United States General Accounting Office

GAO

Report to the Honorable Edward M. Kennedy and the Honorable James M. Jeffords, U.S. Senate

November 2001

STUDENT FINANCIAL AID

Use of Middleware for Systems Integration Holds Promise

G A O

Accountability ★ Integrity ★ Reliability

Contents

Abbreviations

COD	Common Origination and Disbursement
FDLP	William D. Ford Federal Direct Loan Program
FFELP	Federal Family Education Loan Program
HEA	Higher Education Act
IBM	International Business Machines Corporation
IT	information technology
NSLDS	National Student Loan Data System
PBO	performance-based organization
SFA	Office of Student Financial Assistance
XML	extensible markup language

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Accountability ★ Integrity ★ Reliability

United States General Accounting Office
Washington, D.C. 20548

November 30, 2001

The Honorable Edward M. Kennedy
The Honorable James M. Jeffords
United States Senate

Hand in hand with the rapid growth of the Internet is the need for both the
public and private sectors to provide citizens and customers with real-time
access to an increasing amount of data and services. To accomplish this in
its areas of responsibility, the Department of Education spent millions of
dollars over the past 10 years to modernize and integrate[1] its nonintegrated
financial aid systems in an effort to provide more information and greater
service to its customers—students, parents, schools, and lenders.
However, the department met with limited success. For example,
Education's first centralized grant and loan database on student financial
aid participants, the National Student Loan Data System (NSLDS),[2] which
was developed to help schools screen applicants for student aid eligibility,
often does not contain the most recent information from other financial aid
systems.

Recently, Education's Office of Student Financial Assistance (SFA) initiated
a new approach to database integration, utilizing a software approach
commonly referred to as middleware,[3] to provide users with a more
complete and integrated view of information contained in its multiple
databases. As such, you requested that we provide information on the use
of this technology, and the viability of SFA's approach in using it to
integrate student financial aid information. Appendix I describes our
objectives, scope, and methodology in more detail.

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[1]Information *integration* is defined by the National Institute of Standards and Technology as
the establishment of the appropriate computer hardware/software, methodology, and
organizational environment to provide a unified and shared information management
capability for a complex business enterprise.

[2]NSLDS is a 1.5 billion-record database with information on 93 million loans and over 15
million Pell Grants.

[3]A type of software that permits two or more incompatible applications to exchange
information from different databases.

Results in Brief

Middleware technology has been used successfully by many organizations to provide integration solutions and effectively share data across nonintegrated information systems and databases. Banks, for example, use middleware extensively in dealing with the different systems and databases that accompany frequent mergers.

In selecting middleware, SFA has adopted a viable, industry-accepted means for integrating and utilizing its existing data on student loans and grants. SFA's implementation of its use of middleware remains in its early stages; work has thus far focused on making initial technical modifications to five[4] existing systems so they will be able to interact with the new SFA middleware. If implemented and managed properly, this new technology should help ameliorate some of SFA's longstanding database integration problems—problems that have contributed to slow and inconvenient loan servicing and internal control weaknesses. The first use of the common record using middleware technology is scheduled for next March.

SFA, like other organizations, has recognized the importance of having in place personnel with the right experience and skills to implement its middleware integration strategy. To meet its human capital needs, SFA has solicited the help of a private-sector "modernization partner" with experience in implementing and managing middleware solutions—particularly in the financial industry—and has also chosen to use a leading middleware software product.

In commenting on a draft of this report, the Deputy Secretary of Education sought clarification on whether our analysis addressed the full range of issues that we have raised in the past regarding SFA's systems integration problems, and their relationship to the department's inclusion on our high-risk list. We clarified that the scope of our review was specifically focused on SFA's middleware strategy.

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[4]These include four of the 11 major systems and one new system, bTrade, which manages SFA's electronic business processes. In addition, according to SFA management, up to nine newer SFA systems will be modified to use middleware technology by December 2001, and other systems will not be modified as they are scheduled for retirement.

Background

SFA manages and administers student financial assistance programs authorized under title IV of the Higher Education Act of 1965, as amended (HEA). These postsecondary programs include the William D. Ford Federal Direct Loan Program (FDLP--often referred to as the "Direct Loan"), the Federal Family Education Loan Program (FFELP--often referred to as the "Guaranteed Loan"), the Federal Pell Grant Program, and campus-based programs.[5] Annually, these programs together provide about $50 billion in student aid to approximately 8 million students and their families. As a consequence, the student financial aid data exchange environment is large and complex. It includes about 5,300 schools authorized to participate in the title IV program, 4,100 lenders, 36 guaranty agencies,[6] as well as other federal agencies. Currently, SFA oversees or directly manages approximately $220 billion in outstanding loans representing about 100 million borrowers. Figure 1 provides an overview of this environment.

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[5]Campus-based programs, which include the Federal Work-Study Program, the Federal Perkins Loan Program, and the Federal Supplemental Educational Opportunity Grant Program, are administered jointly by SFA and postsecondary educational institutions.

[6]State and private nonprofit guaranty agencies act as agents of the federal government, providing a variety of services, including payment of defaulted loans, collection of some defaulted loans, default-avoidance activities, and counseling to schools and students.

Figure 1: Student Financial Aid Data Exchange Environment
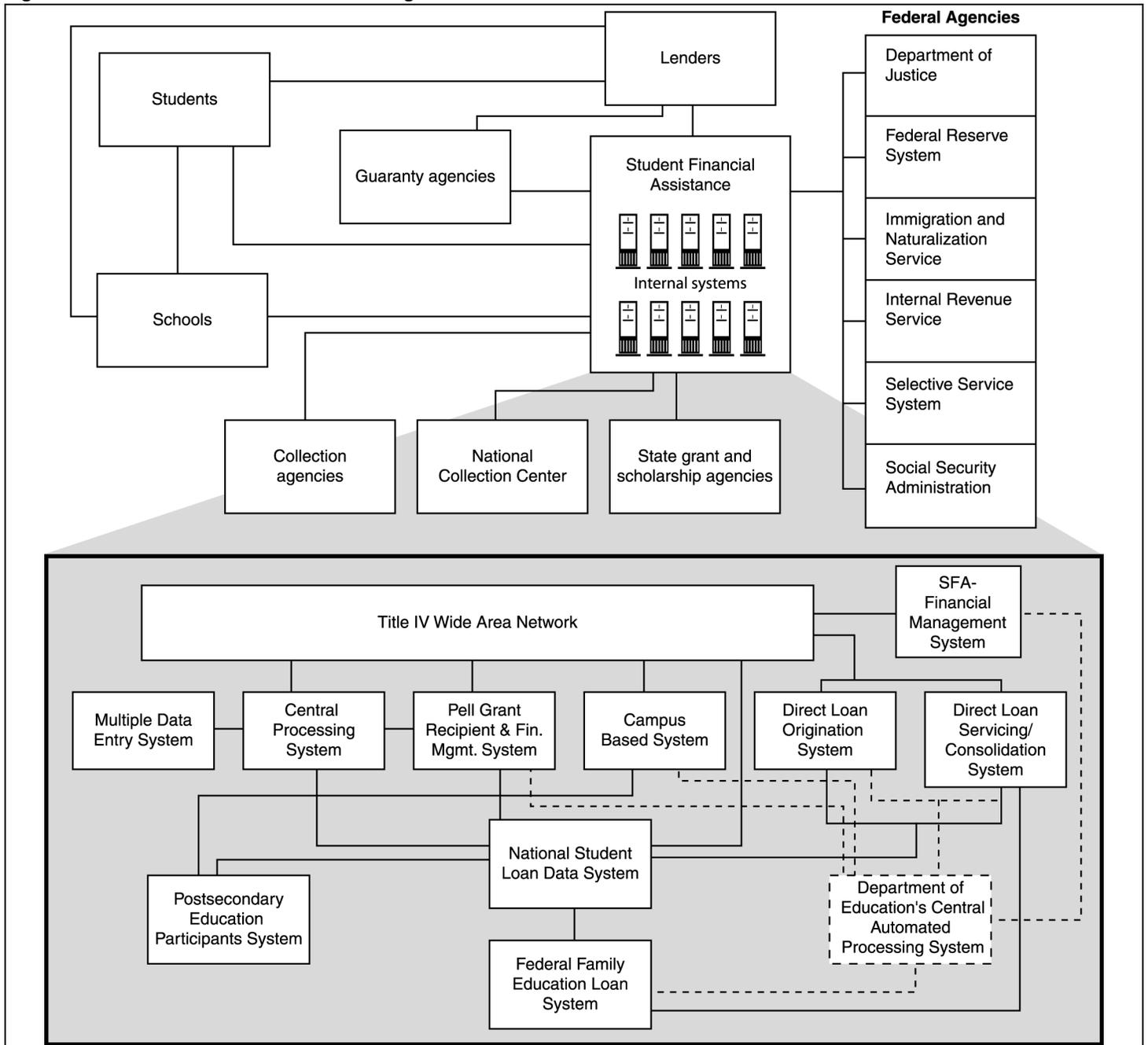
Source: GAO representation based on data supplied by SFA.

