June 2005

INFORMATION TECHNOLOGY MANAGEMENT

Census Bureau Has Implemented Many Key Practices, but Additional Actions Are Needed

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INFORMATION TECHNOLOGY MANAGEMENT

Census Bureau Has Implemented Many Key Practices, but Additional Actions Are Needed

Why GAO Did This Study

The Census Bureau's mission is to serve as the leading source of high quality data about the American people and the economy. This information is used to determine congressional and state legislative districts and to distribute hundreds of billions of dollars in federal funds each year. Information technology (IT) plays a critical role in the bureau's ability to carry out its missions by supporting data collection, analysis, and dissemination activities. In the past, the bureau has experienced problems with the development, acquisition, and implementation of IT systems. GAO was asked to (1) provide an IT profile of the Census Bureau, including an overview of information technology management and plans for the 2010 decennial census and (2) evaluate the adequacy of the bureau's IT policies, procedures, and practices in the areas of investment management, system development/management, enterprise architecture management, information security, and human capital.

What GAO Recommends

GAO is making recommendations to the Secretary of Commerce to improve the bureau's ability to effectively manage IT by addressing weaknesses found in each of the management areas GAO reviewed. In written comments on a draft of this report, Commerce agreed with GAO's recommendations and noted that the bureau has already begun improvements.

www.gao.gov/cgi-bin/getrpt?GAO-05-661.
To view the full product, including the scope and methodology, click on the link above. For more information, contact David A. Powner at (202) 512-9286 or pownerd@gao.gov.

What GAO Found

The Census Bureau has a decentralized approach to IT management. The chief information officer is responsible for establishing policy and strategies and shares responsibility for implementing policies and managing systems and staff with the associate directors for different bureau program areas. In its 5-year strategic IT plan, the bureau identified 10 major investments that are currently estimated to total about $4 billion through 2009. Three of the bureau's 10 major investments—estimated to cost $2.7 billion—are expected to support the 2010 decennial census. For example, the bureau plans to invest about $1.8 billion in the 2010 Testing, Evaluation, and Systems Design program—an effort to redesign procedures and increase the use of automation planned for the 2010 decennial census through a multiyear effort of planning, development, and testing.

The bureau has developed policies and procedures and initiated key practices in many of the areas that are important to successfully managing IT, including investment management, system development/management, enterprise architecture management, information security, and human capital management. However, many of these practices are not fully and consistently performed (see figure). For example, in the IT investment management area, the bureau has established executive-level investment boards, but it lacks written procedures outlining how the investment boards are to operate and ensuring a consistent and repeatable approach to investment management and decision making. As a result of this and other weaknesses, the bureau is at increased risk of not adequately managing major IT investments and is more likely to experience cost and schedule overruns and performance shortfalls. Because the bureau plans to spend billions of dollars on information technology to prepare for the 2010 decennial census, building in sound IT practices now is more critical than ever.

Number of Key Information Technology Management Activities Implemented

Information Technology Management Area	◯ Incomplete or obsolete policies and procedures; ad hoc practices	◐ Policies or procedures for key functions; only selected practices in place	● Comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards
IT Investment Management[a]	0	4	1
System Development/Management[a]	1	7	0
Enterprise Architecture Management[a]	0	2	14
Information Security	0	5	2
IT Human Capital	0	3	1
Total	**1**	**21**	**18**

Source: GAO.

[a]Denotes areas assessed at less than full maturity within a maturity framework.

United States Government Accountability Office

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United States Government Accountability Office
Washington, D.C. 20548

June 16, 2005

The Honorable Tom Davis
Chairman
Committee on Government Reform
House of Representatives

The Honorable Michael R. Turner
Chairman
Subcommittee on Federalism and the Census
Committee on Government Reform
House of Representatives

The Honorable Adam H. Putnam
House of Representatives

The Census Bureau's mission is to serve as the leading source of high-quality data about the American people and the economy. These data are used to determine congressional and state legislative districts and to distribute hundreds of billions of dollars in federal funds each year. Also, federal agencies use census data to evaluate the effectiveness of government programs, while businesses use census data to target new services and products and to tailor existing ones to demographic changes. Information technology (IT) plays a critical role in the bureau's ability to carry out its missions by supporting data collection, analysis, and dissemination activities throughout the organization.

