



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

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GENERAL GOVERNMENT
DIVISION

B-206422

OCTOBER 18, 1983

The Honorable William H. Webster
Director, Federal Bureau of
Investigation

Dear Judge Webster:

Subject: FBI Management Of Its Automated Information
Systems (GAO/GGD-84-24)

We have recently completed a study of 12 of the FBI's automated information systems. (See enc.) We found that the FBI had made considerable progress in correcting the management problems identified in a 1977 FBI-directed study of its information systems and that the systems were generally well managed. However, we did identify two areas where further improvements are needed:

- Independent quality assurance reviews of software¹ for two automated systems are needed to ensure that the software is accurate and efficient, adequately documented, and meets users' needs.
- Central coordination is needed during system development to standardize the data elements of several information systems that will use a data base management system.² Early standardization of data elements can save money and make the software more efficient.

We began our work because of the FBI's growing investment in automated information systems and increasing reliance on

¹Software is the programming material which directs the computer.

²A data base management system is a computer software package that facilitates the management and control of common information stored in a data base accessed by two or more systems. For example, an agent's grade level may be used by the payroll system to determine his salary and by a management system to assign the agent to a job.

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automated systems to support its operations. As of August 31, 1983, 12 automated information systems were in operation and another 4 systems were being developed. (See enc.) The fiscal year 1983 appropriation for these systems was \$51.9 million.

OBJECTIVES, SCOPE, AND METHODOLOGY

We examined 12 of the 16 FBI automated information systems--3 of which were in the development stage. These systems supported both administrative operations and investigations. We did not examine the other four systems because (1) the Automated Identification Division System had previously been evaluated by our agency,³ (2) the Intelligence Information and Scientific Management Information and Research Systems contain sensitive data or scientific and technical data for use only by the FBI, and (3) the Computer Assisted Communication Network is primarily a communication system not directly related to this review of information systems. In conducting our review, we

- evaluated the adequacy of planning for automated information systems;
- ascertained the measures taken by the FBI to ensure that systems are accurate, efficient, adequately documented,⁴ and meet users needs;
- evaluated the approaches used to develop and implement information systems;
- assessed the FBI's development of systems that will use a data base management system; and
- assessed how and why information is obtained and how the systems' information is used.

We interviewed officials with computer-related responsibilities in the Technical Services Division and other headquarters divisions. We reviewed files in headquarters which included systems' descriptions and instruction manuals. We also visited the Washington field office to obtain general information on how automated systems were used in a field office and the Richmond field office to examine the testing of the Field Office Information Management System.

³The FBI Has Improved Its Fingerprint Identification Service
(GAO/GGD-83-78, Aug. 19, 1983).

⁴To adequately document a system means to provide enough descriptive material so that someone unfamiliar with the system can understand its technical details.

Our review was performed from May through August 1983 and was conducted in accordance with generally accepted government auditing standards.

THE FBI HAD MADE PROGRESS IN IMPROVING ITS AUTOMATED INFORMATION SYSTEMS

A 1977 management study of the FBI's information systems made several recommendations to improve the systems. The Technical Services Division of the FBI, which was formed shortly after the study was completed, had made substantial progress toward implementing these recommendations.

In October 1976, the Director, FBI, instructed an audit and review team to assess computer-related activities within the FBI. The team was composed of senior data processing professionals from outside the FBI who were assisted by several FBI agents. The team's February 1977 report, "Audit and Review of Data Processing Systems, Projects and Activities," cited several management problems including a lack of long-range plans for developing and implementing automated information systems and a lack of a structured approach for project management.

The Technical Services Division was formed in April 1977 and given the responsibility for managing most of the FBI's automated information systems. Its functions included long-range planning; system development, implementation, and maintenance; and quality assurance. At the time of our fieldwork, the Division had developed long-range plans for each automated information system as the 1977 report recommended. The plans were comprehensive, including milestone dates for systems development and implementation and detailed cost/benefit analyses for proposed systems. In addition, the individual system plans were integrated into an overall long range plan for all FBI automation efforts. The Division had also improved project management. As of August 31, 1983, each major system was managed by a permanent project manager using standardized procedures.

ADDITIONAL IMPROVEMENTS ARE NEEDED

The FBI needs to further improve its management of automated information systems. The software for two of its systems had not been independently reviewed for quality (accuracy, efficiency, degree of documentation) or to determine whether it met user needs. In addition, the data elements of several systems under development as of August 31, 1983, were not being standardized to ensure compatibility among the systems that will be used with a data base management system called ADABAS. Some coordination of data elements had occurred among systems' managers, but a centralized effort to coordinate the standardization of data elements did not exist. A manager responsible

for central coordination was appointed in September 1983, following completion of our fieldwork.