During the past three decades, the Department of Education has created many nonintegrated information systems to support its growing number of student financial aid programs. In many cases, these systems—maintained and operated by a host of different contractors, on multiple platforms[7]—are unable to easily exchange timely, accurate, and useful information needed to ensure the proper management and oversight of various student aid programs. Table 1 lists SFA's current inventory of major systems.

Table 1: Major SFA Systems

System	Purpose
Campus Based System	Supports the campus-based student financial aid programs, including the collection and editing of data, allocation and distribution of funds, and the update and maintenance of school-related data.
Central Processing System	Used in determining students' eligibility and award levels and passing the information on to students, parents, and schools.
Direct Loan Origination System	Used to originate Direct Loans and Direct Consolidation Loans.
Direct Loan Servicing/ Consolidation Systems	Supports loan servicing (i.e., handles billings and repayments, and assists with customer service) and is used to consolidate existing multiple student loans, held by an individual borrower, into a single loan for repayment purposes.
Federal Family Education Loan System	Used to pay interest and claims on defaulted loans to lenders and supports collection activity on student loans in default.
SFA-Financial Management System	Provides a single, centralized system where all title IV transactions reside, interfaces with the department's General Ledger, and is used to make payments to guaranty agencies.
Multiple Data Entry System	Supports data entry for approximately 10 million applications for federal student aid each year.
National Student Loan Data System	Contains loan and grant-level information; used by schools to screen student aid applicants to identify borrowers who are in default, have reached statutory loan limits, or are otherwise ineligible to receive aid.
Postsecondary Education Participants System	Supports SFA program integrity by providing software development and supporting detailed information on all institutions participating in federal student aid programs, as well as other programs authorized under HEA.
Recipient and Financial Management System	Used to track Pell Grant awards and distribute and monitor grant funds to institutions and students.
Title IV Wide Area Network	Supports electronic telecommunications to link lenders, guaranty agencies, and schools with SFA's information and application processing systems.

Source: SFA.

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[7]The SFA systems environment includes a variety of operating systems and platforms (e.g., IBM OS/390 mainframe, Sun Solaris on Sparc, and Windows NT. SFA's networks use Transmission Control Protocol/Internet Protocol and Systems Network Architecture).

Beginning in 1992, title IV student financial aid systems integration was the subject of heightened congressional concern. The 1992 HEA amendments required the department to centralize data on student loan indebtedness by integrating databases containing student financial aid program information. In response to this mandate, in January 1993 Education awarded a 5-year, $39-million contract for development and maintenance of NSLDS. The system was to provide information on students across programmatic boundaries, yet problems persisted.

Since 1995, because of concerns over Education's vulnerabilities to losses due to fraud, waste, abuse, and mismanagement, student financial aid has been included on our high-risk list.[8] Studies had shown that Education had used inadequate management information systems containing unreliable data, and that inaccurate loan data were being loaded into NSLDS.

In 1997, 4 years after the initiation of the NSLDS contract, data inconsistencies and errors across systems, such as a student's enrollment status or the amount of loan indebtedness, continued to have a negative impact on the student's ability to receive aid. Education still lacked an accurate, integrated system for student financial aid data; the nonintegrated systems would sometimes provide conflicting information to the department's financial aid partners (schools, lenders, guaranty agencies).[9] The department had opted to establish NSLDS as a data repository rather than an integrated database; this meant that while the system could receive and store information from other title IV systems, the lack of uniformity in how the individual systems stored their information— no common student or institutional identifiers or data standards— complicated data-matching among systems. Hence, NSLDS could not be effectively updated (or update other systems) without expensive data conversion programs. As a result, data contained in other systems, operated by a variety of contractors, were often in conflict with data stored in NSLDS due to differences in the timing of updates among the multiple data providers.

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[8]*High-Risk Series: Student Financial Aid* (GAO/HR-95-10, February 1995); *High-Risk Program: Information on Selected High-Risk* Areas (GAO/HR-97-30, May 1997); High-*Risk Series: An Update (*GAO/HR-99-1, January 1999); and *High-Risk Series: An Update* (GAO-01-263, January 2001). The former Guaranteed Student Loan Program, now called the Federal Family Education Loan Program, was included in our original 1990 list; in 1995 we revised this designation to include all title IV student financial aid programs.

[9]See *Department of Education: Multiple, Nonintegrated Systems Hamper Management of Student Financial Aid Programs* (GAO/T-HEHS/AIMD-97-132, May 15, 1997).

As also reported in 1997, large amounts of redundant student financial aid data generated by schools, lenders, guaranty agencies, and several internal department systems, were being stored in standalone databases, thereby increasing the cost to administer the various title IV programs.[10] We concluded that these data exchange and storage problems, as well as other program operation and monitoring difficulties, were partly related to the lack of a fully functional integrated database covering all title IV student financial aid programs.

In 1998, in part to address these and other longstanding management weaknesses, Congress amended HEA and established SFA as the federal government's first performance-based organization (PBO). Under the PBO concept, SFA is a discrete organizational unit within the Department of Education, and focuses solely on programmatic—rather than policy— issues, which remain the responsibility of the Secretary of Education. Thus, upon being designated a PBO, SFA was expected to shift from a focus on adherence to required processes to a focus on customers and program results. Moreover, in establishing SFA as a PBO, Congress gave SFA specific personnel hiring authority, including the ability to appoint up to 25 technical and professional employees without regard to provisions governing appointments to the competitive service. Also in conjunction with its PBO status, SFA can seek waivers from governmentwide regulations, policies, and procedures (e.g., acquisition, human capital, and procurement). This flexibility is intended to give SFA greater freedom in achieving their performance goals while maintaining accountability for operational aspects of federal student aid programs.

