP consists of a Function X Entity Type matrix. This matrix describes the "CRUD" actions (Create, Read, Update, Delete) performed by Functions on the Entity Types.

The ISP did develop a CRUD matrix of Function X Information Need, and a mapping was performed of Information Needs to Entity Types. However, a CRUD of Function X Entity Type was not developed. The matrix simply indicated actions performed by Functions on the Entity Types by placement of check marks on the matrix instead of by identifying each action

as C, R, U, or D.

Done correctly, this matrix represents the most crucial deliverable for identifying Business Areas. By applying an Affinity Analysis routine, the CASE tool will use statistical procedures to group similar Functions and similar Entity Types. The CASE tool algorithm applies different weights to a Create, a Read, an Update or a Delete action. The resulting clusters of Functions and Entity Types thus represent logically related units of business which can be efficiently analyzed together as a Business Area Analysis (BAA) project.

The Clustered CRUD matrix is then used to show the dependency between all of the BAA projects as well as the most efficient way to sequence the BAA projects.

The absence of the CRUD matrix is a significant inhibitor to success in correctly sizing the Business Areas and in showing their dependencies for purposes of sequencing and prioritizing the Business Areas.

3.2.3 Business Systems Architecture (BSA)

The BSA defines the Business Areas consisting of logical groupings of Functions and Entity Types. Based on Affinity Analysis, the individual Functions are grouped into Natural Business Systems and the individual Entity Types are grouped into Natural Data Stores. The Natural Business Systems and Data Stores are then grouped into Business Areas such that they are of approximately the same size in terms of complexity, scope, number of functions, number of entity types, etc.

The ISP identified Business Areas by identifying the component Functions. It did not however identify for each Entity Type, which Business Area contains that Entity Type. If a CRUD Matrix had been produced, it would clearly show, for each Entity Type, the Function which is primarily responsible for CREATING it. The Entity Type would then be contained in the Business Area which contains the Function which creates that Entity Type. Many Entity Types may be READ or UPDATED by a given Business Area, but each Entity Type should be CREATED in one and only one Business Area.

Another typical product of a BSA in the ISP is a BSA Diagram which shows the defined Natural Business Systems in terms of their coverage of the Functions. This diagram is also a principle vehicle for showing the dependencies and interfaces between the to-be-developed systems. The diagram of the Natural Business Systems can be compared to a diagram of the Existing Systems to demonstrate the fact that the new BSA will be much more efficient, e.g. avoiding the duplication inherent in the Existing Systems.

The lack of a well defined BSA showing which Business Areas contain which Entity Types and a pictorial diagram to show dependencies represents a risk for correctly implementing the ISP Action Plan.

As noted above, there are a number of factors which make it difficult to size the BAA and

their associated follow-on RAD projects. Typically, Business Areas are divided into a size such that 6 qualified persons can complete the Business Area Analysis project deliverables in about 6 months, assuming adherence to norms of about 30-40 Elementary Processes and 20-25 owned Entity Types. The guiding principle is to, within these guidelines, divide the total effort into whatever number of Business Areas would be required to obtain approximately equal pieces.

Each such Business Area typically generates 3-5 Design Areas (for IE-RAD implementation) of which 3 will likely be automated. Thus each RAD project should be scoped to contain about 10-15 Elementary Processes and about 7-10 owned Entity Types. A typical effort for a qualified RAD Team would be about the same as that for the Business Area Analysis project.

Given the size and complexity of A.I.D, we estimate, based on expert judgment and application of the above norms, and a high-level review of the ISP document, that the number of properly sized Business Area Analysis projects should probably be between 10-12, and the number of to-be-implemented Design Areas (IE-RAD's) should probably be three times the number of required BAA's. For purposes of estimation, the mid-point number of BAA's will be assumed, which is 11. The original number of BAA's projected in the ISP is 8. Consequently, approximately 40% (11/8) additional effort will be required to accomplish the Software Development effort (for 11 BAA's and about 33 RAD's). It is important to note that this estimate is developed at a high-level only. This estimate should be revised after some of the key ISP analyses are completed. The IE methodology also calls for more accurate estimation of RAD effort at the end of the Outline BAA projects.

The chart on the following page, Figure 3.4, illustrates the results of another sizing analysis we completed. It represents an estimate of "Complexity Rating" based on the performance of five similar full-scope ISP's, and on examination of the definitions of the Functions provided in the ISP. This analysis was done by putting a relative value of from 1-15 on each of the 110 lowest level Functions and then adding the values for all of the Functions within each Business Area. In the chart, the "# of RAD's" column is not a new computation--it lists, for reference purposes, the number of RAD projects shown in the ISP.

Business Area	Complexity Rating	# Lowest Level Functions	# of RAD's
Core Accounting	70	12	7
Procurement Management	67	15	4
Workforce Management	87	18	4
Property Management	81	19	4
Guidance Management	35	14	1
Annual Budgeting	25	6	1
Operations Management	118	21	4
Communications Management	10	5	1
Total	493	110	26

Figure 3.4
Estimated Business Area Complexity Rating

As an alternate means of making a gross estimate of work effort, the Complexity Rating from Figure 3.4 can also be reasonably considered as a very rough estimate of the number of Elementary Processes which may result after the detailed process decomposition analysis is completed. In this perspective, there would thus be approximately 493 Elementary Processes of the type defined by James Martin & Co. (Note: Texas Instruments and other companies tend to treat every Create, Update, Read, or Delete as a separate Elementary Process, but their approach often results in estimating many more Elementary Processes than that represented by the more conservative and business-oriented approach of James Martin). If the 493 is divided by the estimated 11 Business Areas, the result is an average of 44.8. Since each BAA is assumed to yield an average of 3 RAD's, the average number of Elementary Processes would be 15 (44.8/3). This is consistent with the metric described above of 10-15 Elementary Processes per RAD. Thus this second method of estimating effort is not inconsistent with the first and gives some measure of convergence of methods on the estimate of 11 BAA's as reasonable.

Obviously, this analysis is rough and based on very limited input. Nevertheless, even if it is only approximately correct, the variation in the size of the Business Areas is huge. The

principle of dividing the total A.I.D. functional pie into approximately equal pieces was not followed. It is important to remember that it is possible to cut the pie into several or several hundred pieces. The reason for breaking it into approximately equal projects of manageable size is that this increases the chances of success during roll-out.

3.2.4 Technical Architecture

The Technical Architecture is well researched and describes the likely technology trends in the field of Telecommunications. The estimates of workload for CPU processing and telecommunications both within A.I.D/W and with the Missions seems to be based on well-quantified historical data. The direction to move to UNIX and Open Systems Environment is consistent with the industry and would provide improvement to A.I.D over the current hardware configurations.

The Technical Alternatives analysis appears to be thorough and used weighted scores to evaluate each of more than 30 alternatives in terms of technical viability and narrow the field to four alternatives. The weighted score was not used in the final four analysis. Instead, all of the alternatives were determined to be technically viable and thus only cost was considered as the final criterion for selection of the preferred option which was Alternative 2--Distributed Client/Server.

Given the wide range in costs between the four alternatives, it may be appropriate to consider using an evaluation method which uses a Cost per unit of Technical Value ratio. (Optionally, a method could be used which treats cost as a weighted factor among other factors identified in the ISP analysis).

For example, if such a method were used where the cost of each Alternative is divided by the Technical Score it received (see ISP Volume II-Part 4, page II-4-7-11) the result would be that Alternative 4-Regional Centers would be the preferred Alternative as shown below:

Alternative	Technical Score	Cost ($M)	Cost/Tech Ratio
Alternative 1 - (Global Mainframe)	73	209.8	2.87
Alternative 2 - (Distr. Client Server)	72	66.3	.92
Alternative 3 - (Distr. Terminals)	89	86.4	.97
Alternative 4 - (Regional Centers)	100	85.4	.85

(Costs shown are estimated life cycle costs, unlike other tables prior to this one)

Figure 3.5
Cost Per Unit of Technical Value

In other words, Alternative 4-Regional Centers has the lowest cost per unit of technical value achieved (.85) as compared to the other Alternatives.

We are aware that the A.I.D. Administrator and some A.I.D. career employees have had interest in streamlining the organizational structure of the Agency. These interests have included regional center concepts and the centralization of groups of Missions. Our opinion is that the existence of these streamlining desires may add credence to the prospect of further examining the Technical Architecture model. In addition we are also aware of a number of initiatives within FA/IRM (such as establishment of the Customer Liaison and Support Division and of a Quality Management Committee) which demonstrate a commitment to meeting customer expectations. We see the establishment of regional centers with an FA/IRM presence as a potential opportunity for increased customer support.

3.2.5 Review of Additional Initiatives

In addition to the eight BAA and associated RAD efforts evaluated above, there are also six other major ISP Initiatives which comprise the total Development effort estimate presented in Figure 2.3. Each of these six is evaluated below.

Annual ISP Planning

This task is estimated at a total of 2.42 effort years including .7 Contractor Work Years (CWYs) at the cost of $51,940 which should be adequate to perform this annual activity.

ISP Start-Up

This activity is estimated to require a total of 2.66 effort years including 2.1 CWYs ($157,901) which is sufficient.

Development Coordination

This Initiative will be a critical success factor for achieving the overall roll-out of the ISP. It is well recognized by IE practitioners that the establishment and resourcing of an effective Development Coordination infrastructure within any organization attempting an implementation of this size is crucial.

The original estimate for this function is 41.8 effort years of which 24.6 ($1,994,748) are CWYs. It will be recalled from Figure 2.3 that the total work years of effort for the eight BAA and associated RAD Initiatives is 218.9. Adding these eight Initiatives to the Development Coordination effort, the total is 260.7. The Development Coordination thus represents 16% of the total (41.8/260.7).

Successful IE roll-outs are typically staffed such that between 15-20% of the resources are allocated to the important management-oriented tasks of Development Coordination. Since A.I.D has apportioned 16% to this function, it should be adequate assuming that the "best

and the brightest" from FA/IRM and Contractors are assigned to these tasks.

As discussed above, the effort estimate for actual performance of the BAA and RAD projects has increased by 40%. Since the Development Coordination function within an IE implementation is responsible for managing, controlling, monitoring, and standardizing all of the projects operating in parallel, the estimate for Development Coordination must also be increased by 40% to account for the increase in business and technical activities.

Open Systems/World-Wide Network Installation

This Initiative will install the new UNIX hardware to replace the aging WANG platforms. The total effort estimated is 13.17 years of which 9.5 are CWYs ($764,754). This estimate seems reasonable.

A.I.D. has actually been in the process of installing UNIX hardware for some time, especially during the past year. The Mission Accounting and Control System (MACS) has been converted to a UNIX platform. This effort is not part of the Core Accounting Business Area implementation; there has been no change in the functionality of MACS, but simply a conversion to UNIX. This is a first step in enabling and encouraging Missions to shed themselves of the high expense of the Wang VS minicomputers. UNIX machines can be purchased at one-sixth the cost of replacement with VS's and often at a lower price than the cost of one years' VS maintenance.

There has not been a mandated, organized effort to require replacement with UNIX, but rather a voluntary one as Missions can make the up-front capital funds available. To date at least 15 of the 100 Missions/110 sites, all among the 45 accounting stations, have purchased UNIX machines. This is not just a money saver. There is a high probability that replacement VS's, spare parts, and maintenance support may not be available much longer or be available only at even higher costs. Because of this, one could make the argument that even if the ISP were never funded and implemented, the one thing the Agency components would do without choice is convert to UNIX. It could follow then that if conversion to UNIX were going to happen regardless, its cost should not be attributed to the ISP.

This argument is similar to the argument regarding installation of PC's and LAN's. Because the A.I.D./Washington initiative, Excellence Through Automation (ETA), and a similar initiative throughout the Mission field structure were developed separately from the ISP, they have not been considered to be integral parts of the ISP. However, because they are Information Management/Information Technology activities their costs were identified as "related" costs to the ISP, i.e., shown as add-ons to the ISP estimated development costs of $46 million. The Steering Committee guiding the ISP cost/benefit analysis previously considered this issue. The Committee decided that the costs of these initiatives that have already been incurred are sunk costs, i.e., costs that have already been incurred through decisions that will not be impacted by any future decisions in ISP implementation. Furthermore, the completion of this activity over the next two years will likely happen regardless of any turn in events or modification of the ISP. Sunk costs are properly excluded from cost/benefit analyses.

