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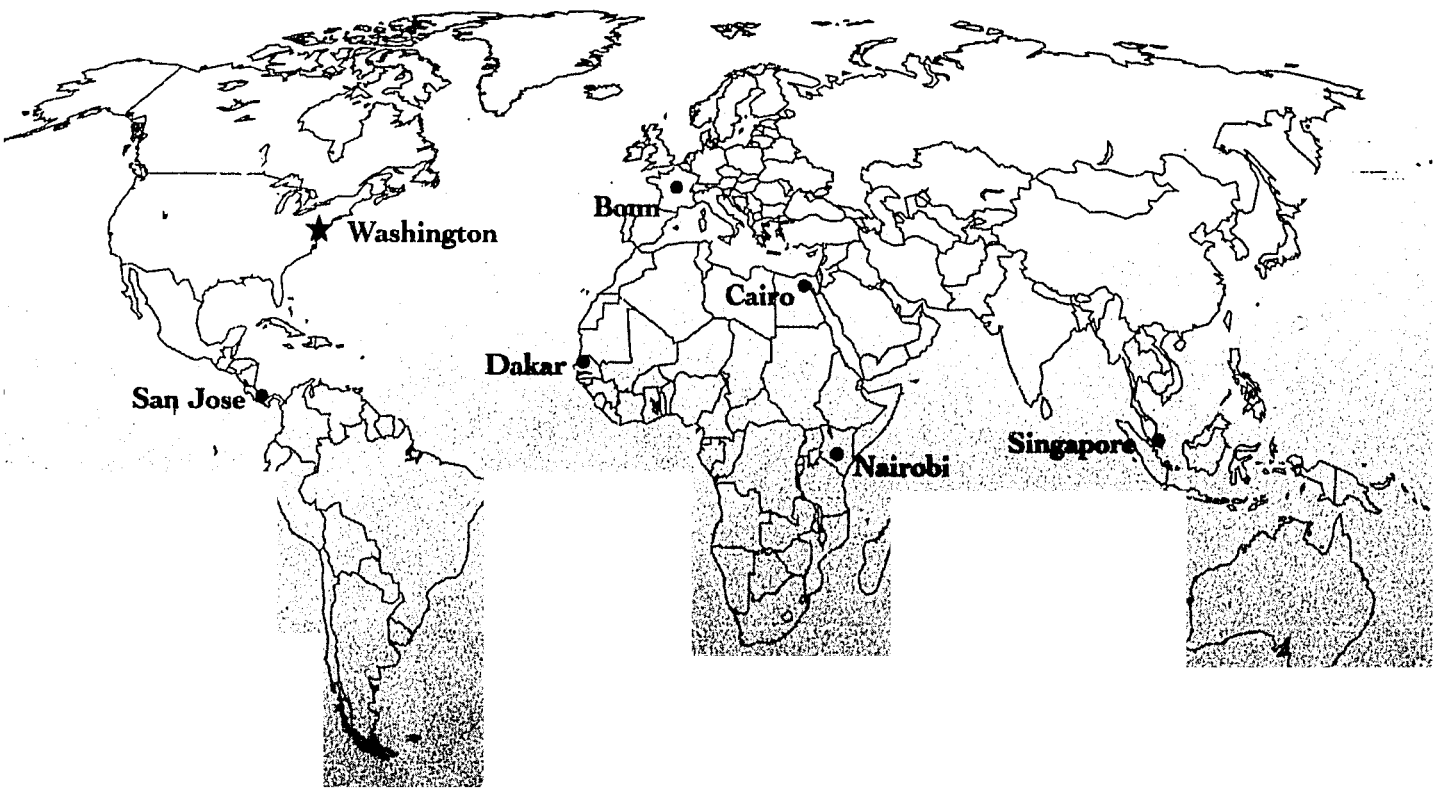
Programs and Systems Audits

AUDIT OF THE INTEGRATION OF USAID's INFORMATION SYSTEMS

Report No. 9-000-95-010
March 17, 1995



INSPECTOR GENERAL

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Agency for International Development
Washington, D.C. 20523

March 17, 1995

Assistant Inspector General
for Audit

MEMORANDUM FOR AA/M, Larry E. Byrne

FROM: AIG/A, James B. Durnil

SUBJECT: Audit of the Integration of USAID's Information Systems (Audit Report No. 9-000-95-010)

The Information Systems Plan (ISP) is an ambitious initiative to solve the severe information systems problems that were previously identified by the Agency's self evaluation, the Office of the Inspector General, and the GAO. If properly implemented, the ISP will assist USAID in meeting the financial and program results reporting requirements of the Chief Financial Officers (CFO) Act and the Government Performance and Results Act (GPRA).