In September 1999, under this PBO procurement authority, SFA hired Accenture (formerly Andersen Consulting) as its "modernization partner," to help it carry out its Modernization Blueprint.[11] Accenture's role is to provide leadership of critical planning activities essential to the success of SFA's modernization. As a result of these and other events between 1992 and 1999, the management structure of SFA's postsecondary education activities was completely reorganized. Under the partnership between the PBO and Accenture, a new systems integration strategy emerged, focusing on the use of middleware software technology to achieve database

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[10]GAO/T-HEHS/AIMD-97-132, May 15, 1997.

[11]The modernization plan that describes the business requirements, business and technical architecture, and sequencing plan that SFA will use to transform the title IV student financial aid systems using technology.

integration and improve access to and use of SFA's information. Table 2 lists key events and milestones during the past decade affecting Education's student financial assistance programs and the systems that support them.

Table 2: Key Milestone Dates, 1992-1999

Date	Milestone
July 1992	HEA amendments enacted requiring the Department of Education to centralize data on student loan indebtedness by integrating databases.
January 1993	Education awards a contract for development and maintenance of NSLDS to integrate student financial aid databases.
February 1995	Student financial aid added to our list of high-risk programs.
July 1997	We report that Education still does not have accurate, integrated SFA systems or databases.
October 1998	HEA amendments establish SFA as a PBO.
October 1998	SFA appoints chief operating officer.
September 1999	SFA chooses a modernization partner to provide expertise for information technology needs.

Source: SFA.

Middleware Technology Used Successfully in Industry

Hundreds of organizations around the world have found successful technology integration solutions through the use of middleware, sharing data across different information systems and databases. Middleware is a type of software that enables programs and databases located on different systems to work together as if they all resided in a single database. Often organizations use middleware together with Web-based applications to present users with an integrated view of relevant data over the Internet, without having to develop new systems or database software. The middleware acts as an intermediary that mines data from existing databases and performs any necessary data transformation so that the existing information can be quickly compiled and presented to the user. For instance, middleware is used heavily in the banking industry, particularly for those institutions involved in numerous mergers and acquisitions, as it allows both banks to keep their existing systems, programs, and databases essentially unchanged, while providing users such as branch personnel with a composite view of both customer databases.

We contacted three major financial institutions that use the same middleware product adopted by SFA: IBM's MQSeries. According to these companies, as with SFA, the driving force behind the acquisition of the middleware technology was multiple, incompatible platforms. Overall, banking industry information technology officials with whom we spoke were pleased with the technical capabilities of middleware, but said that the major issue in successfully implementing and maintaining a middleware-based systems environment was retaining skilled employees—whether in-house or via an external contract.

According to SFA's chief operating officer, by using the banking industry as a benchmark for establishing the viability of the middleware approach, SFA was better able to identify the strengths and weaknesses of that approach. He saw the banking industry as analogous to SFA in that it had to successfully address systems interoperability problems and provide users with an integrated data view following mergers. Similarly, we previously noted a gap between the services available to bank customers, and those available to students and their families—such as the ability to view complete account data and make account changes worldwide, across systems, through automated teller machines.[12]

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[12]GAO/AIMD-97-122, July 29, 1997.

Middleware Implementation at SFA Is in Early Stages; Choice Appears Viable

SFA's initiative is in its early stages, and as of July 1, 2001, SFA had made the initial system modifications necessary to use the middleware technology on five systems. In addition, SFA's contract programmers have been developing software using extensible markup language (XML)[13]—now becoming an industry standard—that will eventually standardize student grant and loan origination and disbursement requests into a single common record format for all aid programs. Moreover, the enterprise application integration architecture plans and documents are in place that are conducive to the IBM MQSeries middleware product line being used to facilitate data integration across SFA's different computing platforms.[14]

The first use of middleware and XML together for loan originations and disbursements is expected in March 2002, when a single process for delivering Direct Loan and Pell Grant aid to students, called Common Origination and Disbursement (COD), is scheduled for implementation in time for the 2002-2003 school year. In March, SFA plans to provide at least 50 schools that participated in testing using COD with the option of submitting data via its new common record format for Direct Loans and Pell Grants.

The COD is designed to provide a consistent process—via the common record—for requesting, reporting, and reconciling Pell Grants and Direct Loans. Now, schools must enter, submit, and reconcile data separately for each program, data including name, address, and other pertinent information for the same student in different formats—a redundant process that can be quite time-consuming.

For the 5,000+ schools authorized to participate in the title IV program, but do not yet utilize the new approach, SFA's middleware is designed to permit submission and receipt of both aid program records in their current record formats, using the existing transmission process. The software contains rules that are used to convert incoming school records into the new

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[13]XML is a meta-markup language that provides a format for describing structured data. XML is designed to enable the exchange of information (data) between different applications and data sources on the World Wide Web and has been standardized by the World Wide Web Consortium, an organization that develops common protocols to promote the evolution and interoperability of the Web.

[14]The Enterprise Application Integration Architecture, Detailed Design Document (October 13, 2000) and the Modernization Blueprint explain the IT architecture that SFA is using to plan and build its middleware strategy.

common record format and outgoing records back to the schools in their current record format. Thus, if SFA's middleware approach is operationally successful, it will allow schools to use either method; those schools that do not use the new common record format could migrate to the common record on timetables that are more feasible for their individual circumstances. Figure 2 illustrates the first planned implementation of COD for Direct Loan and Pell Grant originations and disbursements using either the common record format or middleware.

Figure 2: COD Implementation Using Middleware
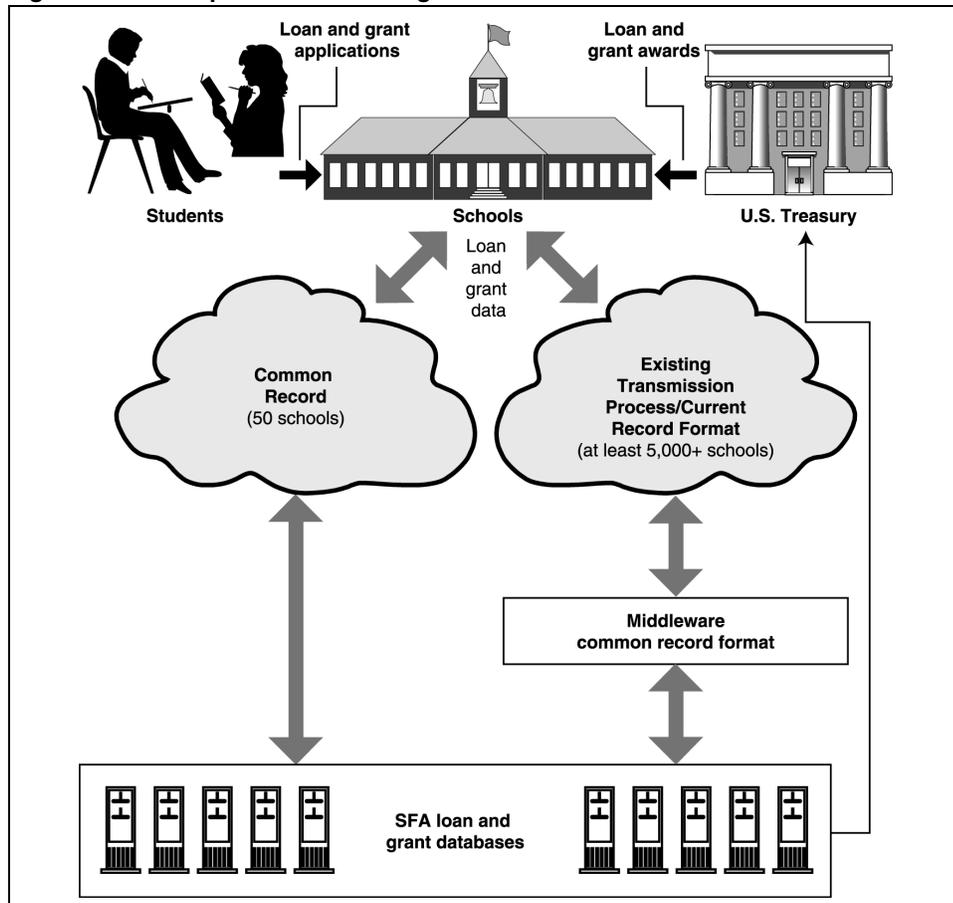
Source: GAO representation based on data supplied by SFA.