There are some notable differences in the two situations, however, as follows:

- While the ISP concept is compatible with the PC/LAN architecture, the UNIX is an integral part of the ISP concept. The commitment to open systems is an ISP precept. Even though there has been some minimal UNIX implementation, the concept cannot be separated from the ISP vision,

- While the ETA has been funded, UNIX costs in Washington are not funded. There is a need for $4.3 million for this. The up-front investment of capital must precede any cost avoidances from eliminating the old technology.

We believe the differences between the PC/LAN and UNIX projects are greater than the similarities with respect to relationship to the ISP. Our judgement is that the UNIX cost should properly be considered as part of the ISP cost.

Small Mission Software

This Initiative will field the "Class II" software for the small missions and will require a total of 20.41 effort years of which only 3.6 are CWYs ($296,572). This estimate appears reasonable.

Special Projects

This is relatively large effort Initiative to accomplish important activities that cut across business functions. The total effort years is 55.3 of which 26.2 ($2,091,358) are CWYs. At first glance, it may seem that this Initiative is resourced at too high a level. However, this Initiative will be heavily involved in the Technical Architecture development of the ISP including assessing and selecting from emerging technologies for graphics and decision support. Consequently, this Initiative is considered to be resourced correctly.

4. PROJECTED COST OF THE ISP

4.1 INTRODUCTION

Based on the discussion of our assessment of development of the ISP, in subsection 3.2 above, it is recommended that A.I.D make revisions to its estimates for implementing the overall ISP. The revisions we provide in this report reflect an estimate that is more consistent with the Information Engineering methodology. It should be noted that the IE methodology is meant to be used to make revised estimates which have a higher degree of confidence and a narrower range of uncertainty. Thus it is to be expected that the estimate will undergo continual periodic revision.

The Agency also estimated certain recurring operational costs but has not published the estimated full life cycle costs. The recurring costs A.I.D. projected were estimated for the purpose of sizing and selecting the Technical Architecture, i.e., for use in a cost/benefit analysis of the four final Technical Architecture alternative models. Costs were estimated for a five-year implementation period and not for the life cycle period. Also, the Technical Architecture Team did its work at the same time as other aspects of the ISP were being developed. The Technical Architecture Team did not have the benefit of ultimate decisions about the timing and other sequencing of BAA and RAD projects and the final plans for distribution of implementation activities over the implementation period. The Team's work was of high quality, however, and does provide a sound basis for estimating some life cycle costs such as recurring equipment maintenance costs.

In this section we discuss revised estimates of development costs, selection of an appropriate life cycle period, and life cycle cost estimates for the principal recurring costs during that period.

4.2 DEVELOPMENT COST

This subsection presents revisions to the original ISP cost estimates which were shown earlier in Figure 3.2. The following assumptions underlie the cost analysis of the ISP:

(1) The ISP will be re-examined to:

- Create Dependency Diagrams for the lowest level Functions
- Develop a CRUD Matrix
- Conduct Affinity Analysis on the CRUD to identify clusters for scoping the Business Area Analysis projects and to sequence the projects based on dependencies
- Prepare a Business Systems Architecture to show at a high level how the

new Business Systems will improve and replace the Existing Systems

(2) At the completion of each Outline Business Area Analysis project, refined estimates will be made for:

- Number of Functions and Entity Types within the Business Area
- Number of properly sized Design Areas (IE-RAD projects)

(3) FA/IRM will assign high quality, knowledgeable staff to oversee the development coordination effort throughout ISP implementation.

(4) The estimates for BAA and RAD team effort assume that the consulting staff are highly experienced in Information Engineering methodology as well as in the I-CASE tool selected for designing and generating the program code. It is assumed that the A.I.D. FA/IRM staff working on the projects will be trained by the consultants and will be leveraged on a series of ISP roll-out projects to take advantage of the investment made in their training. It is also assumed that members of the user community will continue to participate appropriately in these efforts and that they will be provided introductory training in the IE methodology.

(5) Though the Agency could reconsider its Technical Architecture selection, our estimates regarding hardware costs adhere to the Agency selection.

(6) There is an overall plan for acquiring the technical platform (e.g. UNIX boxes) such that this hardware and operating system software will be purchased and installed in an appropriate time frame allowing a logical sequenced implementation across all of A.I.D.

(7) There is a commitment on the part of senior management to implement security measures within A.I.D whether the ISP is implemented or the status quo is maintained.

Figure 4.1 shows our revisions to the original ISP cost estimates.

COST CATEGORY	FY 93	FY 94	FY 95	FY 96	FY 97	TOTAL
FTEs:						
FA/IRM	10	11	9	9	5	44
Users	10	19	79	38	32	178
Contractor WYs	28	42	53	43	20	186
Costs: ($000)						
Contractor	2,172	3,409	4,445	3,752	1,765	15,543
Hardware/Software	996	4,912	9,836	4,968	0	20,712
Travel	336	601	2,348	847	833	4,965
Security	1,800	300	300	300	300	3,000
TOTAL	5,304	9,222	16,929	9,867	2,898	44,220

Figure 4.1
Revised ISP Development Costs

In the following subsections each of the four main factors are reviewed and recalculated if deemed appropriate. These factors are:

- Contractor Staff
- Hardware/Software
- Travel
- Security Requirements.

4.2.1 Contractor Staff

As discussed in subsection 3.2 above, the effort estimate for performance of the 8 BAA Initiatives and their associated RAD projects should be increased by 40%. It is assumed that the increase is to be applied in equal proportions between IRM, User, and Contractor categories as was applied in the original estimate. Consequently, the original estimate for this category was $6,706,990 (see sub-total in Figure 3.3) and the revised estimate is $9,389,786. Figure 3.3 has been revised as well and is shown as Figure 4.2.

The only other Initiative of the 14 Initiatives which needs to be increased is that for Development Coordination. The original estimate for this Initiative was $1,994,748 and is revised to $2,792,647.

The net increase to Contractor Staff for 9 of the 14 Initiatives is thus $3,480,695.

INITIATIVE	IRM FTE	USER FTE	CNTR WY	TOTAL YEARS	CNTR COST
Annual ISP Planning	0.44	1.32	0.66	2.42	$51,940
ISP Start Up	0.52	0.01	2.13	2.66	$157,901
Development Coordination	19.74	4.17	34.61	58.52	$2,792,647
Open Systems/WW Network	1.88	1.71	9.58	19.17	$764,754
Core Accounting	0.60	31.33	11.33	43.26	$903,263
Procurement	1.97	34.02	22.54	58.53	$1,754,728
Annual Budgeting	0.80	11.54	8.75	21.08	$687,474
Operations Mgmt	1.82	33.40	21.00	56.22	$1,681,296
Property Mgmt	1.85	15.25	17.39	34.48	$1,448,440
Workforce Mgmt	2.10	34.51	23.77	60.38	$1,999,535
Guidance	0.49	10.81	7.87	19.17	$668,970
Communications	0.36	10.07	2.93	13.36	$246,079
BAA/RAD Sub–Total	10.00	180.92	115.57	306.49	$9,389,786
Small Mission Software	0.19	16.60	3.62	20.41	$296,572
Special Projects	10.89	18.30	26.12	55.31	$2,091,358
GRAND TOTAL	43.66	223.03	192.29	458.98	$15,544,958

Figure 4.2
Revised Contractor Staff Development Costs

The increased BAA effort is included in the existing Business Areas. To avoid confusion, new BA's have not been added; we have simply shown an increased level of effort for the existing eight BA's.

4.2.2 Hardware/Software

As discussed in Subsection 3.2.4, the Technical Architecture is considered to be reasonable. Assuming that A.I.D decides to remain with Alternative 2-Distributed Client/Server, then there would be no change to the estimate ($20,712,000) for this category. Actual costs could decrease, however, if the number of Missions continues to decline. If A.I.D were to decide to use the cost per unit of Technical Value ratio method, then Alternative 4-Regional Centers might be selected and the Hardware and systems Software estimates for this alternative would have to be substituted. For purposes of this analysis we have assumed that the Distributed Client/Server alternative will be implemented at the number of sites in the ISP, at a hardware/software cost of $20,712,000.

4.2.3 Travel

The original estimate for travel was $3,546,000. The fielding strategy was that all of the RAD business systems for a given BAA (average of three per BAA) would be taken to the missions at one time for installation and providing user/operator training. This approach is sensible. Given that the revised number of BAA's is increased by 40%, the number of trips to install and train for each BAA should also be increased proportionally. The revised estimate for travel is thus $4,964,400.

The estimate for costs related to travel were generated in the ISP to accomplish the primary tasks of:

- Installing the newly developed software modules for each set of systems comprising a BAA after all of the systems for that BAA have been beta tested at A.I.D./Washington
- Training Mission personnel in the use of the new applications software and in the operation of the new system software
- Assisting in the conversion of the Mission data from the existing to the new system including writing conversion programs and utilities
- Establishing a rapport with the Missions and FA/IRM to lay the groundwork for improved communications and cooperation after returning to A.I.D./W

Although at first examination it may appear that the cost estimate for travel is large, when taken in context of the magnitude of the activities described above, it is considered that the travel estimate should not be reduced.

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4.2.4 Security

The original estimate for security from unauthorized access to A.I.D. information was $10,000,000, but this was a preliminary estimate of potential security costs of fully meeting all Federal security requirements and was estimated without the benefit of complete analysis. FA/IRM recognized that more study would be necessary to provide a reliable price tag, but had the foresight to include an estimate for this extremely important item in the ISP. Since the ISP report was completed, a detailed analysis of security requirements and costs has begun within A.I.D. Six areas are being studied:

- Local Area Networks (LAN),
- Wide Area Networks (WAN),
- Mainframe,
- Mini-computers,
- Backup Contingency Planning, and Disaster Recovery, and
- PC Security.

In addition to these, a seventh area (regarding training and establishment of personnel standards for security) which is not a factor in the ISP is being examined.

At this point studies have been completed in the LAN and WAN areas--the other areas will not be studied until the network is further defined. Preliminary indications from these studies are that the original estimate may be substantially higher than is necessary to accomplish A.I.D./W and Mission security. Given that Federal requirements are not currently being met, a similar security program would have to be implemented even if the ISP were not to be implemented. Therefore the original estimate is certainly substantially higher than the cost of meeting any requirements generated by the ISP.

The non-recurring cost estimate for LAN and WAN security is about $3 million for a five year period with first year costs at $1.8 million and costs for the next four years at $300,000 per year.

4.3 LIFE CYCLE COSTS

We consulted Federal Government guidance documents regarding the method of establishing the life cycle period. FIPSPUB 64, Guidelines for Computer Programs and Automated Data Systems for the Initiation Phase, addresses some factors which can impact on useful system life, such as financial pressures, but does not provide specific parameters. OMB Circular A-11, Preparation and Submission of Annual Budget Estimates, provides the most specific guidance. Section 43 addresses Data on Acquisition, Operation, and Use of Information

Technology Systems. Subsection 43.6 addresses Benefit-Cost Analysis for Major Initiatives and states:

> "The analysis should include detailed annual benefits and costs over the entire systems life...System life begins when funds are first obligated for the initiative and ends at the projected end of the useful life of the system (normally after three to six years of operation)."

Our experience is that new systems last longer than three to six years; most agencies cannot afford to replace systems that often. In many agencies systems are patched together to keep them operating for many years, 20 years in some cases. Also, systems developed through an information engineering methodology such as the A.I.D. ISP systems are comparatively easier to maintain and, consequently can yield a greater system life. We have found that many organizations find three to six years to be unrealistically low. General practice over the past five years has been to project an eight to 10 year system life. Our recommendation is that a 10 year life cycle period be used.

When cost/benefit analysis is used as the technique for economic analysis of program proposals, future costs and benefits are to be reflected in present value terms by using an appropriate interest discount rate. The current revision of OMB Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, specifies 7% as the discount rate. The Circular also states that when costs occur in a steady stream, applying mid-year discount factors rather than year-end discount factors is more appropriate.

At the end of this Section we provide spreadsheets which illustrate the costs over a 10 year life cycle and also show the effect of discounting.

4.3.1 Cost Categories

The cost categories used to project the life cycle estimates were selected based on the information available in the ISP document. These categories were referred to as "Operating Costs" in Volume II but were not shown in Volume I since they do not represent "capital" costs. In particular, the cost estimate spreadsheets in the ISP Report: Volume II: Part 4 Technical Architecture for the Distributed Client/Server Alternative provided the cost categories for Equipment Maintenance (Hardware and Software) and Network Communications.

Equipment Maintenance in the ISP refers to the charges assessed by the hardware vendors to receive periodic component maintenance and by the system software vendors to remain current with the periodic releases of software to upgrade capabilities. This is an on-going fee and occurs annually.