The bureau is currently planning the decennial census—the nation's oldest and most comprehensive source of population and housing information. The bureau estimates that the 2010 decennial census will cost $11.3 billion, including $2.7 billion for IT investments. Because the bureau has experienced problems with the development, acquisition, and implementation of systems in preparing for past censuses, you requested that we examine whether it is employing effective information technology management practices. Our objectives were to (1) provide an IT profile of the Census Bureau, including an overview of information technology management and plans for the 2010 decennial census and (2) evaluate the adequacy of the bureau's IT policies, procedures, and practices in the areas of investment management, system development/management, enterprise architecture management, information security, and human capital.

To provide an overview of the bureau's information technology management, we assessed its documentation, including IT operational and strategic plans, and we interviewed bureau officials to identify management roles and responsibilities, organization, staffing, and investments. To evaluate the adequacy of the bureau's information technology management, we reviewed the bureau's policies and procedures in each of five key IT areas—investment management, system development/management, enterprise architecture management, information security, and human capital—and we compared them against applicable laws, federal guidelines, and industry standards. We also reviewed selected projects, to determine whether the bureau's practices were consistent with its own policies and procedures as well as with industry standards. More detailed descriptions of the scope and methodology for each of the five IT areas are provided in the segments of this briefing that address each area. We performed our work at the Department of Commerce in Washington, D.C., and at Census Bureau headquarters, in Suitland, Maryland, from August 2004 to February 2005, in accordance with generally accepted government auditing standards.

In mid-April 2005, we provided a detailed briefing to your subcommittee and committee staffs on the results of this work. The briefing slides are included in appendix I. The purpose of this letter is to formally publish the briefing slides and to officially transmit our recommendations to the Secretary of Commerce.

In brief, we reported that the bureau has a decentralized approach to IT management. The chief information officer is responsible for establishing policy and strategies and shares responsibility for implementing policies and managing systems and staff with the associate directors for different bureau program areas. In its 5-year strategic IT plan, the bureau identifies 10 major investments that are currently estimated to cost about $4 billion through 2009. Three of the bureau's 10 major investments—estimated to cost $2.7 billion—are expected to support the 2010 decennial census. For example, the bureau plans to invest $1.8 billion in the 2010 Testing, Evaluation, and Systems Design program—an effort to redesign procedures and increase the use of automation planned for the 2010 decennial census through a multiyear effort of planning, development, and testing.

The bureau has developed policies and procedures and has initiated key practices in many of the areas that are important to successfully managing IT—including investment management, system development/management,

enterprise architecture management, information security, and human capital management. However, many of these practices are not fully and consistently performed. For example, in the IT investment management area, the bureau has established executive-level investment boards, but it lacks written procedures outlining how the investment boards are to operate and ensuring a consistent and repeatable approach to investment management and decision making. As a result of this and other weaknesses we found, the bureau is at increased risk of not adequately managing major IT investments and is therefore more likely to experience the cost and schedule overruns and performance shortfalls that plague other major IT investments and acquisitions. Because the bureau plans to spend billions of dollars on information technology to prepare for the 2010 decennial census, building in sound IT practices now is more critical than ever.

Recommendations

To improve the Census Bureau's ability to effectively manage information technology, we are making 13 recommendations to the Secretary of Commerce to direct the bureau to address weaknesses we found in each of the IT management areas.

To strengthen the bureau's ability to manage IT investments, we recommend that the Secretary of Commerce direct the bureau to

- develop written procedures to guide its IT investment boards' operations and use these procedures to ensure consistent investment management and decision-making practices,

- develop well-defined and disciplined written procedures that outline the process for selecting new IT proposals and reselecting ongoing investments and use these procedures in investment decision making,

- develop and implement defined criteria and documented policies and procedures for monitoring the progress of all IT projects and systems, and

- create a comprehensive repository that collects investment information that is up to date and accessible to decision makers.