According to the Modernization Blueprint, COD will ultimately provide the 5,300 schools that participate in the title IV student financial aid programs

with a single process for all aid origination and disbursement. This is expected to create a system that facilitates close to real-time sharing of data across all of SFA's partners, and establish a platform that supports integrated technical and functional customer service for schools across all programs. SFA's Modernization Blueprint also outlines key projects that are scheduled for implementation over the course of several years. Table 3 lists some of them.

Table 3: Key Title IV IT Modernization Events

Date	Event
March 2001	COD design complete.
July 2001	Testing completed on five SFA systems to enable transfer of data through middleware.
March 2002	At least 50 schools scheduled to begin submitting Pell Grant and Direct Loan originations using middleware-created COD common record format.
April 2002—October 2004	SFA modernization continues, e.g., COD initiative, electronic commerce initiative, and additional SFA systems retired.

Source: SFA.

In adopting this approach to better integration and utilization of its existing data on student loans and grants, SFA may be able to address, at least in part, long-standing database integration problems. Such problems have contributed to slow and inconvenient loan servicing and management, as well as weak internal controls.
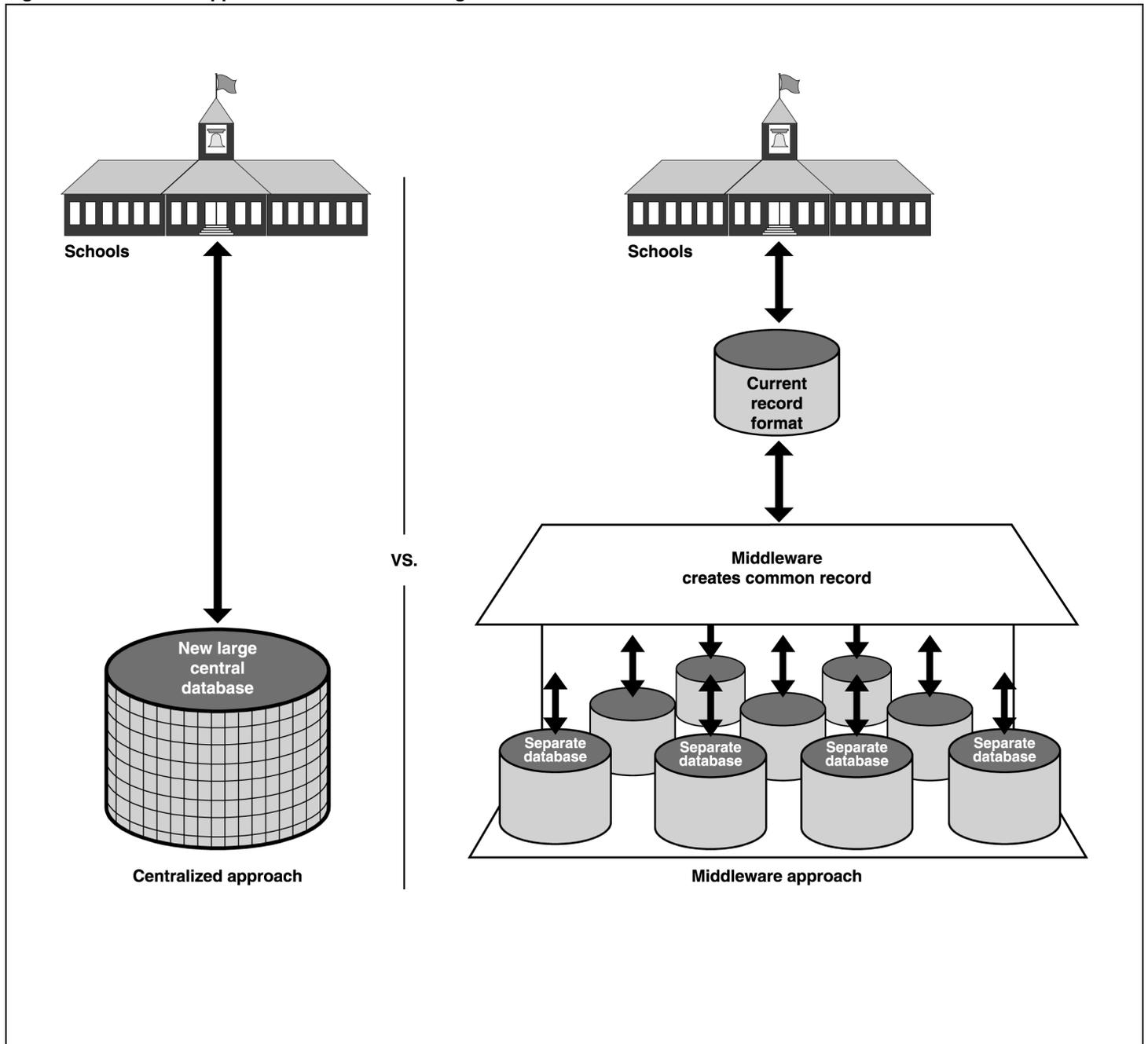
SFA fully expects that this solution will provide improved customer service by permitting its eleven major systems to operate more cohesively in the near future and help reduce the total number of needed systems over the long term. Some of the problems SFA hopes to eliminate include improving the cumbersome process for gaining access to the various SFA system databases. This process sometimes requires users, such as an educational institution's financial aid or accounting staff, to continually log in and out of different systems for related aid information on students for each program. These individuals must sometimes use a different school identifier and password to gain access to student information for each SFA program, and often do not have the ability to retrieve necessary information when they do gain access. As we noted in 1995, this internal control problem of not having access to current, accurate information sometimes led to loans and grants being improperly awarded.[15] SFA expects that its middleware product will enable entities to gradually upgrade or migrate to new systems and databases while maintaining a consistent view for the user. That is, middleware can enable SFA to realize short-term, user-level integration, while enabling it to gradually improve its older systems over time.