Network Communications in the ISP refers to telecommunications charges for local access in A.I.D./W and for recurring circuit and service charges in the Missions. The types of charges and quantities were estimated for purposes of costing the Technical Architecture

alternatives.

Applications Software Maintenance represents those charges that will accrue based on the needs of A.I.D. users to make enhancements, improvements, and modifications to their processing requirements. It is assumed that the largest portion of this work (50%) would be conducted by Contractors. Since the use of the Information Engineering methodology calls for substantial user participation even in the stages of software enhancement, it is assumed that 30% would be A.I.D. user time. The remaining 20% of the software maintenance activity would be performed by FA/IRM Direct Hires. (Note: The proportions estimated for development of the original ISP software were Contractor 45.5%, Users 44%, and FA/IRM 10.5%).

It will be recalled that it was estimated that there will eventually be about 11 Business Areas (and an average of three Business Systems within each). With the assumption that an Integrated CASE (I-CASE) software and powerful code generator development environment will exist at A.I.D., the amount of time required for applications software would be much less than that needed currently. It is assumed that each of the 11 Business Areas and their associated Business Systems will require two WY's to maintain it. Thus the entire maintenance activity could be performed by 22 full-time individuals in the proportions discussed above.

Data Center Operations represents the new cost of contract staff attending to the equipment consolidated in the Data Center. The ISP speaks to such a concentration in Washington. There will no longer be a need for staff to operate the mainframe and the minicomputers, but there will be a need for a much smaller staff to provide on-site equipment management.

Training is currently provided by the Human Resources Development and Management office. There are concerns throughout the Agency of this program being underfunded. For the ISP to achieve receive successful implementation much additional training will be needed.

Security is a category that was costed in the ISP Volume I Report and covers those needs to restrict access to certain information and data. As a life cycle recurring cost, the charges here are primarily for protected LANs and WANs, staff training and compliance reviews. Though this is not a cost generated by the ISP we have included an estimate as the quality of the current Agency security program is questionable by the Agency itself.

4.3.2 Schedule of Life Cycle Costs

Figure 4.3 on the following page presents the life cycle costs for the ISP Program for a 10 year analysis period.

COST CATEGORY	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
One–Time ISP Costs: ($000)											
Contractor Staff	2,172	3,409	4,445	3,752	1,765						15,543
Hardware/Software	996	4,912	9,836	4,968	0						20,712
Travel	336	601	2,348	847	833						4,965
Security	1,800	300	300	300	300						3,000
Subtotal, One–Time Costs	5,304	9,222	16,929	9,867	2,898						44,220
Recurring Costs: ($000)											
Equip. Maintenance (HW&SW)		941	1,692	2,523	2,728	2,837	2,951	3,069	3,191	3,319	23,251
Network Communications	977	1,779	2,674	3,044	3,316	3,449	3,587	3,730	3,879	4,034	30,469
Applications Software Maint			88	182	380	990	1,030	1,071	1,114	1,159	6,014
Data Center Operations		350	364	379	394	409	426	443	461	479	3,704
Training		113	192	312	244	190	148	116	120	125	1,559
Security						300	312	324	337	351	1,625
Subtotal, Recurring Costs	977	3,183	5,010	6,440	7,061	8,175	8,454	8,753	9,102	9,467	66,622
GRAND TOTAL	6,281	12,405	21,939	16,307	9,959	8,175	8,454	8,753	9,102	9,467	110,842

Figure 4.3
ISP Life Cycle Costs

For the two operating cost categories of **Equipment Maintenance (Hardware & Software)** and **Network Communications**, it was assumed that the recurring costs for Years 6-10 would be inflated by 4% per year (compounded) using the Year 5 figure from the ISP Technical Architecture estimate as the starting point.

For the **Applications Software Maintenance** cost category, a baseline cost in Year 1 of $74,000 per Contractor year was used. This figure was inflated by 4% (compounded) for Years 2-10 and actual costs were estimated for Years 6-10 after full ISP development is completed at the end of Year 5 at the levels discussed earlier in subsection 4.3.1.

For the **Data Center Operations** category we estimated a staff of approximately 4 - 5 CWY's to provide the professional care of the equipment and field requests for help.

For **Training** we estimated an initial one-third increase over the cost of the current effort. At its peak, as new systems are introduced, the cost would nearly double that of the current effort, but would decline as users learn the ISP systems.

For the **Security** cost category, it was assumed that the level for Years 6-10 would remain constant at the level for Years 2-4, i.e, $300,000 inflated 4% annually.

Recurring Data Administration costs are provided for in the ISP, but there may be a short-term influx of data administration costs associated with conversion to the new systems. We have not included an estimate for this because estimates by some Agency people range from $250,000 to $400,000 per year for the next two to four years and it is not conclusive that such costs will arise at all.

There will be yet other costs in addition to these to operate the new IM/IT program after implementation of the ISP, i.e., there are some current program costs that will not be saved but will remain. The costs discussed above are the new, incremental costs associated with the ISP. These incremental costs are the costs used in the benefit/cost analysis in Section 6 of this report. Those costs are matched with the savings discussed in Section 5. Figure 4.4 shows the one-time and recurring costs discounted at 7%.

($000)	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost:											
One–Time Costs	5,304	9,222	16,929	9,867	2,898						44,220
Recurring Costs	977	3,183	5,010	6,440	7,061	8,175	8,454	8,753	9,102	9,467	66,622
Discount Rate @ 7% (Mid–year Rate)	0.9667	0.9035	0.8444	0.7891	0.7375	0.6893	0.6442	0.6020	0.5626	0.5258	
Present Value Costs @ 7% Disc:											
One–Time Costs	5,127	8,332	14,295	7,786	2,137						37,678
Recurring Costs	944	2,876	4,230	5,082	5,207	5,635	5,446	5,269	5,121	4,978	44,789
TOTAL Undiscounted Costs	6,281	12,405	21,939	16,307	9,959	8,175	8,454	8,753	9,102	9,467	110,842
TOTAL Present Value Costs	6,072	11,208	18,525	12,868	7,345	5,635	5,446	5,269	5,121	4,978	82,467

Figure 4.4
ISP Present Value Life Cycle Costs

5. ESTIMATED BENEFITS OF THE ISP

5.1 INTRODUCTION

Implementing the ISP will result in benefits (including cost savings) to A.I.D. While some of the benefits can be quantified in dollar terms, others cannot be quantified, but can be identified and described in narrative form. Quantitative benefits will result from operation and maintenance of the ISP systems and also from use of the system by non FA/IRM personnel and users outside the data management organizations in Missions. Nonquantifiable benefits will also accrue to Agency managers, decision makers, and analysts through the use of the information maintained in the ISP systems. The following chart illustrates the concept of the two broad types of benefits and the relationship of benefits to system use.

Type	Beneficiary	Benefit Center	Description/Examples
Quantitative (All benefits can be quantified)	System Operators and Production Staff	Systems Operation and Maintenance (Systems Analysts, Programmers, IRM Managers)	Benefits that accrue to ADP practitioners during operation of the systems:
			-reduced software maintenance cost
			-reduction in cost of cable room operation
			-elimination of stovepipe systems
	System Users	Systems Use (Data Entry clerks, administrative personnel)	Benefits that accrue to users who spend significant amounts of time inputting data and extracting data:
			-reduced cost of data entry
			-reduced cost of tape/batch data transfer
			-reduced cost of report generation
			-reduced cost of data reconciliation
Qualitative (Non-quantifiable benefits)		Information Use (A.I.D. managers, decision makers, analysts)	Benefits that accrue to users who use data and information in the performance of their jobs:
			-better decisions are made
			-operational management is improved
			-more accountability exists

Figure 5.1
Types of Benefits of the ISP

The quantifiable benefits to the system operators and production staff are expressed in this report in terms of the "impact on the current IM/IT program expenditures". As an example of impact on current IM/IT expenditures, the cost of operating and maintaining IM/IT (e.g., software maintenance) will be reduced as a result of implementing the ISP. These anticipated cost savings and cost avoidances are identified, discussed, and quantified in this report.

The benefits that accrue to system users through accessing ISP systems or through using information in the ISP systems are very difficult to quantify. This is because, though it is known intuitively by Agency managers that certain inefficiencies are experienced and unnecessary costs are incurred in the status quo which would be eliminated through improved systems, records do not exist that would document costs or support estimates of such costs. Existing unit costs and the volume and frequency of occurrence of inefficiencies in the status quo, or the contra, the volume of occurrence of benefit yielding transactions in the proposed system, are often unknown. In addition, when analyzed it can be found that some benefits do not yield a clear cost saving or cost avoidance, but instead contribute to an improved state of affairs such as morale and level of satisfaction. These qualitative benefits do support the Agency mission in terms of helping to achieve gains in program delivery and program outcome. Figure 5.2 on the following page illustrates, through several examples of benefits in each of four sample categories, the concept of benefits arising from use of an improved system or group of systems.

Category	Example	Description
Efficiency	Less Downtime	More reliable systems will experience far fewer failures and be available to users more consistently.
	Makes Use of New Equipment	Implementation of UNIX servers and the open systems environment will allow those PC's currently having only the functionality of dumb terminals to be more fully utilized.
	Less Need for Manual Processing	Data needed on recurring basis will be warehoused for electronic transfer without the need for Mission involvement. Also integration of systems can eliminate the need for manual "massaging" of data in data stream, thereby eliminating staffing needs.
	Time Freed for Other Tasks	Since systems will be easier to use and require less time for a given interface with the system, the time of systems users can be freed for higher level tasks in the same discipline area.
	Resources Returned	Because of the increased systems efficiency, staff resources in Missions could be shifted to other disciplines to provide more direct benefit to program activities.
Improved Management	Quality Decisions	Through streamlined data flow, increased availability to data, and greater flexibility of data manipulation and data use, the opportunity for more informed decision making would exist.
	Agency Image	Because of increased accuracy of data, Agency customers and counterparts in Development will have increased professional respect for the Agency.
	Increased Communications	Implementation of network communications will enable an increased level of communications and will foster more interaction among Agency employees.
	Job Satisfaction	The ability to "get things done" through efficient/effective systems can improve the morale of Agency employees and result in increased job satisfaction.
Improved Customer Service	User Friendly Systems	Modern hardware and software is easier for end users to learn how to use and to want to use.
	Software Not Controlling	Applications are adapted to the work situation rather than requiring users to change work practices because of the limitations of systems.
	Fewer Data Requests	Through systems integration multiple data requests causing redundant reporting of certain data elements can be eliminated.
	Quicker Modifications	Software enhancements requested by functional units can get done quicker and with less effort with code generators.
	Timely Data Flows	Improved network communications system will allow for less cumbersome and more rapid, streamlined data flow.
Government Requirements	Functionality	System modifications should be easy to accommodate to address needs for increased functionality that may have been overlooked.
	Upgradeability	New legislative and central guidance agency regulatory requirements could be met with increased ease over the present system.
	Audits/Reviews	The increased accuracy and internal controls can make the systems more impervious to audit criticism.

Figure 5.2 Concept of Other Quantitative & Qualitative Benefits

The quantifiable benefits to system users (labor savings) are expressed in this report as "other quantitative benefits". The nonquantifiable benefits are expressed as "other qualitative benefits".

In summary, we have classified benefits into the following three categories:

- **Impact on IM/IT Expenditures** - the cost of operating and maintaining IM/IT (e.g., software maintenance) will be reduced as a result of implementing the ISP. These anticipated cost savings and cost avoidances are identified, discussed, and quantified below in subsection 5.2.

- **Other Quantitative Benefits** - the ISP will result in labor savings associated with using the systems (e.g., producing reports). These anticipated cost savings and cost avoidances are identified, discussed, and quantified below in subsection 5.3.

- **Other Qualitative Benefits** - the systems implemented as part of the ISP will result in various types of benefits to A.I.D. managers and customers. These benefits are nonquantifiable, but are identified and discussed in narrative form below in subsection 5.4.

5.2 IMPACT ON IM/IT EXPENDITURES

We have identified the principal areas in which implementing the ISP will result in significant recurring savings or avoidance of IM/IT costs. These are discussed below in part 5.2.1 of this subsection. The following part, 5.2.2, provides a schedule of the estimated impact.