To strengthen agencywide system development and management capabilities, we recommend that the Secretary of Commerce direct the bureau to institutionalize a process improvement initiative, such as the Capability Maturity Model Integration framework, and establish goals for

projects to reach successive capability levels in selected process areas, including project planning, project monitoring and control, requirements management, process and product quality assurance, configuration management, measurements and analysis, verification, and risk management.

To support the bureau in its efforts to develop and implement an effective enterprise architecture (EA), we recommend that the Secretary of Commerce direct the bureau to

- determine an adequate level of resources to accomplish planned EA activities in order to ensure continued improvements to the bureau's EA model and

- establish a written policy endorsing and enforcing the bureau's enterprise architecture.

To improve information security, we recommend that the Secretary of Commerce direct the bureau to

- establish milestones for identifying staff with special security training needs and developing an effective training program for them;

- establish milestones for identifying system penetration tools to aid network access security and for testing network controls using these tools; and

- monitor progress against these milestones and the milestones that have already been established to address weaknesses in risk assessments, information system security controls, and oversight management tools, in order to ensure that these activities are completed in a timely manner.

To improve the bureau's ability to manage its IT workforce, we recommend that the Secretary of Commerce direct the bureau to

- annually assess IT knowledge and skills to determine whether they meet current requirements and

- use the planned gap analysis to identify workforce strategies to fill skills gaps and then evaluate these strategies to determine their effectiveness in improving human capital management.

Agency Comments and Our Evaluation

We received comments on a draft of this report from the Department of Commerce (see app. II). In these comments, the Acting Deputy Secretary of Commerce stated that the agency agrees with our recommendations and that our findings are accurate, but noted that the report did not acknowledge steps that the Census Bureau is taking to address the report's findings and other IT issues. In particular, the deputy secretary noted that the bureau is taking a very proactive and aggressive movement toward change and that it is in the process of introducing a corporate IT environment—which is expected to lead to improvements in IT management. Commerce also commented that only 1 of 40 activities we evaluated was found to be incomplete or obsolete.

The bureau's steps to act on our recommendations should put it in a better position to manage information technology in the future. However, it is important to note that while only 1 of 40 activities was rated as incomplete or obsolete, there were 21 other activities that did not have key policies and/or practices in place. For example, while we found that the bureau collects information about IT projects, it does not have a comprehensive and consistent repository of IT investment information that provides decision makers with data for evaluating the impacts and opportunities created by IT investments. We plan to assess the bureau's recent, ongoing, and planned steps to improve its IT management practices as part of our follow-up on open recommendations.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees, the Secretary of Commerce, and other interested parties. In addition, this report will be available at no charge on GAO's Web site at www.gao.gov.

If you have any questions on matters discussed in this report, please contact me at (202) 512-9286 or pownerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.

David A. Powner
Director, Information Technology
Management

Briefing Slides

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Census Bureau
Information Technology Management

Briefing for the

Subcommittee on Federalism and the Census

Committee on Government Reform

House of Representatives

April 20, 2005

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Purpose and Outline

Purpose:

- To provide an overview and our analysis of the Census Bureau's information technology (IT) management

Outline: Page:

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Objectives

- To provide an IT profile of the Census Bureau, including an overview of information technology management and IT plans for the 2010 decennial census

- To evaluate the adequacy of the bureau's IT policies, procedures, and practices in the areas of investment management, system development/management, enterprise architecture management, information security, and human capital

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Scope and Methodology

- To identify the bureau's IT profile, we assessed agency documentation, including IT operational and strategic plans, and we interviewed bureau officials to determine IT management roles and responsibilities, organization, staffing, and investments.

- We analyzed GAO's and the Department of Commerce's Inspector General's reports to identify past IT management issues that affected the 2000 census, and we reviewed bureau documentation and interviewed agency officials to determine plans for IT systems during the 2010 decennial census.

- To evaluate the adequacy of the bureau's IT management, we reviewed the bureau's IT policies and procedures for investment management, system development/management, enterprise architecture management, information security, and human capital, and we compared them with applicable laws and regulations, federal guidelines, and industry standards. More detailed descriptions of the scope and methodology for each of the five IT areas is provided in the segments of this briefing that address each area.