The software for two systems
had not been independently reviewed
for quality assurance

Quality assurance reviews performed by individuals not involved in system development and implementation can provide greater assurance that software is accurate, efficient, well documented, and meets users' needs. Quality assurance reviews of the software developed for the Field Office Information Management System (FOIMS) and the Budget and Accounting System (BAS), part of the Resource Management System, were done by staff who were also involved in implementing these systems. The systems may eventually receive independent review under a recently issued Quality Assurance Plan. However, while the plan enhances the independent review process, FOIMS and BAS will not be included until some unspecified time.

The National Bureau of Standards establishes guidelines for developing and managing automated information systems for all federal agencies. It has published guidance for software quality assurance (Special Publication 500-11) which states that software should be formally reviewed by an independent technical group. A recent GAO report⁵ also noted the importance of independently reviewing a system's software. The report states that:

"Testing by persons independent of the developmental process. . .provides greater assurance that the [software is] accurate and complete.

"Without an independent test [there is]. . .little assurance that the [software is] free from error, and will produce reliable data."

The Systems Development Section of the Technical Services Division has overall responsibility for the development and implementation of most of the FBI's automated information systems. The project manager for each individual system was responsible for its development and implementation. For the most part, this section had been conducting independent quality assurance reviews of systems for which it was responsible. Several section officials, who did not work on a particular system's development process, reviewed the system's software

⁵Inadequate Internal Controls Affect Quality and Reliability of the Civil Service Retirement System's Annual Report (GAO/AFMD-83-3, Oct. 22, 1982).

when development was completed. FOIMS and BAS were not included in these reviews because they were being developed or managed outside the Systems Development Section.

FOIMS is a large and complex information system which provides automated administrative and investigative support for two FBI field offices and will eventually serve all 59 field offices. The estimated total cost of developing and implementing FOIMS through fiscal year 1984 is about \$50 million. Because of FOIMS' size and complexity, the Technical Services Division assigned FOIMS development to another section within the Division--the Office of Information Systems-Research and Development Section. This section normally evaluates automation proposals; FOIMS is the only system it is developing. Quality assurance reviews of FOIMS software were being conducted by the FOIMS project manager who told us independent review is also needed.

BAS also was being developed outside the Systems Development Section. BAS software was developed and implemented by the Financial Branch of the FBI's Administrative Services Division because the Systems Development Section could not respond in a timely manner to the Branch's request for the system. The system enables the Branch to obtain immediate feedback on expenditures and budget projections. It cost about \$0.3 million to develop during fiscal years 1978 through 1982. The Branch official who had overall responsibility for developing and implementing the system told us that he provided the only technical quality assurance review of the software. BAS will eventually be maintained by the Systems Development Section when it is integrated into the section's Resource Management System, which as of August 31, 1983, was being developed. A date has not been set for the integration.

The Systems Development Section's independent evaluation procedure was being enhanced with the implementation of a Quality Assurance Plan beginning in August 1983. Rather than quality assurance reviews only at the end of a system's development, the plan provides for the establishment of independent groups to review the quality of the Section's software at several stages in the development process and also establishes comprehensive standards for these reviews. Each review group will be comprised of the system's project manager and several automated systems experts who were not involved in developing the system. The reviews include testing the software for errors, determining if it is efficiently written, assessing the adequacy of documentation based on standards, and ensuring that the software meets users' needs.

The Quality Assurance Plan will not initially include FOIMS and BAS. A Technical Services Division official told us the plan initially will apply only to the Resource Management System

and to major enhancements to other systems managed by the Systems Development Section. The official said the review groups and standards need to be tested, and if found effective, will be implemented divisionwide at some unspecified future date.

Systems' data elements
need to be standardized

FBI efforts to standardize data elements of several information systems that will use a data base management system called ADABAS had been hampered by a lack of central coordination. A few project managers were coordinating their data needs in part, but little overall coordination existed. The position responsible for overall coordination and standardization of systems' data elements was vacant from January to September 1983. Standardized data elements are needed to achieve the full benefits of a shared data base and to make the data base management system efficient.

Technical Services Division officials told us that ADABAS will be used by about five major information systems which contain both administrative and investigative data. At the time of our fieldwork, two subsystems of one administrative system were using ADABAS. A time schedule had not been established for using ADABAS in the other systems. Division officials estimated that the total cost of ADABAS software through fiscal year 1984 would be about \$0.9 million.