5.2.1 Cost Savings Categories

The major areas in which the cost of the current IM/IT program can be positively impacted through ISP system-generated quantifiable benefits are:

- **Reduced Hardware Maintenance Costs** - A.I.D. uses proprietary architecture (Wang) minicomputers in about 40 of its larger missions and several of its larger A.I.D./W offices. A.I.D. has failed to benefit from multi-vendor competition and paid inflated prices for technically mediocre equipment. Hardware maintenance costs should be reduced as a result of the ISP activities to convert to more modern, efficient hardware requiring less expensive maintenance.

  In addition, hardware maintenance costs should be reduced as more systems and applications run in a PC/LAN environment rather than mainframe and minicomputers. A move to an open systems/client server hardware architecture will permit the Agency to run the same software at Missions and offices of all sizes at significantly lower costs than the Agency's current hardware platforms.

- **Reduced Software Maintenance Costs** - Software maintenance costs will be reduced through the following:

  — **Elimination of redundancy** - Currently, A.I.D. has tremendous redundancy in corporate systems, both in Washington and across the Missions. One reason is that because A.I.D./W uses an IBM mainframe and Missions use Wang minicomputers, most applications must be developed twice, even though the business function is mostly the same in Washington and overseas. In addition, there are examples of different applications for the same business function such as the utilization of FACS in A.I.D./W and MACS at Missions.

  The ISP will eliminate this redundancy, thereby decreasing the number and size of systems. As a result, software maintenance costs will decrease.

  — **Modernization and standardization of software** - Most of A.I.D.'s current systems were developed to meet the needs of a particular organization at a particular time and location, without regard to standards or any overall architecture. In addition, most of the systems employ outdated software languages and conventions. As a result, software maintenance is difficult, time consuming, and expensive.

  The ISP will reduce software maintenance costs because modern tools and techniques such as Information Engineering (IE) and CASE tools will be employed and software standards will be observed. Systems will be designed to provide an appropriate degree of flexibility, instead of building duplicative systems to satisfy the particular desires of individual users.

- **Reduced Communications Costs** - As of October, 1992 only one-third of 110 overseas locations had reliable desktop-to-desktop telecommunications with A.I.D./W. While this has since improved to nearly 75%, communication costs are still much higher than necessary. Also, because of lack of access to a modern telecommunications system, A.I.D. direct hire and contract personnel are forced to use the State Department-operated antiquated, time consuming, cable system to communicate between A.I.D./W and Missions and vice versa. The ISP will result in a world-wide telecommunications network that will permit the daily uploading and downloading of data. It will provide an effective telecommunications system that will require considerable initial investment but should result in savings over the long-term.

- **Eliminate Cuff Applications** - Cuff systems, or unofficial records and automated applications are currently maintained by individuals and offices. They are used when in their view the official major systems do not maintain information at a level of detail or in the form required. As an example, virtually every Mission, large or small, accounting station or not, maintains some local fund control and budget applications. Some Missions operate several such local cuff applications. In addition, at many locations cuff

applications are developed even when there is no systems void, but simply at the election of local managers so they have systems with which they are more comfortable. The ISP, through effective business area analysis, should result in systems that provide adequate functionality and performance so as to eliminate the need for cuff systems.

5.2.2 Schedule of Estimated Impact

Figure 5.3 illustrates the system generated benefits, in terms of impact on the current IM/IT program, that could be achieved from ISP implementation. To estimate these benefits we assumed:

- There would be a 50% reduction in the level of effort needed for equipment acquisition support (i.e., half of seven of the CWY's included in the client support contract staffing) beginning in 1997.

- The activities giving rise to Project Support costs (program office buy-ins to FA/IRM contracts) will be eliminated as the activities are enveloped into the Operations Business Area systems.

- Though a facility will be needed for housing and operating the consolidated equipment in A.I.D./W, the requirements for the current equipment could be halved beginning in 1998.

- The mainframe would no longer be needed after full implementation and maintenance costs would cease in 1998.

- The minicomputers would be eliminated by the end of FY 1994.

- Other equipment currently procured would continue to be used in the ISP architecture.

- FA/IRM current program software maintenance would cease as the new business area systems are implemented. The costs would decline beginning in 1995 and would be eliminated in 1997.

- Implementation and operation of the ISP network communications system, a major cost item, will enable users to operate more efficiently. Its cost will be offset greatly through reductions in current communications systems costs.

  — There could be a 75% reduction in the cost of operating the cable room because of new communications opportunities. Staff will opt to use the new network and avoid the cumbersome, bureaucratic cable system.

  — Telephone costs could be reduced by 20% also because of improved network communications. The voice telephone system will not have to be used as often as is done currently.

- Cuff applications costs are essentially represented by the software development, maintenance and operation costs outside FA/IRM and they would be eliminated proportionate to implementation of the business area systems.

COST CATEGORY	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Impact on Existing Costs:											
Existing Costs:											
Program Direction	$530	$551	$573	$596	$620	$645	$671	$697	$725	$754	$6,363
Client Support	$1,591	$1,655	$1,721	$1,790	$1,861	$1,936	$2,013	$2,094	$2,177	$2,264	$19,102
Project Support	$420	$437	$454	$472	$491	$511	$531	$553	$575	$598	$5,043
Space	$1,749	$1,819	$1,892	$1,967	$2,046	$2,128	$2,213	$2,302	$2,394	$2,489	$20,999
Supplies	$1,871	$1,946	$2,024	$2,105	$2,189	$2,276	$2,367	$2,462	$2,561	$2,663	$22,463
Operate Mainframe/Minis	$2,907	$3,023	$3,144	$3,270	$3,401	$3,537	$3,678	$3,825	$3,978	$4,138	$34,902
Operate Lan	$976	$1,015	$1,056	$1,098	$1,142	$1,187	$1,235	$1,284	$1,336	$1,389	$11,718
Hdwe. Mtce.(m/f,mini,LAN)	$3,793	$3,945	$4,321	$4,494	$4,673	$4,860	$5,055	$5,258	$5,467	$5,686	$47,552
Hdwe. Mtce. (PC's)	$2,122	$2,207	$2,808	$2,920	$3,037	$3,158	$3,285	$3,416	$3,553	$3,695	$30,199
Software Mtce.	$4,217	$4,386	$4,561	$4,744	$4,933	$5,131	$5,336	$5,549	$5,771	$6,002	$50,630
Communications	$10,137	$10,542	$10,964	$11,403	$11,859	$12,333	$12,827	$13,340	$13,873	$14,428	$121,706
Cuff Applications	$6,950	$7,228	$7,517	$7,818	$8,131	$8,456	$8,794	$9,146	$9,512	$9,892	$83,442
Directives Support	$76	$79	$82	$85	$89	$92	$96	$100	$104	$108	$912
Security	$222	$231	$240	$250	$260	$270	$281	$292	$304	$316	$2,665
Travel	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$480
Training	$340	$354	$368	$382	$398	$414	$430	$447	$465	$484	$4,082
Total, Existing Costs	**$37,941**	**$39,459**	**$41,768**	**$43,439**	**$45,176**	**$46,983**	**$48,863**	**$50,818**	**$52,849**	**$54,964**	**$462,259**
Less ISP Cost Reductions:											
Client Support					$211	$219	$228	$237	$246	$256	$1,397
Project Support			$254	$472	$491	$511	$531	$553	$575	$598	$3,986
Space						$158	$164	$171	$178	$185	$857
Operate Mainframe/Minis			$1,638	$2,271	$2,362	$3,537	$3,678	$3,825	$3,978	$4,138	$25,427
Hdwe. Mtce.(m/f,mini,LAN)			$2,789	$3,005	$3,125	$4,107	$4,272	$4,443	$4,620	$4,805	$31,165
Software Mtce.			$1,710	$2,965	$4,933	$5,131	$5,336	$5,549	$5,771	$6,002	$37,398
Communications			$2,304	$2,396	$2,492	$2,592	$2,696	$2,803	$2,916	$3,032	$21,232
Cuff Applications			$2,819	$4,886	$8,131	$8,456	$8,794	$9,146	$9,512	$9,892	$61,635
Total, Cost Savings			**$11,515**	**$15,995**	**$21,745**	**$24,711**	**$25,699**	**$26,727**	**$27,796**	**$28,908**	**$183,096**
Remaining Existing Costs:											
Program Direction	$530	$551	$573	$596	$620	$645	$671	$697	$725	$754	$6,363
Client Support	$1,591	$1,655	$1,721	$1,790	$1,651	$1,717	$316	$316	$316	$316	$11,389
Project Support	$420	$437	$200								$1,057
Space	$1,749	$1,819	$1,892	$1,967	$2,046	$1,970	$2,049	$2,130	$2,216	$2,304	$20,142
Supplies	$1,871	$1,946	$2,024	$2,105	$2,189	$2,276	$2,367	$2,462	$2,561	$2,663	$22,463
Operate Mainframe/Minis	$2,907	$3,023	$1,506	$999	$1,039						$9,474
Operate Lan	$976	$1,015	$1,056	$1,098	$1,142	$1,187	$1,235	$1,284	$1,336	$1,389	$11,718
Hdwe. Mtce.(m/f,mini,LAN)	$3,793	$3,945	$1,532	$1,489	$1,548	$753	$783	$815	$847	$881	$16,387
Hdwe. Mtce. (PC's)	$2,122	$2,207	$2,808	$2,920	$3,037	$3,158	$3,285	$3,416	$3,553	$3,695	$30,199
Software Mtce.	$4,217	$4,386	$2,851	$1,779							$13,232
Communications	$10,137	$10,542	$8,660	$9,006	$9,367	$9,741	$10,131	$10,536	$10,958	$11,396	$100,474
Cuff Applications	$6,950	$7,228	$4,698	$2,932							$21,808
Directives Support	$76	$79	$82	$85	$89	$92	$96	$100	$104	$108	$912
Security	$222	$231	$240	$250	$260	$270	$281	$292	$304	$316	$2,665
Travel	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$480
Training	$340	$354	$368	$382	$398	$414	$430	$447	$465	$484	$4,082
Total, Remaining Costs	**$37,941**	**$39,459**	**$30,253**	**$27,444**	**$23,431**	**$22,272**	**$23,164**	**$24,091**	**$25,053**	**$26,056**	**$279,163**

Figure 5.3
ISP System–Generated Savings Over Life Cycle

5.3 OTHER QUANTITATIVE BENEFITS

Implementation of the ISP will provide opportunities for achieving cost savings through savings of labor in A.I.D./W outside the FA/IRM organization and, at Missions, outside the data management organizations. These opportunities will present themselves because of the reduced level of effort that will be required to be expended by ISP systems users, e.g., data entry personnel, other administrative personnel, and other A.I.D. personnel, including managers, who currently spend significant amounts of time inputting and extracting data using corporate data in their work. We label these as benefit opportunities as they will not be "automatically" achievable. We wish to make that distinction between these benefits and the system operation and maintenance generated benefits described above. The system benefits will be more or less automatic--lower operation and maintenance costs will result. The other quantifiable benefits will not just occur. While the benefits are real, A.I.D. managers around the Agency will have to take actions (such as reorganizing staffs, reassigning personnel, or eliminating direct hire or contract positions) in some cases in order to take full advantage of the opportunities and capture the benefits. We identified a number of such opportunities and then met with a panel of informed A.I.D. experts to test out our ideas, obtain additional ideas and perspectives, and develop bases for estimating the dollar value of these benefits. The results of this are discussed below; part 5.3.1 of this subsection documents benefit opportunity areas, and the following part, 5.3.2, provides a schedule of the estimated other quantifiable benefits.

5.3.1 Cost Savings Opportunities

Through the following listing we describe the range of other quantitative benefit opportunity items we identified:

- **Manual Processing** - Many tasks that are currently performed manually will be automated. For example, currently Missions are required to frequently gather, organize, and report various types of data to A.I.D./W. Much of this work is performed manually. Implementation of the ISP will result in the ability of A.I.D. managers everywhere to readily access data, regardless of where the data was originally recorded.

- **Reporting and Analysis** - The ISP will reduce the time required for these activities in the following ways:

  — **Increase access to information** - Currently, data required for reports are stored in various incompatible systems, and little information is shared in A.I.D. Without an integrated information architecture with a corporate data dictionary, A.I.D. system users often are uncertain where to look for data they require. Once they identify the location of the data, accessing it can be difficult if the data is stored in other systems. These savings represent time currently spent searching for data that is either difficult to find in existing reports, or that must be obtained from other systems.

- **Improve capability to design and modify reports** - Currently, reports are difficult to develop and produce because many systems use old technology. A modern relational data base management system will serve as the basis for all applications, permitting easy access to data by users through user-friendly query and reporting tools. Modern ad hoc reporting capabilities and flexible, table-driven report writing features available with standardized DBMS will greatly streamline this process.