Due to the importance of this initiative, the Inspector General has committed substantial resources to auditing various aspects of ISP implementation. In line with the pronouncements of the National Performance Review and the President's Council on Integrity and Efficiency, our office is working with USAID management by providing periodic feedback on ISP implementation as management control systems are being developed.

This is our audit report on the integration of USAID's information systems under the ISP. We considered your comments on the draft and have included them as Appendix II. We found that effective quality control and development coordination functions did not exist at the time of our audit. Because of these problems, we recommended that the Assistant Administrator, Bureau for Management: (1) establish a quality control process to ensure that systems development projects under the ISP comply with data standards and (2) establish a high-level development coordination mechanism to make decisions on unresolved technical questions.

Management stated that they have implemented three processes: (1) conduct quality assurance reviews of BAA data models; (2) develop a corporate encyclopedia management plan; and (3) conduct cross project integration meetings. However, these processes do not implement a quality control process to ensure that systems development projects under the Information Systems Plan meet data standards. Therefore, the **first recommendation is unresolved** (see page 9). When we receive supporting documentation from the Bureau that it is taking the necessary action to

ensure that systems development projects under the Information Systems Plan comply with data standards, we will resolve and/or close this recommendation.

Management also stated that they have a high-level development coordination mechanism to make decisions on unresolved technical issues. Based on this information, the **second recommendation is resolved** (see page 9). We will close this recommendation when we receive supporting documentation outlining the responsibilities of the coordinating mechanism.

I appreciate the cooperation and courtesy extended to my staff during the audit.

Introduction

Five years ago, the Inspector General sent a memorandum to the Acting Administrator discussing the poor state of USAID's financial accounting and management systems. The memorandum report concluded that after ten years of design, implementation, and expenditure of almost $20 million, the Financial Accounting and Control System (FACS) did not provide for an accurate accounting and control of Agency resources. The Inspector General concluded that USAID:

- was operating at severe risk of undetected financial irregularities;
- was at risk of making inaccurate and incomplete financial reports to the Congress and the Office of Management and Budget; and
- suffered from inadequate, inaccurate and untimely fiscal reporting necessary for decision makers at all levels.

Three years later, in September 1992, the GAO stated in a report that USAID "needs to better manage information as a corporate resource." Acknowledging that data administration is a crucial activity for effective information management, the report concluded that there was a lack of management emphasis on this area and that the Data Administration Unit within USAID's Office of Information Resources Management (IRM) did not have the authority to enforce compliance with IRM's data standards:

AID's overarching lack of an IRM management framework has in turn led to ineffective management of its information resources and failure to comply with Paperwork Reduction Act requirements...AID manages information on an as needed basis, gathering data and compiling reports upon request to support the information requirements of AID managers and legislative and executive branch officials. Formal mechanisms for managing the flow, format, and content of internal reports have been neglected. Processes for monitoring external reporting requirements are not systematized. As a result, AID continues to experience long-standing problems with inadequate, duplicate, and improperly formatted information.

That same year, 1992, USAID conducted its own study of the Agency's information management and found that there was little information sharing because of both system design problems and the systems managers' perception that they "owned" the data. Data sharing was frequently accomplished by re-keying existing data into stand-alone or "stovepipe" systems[1], with resulting high error rates and a tendency toward forced reconciliations. Because mission data was inaccessible to USAID management in Washington, redundant and inaccurate reporting to headquarters was endemic throughout the Agency.