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Scope and Methodology

- We reviewed selected IT projects to determine whether practices complied with the agency's policies and procedures, federal guidance, and industry standards, and we sought work products documenting these practices, where applicable. Given the importance of IT to the decennial census effort, we selected projects that support decennial census activities.

- We conducted this review at the Department of Commerce in Washington, D.C. and at Census Bureau headquarters in Suitland, Maryland. We conducted our work from August 2004 through February 2005, in accordance with generally accepted government auditing standards.

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Results in Brief

The Census Bureau has a decentralized approach to IT management. The Information Technology directorate, led by the Chief Information Officer, is responsible for establishing IT policy and strategies, while multiple program directorates are responsible for implementing policies and managing IT systems and staff.

The bureau's 5-year strategic plan identifies 10 major IT investments that are currently estimated to cost about $4 billion through 2009, of which three investments support the reengineering of the 2010 decennial census. The bureau is reengineering its approach to IT support for the decennial census and plans to test new technologies and systems in 2006 and 2008.

The bureau has established policies or procedures and initiated key practices in many of the areas that are important to successfully managing IT, including investment management, system development and management, enterprise architecture management, information security, and human capital management. However, many of the key practices are not fully and consistently performed. As a result, the bureau is at increased risk of not adequately managing major IT investments and is more likely to experience the cost and schedule overruns and performance shortfalls that plague other major IT investments and acquisitions.

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Results in Brief

Since the bureau plans to spend billions of dollars on information technology to prepare for the 2010 decennial census, building in sound IT practices now is more critical than ever.

In order to improve the bureau's ability to effectively manage IT investments, we are making recommendations to the Secretary of Commerce to direct the Census Bureau to address weaknesses we found in each of the IT management areas.

In commenting on a draft of this briefing, Census Bureau officials, including the Chief Information Officer, the Comptroller, and the Chief of the Information Systems Support and Review Office, stated that they agreed with our findings and recommendations.

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Background

Census Bureau's Mission and Core Activities

The bureau's mission is to serve as the leading source of high quality data about the nation's people and economy. Core activities include

- conducting decennial, economic, and government censuses;
- conducting demographic and economic surveys;
- managing international demographic and socioeconomic databases and providing technical advisory services to foreign governments; and
- performing other activities such as producing official population estimates and projections.

Public and private decision makers use census population and socioeconomic data for various purposes. For example, decennial census data are used to determine congressional and state legislative districts and to distribute hundreds of billions of dollars of federal funds each year. Also, federal agencies use census data to evaluate the effectiveness of established programs, while businesses use census data to target new services and products and to tailor existing ones to demographic changes.
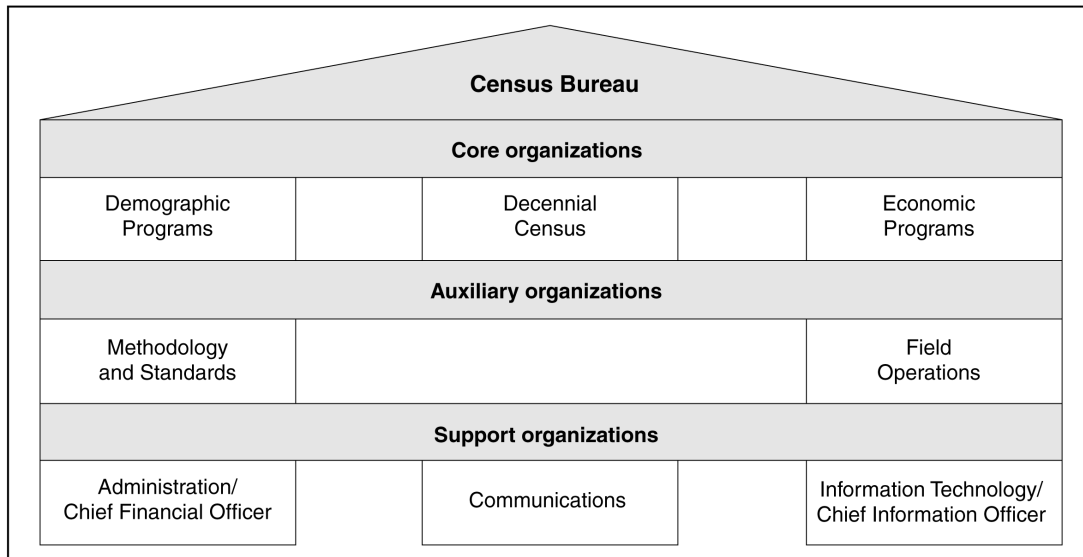
IT plays a critical role in the bureau's ability to carry out its missions, supporting data collection, analysis, and dissemination throughout the organization.