- **Eliminate unnecessary reports** - As an element of the BAAs, true reporting needs will be analyzed and unnecessary reports identified. Reports that are not used will be eliminated, and because reports will be available on-line, unnecessary report distribution will be eliminated.

- **Reduce time spent analyzing and repackaging information** - A significant amount of effort is devoted by Missions to transmitting information to Washington in hardcopy form. Staff in A.I.D./W spend considerable time analyzing and repackaging the information for transmission to other staff. The ISP will result in automating and streamlining much of this process, thereby substantially reducing costs associated with staff time. Staff time will instead be focused on more critical areas, such as program delivery.

- **Data Entry/Update** - A.I.D. currently operates numerous systems and local applications that are not fully integrated, and many of them use obsolete technology. As a result, data is frequently not entered at the source, entered duplicatively, and data entry is not efficient or standardized. The ISP will result in single-point data capture and update. The ISP systems will reduce costs by saving time in the following ways:

  - **Increase the efficiency of data entry** - All A.I.D. ISP systems will utilize a common user interface, so that all screens will use the same conventions and A.I.D. staff will more easily utilize multiple systems. The ISP systems will also provide for interactive data entry screens, consistency between functions, system provided data edits and defaults, and quicker response times.

  - **Enter data at its source** - Recording data at its source eliminates the need to route paper and eliminates the time delay associated with such paper transfer. Once data is recorded in the systems, it will become available to all appropriate users immediately.

  - **Eliminate redundant data entry** - Redundant data entry will be eliminated by integrating systems and databases and making data available throughout A.I.D.

- **Data Verification, Control, and Reconciliation** - In today's non-integrated systems environment, labor-intensive data verification and reconciliation are required to keep the data bases and data files of the different systems and applications in synchronization. Implementation of the ISP would substantially

eliminate the need for such verification and reconciliation, again because all data relevant to core system operation would be available as a shared data resource.

The ISP will improve data verification and control through the use of on-line interactive editing, automated error reporting, and reconciliations facilitated via the system's integration of previously separate systems and improved interfaces with external systems. Closely related to these labor savings are savings in audit time due to exception and error reporting, integration with an audit module, and improved audit trail documentation.

These features of the ISP systems will also reduce costs to users by saving time in the following ways:

— **Improve error correction process** - Improved controls over data entry, improved error reporting, and more efficient methods of correcting transactions will reduce the time spent identifying and correcting errors.

— **Eliminate reconciliations between systems** - Currently, data sharing is frequently accomplished by rekeying, with a resulting high error rate and tendency toward forced reconciliations. A recent GAO report found a 26% error rate in the rekeying of disbursement data.

Eliminating data duplication will eliminate the need to reconcile data, either routinely or when data is reported or scrutinized.

— **Strengthen controls** - The new systems will provide for stronger controls, e.g. subsidiary supporting records, stronger edits, improved user guidance, and improved procedures.

- **System Performance** - Many of A.I.D.'s computers are saturated with demand and near collapse from old age. The IBM 3083 mainframe in Washington is two generations behind current technology. To avoid rationing usage due to capacity limitations, a new mainframe is being procured this year. Poor system performance raises system users costs dramatically as data entry, data transfer, and reporting becoming slow, difficult, and must often be delayed until non-peak hours.

We discuss how we sorted these items out and developed a means of quantifying estimated achievable benefits that could be derived from opportunities like these in the next part of this subsection.

5.3.2 Schedule of Estimated Benefits

We met with a small group of Senior A.I.D. officials knowledgeable about staff time spent interfacing with the existing systems. In this context interfacing means accessing one system or another to obtain data, complete reports, make decisions and a variety of similar tasks. We discussed the list presented above and focused on ways to measure the impact of

implementing the ISP.

The panel validated the listing and added its own perspective regarding the factors or characteristics of the ISP that will allow benefits to accrue, as follows:

- Having a corporate data base, i.e., having the data in the first place,
- Having effective systems, in combination with a corporate data base, to allow the data to be easily accessed, and
- Completing business process reengineering.

Corporate Data Base and Effective Systems

It was generally agreed that it is difficult, but possible, to estimate benefits growing out of the first two characteristics. From the original list and the meeting discussion the panel then identified four broad and discrete benefit areas:

- **Single Source Entry** - This incorporates two thoughts. First, data will be entered at its origin eliminating the need for it to be passed through many hands before getting into the automated system. Secondly, its entry into the automated system will be done only once for all systems, rather than once for each system as is required now. This will make available currently unavailable data and information.
- **Reformatting and Modifying Automated Output** - Even when data are available in the current environment, people have to spend time rearranging data to make it useable and meaningful. The benefit from the ISP will be that the ISP systems will allow report modification or tailoring to the specific user's need. The expectation is that the user will be able to structure the report format at his or her desk.
- **Reconciliation of Data** - This item focuses on the current required task of integrating across multi-systems to report, i.e., comparing data from one system or source with data from the other involved systems and sources to achieve some level of consistency, even before attempting to put it into a useable and meaningful format.

The panel estimated that as many as 700 of the direct hire people in grades GS-7 through GM-14 and the Foreign Service equivalent could save 5% - 10% of their time from single source entry, 5% - 7% on reformatting, and 5% - 15% on reconciliation and integration.

The fourth item about which the panel felt strongly is:

- **Unnecessary Monitoring, Coordinating, and Validating** - The panel's belief is that people in the supervisory structure spend far too much time reviewing subordinates' products and consume far too much time holding and participating in meetings in which to do this. While it is conceded that some

of this practice is the result of poor supervisory skills and inappropriate management styles (such as an unwillingness to empower people), it is also believed that much of it results from a basic mistrust of systems and the data from them.

The panel's conjecture was that 20% of the time of three quarters of the people in grades GS/GM 13 through the SES and Foreign Service equivalent could be saved.

Business Process Reengineering

The panel members supported the notion that the ISP process will implement a rigor and discipline which will lead the Agency to examine its business processes, and through helping Agency personnel better understand their business, will generate benefits from improved business processes. They took the position, however, that the magnitude or dollar value of benefits emanating from business process reengineering is virtually impossible to project. They did speculate that elimination of unnecessary reports, for example, could save about 10 person years. This could save the time of all the people that have to deal with such reports--people who prepare, mail, receive, distribute, read, review, file, and so forth--in addition to equipment, printing, and postage costs.

Details of Benefit Calculation

From the panel's projections we estimated that the potential savings could range from $29.4 million to $41.1 million, as illustrated in Figure 5.4

ACTIVITY AREA	ESTIMATED SAVINGS			
	LOWER BOUND	UPPER BOUND	MEAN	BEST ESTIMATE
Single Source Entry	$2,198,751	$4,397,502	$3,298,127	$3,298,127
Reformatting	$2,198,751	$2,638,501	$2,418,626	$2,418,626
Reconciliation	$2,198,751	$6,596,253	$4,397,502	$4,397,502
Unnecessary Monitoring	$22,845,319	$27,494,584	$25,169,952	$22,845,319
Totals	$29,441,572	$41,126,840	$35,284,206	$32,959,574

Figure 5.4
Range of Other Quantitative Benefits

The following shows the number of A.I.D. personnel by grade level for the affected grades. Note that there is no total as the four bands displayed overlap.

Grade Range	Number of Positions
Executive Schedule, Senior Executive Service, Senior Foreign Service, GS 16-18	316
FS 1-2, GS/GM 14-15	1,315
FS 3, GS/GM 13	471
FS 2-7, GS 7-14	1,908

Figure 5.5
A.I.D. Workforce Distribution by Selected Grade Equivalents

To calculate savings we used the pay rate for step 5 of each grade and ES-4 for the SES and added 22% for fringe benefits. That percentage covers all portions of the two retirement systems, life insurance, health benefits, and the medicare tax for an average mix of Federal Employees Retirement System (FERS) and Civil Service Retirement System (CSRS) employees, but excludes housing allowances, education allowances, and other allowances for employees in the Foreign Service personnel system.

Figure 5.6 illustrates the calculation of the 5% lower bound for the single source entry, reformatting, and reconciliation activity areas:

(1) EQUIV. GRADE	(2) NUMBER	(3) SAVINGS (%)	(4) FTE (2 X 3)	(5) LABOR RATE (Incl.Frnge)	(6) EST. SAVINGS (4 X 5)
GS-7	35	5	1.75	$31,195	$54,591
GS-8	45	5	2.25	$34,550	$77,738
GS-9	15	5	0.75	$38,161	$28,621
GS-11	57	5	2.85	$46,177	$131,604
GS-12	108	5	5.4	$55,339	$298,831
GS-13	173	5	8.65	$65,807	$569,231
GS-14	267	5	13.35	$77,763	$1,038,136
TOTALS	700				$2,198,751

Figure 5.6
Calculation of Benefits, GS-7 - GM-14

The upper bound (refer back to Figure 5.4) was calculated at 7%, 10%, or 15%, as applicable, and the mean, which we are assuming as the best estimate, equates to 6%, 7.5%, or 10%, as applicable.

The panel's estimate of time savings from eliminating unnecessary monitoring and reducing meetings was 20% of the time of 75% of all the employees at GS-13 through SES. The calculation is shown in Figure 5.7

(1) GRADE	(2) NUMBER	(3) SAVINGS % .75 X .20	(4) FTE (2 X 3)	(5) LABOR RATE (Incl.Frnge)	(6) EST. SAVINGS (4 X 5)
GS–13	471	15	70.65	$65,807	$4,649,265
GM–14	730	15	109.5	$77,763	$8,515,049
GM–15	585	15	87.75	$91,476	$8,027,019
SES	316	15	47.4	$132,980	$6,303,252
TOTALS	2102				$27,494,584

Figure 5.7
Calculation of Benefits, GS–13 – SES

Because of the abnormally high number of people clustered in the GS-13 through SES range relative to the total employee population (as compared to many other Federal Government agencies), we believe that the calculation could produce an unrealistic estimate. Therefore, we modified the panel's projection, reducing it by excluding the GS-13's and thereby producing a lower bound, which we have also assumed as the best estimate. These benefits, projected over the ISP life cycle period are shown in Figure 5.8.

	($ in Thousands)										
BENEFIT AREA	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Single Source Entry				$1,237	$2,111	$3,432	$3,569	$3,712	$3,860	$4,015	$21,936
Reformatting				$907	$1,548	$2,517	$2,618	$2,723	$2,832	$2,945	$16,089
Reconciliation				$1,649	$2,815	$4,577	$4,760	$4,950	$5,148	$5,354	$29,252
Unnecessary Monitoring				$8,567	$14,621	$23,773	$24,723	$25,712	$26,741	$27,810	$151,947
Total				$12,360	$21,094	$34,298	$35,670	$37,097	$38,581	$40,124	$219,224

Figure 5.8
Other Quantitative Benefits Over Life Cycle

We assumed that the benefits would begin accruing in fiscal year 1996, following implementation of the business area systems, and be fully accrued in 1998. The cumulative rate of accrual we used is fiscal year 1996, 37.5%; 1995, 62.5%; 1996, 100%. The benefit we calculated for each year was increased by a 4% inflation factor in the following year before we added in the new year's benefit accrual.

5.4 OTHER QUALITATIVE BENEFITS

The ISP will facilitate effective information management and use to support the A.I.D. mission and operations. This will happen as a result of streamlining work, providing accurate, useful information in a timely fashion, improving the flexibility and functionality of systems, providing flexible reporting capabilities, and providing for greater responsiveness to customers. The resulting benefit will be an improved state of affairs for A.I.D.--a qualitative improvement that cannot be quantified.

5.4.1 Means of Achieving Benefits

The following items identify the means through which the other qualitative benefits can be achieved. Many of these items overlap each other and overlap others we already described above, as the means for achieving the benefits centers around the integration of the ISP systems. Following these items, in part 5.4.2, we discuss the benefits themselves.

- **Obtain Information in a Timely Manner**
- **Increase the Integrity of Information**
- **Improve the Flexibility of A.I.D. Systems**
- **Improve Report Capability**
- **Streamline Work Processes**

5.4.2 Anticipated Benefits

The following identifies some of the qualitative benefits anticipated as a result of implementation of the ISP:

- **Improved Support for Internal Decision Making** - Today, internal decision-making within A.I.D. is greatly hampered by a lack of meaningful, accurate, consistent, and timely information. Of particular importance is the inaccessibility of Mission data in A.I.D./W. A major part of this problem is attributable to deficiencies in the Agency's existing information management systems. Making use of the ISP systems, A.I.D. managers can make quicker, more informed, quality decisions which will engender improved support for the Agency's proposals and decisions.