In short, by adopting a middleware-based strategy, SFA expects that it can continue operating some of its existing systems, applications, and databases, but in a more homogeneous fashion. Moreover, according to SFA's chief operating officer, the alternative of developing a new, large, central database or student financial aid system was less suitable because of the cost and time involved in database redesign and data format conversion. Further, he expects middleware to be part of SFA's long-term solution for integrating databases under its Modernization Blueprint and, through 2004, allow the eventual retirement of several existing systems. Finally, he expects this approach to allow SFA to be more responsive to customer needs. Figure 3 shows how the two alternative approaches differ in providing data to users.

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[15]Student Financial Aid: Data Not Fully Utilized to Identify Inappropriately Awarded Loans and Grants (GAO/HEHS-95-89, July 11, 1995).

Figure 3: Alternative Approaches to Database Integration

Schools

Schools

Current record format

Middleware creates common record

VS.

New large central database

Separate database

Separate database

Separate database

Separate database

Centralized approach

Middleware approach

Source: GAO representation based on data supplied by SFA.

Successful Middleware Technology Implementation Requires Right People, Right Skills

The experiences of other organizations have demonstrated that critical skill shortages must continually be addressed when using middleware as an integration solution. According to middleware users, the technology requires experienced, highly skilled programmers, with a broad knowledge of the entire environment in order to maintain seamless data exchanges. Industry officials cite the lack of sufficient numbers of programmers with the needed technical skills. According to IBM representatives, extensive technical training is needed before an experienced programmer can become effective using its middleware product.

Banking officials confirm that finding people who are highly skilled in the use of this technology is difficult. For example, according to a senior official at a major bank, an experienced, certified middleware systems programmer can command over $100,000 annually, making retention of this type of talent challenging even for this bank in today's competitive information technology marketplace.[16]

SFA management recognizes that it will face the same inherent human capital issues as these organizations and has tried to address them by leveraging experiences from the banking industry and by acquiring contracted expertise. In addressing the human capital skills issue associated with successful middleware implementation, SFA will count on the help of its modernization partner, who has substantial experience in implementing middleware solutions in the banking industry and the use of the middleware product's vendor (IBM) as programmers.

According to officials of another federal agency using MQSeries, when they originally tried to develop similar capabilities in-house, they were later forced to switch to the commercial product because of technical difficulties in maintaining the system on their own. A MQSeries users group also exists; other federal agencies using the MQSeries include the Customs Service, the Department of Veterans Affairs, and the Air Force, from which SFA may be able to borrow knowledge and technical expertise.

Conclusion

As has been the case with several other organizations, a middleware integration strategy is likely a viable technology alternative for SFA in

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[16]According to IBM, this bank is the largest user of IBM's middleware product in the Northern Hemisphere.

addressing its long-standing systems integration problems. SFA recognizes the human capital issues that middleware presents, and is preparing to meet them. While early, if implemented properly, middleware appears to be a reasonable approach that could result in improved user-level systems integration, while enabling SFA to gradually retire many of its remaining systems over time.

Agency Comments and Our Evaluation

In commenting on our draft report, the Deputy Secretary sought clarification on whether our analysis of SFA's actions to use a middleware integration strategy addressed the full range of issues that we and the Education Inspector General had raised in past reports regarding SFA's systems integration problems and rationale for SFA's programs being included on our high-risk list. Specifically, he suggested that we clarify whether the middleware strategy adequately addressed our earlier concerns about SFA's lack of an architecture, the costs associated with maintaining nine or more separate information systems, and the need for a long-term integrated SFA database. Additionally, the Deputy Secretary wanted us to clarify whether the new strategy introduced any new problems related to costs, increased risk of system breakdown, or introduction of errors into the current systems environment.

While these are important issues, the focus of our review was to provide information on the use of the middleware technology and its viability as a means of integrating student financial aid information. As we note in the report, SFA's middleware integration work is still in development and is moving into very early stages of implementation. Although preliminary testing and pilot efforts involving the middleware data integration capability have been positive, the actual versus expected benefits will not be known or measured until planned projects and activities become operational. We have concluded that SFA's middleware strategy itself appears to be a reasonable technical approach for improving data integration.

The Deputy Secretary also asked whether we took into account several previous reports in which we stated that the department needed a sound systems architecture before embarking on systems integration. We note that SFA has devised an enterprise-wide systems architecture in response to our 1997 recommendation and that SFA provided us with requisite technical documents that explained the guiding architecture on which it is building its middleware strategy. However, the scope of our review did not

include an assessment of the adequacy of departmentwide architecture implementation and usage.

Finally, the Deputy Secretary raised several technical questions related to the report's graphics, terminology, and descriptions. We have clarified or modified these points where appropriate. Education's written comments, along with our responses, are reproduced in appendix II.

As we agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. We are sending copies of this report to the Secretary of Education, Education's Office of Student Financial Assistance's chief operating officer, the Director of the Office of Management and Budget, and appropriate congressional committees. Copies will also be available to other interested parties upon request. This report will be available on our Web site at www.gao.gov. If you or your offices have questions regarding this report, please call me at (202) 512-6257 or David B. Alston, Assistant Director, at (202) 512-6369. We can also be reached by e-mail at mcclured@gao.gov and alstond@gao.gov, respectively. Other individuals making key contributions to this report included Nabajyoti Barkakati, Michael P. Fruitman, and Glenn R. Nichols.
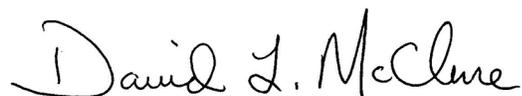
David L. McClure
Director, Information Technology
  Management Issues

Objectives, Scope, and Methodology

Our objectives were to provide information on the use of middleware technology, and to evaluate the viability of SFA's approach to using it to integrate student financial aid information. To achieve these objectives, we examined SFA documents, including the Modernization Blueprint and updates and information technology target architectures. We assessed how critical information technology integration issues are being addressed at SFA, including the merits and risks of the blueprint, and assessed agency documentation to determine whether SFA's systems environment lends itself to a technically feasible middleware solution. In addition, we analyzed several technical documents on the general function and use of middleware, and interviewed officials from SFA and Accenture, its modernization partner. We also interviewed officials from the Advisory Committee on Student Financial Assistance[1] to obtain their perspective on SFA's use of middleware.

Further, we spoke with officials from IBM, the developer of the middleware product (MQSeries) being implemented by SFA. We analyzed technical documents describing the operation of the MQSeries in general, as well as design documents addressing the implementation of this middleware product at SFA.

To independently document the success of this middleware product in the public and private sectors, we consulted with users from the U.S. Customs Service, Bank of America, Chase Manhattan Bank, and First Union Bank. We analyzed documents relating to the implementation of this middleware product in two of these organizations.

We performed this work at SFA headquarters and Accenture offices in Washington, D.C.; IBM's office in McLean, Virginia, the U.S. Customs Service office in Springfield, Virginia; and Bank of America offices in Charlotte, North Carolina. We also conducted telephone interviews with officials from Chase Manhattan Bank and First Union Bank. Our work was performed from February through August 2001, in accordance with generally accepted government auditing standards.

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[1]The Congress created the Advisory Committee on Student Financial Assistance when it enacted the HEA Amendments of 1986. The Advisory Committee serves as an independent public advisory committee to the Department of Education and the Congress.