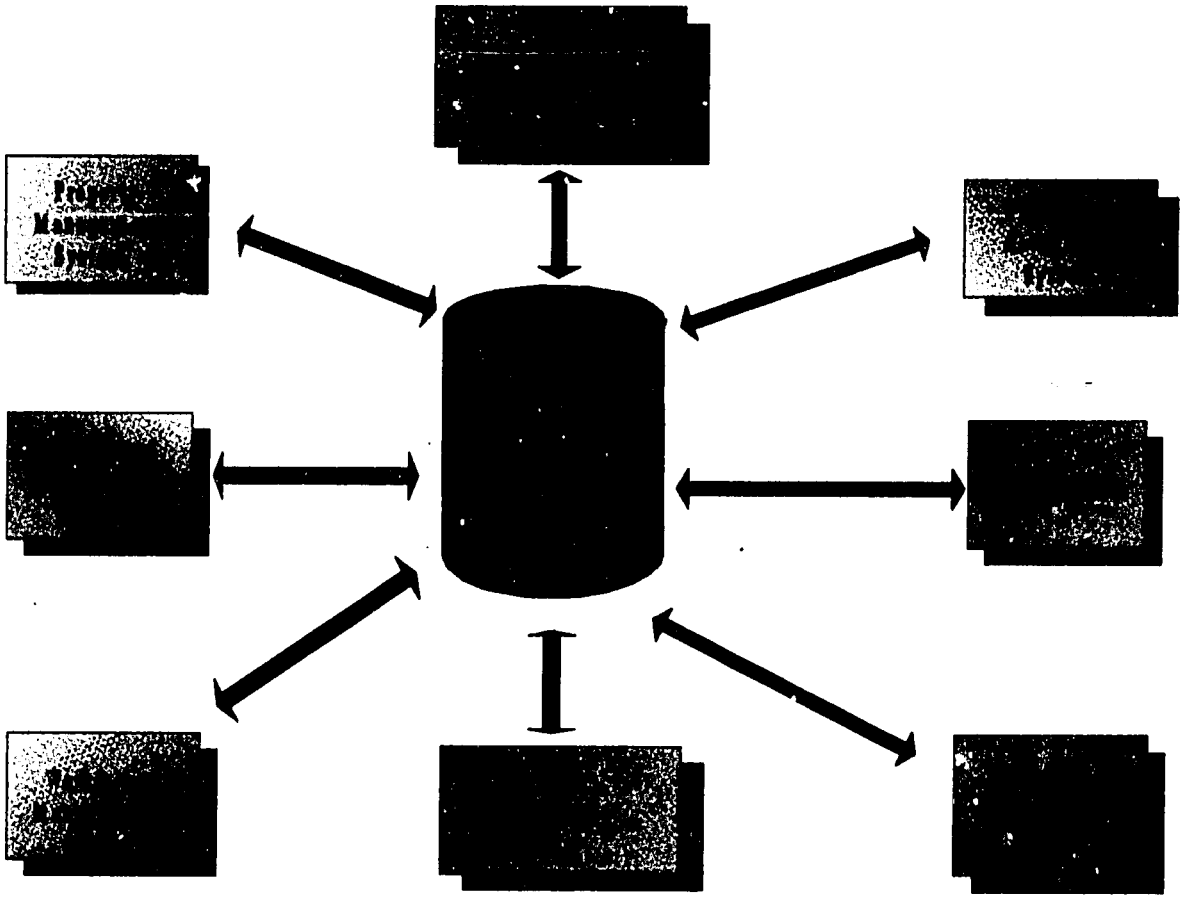
Information Systems Plan

To address these problems, USAID developed an Information Systems Plan (ISP) which envisions a sharing of data by all Agency organizations (See Appendix IV). Data will not be owned by the office that creates it, but rather managed as a corporate resource.

Under this plan, the Agency is divided into eight functional areas--referred to as business areas--with information systems for Accounting, Budgeting, Operations, Workforce, Acquisitions, Property, Communications, and Guidance. As shown in the following graphic, the ISP calls for fully integrated systems (replacing the existing independent stovepipe systems) whereby Washington offices and missions throughout the world will enter data electronically into a central data warehouse. All Agency financial and information systems will obtain their data from this data warehouse thus

[1]Stovepipe systems are developed to solve a specific problem and have little or no interconnection with other systems. They are characterized by a limited focus and functionality, and typically contain redundant data, non-standard data element names, and data that cannot be shared easily with other systems.

eliminating inaccuracies associated with re-keying the same data from system to system.



In order for these eight business areas' systems to share the same data, it is critical that the systems be designed and the data be modeled for compatibility. This data modeling process begins by developing an inventory of all information categories--referred to as entities--necessary to satisfy the Agency business requirements.

After this inventory is identified, detailed analyses of data needs in each business area is performed followed by a process of consolidating these needs. At the end, a data model is developed which will contain all of the entities used by the Agency with consistent definitions and other data standards.

Audit Objective

- Is USAID developing information systems that will integrate data across the Agency's functional areas?

Audit Finding

Although the ISP calls for data integration across the Agency's eight functional areas, data compatibility problems in the early stages of system development could undermine the foundation of the ISP's systems integration concept.