- **Improved Support to Internal Customers and an Increase in Job Satisfaction** - This will occur in several ways:

  — All Agency employees will have access to the information necessary to do their work at their desktop workstation (to the extent technically feasible), including both numeric and text data. "Access" includes availability of friendly tools for ad hoc queries, rather than having to

rely on predefined report programs. For example, an expanded telecommunications and program management software network will increase the field manger's ability to communicate with other organizations involved in the project, draw on external data useful to the project, and monitor the progress and funding of the project.

— Senior managers will systematically be provided with up-to-date summary information in an easy to digest form for monitoring, decision making and external reporting.

— All Agency personnel will be served by reliable and secure communications links between A.I.D./W and Missions, and among Missions, for both voice and data. This will involve a world wide telecommunications network that will permit the daily uploading and downloading of data so personnel at Missions can do their work more efficiently, and so A.I.D./W officials can exercise their oversight responsibilities.

- **Improved Service to External Customers and a Bolstering of the Image of the Agency** - A.I.D. is a key supplier of information not only to its own internal decision makers, but also to higher level policy makers, other Federal agencies, Private Voluntary Organizations and Non-Government organizations in the international relief and development fields, and host countries. A.I.D.'s ability to meet the needs of these external customers with accurate, meaningful, and timely financial information is critical to both the formulation of A.I.D. policies and planning and to the administration of A.I.D. programs.

  Maintaining the status quo would result in more unmet information needs and continued inability to meet legitimate information needs of external customers. Implementing integrated and strengthened systems and technology environment, in contrast, would provide the shared data stores and advanced technology needed to meet external customer needs for information more effectively, particularly time-critical needs and needs that can only be fulfilled by drawing together different kinds of data currently stored in different systems.

  The ISP envisions that, to the extent feasible and appropriate in light of security and privacy concerns, interchange of data between A.I.D. and its contractors, other donors, other Federal agencies, other outside groups, and the general public will be in electronic form.

- **Improved Accountability and a Reduction in the Level of Criticism and Adverse Audit Findings** - The ability to properly account for the accuracy and completeness of data is vitally important to the prevention of fraud, waste, and abuse. Once the ISP is implemented, the Agency can reasonably expect a material improvement in the deterrence and detection of fraud, waste, and abuse, in addition to an improvement in the ability to account to both Congress and taxpayers for the budgetary resources provided the Agency through the appropriation process. Not only better funds control and other financial

resource management improvement will result, but improvement in all human resource management systems and property resource management systems will result.

- **Readiness for the Future** - A.I.D. is in a period of change, with changes to the Agency mission and its organization likely. As a result of the ISP, the Agency's information architecture will accommodate the rapid strategic and tactical changes of the Agency, in response to the pursuit of U.S. interests and A.I.D. goals. As a result of implementation of the ISP systems, including a solid technical architecture and a solid information architecture conceptual underpinning, A.I.D.'s information management program should be in a good position to meet new or changed Federal legislative and regulatory requirements.

6. COST/BENEFIT ANALYSIS

6.1 INTRODUCTION

Cost/Benefit ratios provide an indication of a proposal's value by measuring the financial benefit per dollar spent. Often the concept is expressed as Benefit/Cost rather than Cost/Benefit, as the ratio is the fraction of the total present value benefits over the total present value costs. A ratio of 1.0 represents break-even; the higher the ratio, the more cost effective the proposal is considered to be. The higher the ratio, the larger the dollar return per dollar spent.

For each of the ten years in the ISP life cycle, we calculated the net costs or benefits by subtracting the total monetary benefits from total costs. As discussed earlier, a 7% discount rate, per Office of Management and Budget guidance, was used. We provide the results of the analysis in the next subsection. In subsection 6.3 we modify the analysis by changing some of the assumptions and variables we originally used in order to measure the impact of those changes. Following that we illustrate the payback period required to offset investment costs through generation of savings.

6.2 BENEFIT/COST SCHEDULE

Figure 6.1 following, a net present value schedule, shows the calculation of a benefit/cost ratio of 3.10 assuming a ten-year life cycle with estimated costs and benefits discounted at a 7% mid-year rate.

Figures 6.2 and 6.3 provide a recapitulation of the costs and benefits, respectively, (summarized from earlier Figures) that were used in Figure 6.1.

The costs used in the analysis are the new, incremental costs brought about by the ISP. The benefits are of two types--the savings in current system costs generated by the ISP (i.e., the current system costs that will not continue), and other benefits or savings to users of the ISP systems.

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$11,515	$15,995	$21,745	$24,711	$25,699	$26,727	$27,796	$28,908	$183,096
Other Quantifiable Benefits				$12,360	$21,094	$34,298	$35,670	$37,097	$38,581	$40,124	$219,224
Total, Undiscounted Savings			**$11,515**	**$28,355**	**$42,839**	**$59,009**	**$61,369**	**$63,824**	**$66,377**	**$69,032**	**$402,320**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	**0.9667**	**0.9035**	**0.8444**	**0.7891**	**0.7375**	**0.6893**	**0.6442**	**0.602**	**0.5626**	**0.5258**	
Present Value Cost Savings @ 7% (Undiscounted Savings X Rate)			$9,723	$22,375	$31,594	$40,675	$39,534	$38,422	$37,344	$36,297	**$255,964**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($8,802)**	**$9,507**	**$24,249**	**$35,040**	**$34,088**	**$33,153**	**$32,223**	**$31,319**	**$173,497**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											**3.10**

Figure 6.1
Aggregate Benefit/Cost Ratio of ISP

COST CATEGORY	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
One-Time ISP Costs: ($000)											
Contractor Staff	2,172	3,409	4,445	3,752	1,765						15,545
Hardware/Software	996	4,912	9,836	4,968	0						20,712
Travel	336	601	2,348	847	833						4,965
Initial Est. of Security Requir.	1,800	300	300	300	300						3,000
Subtotal, One-Time Costs	5,304	9,222	16,929	9,867	2,898						44,221
Recurring Costs: ($000)											
Equip. Maintenance (HW&SW)		941	1,692	2,523	2,728	2,837	2,951	3,069	3,191	3,319	23,251
Network Communications	977	1,779	2,674	3,044	3,316	3,449	3,587	3,730	3,879	4,034	30,469
Applications Software Maint			88	182	380	990	1,030	1,071	1,114	1,159	6,014
Data Center Operations		350	364	379	394	409	426	443	461	479	3,704
Training		113	192	312	244	190	148	116	120	125	1,559
Security						300	312	324	337	351	1,625
Subtotal, Recurring Costs	977	3,183	5,010	6,440	7,061	8,175	8,454	8,753	9,102	9,467	66,622
TOTAL	6,281	12,405	21,939	16,307	9,959	8,175	8,454	8,753	9,102	9,467	110,842

Figure 6.2
Total Undiscounted Costs

	($ in Thousands)										
BENEFIT AREA	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
ISP Cost Savings:											
Client Support					$211	$219	$228	$237	$246	$256	$1,397
Project Support			$254	$472	$491	$511	$531	$553	$575	$598	$3,986
Space						$158	$164	$171	$178	$185	$857
Operate Mainframe/Minis			$1,638	$2,271	$2,362	$3,537	$3,678	$3,825	$3,978	$4,138	$25,427
Hdwe. Mtce.(m/f,mini,LAN)			$2,789	$3,005	$3,125	$4,107	$4,272	$4,443	$4,620	$4,805	$31,166
Software Mtce.			$1,710	$2,965	$4,933	$5,131	$5,336	$5,549	$5,771	$6,002	$37,397
Communications			$2,304	$2,396	$2,492	$2,592	$2,696	$2,804	$2,916	$3,032	$21,233
Cuff Applications			$2,819	$4,886	$8,131	$8,456	$8,794	$9,146	$9,512	$9,892	$61,636
Total, Cost Savings			$11,515	$15,995	$21,745	$24,711	$25,699	$26,727	$27,796	$28,908	$183,096
Other Quantifiable Benefits:											
Single Source Entry				$1,237	$2,111	$3,432	$3,569	$3,712	$3,860	$4,015	$21,936
Reformatting				$907	$1,548	$2,517	$2,618	$2,723	$2,832	$2,945	$16,089
Reconciliation				$1,649	$2,815	$4,577	$4,760	$4,950	$5,148	$5,354	$29,252
Unnecessary Monitoring				$8,567	$14,621	$23,773	$24,723	$25,712	$26,741	$27,810	$151,947
Total, Other Benefits				$12,360	$21,094	$34,298	$35,670	$37,097	$38,581	$40,124	$219,224
TOTAL BENEFITS			$11,515	$28,355	$42,839	$59,009	$61,369	$63,824	$66,377	$69,032	$402,320

Figure 6.3
Total Undiscounted Benefits

6.3 SENSITIVITY ANALYSES

3.10

The benefit/cost ratio displayed in Figure 6.1 above is a very high ratio compared to that often found in similar analyses. For example, one analysis we reviewed that had been completed for another Federal agency, showed that the cost of replacing its financial systems would exceed benefits. Only after sensitivity analysis that subjected the data to cost reduction assumptions was a benefit/cost ratio above 1 achieved. In another analysis we reviewed, several alternatives were considered for integrating financial and program systems containing financial data. Most of the alternatives yielded benefit/cost ratios above 1, but less than 2. One of the alternatives did yield a ratio comparable to the ratio derived in the A.I.D. ISP analysis.

The results of our analysis are a function of the assumptions we made in this report. We are aware that some of the assumptions, especially those related to other quantifiable benefits, may be subject to differing interpretations. As we stated in subsection 5.3, the other quantifiable benefits assumptions were based on our discussion with an Agency panel of knowledgeable people. Nevertheless, others in the Agency doubt savings at such high levels could be achieved. Those in disagreement are not arguing against the good or value of the ISP, but they do not believe that the base figures we used from the panel's input accurately represents the time spent on reentry, reformatting, reconciliation, and unnecessary monitoring. Therefore, we modified the estimates of savings to identify the impact (or relative risk) of changed assumptions in that regard.

In addition, there are individuals in the Agency who suspect that cuff applications can never really be totally eliminated. We modified that assumption also, again to measure the impact on the benefit/cost ratio of the changed assumption.

The key assumptions tested for this analysis include the following:

- A reduction by half of the estimated benefits to be derived through reduction of unnecessary monitoring, from $151.9 million to $75.97 million (a reduction in estimated other quantifiable benefits from $219.2 million to $143.3 million).
- A reduction by half of the estimated other quantifiable benefits, from $219.2 million to $109.6 million.
- A reduction by three-quarters of the estimated other quantifiable benefits, from $219.2 million to $54.8 million; and a reduction of half of the estimated benefits from elimination of cuff applications, from $61.6 million to $30.8 million.
- A reduction by three-quarters of the estimated other quantifiable benefits, from $219.2 million to $54.8 million; a reduction of half of the estimated benefits from elimination of cuff applications, from $61.6 million to $30.8 million; and a reduction by half of the estimated system-generated communications savings, from a 20% savings of $21.2 million to a 10% savings of $10.6 million.

- Elimination of all other quantifiable benefits, but no other reductions in estimated communications savings or estimated cuff application elimination savings.

The results of these sensitivity analyses are presented in net present value schedules show as Figures 6.5, 6.6, 6.7, and 6.8. Figure 6.4 summarizes the result of the sensitivity analyses. As will be seen, though radical modification of these assumptions alters the ratio, none of the modifications causes an unfavorable ratio. The fifth modification lowers the ratio to 1.44.