GAO-02-7 Student Financial Aid

Comments From the Department of Education

UNITED STATES DEPARTMENT OF EDUCATION

THE DEPUTY SECRETARY

November 6, 2001

Mr. David L. McClure
Director
Information Technology
  Management Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. McClure:

Thank you for your letter to the Secretary transmitting the draft report, Student Financial Aid:
Revised Database-Integration Strategy Holds Promise.

On behalf of the Secretary, I am pleased to submit the enclosed comments on the draft report. If
you have any questions about these comments, please contact Jeff Andrade of my staff at 401-
1000.

Sincerely,

William D. Hansen

Enclosure

See comment 1.

See comment 2.

See comment 3.

Title/Scope	The title of the draft report, <u>Revised Database-Integration Strategy Holds Promise</u>, implies that GAO made a broader evaluation of the use of middleware than appears in the scope, objectives, and methodology section of the report. The Department believes that a title such as <u>Use of Middleware for System Integration Holds Promise</u> would be a more accurate description of the narrow scope of issues addressed. In the last report on SFA system integration released in 1997, <u>Student Financial Aid Information: Systems Architecture Needed to Improve Programs' Efficiency</u> (AIMD-97-122), GAO concluded that ED "will likely be unable to correct long-standing problems resulting from a lack of integration across its student financial aid systems until a sound systems architecture is established and effectively implemented. Further, unless this happens, problems and maintenance costs with its nine separate information systems will probably escalate, as will the likelihood of acquiring new stand-alone systems." In preparing that report, GAO "reviewed prior GAO, OIG, and Department of Education internal reports showing deficiencies in title IV programs and the need for an integrated title IV database." It is not clear from the draft whether GAO took these previous reports into account in preparing this report. Moreover, Secretary Paige is committed to getting SFA off GAO's High Risk List. According to the 2001 High Risk Report for ED (GAO-01-245), the SFA programs continue to be on the High Risk list "primarily because Education lacks the financial and management information needed to manage these programs effectively and the internal controls needed to maintain the integrity of their operations." That report also noted that "continued weaknesses in information systems controls increase the risk of disruption in services and make Education's loan data vulnerable to unauthorized access, inadvertent or deliberate misuse, fraudulent use, improper disclosure, or destruction." The Department believes the report should note the extent to which these issues may or may not still exist and to what extent they may or may not have been evaluated in preparing this report. Given these earlier findings and recommendations, and SFA's continued High Risk designation, it is not clear from the positive tone of the draft report whether GAO now believes that SFA's strategy for using middleware adequately addresses its earlier concerns about the cost and problems in maintaining nine or more separate information systems, whether there is still a long-term need for an integrated SFA database, or whether the adoption of the middleware strategy introduces any new issues related to costs, increased risk of breakdown, or introduction of errors into the current system environment.

See comment 4.

See comment 5.

See comment 6.

Location Reference	Comments
Opening Letter, Paragraph 1	**Need for integration and cost implications** The paragraph does not properly identify the purpose for integration of SFA data systems. Congress specifically charged the PBO with integrating the information systems supporting the Federal student financial assistance programs because of past failures to integrate systems and the cost implications of the lack of system integration. The House Report for the legislation creating the PBO (House Rpt. 105-481) noted "very limited progress in integrating the National Student Loan Data System (NSLDS) with its other data systems that support the delivery of federal student aid despite legislative mandates in the last two authorizations of the Higher Education Act." The bill report also mentioned the tripling of spending on student aid information systems from 1993 to 1998 and the fact that SFA had increased the number of system contracts that cannot share data with each other instead of consolidating its existing data systems as reasons for the PBO. The current draft incorrectly cites the goal of integration as providing "more information and greater service to customers." While these results are important consequences of system integration they are not the driving force. The Department's primary goals of integration are to reduce the Federal costs of redundant information systems, improve program monitoring and data quality assurance, as well as work with the participants in the Federal student aid programs toward an open, common, integrated delivery system for student financial assistance. With regard to NSLDS, the most pressing problem is not timeliness of the data but the redundancy and contradictory data found in SFA's systems. Not only is the data sometimes redundant, it is in different record formats with different "owners" and maintenance responsibilities. GAO identified this shortcoming in its 1997 report on NSLDS (AIMD-97-122) and testimony before the Senate Committee on Labor and Human Resources (T-HEHS/AIMD-97-132).

See comment 7.

See comment 8.

See comment 9.

See comment 10.

Opening Letter, Paragraph 2	**Middleware is an interim integration solution** The middleware solution currently being implemented as part of SFA's Modernization Blueprint is an interim solution. The middleware strategy is designed to address current redundancy concerns and challenges until the systems are actually rewritten, replaced, or retired. The paragraph should be revised to note this.
Opening Letter, Paragraph 2	**Scope of report addresses only viability of middleware technology and does not evaluate the entire integration approach or progress** The scope of the report appears to only address whether middleware technology is viable and technically feasible in SFA's system environment. It does not appear to address broader issues associated with the approach, such as additional risks and costs, contracting considerations, functionality, and the long-term vision for SFA's systems. It also does not evaluate SFA's progress in integrating its information systems. Recently, the Department's Inspector General (IG) has noted that SFA's current performance plan does not fully satisfy reporting requirements under the Government Performance and Results Act because it does not include a specific system integration goal. The IG has recommended that revised SFA performance plans include an objective, quantifiable, and measurable systems integration goal. The Department believes that the current draft of the GAO report could appear contradictory to the IG's recommendation regarding the need for measurable systems integration goals. This paragraph of the report should clearly note that GAO only evaluated the viability and technical feasibility of middleware for integration and did not evaluate costs, progress, alternatives, or a long-term integration strategy.
Page 2, Paragraph 2 Page 11, Paragraph 1 Page 13, Table 3	**Number of systems connected to middleware is now 10 not 5** The report states that five existing systems have received the initial technical modifications to be connected to the middleware. This was true in July. Currently, initial technical modifications have been completed for 10 systems -- CPS, PEPS, DLSS, NSLDS, b Trade, Websphere, eMPN/LOWeb, Imaging, FMS, and eCBS. An additional three to four modernized systems will be connected by December 2001. We suggest that Table 3 on page 13 be expanded to more fully reflect this schedule. The report should note that some legacy systems do not need to be connected to the middleware because modernization will soon retire

them. For example, COD will soon retire RFMS and DLOS. Thus, these systems do not need middleware connections. The data exchanges between these legacy systems with other systems will be replaced with modernized, middleware-based data exchanges with COD.