Data Model Standards Not Being Followed

At the time of our review, there were 727 entities (information categories) in the ISP data model involving four of the eight business areas. From this universe, we selected a statistical sample of 73 entities for review. We compared these 73 entities in the data model with four Agency data standards and found that deviations from the standards ranged from 64 to 92 percent--97 percent of the entities did not follow at least one standard. As shown in the following table, our audit disclosed that a significant number of entities were not properly defined, were not properly named, had significant overlap, and did not have unique attributes.

RESULTS OF OUR REVIEW			
Data Standards*	Number of Entities Reviewed	Number of Entities with Errors	Percentage of Entities with Errors
Proper Definition	73	47	64%
Named Properly	73	51	70%
No Overlap or Conflict	73	67	92%
Attributes Unique	73	63	86%
All four tests	73	71	97%

* See Appendix III for a more detailed explanation of the data standards tested.

The centerpiece of the ISP is that all systems in USAID will use the same definitions for the same types of data. To ensure this, IRM established data standards in its publication entitled Data Administration Standards and Procedures. These standards provide the basis for building a logical and integrated agency-wide data model which in turn will allow the eight business areas' financial and information systems to use the same data from the data warehouse.

The following are IRM's key data standards included in our audit:

PROPER DEFINITION

- Definition should be clear, concise, and unambiguous,
- Definition should answer the question, "What?"
- Definition should not be time dependent.

NAMED PROPERLY

- The name should be fully descriptive using nouns (not verbs).
- Entity which defines role, value, or range should have the word "type" as part of the name; e.g. Financial Event Type, Leave Type, or Interest Rate Type.

NO OVERLAP OR CONFLICT

- Entity should be mutually exclusive, in terms of its content and purpose, from all other entities.

UNIQUE ATTRIBUTES

- Entity should have attributes different from all other entities.

What Caused the Problem?

Non-adherence to data standards was caused by two different factors: (1) lack of a quality control process for data administration and (2) improper organizational placement of the development coordination function.

1. Lack of a Quality Control Process For Data Administration

Data administration is a crucial activity for effective information management. It encompasses the responsibilities for managing and maintaining the corporate data resources with respect to standardization, integrity, and sharing. USAID established in fiscal year 1991 a data

administration unit within the Bureau for Management's IRM office.[2] Although the office developed Data Administration Standards and Procedures, no process was established to ensure the standards were followed. Data entities were entered into the corporate data model without being reviewed--there was no requirement to compare entities to the agency's data standards or even other entities in the data model.

A standard industry practice is to establish a control function to reconcile data entities as they are developed by various functional areas to ensure that data is defined consistently across the agency. One of the reasons that such a quality control function was not established was that the Data Administration staff was regularly assigned to conduct Business Area analysis and therefore not available to manage the data model.

The Office of Management and Budget addressed the importance of data stewardship in its August 1994 Federal Financial Management Status Report:

> *At the agency level, effective stewardship requires compliance with department-wide information architecture standards... Agencies need to establish department-wide information architecture standards and financial data classification standards to resolve the issue of redundant, inconsistent and inaccurate data.*

Although USAID has developed data standards, it has not implemented the quality controls to ensure that they are met.

2. Improper Organizational Placement of Development Coordination Function

In addition to the lack of quality control over data standards, there were also organizational problems which prevent a strong development coordination function.

According to a USAID official, the development coordination function does not rest with the Assistant Administrator for Management (AA/M) or a high-level committee chaired by the AA/M. Instead, the function lies within IRM, a subordinate organizational unit. This creates an organizational problem because IRM does not have direct control over the systems development for all the business areas within the agency. Particularly noteworthy is the fact

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[2]GAO/IMTEC-92-64; "Information Resources Management: Initial Steps Taken But More Improvements Needed in AID's IRM Program"; page 41.

that IRM has no control over the development of systems for Core Accounting--by far the largest business area which is located within the Bureau for Management's Office of Financial Management.

IRM's lack of authority and responsibility for some of the business areas has contributed to the problem of ineffective development coordination. GAO recognized the potential for this problem and warned of the consequences in its September 1992 report:

> *Development and dissemination of data administration policies and standards will not guarantee agencywide usefulness. Due to its organization placement, the data administration office may still have a problem implementing guidelines agency-wide. Instituted as a small unit within the IRM office, the data administration office does not have the authority to provide the necessary cross-functional direction to and influence over the rest of USAID. The office is at too low a level in the IRM structure and has no mechanism for obtaining agency-wide user commitment or enforcing compliance to its guidelines.*

Conclusion

Although USAID's ISP recognized the need for data compatibility, effective quality control and development coordination functions did not exist at the time of our audit to ensure that this compatibility would be realized. If USAID proceeds with the development of individual systems without consolidating the data model and following IRM data standards, the Agency will have the same problems with systems in the future that we have now:

- Maintenance costs will be high.
- Stovepipe systems will not talk to each other.
- Large amounts of time and money will be spent collating and reconciling data from divergent systems.
- The Agency will be unable to provide complete, accurate and timely management reports on USAID's operations required by the CFO Act and the GPRA.