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Background

Census Bureau Organization

The bureau is a large and complex organization. A conceptual view of the agency includes three core organizations, two auxiliary organizations that provide guidance and operational support for the core organizations, and three support organizations that provide administrative and technical support for the entire bureau. Each of these organizations is headed by an associate director who reports to the Deputy Director of the Census Bureau.

Census Bureau		
Core organizations		
Demographic Programs	Decennial Census	Economic Programs
Auxiliary organizations		
Methodology and Standards		Field Operations
Support organizations		
Administration/ Chief Financial Officer	Communications	Information Technology/ Chief Information Officer

Source: U.S. Census Bureau.

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Background

The Bureau's Decennial Census

The bureau's decennial census is the nation's oldest and most comprehensive source of population and housing information.

Conducting a decennial census involves

- identifying and correcting addresses for all known living quarters in the United States,
- sending questionnaires to housing units,
- following up with non-respondents through personal interviews,
- trying to identify people with non-traditional living arrangements,
- managing a voluminous workforce that is responsible for follow-up activities,
- collecting census data using questionnaires, phone calls, and personal interviews,
- summarizing and tabulating census data, and
- disseminating analytical results from the census to the public.

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Background

IT Issues Affected the 2000 Census

Information technology is critical to a successful decennial census. We and Commerce's Inspector General have reported on several issues that arose as the bureau developed and used IT systems for the 2000 census.[1] These issues included

- untimely and inaccurate management information,
- lack of mature and effective software and systems development processes,
- inadequate testing of key systems,
- inadequate security controls, and
- insufficient number of experienced staff to manage expensive and complex system projects.

Both we and the Inspector General have made a series of recommendations to address these issues, and the bureau has initiated efforts to address them.

[1]See attachment for a list of relevant reports by us and by the Inspector General.

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IT Profile—Overview and Plans

IT Roles and Responsibilities

The bureau's Associate Director for Information Technology—who is also the Chief Information Officer (CIO)—and the other associate directors share key responsibilities for IT management.

- The CIO is responsible for bureauwide IT technical support and leadership, including
  - managing the **investment management** process to ensure that all IT investments support desired mission outcomes;
  - establishing standards for **system development and management** of IT projects;
  - defining and directing **enterprise architecture** development, education and compliance; and
  - ensuring the **information security** of systems and networks.

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IT Profile—Overview and Plans
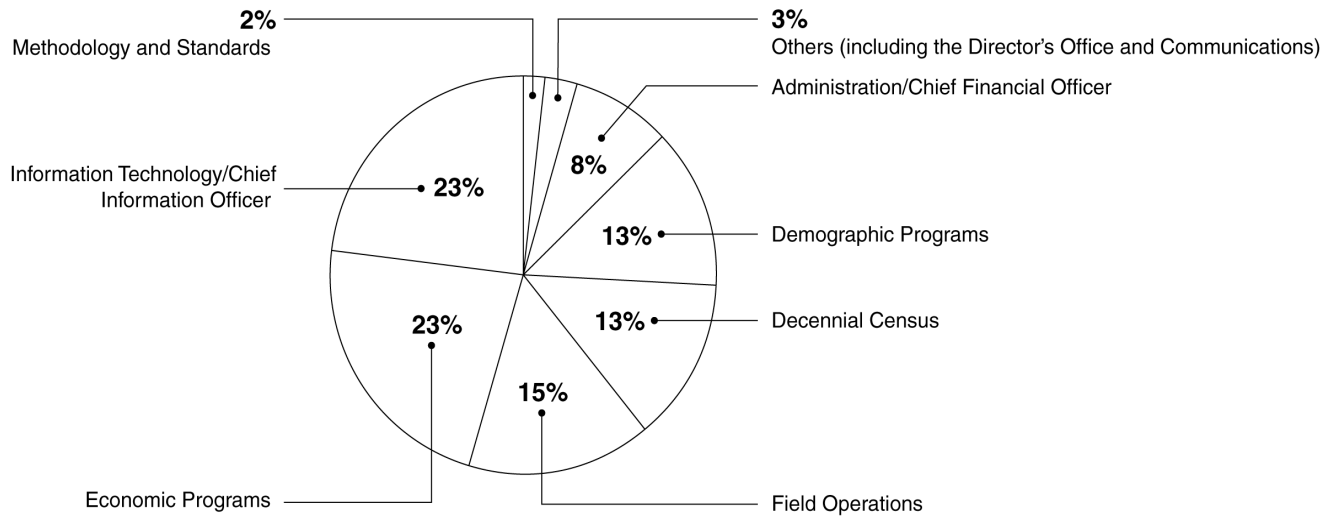
IT Roles and Responsibilities