See comment 11.	Page 2, Paragraph 2 Page 4	**First Use of Middleware Technology will be in November 2001, not February 2002** The first use of SFA's middleware technology for a production system will be in November as part of the retirement of FARS. SFA's middleware technology will be used to connect DLSS with the new Credit Management Data Mart that is part of FARS retirement. (The main part of FARS retirement is the integration of its financial record-keeping functions into FMS).
See comment 12.	Page 2, Paragraph 2	**Changes to COD Delivery Schedule** The first release of COD will now occur in early March instead of late February. In several references, the report notes February 2002 as the implementation date. These references should now say March 2002.
See comment 13.	Page 4, Figure 1 Page 6, Table 1	**SFA's Central Data System was retired in November 2000** Figure 1 includes "Education's Central Automated Processing System." SFA retired this system (more commonly known as the Central Data System) in November 2000 as part of our modernization effort. It would be appropriate to include this system if GAO were depicting SFA systems before modernization began. If so, this should be noted more clearly in the report. If GAO intends to depict a more updated version of SFA systems, the chart should be dated, and CDS should not be shown. The table on page 6 also does not describe the "Central Automated Processing System." This table should be consistent with the SFA systems depicted in Figure 1.
See comment 14.	Page 8, Paragraph 2	**Establishment of the PBO** The 1998 law did not "charter SFA as a PBO." Rather, Congress established a PBO in 1998 in the Department as a discrete management unit in the Department of Education to manage the information and financial systems supporting the Federal student aid programs (i.e., administrative, accounting, and financial management functions) (sec. 141 of the HEA). Under the law, the PBO is subject to direction of the Secretary in the exercise of these functions and the Secretary maintains responsibility for policy and regulations for the Federal student financial assistance programs. The report should clarify these facts and note that Congress "established" a PBO rather than "chartering" or "designating"

See comment 15.

See comment 16.

See comment 17.

		the existing OSFA as such. It should also note that in implementing the statute the Clinton Administration applied the authority to the entire Office of Student Financial Assistance rather than simply to the units within that office performing the functions mentioned in the legislation. The draft report also fails to mention the goal in the legislation to "increase the accountability of the officials responsible for administering the operational aspects" of the Federal student aid programs. The Department believes that this goal should be included in lieu of the sentence, "Thus, upon being designated a PBO, SFA was expected to shift..." which is unsupported by the legislative history. The last sentence should also be modified to note that Congress provided program officials with greater flexibility in the law in exchange for greater accountability.
Page 9, Paragraph 1	**SFA's System Integration Strategy** The report states that "Under the direction of Accenture, a new systems integration strategy emerged ...." SFA's management played a significant role in deciding on this strategy. In addition, a middleware proof-of-concept pilot was conducted with Highway One using current systems in 1999. We suggest wording similar to "SFA management and Accenture put a new systems integration strategy into place ...."
Page 9, Table 2	**Milestone Modifications** The October 1998 reference should be revised to read "HEA Amendments establish a PBO which includes a goal to integrate SFA information systems." The appointment of a chief operating officer is not a relevant milestone and should be deleted, as should the selection of the modernization partner. The milestones should include the inclusion and refinement of the middleware concept in the Modernization Blueprint, as well as SFA's decision to adopt the IBM MQSeries as its middleware solution.

See comment 18.

See comment 19.

See comment 20.

See comment 21.

Page 10, Paragraph 2	**More than 3 Financial Institutions Use MQSeries** The first sentence in this paragraph could be read to imply that only three financial institutions use IBM's MQSeries – the major middleware product adopted by SFA. While GAO interviewed officials from three financial institutions, many other firms use IBM MQSeries. IBM claims that MQSeries has the largest market share among financial institutions. We suggest rewording this sentence to eliminate any potential for confusion.
Page 12, Figure 2	**Graphic Errors** The graphic incorrectly implies a direct data linkage with the U.S. Treasury that does not exist and incorrectly shows that students submit loan and grant applications to schools. Applications are submitted to a separate information system, and payments are disbursed through the ED payment system. The graphic should note that the disbursement records in the databases will be in the common record format, and that for the several thousand that will not be using the new format, the middleware will map the existing process and record format to the SFA systems.
Page 13, Paragraph 1	**Scope of COD** This paragraph incorrectly states that the Department envisions that all aid origination and disbursement will be made through the COD system. COD only combines the current Direct Loan and Pell Grant disbursement systems. It is important to note that the majority of student financial assistance funds are not disbursed through Federal systems; lenders in the FFEL program disburse funds directly to schools, as do state grant programs. Campus-based funds are awarded to institutions as an annual pool of funds for the institutions to disburse to individual students. While the COD has established a Common Record format, which can be used to record aid disbursements not made through the COD system, disbursements for the FFEL and state programs are not and will not be made through SFA systems.

See comment 22.

See comment 23.

See comment 24.

See comment 25.

Page 13, Paragraph 2	**Clarification** This paragraph should note the COD system integration is limited to Pell Grants and Direct Loans.
Page 14, Paragraph 1	**Improper payments** The paragraph implies that the internal control problems identified in GAO Report HEHS-95-89 were the result of school financial aid administrators having to continually log in and out of different systems for each aid programs. However, the scope of that report focused on the Department's use of data in its systems to ensure program integrity. If this paragraph is retained, it should note how middleware could be used to enable SFA staff to ensure that improper payments are not made.
Page 14 Paragraph 2	**Integration Alternatives and System Retirements** The paragraph seems to imply that the only integration alternatives are one large central database and maintaining several databases and using middleware. There is little discussion of the Department's goal to consolidate systems over the long-term and reduce the number of systems administered by SFA. While this consolidation may not result in a single large database, it is likely to result in far fewer databases than currently exist today. The report should include the number of databases envisioned in the Modernization Blueprint by 2004. Additionally, this paragraph as worded may be read by some to imply that system retirements will not occur until 2004. In fact, several retirements will occur much sooner. CDS was retired in 2000. CBS will be retired in 2001. FARS and FFEL will be retired, mostly through integration with FMS, in 2002. Retirement of RFMS and DLOS will begin with the implementation of COD in March 2002 and be completely retired by March 2003.

See comment 26.

See comment 27.

See comment 28.

Page 16, Paragraph 3	**Qualified People for Middleware Implementation**
	While the previous paragraphs note the importance and expense of experienced middleware programmers, it does not address how Accenture will provide the services of these highly skilled professionals to SFA going forward in the middleware implementation. The Department believes that the report should include a discussion of GAO's evaluation of Accenture's capacity to meet this need, given the lack of sufficient programmers with the needed technical skills cited in the first paragraph, and the high costs of meeting this need.
	It also is not clear from this paragraph if GAO believes that SFA has adequately addressed the human capital issues related to the extensive use of middleware and whether this needs to be addressed in the Department's workforce planning.
	Finally, the last sentence, which discusses customer support for the middleware product, seems irrelevant to this discussion. The Department recommends that it be dropped.

GAO Comments

1. We changed the report title to clarify that the scope of our review was focused on determining if SFA's middleware systems integration strategy was a viable approach.

2. Given the scope of our review, we believe the report adequately addresses this concern. In drafting our report, we took into consideration previous GAO, Education's Inspector General reports, and the department's internal reports, particularly those relating to Education's lack of a guiding enterprise architecture and the department's pressing need to integrate its student financial aid systems and databases. For instance, we have already credited the department with defining a departmentwide systems architecture in response to our 1997 report on this topic. Further, in reviewing SFA's middleware strategy, we confirmed that enterprise application integration architecture plans and documentation existed and was conducive to the IBM MQSeries middleware product line being used to facilitate data integration across SFA's current computing platforms. However, the scope of our work did not permit us to assess the adequacy of departmentwide architecture implementation and usage issues.