A solid Agency-wide data model, based on common data standards, is the single most critical requirement to build integrated information systems. The Agency has made a major investment in the ISP. Unless the problems identified in this report are addressed, much of the investment made over

the last five years developing a rational approach to systems development will be lost and continued development will require substantial costs to retrofit systems developed outside of the data model.

To ensure these common data standards are met, the quality control processes need to be strengthened. Further, a high-level development coordination mechanism, such as a committee chaired by the AA/M, is needed to resolve technical questions and organizational conflicts that arise during the development of integrated systems.

Recommendation No. 1: We recommend that the Assistant Administrator, Bureau for Management:

1.1 Establish a quality control process to ensure that systems development projects under the Information Systems Plan comply with data standards; and

1.2 Establish a high-level development coordination mechanism to make decisions on unresolved technical questions.

Management Comments and Our Evaluation

In commenting on our draft report, the Bureau stated that they took several positive actions to address recommendations related to our assessment of the data model as it existed at the time of our audit.

Regarding Recommendation No. 1.1, Bureau management stated that they have implemented three processes: (1) conduct quality assurance reviews of BAA data models; (2) develop a corporate encyclopedia management plan; and (3) conduct cross project integration meetings. However, these processes do not implement a quality control process to ensure that systems development projects under the Information Systems Plan meet data standards. Therefore, Recommendation No. 1.1 is unresolved. When we receive supporting documentation from the Bureau that it is taking the necessary action to ensure that systems development projects under the Information Systems Plan comply with data standards, we will resolve and/or close this recommendation.

Regarding Recommendation No. 1.2, Bureau management stated that they have a high-level development coordination mechanism to make decisions on unresolved technical issues. Based on this information, we consider Recommendation No. 1.2 to be resolved. We will close this recommendation when we receive supporting documentation outlining the responsibilities of the coordinating mechanism.

Appendix II contains management's complete comments.

SCOPE AND METHODOLOGY

Scope

The Office of Programs and Systems Audits audited the integration of USAID's information systems in accordance with generally accepted government auditing standards. Performed during the period from May 23, 1994, through October 7, 1994, at USAID/Washington, the audit reviewed the entities contained in the agency data model as of May 25, 1994. From a universe of 727 entities we selected a statistical sample and projected the error rate to the universe. If the error rate was significant, we also evaluated the cause and made appropriate recommendations.

Methodology

After consulting with Information Resources Management officials in Washington, D.C., we identified the most current Agency data model. We also discussed with the IRM officials four important features of a stable data model:

- Proper definition
- Proper Naming
- No overlap or conflict
- Unique attributes

We selected a statistical sample of the entities in the data model that would provide a confidence level of 90% and a precision level of plus or minus 4% with an expected error rate of 5%.

For each entity reviewed, we determined whether the four features met the criteria set forth in the Data Administration Standards and Procedures document. Based on the results of these determinations, we calculated error rates for each entity and assessed whether the error rate was significant. An error rate of 5% or greater was considered significant. We statistically projected the number of errors in the Agency data model. These projections indicate the total number of errors estimated for each of the four features used to errors found in the statistical sample.

MANAGEMENT COMMENTS TO DRAFT AUDIT REPORT

ATTACHMENT

Comments on the IG Audit Report

Integration of USAID
Information Systems

M/IRM Data Administration Group appreciates this opportunity to comment on the Audit Report and specifically those sections that pertain to our data modeling activities. The audit was performed in May of 1994 and presents an assessment of the data model as it existed at that time.

Recommendation 1.1. Quality Control Process

The data model that you audited represented a consolidation of initial models from the four BAs and legacy system data models. The inclusion of legacy data was for analysis purposes only. The audited model was a starter model and was not intended to be a representation of the agency-wide data model at that time.