Assumption Change	Ratio	Figure Ref.	Modif. Ref.
Initial Analysis	3.10	Fig. 6.1	
A reduction by half of the estimated benefits to be derived through reduction of unnecessary monitoring, from $151.9 million to $75.97 million (a reduction in estimated other quantifiable benefits from $219.2 million to $143.3 million).	2.53	Fig. 6.5	Mod.#1
A reduction by half of the estimated other quantifiable benefits, from $219.2 million to $109.6 million.	2.27	Fig. 6.6	Mod.#2
A reduction by three-quarters of the estimated other quantifiable benefits, from $219.2 million to $54.8 million; and a reduction of half of the estimated benefits from elimination of cuff applications, from $61.6 million to $30.8 million.	1.62	Fig. 6.7	Mod.#3
A reduction by three-quarters of the estimated other quantifiable benefits, from $219.2 million to $54.8 million; a reduction of half of the estimated benefits from elimination of cuff applications, from $61.6 million to $30.8 million; and a reduction by half of the estimated system-generated communications savings, from a 20% savings of $21.2 million to a 10% savings of $10.6 million.	1.53	Fig. 6.8	Mod.#4
Elimination of all other quantifiable benefits, but no other reductions in estimated communications savings or estimated cuff application elimination savings.	1.44	Fig. 6.9	Mod.#5

Figure 6.4
Summary of Results of Sensitivity Analyses

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$11,515	$15,995	$21,745	$24,711	$25,699	$26,727	$27,796	$28,908	$183,096
Other Quantifiable Benefits				$8,077	$13,784	$22,412	$23,308	$24,241	$25,210	$26,219	$143,251
Total, Undiscounted Savings			**$11,515**	**$24,072**	**$35,529**	**$47,123**	**$49,007**	**$50,968**	**$53,006**	**$55,127**	**$326,347**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	**0.9667**	**0.9035**	**0.8444**	**0.7891**	**0.7375**	**0.6893**	**0.6442**	**0.602**	**0.5626**	**0.5258**	
Present Value Cost Savings @ 7% (Undiscounted Saviings X Rate)			$9,723	$18,995	$26,203	$32,482	$31,570	$30,683	$29,821	$28,986	**$208,463**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($8,802)**	**$6,127**	**$18,858**	**$26,847**	**$26,124**	**$25,413**	**$24,700**	**$24,008**	**$125,996**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											**2.53**

Figure 6.5
Aggregate Benefit/Cost Ratio – Modification # 1

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$11,515	$15,995	$21,745	$24,711	$25,699	$26,727	$27,796	$28,908	$183,096
Other Quantifiable Benefits				$6,180	$10,547	$17,149	$17,835	$18,548	$19,290	$20,062	$109,611
Total, Undiscounted Savings			**$11,515**	**$22,175**	**$32,292**	**$41,860**	**$43,534**	**$45,275**	**$47,086**	**$48,970**	**$292,707**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	0.9667	0.9035	0.8444	0.7891	0.7375	0.6893	0.6442	0.602	0.5626	0.5258	
Present Value Cost Savings @ 7% (Undiscounted Saviings X Rate)			$9,723	$17,498	$23,815	$28,854	$28,045	$27,256	$26,491	$25,748	**$187,430**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($8,802)**	**$4,630**	**$16,471**	**$23,219**	**$22,599**	**$21,986**	**$21,370**	**$20,771**	**$104,964**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											2.27

Figure 6.6
Aggregate Benefit/Cost Ratio – Modification # 2

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$10,105	$13,552	$17,680	$20,483	$21,302	$22,154	$23,040	$23,912	$152,228
Other Quantifiable Benefits				$3,090	$5,274	$8,575	$8,918	$9,274	$9,645	$10,031	$54,807
Total, Undiscounted Savings			**$10,105**	**$16,642**	**$22,954**	**$29,058**	**$30,220**	**$31,428**	**$32,685**	**$33,943**	**$207,035**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	**0.9667**	**0.9035**	**0.8444**	**0.7891**	**0.7375**	**0.6893**	**0.6442**	**0.602**	**0.5626**	**0.5258**	
Present Value Cost Savings @ 7% (Undiscounted Savings X Rate)			$8,533	$13,132	$16,929	$20,030	$19,468	$18,920	$18,389	$17,847	**$133,246**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($9,993)**	**$264**	**$9,584**	**$14,395**	**$14,022**	**$13,650**	**$13,268**	**$12,869**	**$50,780**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											**1.62**

Figure 6.7
Aggregate Benefit/Cost Ratio – Modification #3

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$8,853	$12,254	$16,384	$19,187	$19,954	$20,753	$21,582	$22,396	$141,363
Other Quantifiable Benefits				$3,090	$5,274	$8,575	$8,918	$9,274	$9,645	$10,031	$54,807
Total, Undiscounted Savings			**$8,853**	**$15,344**	**$21,658**	**$27,762**	**$28,872**	**$30,027**	**$31,227**	**$32,427**	**$196,170**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	**0.9667**	**0.9035**	**0.8444**	**0.7891**	**0.7375**	**0.6893**	**0.6442**	**0.602**	**0.5626**	**0.5258**	
Present Value Cost Savings @ 7% (Undiscounted Saviings X Rate)			$7,475	$12,108	$15,973	$19,136	$18,599	$18,076	$17,568	$17,050	**$125,987**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($11,050)**	**($760)**	**$8,628**	**$13,501**	**$13,153**	**$12,807**	**$12,448**	**$12,072**	**$43,520**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											**1.53**

Figure 6.8
Aggregate Benefit/Cost Ratio – Modification #4

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
Undiscounted Cost Savings:											
System-Generated Savings			$11,515	$15,995	$21,745	$24,711	$25,699	$26,727	$27,796	$28,908	$183,096
Other Quantifiable Benefits											
Total, Undiscounted Savings			**$11,515**	**$15,995**	**$21,745**	**$24,711**	**$25,699**	**$26,727**	**$27,796**	**$28,908**	**$183,096**
Undiscounted ISP Costs:											
Development Costs	$5,304	$9,222	$16,929	$9,867	$2,898						$44,220
Life Cycle Costs	$977	$3,183	$5,010	$6,440	$7,061	$8,175	$8,454	$8,753	$9,102	$9,467	$66,622
Total, Undiscounted Costs	**$6,281**	**$12,405**	**$21,939**	**$16,307**	**$9,959**	**$8,175**	**$8,454**	**$8,753**	**$9,102**	**$9,467**	**$110,842**
Discount Rate @ 7% (mid-yr rate)	**0.9667**	**0.9035**	**0.8444**	**0.7891**	**0.7375**	**0.6893**	**0.6442**	**0.602**	**0.5626**	**0.5258**	
Present Value Cost Savings @ 7% (Undiscounted Saviings X Rate)			$9,723	$12,622	$16,037	$17,033	$16,555	$16,090	$15,638	$15,200	**$118,898**
Present Value Costs @ 7% (Undiscounted Costs X Rate)	$6,072	$11,208	$18,525	$12,868	$7,345	$5,635	$5,446	$5,269	$5,121	$4,978	**$82,467**
Net Present Value @ 7% (Present Value Savings less Present Value Costs)	**($6,072)**	**($11,208)**	**($8,802)**	**($246)**	**$8,692**	**$11,398**	**$11,109**	**$10,820**	**$10,517**	**$10,222**	**$36,431**
Aggregate Benefit/Cost Ratio (Present Value Savings divided by Present Value Costs)											**1.44**

Figure 6.9
Aggregate Benefit/Cost Ratio – Modification #5

6.4 PAYBACK PERIOD ANALYSIS

The payback period analysis examines the period of time required for implementation of a proposal to accumulate enough savings to offset investment costs. Figure 6.10 provides the payback period calculation. It shows that in 1997 the cumulative present value savings exceeds the total present value investment costs. The payback period extends up to 1996 and include a fraction of 1997. Figure 6.10 also provides the interpolation calculation illustrating that the exact payback period requirement is 4.18 years.

	($ in Thousands)										
	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	TOTAL
ISP Investment Costs											
(Present Value Development Costs)	$5,127	$8,332	$14,294	$7,768	$2,137						$37,658
Present Value Savings			$9,723	$22,375	**$31,594**	$40,675	$39,534	$38,422	$37,344	$36,297	$255,964
Cumulative Investment Cost	$5,127	$13,459	$27,753	$35,521	**$37,658**	$37,658	$37,658	$37,658	$37,658	$37,658	$37,658
Cumulative Savings			$9,723	**$32,098**	$63,692	$104,367	$143,901	$182,323	$219,667	$255,964	$255,964

Payback Period Interpolation:	
Total Present Value Investment	$37,658
Less Cumulative Present Value Savings For Year Investment Level Approached	($32,098)
Discounted Value	$5,560
Divided By Present Value Savings For The Next Year (1997)	$31,594
Interpolation (5560/31594)	−0.176
Payback Period	4.18 Years

Figure 6.10
Payback Period Analysis

7. CONCLUSIONS AND RECOMMENDATIONS

We mentioned some recommendations in various parts of this report and alluded to concerns at other points. The purpose of this section is to reiterate the sense of those comments in one place and highlight the conclusions of the benefit/cost analysis.

Current IM/IT Program

The Exhibit 43-A report is the single document A.I.D. annually produces reporting the cost of its information management program. In addition to the fact that certain cost items are excluded, there are other indicators which render the data in the completed report questionable. They are:

- The data call response rate from missions is inadequate,
- There is a significant amount of extrapolation and estimating performed in FA/IRM to complete the report using a cost estimation modeling technique which needs refinement,
- The quality and methodology of recordkeeping of IM/IT costs in A.I.D. offices outside FA/IRM is questionable, and
- The timing of the 43-A preparation and submission is not in synchronization with other budget planning.

In order to estimate amounts for nonreporting missions, the individuals in FA/IRM responsible for report accumulation go to individuals in the CLS Division for assistance. These CLS individuals are the people in FA/IRM most familiar with the missions and their structure, size, and scope. They have much information available, and some have even been on site at some mission offices, but they do not have the wherewithal to estimate past year, current year, and budget year figures for a particular mission. Instead they determine which reporting offices most closely resemble nonreporting offices and FA/IRM duplicates the figures from the selected reporting offices. In the case of the Africa Bureau, of the total amount shown in the Agency's report for Africa, 25% was estimated by FA/IRM, i.e., the missions' reported amounts were increased by 34% to account for non-reporting missions. The total Africa amount then represents about half of all the overseas expenditures included in the Agency report.

When the 43-A submissions are required to be made the budget year allowances are not yet known. The Fiscal Year 1994 submissions were made in November and December 1992. The figures in the budget year column then represent wishes more than plans. When the budget year allowances do become known it is too late to get any replanning done by missions. Instead FA/B adjusts the column to conform to the allowances, i.e., makes an adjustment comparable to the level of change made in the allowances. This assumes that the

information management spending would change in proportion to the total spending. Informed sources tell us that would not be the case. Many suspect that when the budget year funding is cut, information management spending is cut by an even greater amount, or at least the planned spending is cut significantly and the unit adopts a wait and see posture regarding the availability of year end funding.

The few key information management figures shown in the Annual Budget System (ABS) are not reviewed by any people having information sufficient to make judgements about the appropriateness of the amounts. The FA/B analysts rely on trend analysis, i.e., if the amounts are in line with what has been taking place during recent years they are not questioned. More emphasis in the analysis is focused on the program aspects rather than the support aspects of the budget. The same is true of the analysis in some regional bureaus. If the overall ABS, especially the narrative, seems to be in support of the guidance and gives proper regard to emphasis areas in the guidance, e.g., X amount devoted to environmental projects, then the support amounts carry.

There is no review or participation in the review by FA/IRM and no opportunity for correlation of the ABS with information management planning documents. In addition, the 43-A submissions from missions proceed along a separate track.

Principal issues are:

- There is no single definition of IM/IT in use in the Agency.
- There is no integrated record system used to record, track, and report this type of data.
- Because of the ultimate use of the ABS and the greater significance attached to it, more emphasis is placed on that document. There often is no budget personnel involvement in preparation of reports like the 43-A.
- Report preparers sometimes have different motivations for the presentation of data in reports depending upon the intended audience.

A systems approach of integrating the requirements for preparation of all budget documents can provide an effective foundation for eliminating these causes and assuring data quality. It is our opinion that FA/IRM cannot fully administer its oversight responsibilities if it does not have some involvement in the budget development process for the IM/IT program.

At present the A.I.D. IM/IT program is only the program conducted through FA/IRM. Based on our review of records and the interviews we conducted we believe the agency's total expenditures for IM/IT are simply an accumulation of related, but independent costs, not a representation of an agency plan or a program. Regardless of the total amount that may be spent, the agency does not plan an IM/IT program, does not account for it, and cannot attest to the efficiency or effectiveness of the expenditures. The agency-wide IM/IT budget is not directly linked to supporting and meeting field program mission, goals, and objectives.

Many units, including the Regional Bureaus, buy in to CDIE contracts. We observed that these units, in need of some IM/IT assistance, will by-pass FA/IRM and instead utilize services contracted for by CDIE. In these arrangements CDIE supplies contract staff members with systems analysis and related skills. Such contract employees usually bring contractor-owned equipment. This further emphasizes the lack of coordination within the Agency regarding IM/IT planning and delivery.