- The Associate Director for Administration, who is also the Chief Financial Officer, is responsible for providing bureauwide administrative and financial management for the agency, including conducting **human capital** strategic planning for IT and other personnel.

- The associate directors for the other organizations are responsible for managing system acquisitions and IT staff to support their programs and goals.

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IT Profile—Overview and Plans

IT Staffing

As of February 2005, the bureau reported having about 1,100 IT staff in its approximately 12,000-person workforce. These staff are spread throughout the bureau, to support the bureau's organizations as follows:

- **2%** Methodology and Standards
- **3%** Others (including the Director's Office and Communications)
- Administration/Chief Financial Officer
- **8%**
- **23%** Information Technology/Chief Information Officer
- **13%** Demographic Programs
- **23%**
- **13%** Decennial Census
- **15%**
- Economic Programs
- Field Operations

Source: GAO analysis based on U.S. Census Bureau data.

The bureau also has about 500 on-site contractor staff who perform a variety of activities, including systems design and programming, systems integration, studies, and analyses.

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IT Profile—Overview and Plans

IT Investments

In its 2004-2009 strategic IT plan, the bureau identified 10 major IT investments that are currently estimated to total about $4 billion.

Investment Name	Description	Estimated Total Life Cycle Costs (in millions)
American Community Survey	an initiative to survey households on a monthly basis, provide annual tabulations, and thereby eliminate the long form from the 2010 decennial census	$324.0
Master Address File/Topologically Integrated Geographic Encoding & Referencing (MAF/TIGER) system enhancement program	an effort to modernize the MAF/TIGER systems to support the 2010 census and its associated testing activities	$535.5
2010 Testing, Evaluation, and Systems Design	an integrated set of tasks oriented toward developing an IT architecture to enable the bureau to conduct a reengineered, short-form only decennial census in 2010; includes identifying the conceptual components of specific systems, testing operations during 2004 and 2006 tests and then defining the functional requirements for specific systems that will be implemented in the 2008 dress rehearsal and the 2010 census	$1,813.3

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IT Profile—Overview and Plans

IT Investments (continued)

Investment Name	Description	Estimated Total Life Cycle Costs (in millions)
Automated Export Trade Statistics System	a system that supports expedited monthly statistics on international trade, remedies shortcomings in export statistics, and helps to control the export of weapons or other hazardous items that could be a threat to our national security or the public welfare	$42.5
Data Access and Dissemination System[2]	a system that provides portal access to the largest and most popular census data sets	$265.9
Demographic Statistics IT Support Systems	systems that account for and provide tools for managing the costs associated with the demographic surveys division's IT infrastructure maintenance	$123.0
Economic Census, Government Census, and Surveys	a project to provide statistical programs that count and profile U.S. businesses and government organizations	$462.5

[2]Bureau officials stated that they are evaluating whether to extend the Data Access and Dissemination System through the 2010 census or to acquire a new capability, called the Integrated Dissemination System. The cost, schedule, and scope of the Integrated Dissemination System have not yet been determined.