Each of the five information systems was being developed independently to be used with ADABAS. The extent of coordination among the various project managers has been limited. While some of the managers worked closely with one another, none of the managers coordinated with all the other managers to assure that each system's data elements were compatible.

A guide for standardizing data elements in implementing a shared data base management system, such as ADABAS, is included in the National Bureau of Standards Federal Information Processing Standards (Publication 76). Standardized data can improve information retrieval and can facilitate updating and deleting information. For example, if FOIMS uses hyphens within an investigative case identification number and the Automated Records Management System uses blanks, both formats have to be requested in order to obtain all information on that case. Even if the user knew of both formats, the inefficiency of two queries defeats the purpose of a common data base. Similarly, data updates and deletions are completed with one transaction when synonymous data elements and data formats have been standardized.

The Federal Information Processing Standards also state that a central coordination group or individual should have the data standardization responsibility. This responsibility should include

- determining the data elements to be standardized;
- developing the standard name, definition, and format for common data elements; and
- resolving conflicts among users during the standardization process.

Prior to our review, the Technical Services Division had established the position of Data Administrator. The Data Administrator began some efforts to coordinate and standardize data elements among the various systems. However, the individual in this position left the FBI in January 1983. The position was vacant during our fieldwork and coordination of data elements was left to individual project managers. A Division official told us that this position was filled in September 1983.

Data standardization tools such as a data dictionary or data tables also had not been developed for the common use of system developers of all the systems that will use ADABAS. A data dictionary usually contains the standard names and descriptions of each element stored in the common data base. Data tables are combinations of related data elements such as accounting codes, states, or salaries which make it easier to access and use data which has been compiled from several information systems.

Division officials agreed that the software being developed for the systems that will use ADABAS will contain data elements that are not compatible among systems. However, they disagreed about the effect of these differences. One official told us that the Design Review Board, which reviews all data base management system software, will identify the differences during its reviews. The software will then be modified so that all data elements are compatible. The official said that while the software for the two subsystems using ADABAS was reviewed only after it was developed, software for the additional systems that will use ADABAS will be reviewed during development. Another official told us that the Design Review Board examines not only software, but also all aspects of system development, and it would be difficult for the Board to identify every data element that needs standardization.

If the Board does not standardize all data elements before implementation, unnecessary costs could result. The National Bureau of Standard's Special Publication 500-75 states that

while all data modifications are costly, the later in the development process the modifications are made, the greater the cost. In addition, as discussed previously, standardized data elements can make the use of a common data base more efficient.

CONCLUSIONS

Development and implementation of automated information systems to support FBI administrative and investigative operations were generally well managed. However, independent quality assurance reviews are necessary to fully ensure the integrity of FOIMS and BAS software. Filling the Data Administrator position should provide the central coordination needed to standardize the data elements of systems that will use ADABAS and thus improve software efficiency and minimize the need for costly modifications.

RECOMMENDATION

We recommend that you make independent quality assurance reviews of FOIMS and BAS software as provided for other systems in the Quality Assurance Plan.

AGENCY COMMENTS

FBI officials concurred with the findings in this report and have agreed to take the action recommended.

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This report contains the above recommendation to you. As you know, 31 U.S.C. §720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report. Copies of this report will be provided to those Committees.

We appreciate the cooperation given our representatives during this review and welcome the opportunity to discuss these matters with you and your staff.

Sincerely yours,

A handwritten signature in black ink, appearing to read "W. J. Anderson". The signature is written in a cursive style with a large initial "W".

William J. Anderson
Director

Enclosure

FBI AUTOMATED INFORMATION SYSTEMS

<u>Title</u>	<u>Acronym</u>	<u>Reviewed by GAO</u>
<u>Systems in operation:</u>		
Automated Identification Division System	AIDS	No
Automated Records Management System	ARMS	Yes
Field Office Information Management System	FOIMS	Yes
Field Office Specials and Computerized Telephone Number File	- CTNF	Yes
Intelligence Information System	IIS	No
Investigative Support Information System	ISIS	Yes
Microcomputer systems	-	Yes
National Crime Information Center/Computerized Criminal History	NCIC/ CCH	Yes
Organized Crime Information System	OCIS	Yes
Resource Management System	RMS	Yes
Scientific Management Information and Research System	SMIRS	No
Uniform Crime Reporting	UCR	Yes
<u>Systems in development:</u>		
Computer Assisted Analytical Support System	CAASS	Yes
Computer Assisted Communication Network	CACN	No
Decision Support System	DSS	Yes
Headquarters Office Automation	HQOA	Yes