Installing a strong budget and accounting code structure for IM/IT spending, as FA/IRM has proposed, would establish the discipline necessary to track expenditures. Critical factors in implementing such requirements include providing adequate education and training and demonstrating Agency executive level support for implementing the planning and recording of IM/IT costs in the budget and accounting systems. We believe this needs to be done to enable A.I.D. to carry out the responsibilities assigned to it through OMB Circular A-130. This will be especially important as the Agency embarks on investment of the funds necessary for implementation of its ISP.

Reexamination of the ISP

We believe the Agency performed a high quality job in ISP planning through an Information Engineering approach. We have, however, noted deficiencies. Our concerns and recommendations in that area are:

- The ISP should be reexamined to:
  - Create Dependency Diagrams for the lowest level Functions
  - Develop a CRUD Matrix
  - Conduct Affinity Analysis on the CRUD to identify clusters for scoping the Business Area Analysis projects and to sequence the projects based on dependencies
  - Prepare a Business Systems Architecture to show at a high level how the new Business Systems will improve and replace the Existing Systems
- At the completion of each Outline Business Area Analysis project, refined estimates should be made for:
  - Number of Functions and Entity Types within the BA
  - Number of properly sized Design Areas
- FA/IRM should assign high quality, knowledgeable staff to oversee the development coordination effort throughout ISP implementation.

- The Agency's consulting staff should be highly experienced in Information Engineering methodology as well as in use of the I-CASE tool and A.I.D. FA/IRM staff working on the projects should be trained by the consultants. Also, user community participants should be provided introductory training in the IE methodology.

- An overall plan for acquiring the technical platform (e.g. UNIX boxes) should be made so that hardware and operating system software will be purchased and installed in an appropriate time frame allowing a logical sequenced implementation across all of A.I.D.

- The level of systems training provided to Agency staff should be significantly increased to meet the demand. This will become even more important with the introduction of the new technology.

Benefit/Cost Analysis

The analysis provided in this report is preliminary. More information will be available with which to more reliably estimate costs and benefits after the Business Area Analyses are conducted. The benefit/cost analysis should be refined at a future point. The benefit/cost ratio calculated at this juncture is a very high ratio compared to that often seen in similar analyses. The estimate of other quantifiable benefits is necessarily subjective. As we stated in subsection 5.3, the other quantifiable benefits assumptions were based on our discussion with an Agency panel of knowledgeable people. Nevertheless, others in the Agency doubt savings at such high levels could be achieved. Those in doubt are not arguing against the good or value of the ISP, but they do not believe that the base figures we used from the panel's input accurately represent the time spent on reentry, reformatting, reconciliation, and unnecessary monitoring. We demonstrated through sensitivity analysis that significant downsizing of those estimates still yields a favorable benefit/cost ratio.

This, however, also demonstrates that the cost side of the equation, along with the system-generated cost savings, is extremely important in the construction of the benefit/cost ratio. The cost estimates and cost saving estimates are based on our professional judgement, previous experience, and the Agency information that was available to us. We cannot overemphasize that, while we believe the assumptions and our overall approach to be reasonable, the assumptions need to be refined as more information becomes available.

The achievement of any estimate is dependent on the occurrence of future events. Frequently future events do not occur as expected when expectations are not modified on a current basis and when sufficient dedicated, quality staff are not assigned to oversee ventures such as implementation of the A.I.D. ISP.

APPENDIX A

Documents Reviewed

A.I.D IRM Organization

Office of Information Resources Management Organizational Charts, October, 1992 and March 5, 1993

Functional Statements, Office of Information Resources Management (MS/IRM)

Committee Charter, Draft Re-Charter of ISP Steering Committee, February 2, 1993

Committee Charter, Information Management Committee, October 2, 1991

A.I.D IRM Plans

"A.I.D. Strategic Information Resources Management Plan, 1991-1996," September 1990

"Strategic Information Resources Management Plan: Volume I," November, 1991

"Strategic Information Resources Management Plan: Volume II," January, 1992

"Information Systems Plan Volume I: Report to Management," December, 1992

"Information Systems Plan Volume II: Appendices," December, 1992

A.I.D. Systems

"FA/IRM/SDM System Inventory," June 1, 1993

Memorandum from Barry Goldberg, FA/IRM, "Federal Information Processing (FIP) Resources," December 28, 1992

Memorandum from Dennis Diamond, GC/EPA, "FIP Resources," January 5, 1993

Memorandum from Wayne H. Van Vechten, "Synopses for the FY-1992 IRM Reviews"

"Summary of US A.I.D. Information Technology Status," February 18, 1993

"Summary of Africa Bureau Information Technology Status"

US A.I.D./Guatemala, Information Resources Management Review, August 1992

US A.I.D./San Salvador, Information Resources Management Review, August 1992

93

PC Budget R&D User's Manual, 1993

Management Information Systems Study, Volume I - Management Report, US A.I.D. Philippines, April, 1993

Training Technology Assessment Guide, Education Development Center, Inc. and Labat-Anderson, Inc., (Africa Bureau), 15 January, 1993

Special Briefing, National Policy on Telecommunications and Information Systems Security, March 27, 1992

A.I.D. Budget Documents

Annual Budget Submission, FY-1994 - Nigeria, June 1992

Annual Budget Submission, FY-1994 - Zimbabwe, June 1992

Annual Budget Submission, FY-1994 - Gambia, July 1992

Annual Budget Submission, FY-1994 - CCWA Small Country Program, July 1992

Annual Budget Submission, FY-1994 - Botswana, July 1992

Annual Budget Submission, FY-1994 - El Salvador, June 1992

Annual Budget Submission, FY-1994 - Guatemala, June 1992

Annual Budget Submission, FY-1994 - Kenya, July 1992

Annual Budget Submission, FY-1994 - Mozambique, July 1992

Annual Budget Submission, FY-1994 - Philippines, July 1992

Annual Budget Submission, FY-1994 - Indonesia

Annual Budget Submission, FY-1994 - Czechoslovakia Expense Breakdown, Undated

OMB Exhibit 43A, "Report on Obligations for Information Technology Systems - FY 1993," April 27, 1992; related instructions, of October 8, 1991; FY 1994 Report, May 14, 1993

OMB Exhibit 43B, "Major Information Technology Acquisition Plans - FY 1993," April 12, 1992; related instructions of October 8, 1991; FY 1994 Reports, May 14, 1993

Spreadsheets of Mission submissions for Exhibit 43-A, January 12 through 22, 1993

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A.I.D. Congressional Presentation FY 1993

United States Trade and Development Program, FY 1993 Congressional Presentation

Agency for International Development, FY 1993 Congressional Presentation

International Organizations and Programs, FY 1993 Congressional Presentation

Agency for International Development, FY 1993 Congressional Presentation, February 3, 1992

Agency for International Development, FY 1993 Congressional Presentation, Statistical Annex, February 3, 1992

Agency for International Development, FY 1993 Summary Tables

A.I.D. Financial Management Systems

A.I.D. Washington Accounting and Control System (AWACS) - Project Charter, March 24, 1993

A.I.D. Washington Accounting and Control System (AWACS) - Cost/Benefit Lifecycle Cost Discussion

A Cost/Benefit Analysis for the Proposed AWACS Systems, February, 1992

"Financial Management Status Report and 5-Year Plan for FY 1992-1996," August 28, 1992

A.I.D. Policies

Index of Directives, Document No. 1354, December 11, 1991

Internal Directive No. 1-1, Management Guidelines - Revised IRM Directive System, April 29, 1991

Internal Directive No. 1-3, Management Guidelines - Emergency Plan for Floors Ten and Eleven, SA-14, April 29, 1991

Internal Directive No. 1-4, Management Guidelines - Preparation of Policy Statements, September 30, 1991

Internal Directive No. 3-1, Data Administration, July 15, 1991

Internal Directive No. 3-2, Metric Units of Measurements, October 8, 1991

Internal Directive No. 9-1, Procurement Guidelines - Migration to Open Systems, October 1, 1991

Internal Directive No. 14-1, IRM Human Resource Procedures - Personnel Management for IRM, July 19, 1991

Internal Directive No. 15-1, Contract Administration - Contractor Training Concerning IRM Core Contracts, June 11, 1991

Internal Directive No. 15-2, Contract Administration Guidelines - Sign-In and Sign-Out Policy and Procedures for IRM Level of Effort Contract Staff, July 15, 1991

Internal Directive No. 20-1, Applications Development Guide - Service Requests to SDM, May 24, 1991

Internal Directive No. 23-1, Client Support and Liaison - Guidelines for Forming an Information Technology Committee, June 11, 1991

Internal Directive No. 23-2, Client Support and Liaison - Systems Administrators Policy, July 19, 1991

Internal Directive No. 26-1, Government Guidelines and Regulations - Equivalent Access to Federal Information Processing Resources for Handicapped or Disabled Employees, April 29, 1991

MS/IRM Internal Directive 2-1, Information Engineering: Life Cycle Development Methodology, April 3, 1991

Memorandum for the Executive Staff from James H. Michel, "Policies and Guidelines for Nonpersonal Service Contracts in A.I.D./W," March 23, 1993

Staff paper, "Reinventing A.I.D.," April 16, 1993

FA/IRM Internal Budget Documents

Office of Information Resources Management (FA/IRM), Annual Budget Submission, Part I, May 12, 1992

Proposed P-Code Definitions, September 9, 1992

Spreadsheets of FA/IRM budget and buy-ins to FA/IRM contracts

A.I.D. IM/IT Contracts

Contract Information Management System typed list of ADP contracts awarded during FY 1990 - FY 1992, Undated (Prepared June 1993)

Contract Information Management System printout, "Active CIMS Data," by Standard Industrial Classification (SIC) code, Undated (Prepared June 1993)

Microfiche of numerous individual contract files

Recent Audit Reports

Audit of A.I.D.'s Practices Reviewing and Reporting on Unliquidated Obligations, Report No. 9-000-92-013, Office of Inspector General, September 30, 1992

Information on A.I.D.'s Implementation of MACS and Automation in West and Central Africa, Information Report No. 7-000-92-1-I, Office of Inspector General, October 16, 1991

Inadequate Accounting and System Project Controls at A.I.D., Report No. GAO/AFMD-93-19, US General Accounting Office, May 1993

APPENDIX B

List of People Interviewed

Inspector General

Bob Mein
Stuart Nichols
Phil Henegan

Finance and Administration

Mike Doyle

Budget

Richard Nygard
Jim Painter
Carol McGraw
Marcus Rarick
Ken Milow

Financial Management

Joe Keady
Keith Tayloe

Administrative Services

Cathy Smith

Information Resources Management

David Neverman
Gerry Sajewski
Sue Buzzard
Bill Anderson
John Elgin
Van Newstrom
Joe Gueron
Sandy Muldoon
Jesse Cloud
George Moore
Chris Woodard
Brenda Gray

Center for Development Information and Evaluation

John Eriksson
Gerald Britan
Maury Brown

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Bureau for Food and Humanitarian Assistance

Larry Tanner
Jeanne Markunas

Bureau for Research and Development (OIT, Pop, UC)

Ron Grosz
Alan Kreger
Kathy Kosar
Brian Kennedy
Randy Hoffman

Bureau for Research and Development (N, PO)

Ron Grosz
Betty Roche
Kathy Thompson
Johnnie Holt

Bureau for Latin America and the Caribbean

Pete McLain
Bob Meehan

Bureau for the Near East

Leslie Daugherty
Debra Hymes

Bureau for Africa

Dennis Lauer

Bureau for Asia

Peter Davis
Theresa Ware
Myra Proctor

Bureau for Private Enterprise (CTIS)

Deborah Diaz

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U.S. A.I.D./San Salvador, El Salvador

Anne Dahlstedt
Mario Lopez Gomez

U.S. A.I.D./Guatemala City, Guatemala

William Granger

U.S. A.I.D./Nairobi, Kenya

Neil Kester
Cephas Agola

U.S. A.I.D./Maputo, Mozambique

John Tincoff
Paulo Weng

U.S. A.I.D./Manila, The Philippines

Danilo S. Ty
Ann Hearde

APPENDIX C

ISP Cost/Benefit Analysis Steering Committee

A seven member steering committee was appointed by the FA/IRM Director to guide us in our work. The members and their A.I.D. organizational units are:

Name	Organization
Ron Grosz	Research and Development
Pete McLain	Latin America and Caribbean Bureau
Marcus Rarick	FA/Budget
Joe Keady	FA/Financial Management
Frank Kenefick	FA/Management Control Staff
Gerry Sajewski	FA/IRM Planning, Management and Acquisition
Linda Lion	FA/IRM Office of the Director

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