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IT Profile—Overview and Plans

IT Investments (continued)

Investment Name	Description	Estimated Total Life Cycle Costs (in millions)
E-Government	an initiative to support e-government services by letting businesses file electronically in any current economic survey	$17.1
Field Support Systems	an initiative that involves developing, testing, and maintaining automated systems for data collection, tracking, and training for the critical current survey programs and for maintaining IT infrastructure for field headquarters and twelve regional offices	$246.0
Geographic Support Systems	systems that provide the integrated and automated computer-based geographic support that is crucial to all censuses and household surveys	$175.0

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IT Profile—Overview and Plans
Plans for 2010 Decennial Systems

Three of the 10 major IT investments in the bureau's strategic IT plan (comprising $2.7 billion, or 67 percent, of the $4 billion in planned IT investments) are expected to support the reengineering of the 2010 decennial census:

- American Community Survey

- MAF/TIGER Enhancement Program
- 2010 Testing, Evaluation, and Systems Design

The bureau is reengineering the 2010 decennial census by changing procedures, increasing the use of automation, and using new technologies. These initiatives are expected to lead to a simpler decennial census which is more efficient and cost effective, provides richer information, improves coverage accuracy, and reduces operational risk.

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IT Profile—Overview and Plans

Plans for 2010 Decennial Systems

Key elements of this reengineering include

- moving away from using the long form during the decennial census (by substituting the **American Community Survey** in its place),

- improving the accuracy and reliability of address data (via **MAF/TIGER Enhancements**), and

- redesigning procedures and increasing the use of automation planned for the 2010 decennial census through a multiyear effort of planning, development, testing, revision, and retesting (via the **2010 Testing, Evaluation, and Systems Design** program).

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IT Profile—Overview and Plans

Plans for 2010 Decennial Systems

More specifically, the **2010 Testing, Evaluation, and Systems Design** program includes the following:

- Field data collection activities:
  - exploring improved integration and automation of field data collection activities, including new technologies such as hand-held computers;
  - awarding a contract to design and develop field data collection processes and systems by April 2006; the cost of this contract, called the **Field Data Collection Automation** program, has not yet been finalized.
- Public response activities:
  - identifying new approaches to providing assistance to the public and capturing census data from telephone, paper, and internet sources;
  - awarding a contract by October 2005 to develop a system for providing assistance to the public and capturing data; according to bureau officials, this contract, called the **Decennial Response Integration System**, is estimated to cost over $669 million through 2013.

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IT Profile—Overview and Plans

Plans for 2010 Decennial Systems

The **2010 Testing, Evaluation, and Systems Design** program also includes a series of tests in the years leading up to the decennial census.

2004:   The bureau tested critical field operations using systems under conditions similar to those that will be used during the decennial census. In particular, the agency studied the feasibility of using hand-held mobile computing devices equipped with Global Positioning System capability to conduct nonresponse follow-up operations. We recently reported on lessons learned during this test.[3]

2006:   The bureau plans to test the methodology and functions of the integration of systems that will be needed to carry out the reengineered census, focusing on efforts to automate nonresponse follow-up activities and on initiatives to update the address list.

2008:   The bureau plans to conduct a final operational test of the entire complement of methodological, procedural, and systems innovations for the 2010 decennial census.

[3]GAO, *2010 CENSUS: Basic Design Has Potential, but Remaining Challenges Need Prompt Resolution,* GAO-05-9 (Washington, D.C.: January 12, 2005).

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IT Policies, Procedures, and Practices

IT Areas Evaluated

To evaluate IT management, we focused on five key areas that encompass major IT functions and are recognized by public and private entities as having substantial influence on the effectiveness of IT operations:

- **IT investment management** processes and practices are used to select, control, and evaluate investments in order to help ensure that they increase business value and mission performance. In 2004, we issued a framework for assessing federal agencies' IT investment management practices.[4] This framework identifies critical processes for making successful IT investments; it is organized into five increasingly mature stages. The framework's five maturity stages represent steps toward achieving a stable and mature IT investment process. By determining the current stage of maturity of an organization, managers are better able to identify specific steps that would contribute to improving IT management.

- **System development/management** capabilities help organizations acquire, develop, and manage information systems and technology successfully—that is, they help reduce the risk of cost overruns, schedule delays, and performance shortfalls. The Software Engineering Institute has established a framework for organizations to use to assess and improve system management capabilities in different process areas, such as project planning, project monitoring and control, requirements management, configuration management, and risk management. By determining a project's or organization's current capabilities, managers can identify steps for improving the processes that can contribute to successful project results.