The agency-wide data model brings together BAA models and a proven modeling technique known as Subject Areas. The Subject Area approach made it possible to bring the AWACS data model (whose data modeling efforts started earlier than the agency ISP system project) into agreement with the other on-going BAs and their data models. This was accomplished by standardizing the data that was common to the four BAs and organizing it into Subject Areas that could be shared by the individual BAs. Subject Areas eliminate redundant data and duplication of effort in collecting and storing the data. Subject Areas also facilitate the development of the strategic enterprise-level model while at the same time provide immediate improvement to the individual BAA project-level models.

Several key processes have been implemented since the IG audit. These activities address your audit findings concerning the quality control process and reflect positive efforts to develop integrated agency-wide systems. These processes include:

1. Quality Assurance (QA) Reviews of BAA Data Models
A quality assurance process has been established to review the BAA data models. This process includes a review against established standards, the disposition of findings with the BA, and subsequent review of model corrections. These reviews are performed on stable BAA data models. Established standards have been structured to focus on integration and data normalization. These QA reviews are a prerequisite for migration of the BAA data models to the agency-wide data model.

2. Corporate Encyclopedia Management Plan
The encyclopedia management function, within Data Administration, has been defined and documented in the Corporate Encyclopedia Management Plan. The document establishes processes and conventions that support the development of quality data models.

3. Cross Project Integration Meetings (Subject Areas)
Weekly cross project meetings have been established to address key integration areas. Participation by all BAs has brought about consensus on several integration areas. These integration areas are modeled and migrated to project-level and stategic enterprise-level data models.

Recommendation 1.2 High-level Development Coordination Mechanism

A high-level development coordination mechanism exists to make decisions on unresolved technical issues. Development coordination issues are first worked through the business area project managers. Unresolved issues are escalated to the Assistant Administrator for Management (AA/M) who chairs the Executive Sponsors Committee. This committee ultimately resolves all ISP systems development conflicts.

DATA MODEL AND STANDARDS REVIEWED

DATA STANDARDS	UNIVERSE	NUMBER OF ENTITIES REVIEWED	NUMBER OF ENTITIES WITH ERRORS	PERCENTAGE OF ENTITIES WITH ERRORS	PROJECTED ERRORS IN UNIVERSE
#1 Proper Definition	727	73	47	64%	465
#2 Named Properly	727	73	51	70%	509
#3 No Overlap or Conflict	727	73	67	92%	669
#4 Unique Attributes	727	73	63	86%	625
All four tests	727	73	71	97%	705

#1 Proper Definition
Is the entity definition clear, concise, and unambiguous, including the relevance of the data and the relationship to other entities? Does it answer the question WHAT?

#2 Named Properly
Does the name accurately reflect a definition of the full description using nouns (not verbs)? Do entities which define roles, values, or ranges have the word "type" as part of the name? Is there an entity definition?

#3 No Overlap or Conflict
Is the entity mutually exclusive in terms of its contents and purpose from all other entities?

#4 Unique Attributes
Does the entity have attributes different from all other entities?

USAID'S INFORMATION MANAGEMENT

This new USAID effort to establish a quality information system is described in the Agency's[3] Information Systems Plan (ISP). A primary goal of this plan is to have corporate data managed at the Agency level rather than "owned" by each individual office.

Using an information engineering methodology, models of the Agency's business processes and data requirements were created. These models were then broken into eight logical Business Areas. Each Business Area represents related functions within the Agency that share similar business processes and data needs. Each of these eight areas will be studied in depth, in a process called Business Area Analysis (BAA).

The Business Area Analysis (BAA) provides a greater level of detail on the functions in each area and provides a basis for designing system requirements. Each BAA (1) continues to model the data requirements and business functions, (2) includes this information in the Agency's electronic repository, and (3) reconciles the new models back to the Agency-wide models. This results in a high degree of standardization, stability, and reusability.

Currently five BAA's are being conducted—Core Accounting, Procurement, Operations, Human Resources, and Budgeting. The inter-dependencies of these five business areas are high and will require significant sharing of data. Therefore, to facilitate the systems development work, IRM is planning a data warehouse that will allow movement to a data-sharing environment.

Populating this data warehouse will begin with transferring MACS transaction level data into the warehouse. The Core Accounting BAA, which includes the AWACS project, needs a functioning warehouse to provide the most benefit to the Agency.

Smaller initiatives are underway to begin the transition to a corporate database. PIPE (Project Information and Pipeline Evaluation) currently brings in summary MACS and FACS data to provide project status and pipeline information to Agency managers. In order to make sound decisions, it is important that managers using such information know the quality of the data being used.

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[3]Information Systems Plan, Volume I: Report to Management, February 1993.