3. The commitment indicated by the Secretary and SFA to resolve longstanding problems mentioned in our previous reports can go a long way towards providing the catalyst to solve many of Education's data integrity problems. These problems have contributed to the inclusion of SFA's programs on GAO's high-risk list. However, neither the department's or SFA's efforts to address critical data quality and internal control issues related to its high-risk designation were included in the scope of this review. We do note, however, that SFA expects to reduce the number of total systems needed in the long-term in conjunction with its middleware implementation.

4. Past problems as well as rationale for better integrated program and financial data across SFA's existing databases are explained in the background section of our report rather than in this brief opening paragraph. As such, we made no changes to the report. While middleware provides a means for better user integration, sound business practices and disciplined internal management controls will be needed for any organization to achieve mission improvements and financial benefits from its information systems investments.

5. Our discussion of integration in this context is based upon SFA's most recently released Modernization Blueprint, which states that SFA's task is to create:

    " . . . *an integrated enterprise that meets our PBO goals of improved customer and employee satisfaction, and reduced unit costs. Part of that task is to modernize key systems and processes to create an enterprise that meets our customers needs. We can view some of these key processes and systems as major pieces of an overall integrated solution."*

    Given SFA's description of the goals they wish to achieve through integration, we did not modify our report.

6. We agree with the descriptions of the additional shortcomings of NSLDS, but timeliness of updates remains a major issue. The objective of our review also was not to review and critique the problems of NSLDS as we did previously, rather, to focus on looking forward and assessing middleware as a suitable technology solution in the future for integrating SFA's systems. Thus, we only provided one example of the negative consequences stemming from the lack of integration but provided numerous references to previous reports that describe these and other problems in greater detail. Accordingly, we did not modify our report.

7. SFA's Chief Operating Officer (COO) clearly considers the use of middleware part of a long-term systems integration solution. Therefore, we did not modify our report.

8. We concur that the scope of our review was to determine whether middleware technology is viable and feasible in SFA's system environment and that other issues were not covered in our work. Accordingly, we did not modify our report.

9. We updated our report to reflect that SFA now plans to have about 14 systems connected to middleware by December 2001.

10. We updated our report to clarify that some legacy systems, according to SFA's Modernization Blueprint, will not have to be modified for middleware because some will be retired in the future.

11. We modified our report to reflect that the first planned use of middleware for Direct Loan and Pell Grant originations and disbursement would occur next year.

12. We updated our report to reflect the change in the implementation date.

13. We did not modify our report. Education's Central Automated Processing System (EDCAPS) included in figure 1 and table 1 in our report is not the same as the Central Data System (CDS), which has been retired. EDCAPS is the primary accounting system for the department. The department's Management Improvement Team Accomplishments document, dated October 30, 2001, describes EDCAPS as Education's "financial records and accounting system." CDS is not discussed in our report.

14. We modified our report to reflect that the PBO was established in 1998.

15. We modified our report to clarify responsibilities of SFA under the PBO legislation.

16. We modified our report to indicate SFA's participation.

17. We believe the appointment of SFA's COO was a relevant milestone. Several sections of the HEA Amendments of 1998 creating the PBO address the functions of the COO, including the requirement to have a PBO performance plan. Likewise, the selection of the SFA modernization partner also was a relevant milestone, especially in light of the important role that the partner plays in SFA's systems modernization, which is described in the report. Therefore, we did not modify our report.

18. We modified our report to clarify that there are additional users of the MQSeries product.

19. We did not modify our report. The figure displays only the COD process, which will initially include only Direct Loan and Pell Grant origination and disbursements. All Direct Loan and Pell Grant funds are federal and ultimately come from the U.S. Treasury. We purposely omitted the Federal Reserve and other intermediary systems for simplicity. Schools will follow the COD process described in the figure when originating loan and grant applications on behalf of students.

20. We modified our report to better reflect that middleware will also convert disbursement records back to each school's current record format.

21. According to SFA's most recently released Modernization Blueprint (page 13), the COD is expected to be able to provide all schools that participate in title IV financial aid programs with a single process for aid origination and disbursement. SFA staff confirmed the accuracy of this statement. Therefore, we did not modify our report.

22. According to SFA's Modernization Blueprint, COD is expected to be capable of handling all aid distribution. The first use will be for Direct Loan and Pell Grant origination and distribution. Therefore, we did not modify our report.

23. We did not modify our report. The internal control problems identified in the 1995 report focused on the need to have timely, accurate student eligibility data. Also, see comment 6.

24. As noted in the report, we are attributing the choice between two options -- developing a large central database or maintaining several integrated databases using middleware -- to SFA's COO. By 2004, SFA does expect to retire several existing systems that should result in fewer databases than currently exist.

25. We modified our report to note that SFA plans to retire systems through 2004.

26. We did not assess the capabilities of Accenture, as this was not included in the scope of our work. Therefore, we did not modify our report.

27. As noted, we point out that SFA is attempting to address its human capital challenges associated with the use of the new middleware technology by leveraging the experiences from the banking industry as well as acquiring recognized contractor expertise. These are prudent steps, but the adequacy of specific measures being taken both by SFA management and its modernization partner in addressing workforce management and planning needs go beyond the scope of this review; therefore, we did not modify the report.

28. We modified the report to delete any reference to the availability of 24-hour customer support.

Related GAO Products

Financial Management: Internal Control Weaknesses Leave Department of Education Vulnerable to Improper Payments (GAO-01-585T, April 3, 2001).

High-Risk Series: An Update (GAO-01-263, January 2001).

High-Risk Series: An Update (GAO/HR-99-1, January 1999).

Student Financial Aid Information: Systems Architecture Needed to Improve Programs' Efficiency (GAO/AIMD-97-122, July 29, 1997).

High-Risk Program: Information on Selected High-Risk Areas (GAO/HR-97-30, May 1997).

Department of Education: Multiple, Nonintegrated Systems Hamper Management of Student Financial Aid Programs (GAO/T-HEHS/AIMD-97-132, May 15, 1997).

High Risk Series: Student Financial Aid (GAO/HR-97-11, February 1997).

Reporting of Student Loan Enrollment Status (GAO/HEHS-97-44R, February 6, 1997).

Department of Education: Status of Actions to Improve the Management *of Student Financial Aid* (GAO/HEHS-96-143, July 12, 1996).

Student Financial Aid: Data Not Fully Utilized to Identify Inappropriately *Awarded Loans and Grants* (GAO/T-HEHS-95-199, July 12, 1995).

Student Financial Aid: Data Not Fully Utilized to Identify Inappropriately *Awarded Loans and Grants* (GAO/HEHS-95-89, July 11, 1995).

Federal Family Education Loan Information System: Weak ComputerControls Increase Risk of Unauthorized Access to Sensitive Data (GAO/AIMD-95-117, June 12, 1995).

High-Risk Series: Student Financial Aid (GAO/HR-95-10, February 1995).

Financial Audit: Federal Family Education Loan Program's Financial *Statements for Fiscal Years 1993 and 1992* (GAO/AIMD-94-131, June 30, 1994).

Financial Management: Education's Student Loan Program Controls Over *Lenders Need Improvement* (GAO/AIMD-93-33, September 9, 1993).

Financial Audit: Guaranteed Student Loan Program's Internal Controls and *Structure Need Improvement* (GAO/AFMD-93-20, March 16, 1993).

Department of Education: Management Commitment Needed to Improve *Information Resources Management* (GAO/IMTEC-92-17, April 20, 1992).

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