[4]GAO, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity (Version 1.1)*, GAO-04-394G (Washington, D.C.: March 2004).

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IT Policies, Procedures, and Practices

IT Areas Evaluated (continued)

- Effective use of an **enterprise architecture (EA)**, or a modernization blueprint, is a trademark of successful public and private organizations. An EA connects an organization's strategic plan with program and system solutions by providing the fundamental information details needed to guide and constrain investments in a consistent, coordinated, and integrated fashion—thereby improving interoperability and reducing duplicative efforts. As such, it should provide a clear and comprehensive view of an entity, including descriptions of the entity's current or "as is" environment, its target or "to be" environment, and a capital investment road map for transitioning from the current to the target environment. In 2003, we updated our framework for assessing and improving an organization's EA management.[5]

- **Information security** helps protect the integrity, confidentiality, and availability of an agency's data and systems by reducing the risks of tampering, unauthorized intrusions and disclosures, and serious disruptions of operations. Information security activities include conducting risk assessments, promoting awareness and training, implementing controls, performing evaluations, and providing centralized coordination and oversight of all security activities.

- **IT human capital management** helps provide employees with the appropriate knowledge and skills to effectively execute critical IT functions. Key processes for human capital management involve assessing IT knowledge and skills requirements, inventorying existing staff's knowledge and skills and assessing them against requirements, developing strategies and plans to fill any gaps between requirements and existing staffing, and evaluating and reporting on progress in filling any gaps in knowledge and skills.

[5]U.S. GAO, *Information Technology: A Framework for Assessing and Improving Enterprise Architecture Management (Version 1.1)*, GAO-03-584G (Washington, D.C.: April 2003).

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IT Policies, Procedures, and Practices

Evaluation Indicators

In evaluating the five key IT areas at the Census Bureau, we assessed applicable policies, procedures, and practices. We use three broad indicators to depict our results:
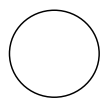
A **blank circle** indicates that policies and procedures do not exist or are obsolete or incomplete and that practices are not performed at all or are performed on a predominantly ad hoc basis.
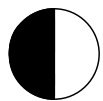
A **half circle** indicates that policies or procedures facilitate key functions and that selected key practices have been performed, while others remain to be implemented.

A **solid circle** indicates that policies and procedures are current and comprehensive for key functions and that practices adhere to policies, procedures, and generally accepted standards.

For each of the five key IT areas we reviewed, we selected indicators based on our judgment of the current state of Census policies, procedures, and practices.

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IT Policies, Procedures, and Practices

Evaluation Summary

IT Investment Management*

Instituting the investment board	◐
Meeting business needs	●
Selecting an investment	◐
Providing investment oversight	◐
Capturing investment information	◐

System Development/Management*

Project planning	◐
Project monitoring and control	◐
Requirements management	◐
Process and product quality assurance	◐
Configuration management	◐
Measurement and analysis	○
Verification	◐
Risk management	◐

Enterprise Architecture Management*

Agency is aware of EA	●
Adequate resources exist	◐
Enterprise committee approves EA	●
Program office for EA exists	●
Chief architect exists	●
EA is developed using a framework, methodology, and tool	●
EA plans call for "as is" and "to be" environments and a sequencing plan	●
EA plans call for key descriptions	●
EA plans call for key descriptions to address security	●
EA plans call for metrics	●
Policy for EA development exists	◐
EA products are under configuration management	●
EA products include key descriptions	●
EA products will describe "as is" and "to be" environments and a sequencing plan	●
EA key descriptions will address security	●
Progress is measured and reported	●

Information Security

Risk assessment	◐
Awareness and training	◐
Controls--Information systems	◐
Controls--Physical security	●
Controls--Network access	◐
Evaluation	◐
Central management	●

IT Human Capital

Requirements	◐
Inventory	●
Workforce strategies and plans	◐
Progress evaluation	◐

*Denotes areas assessed at less than full maturity within a maturity framework.

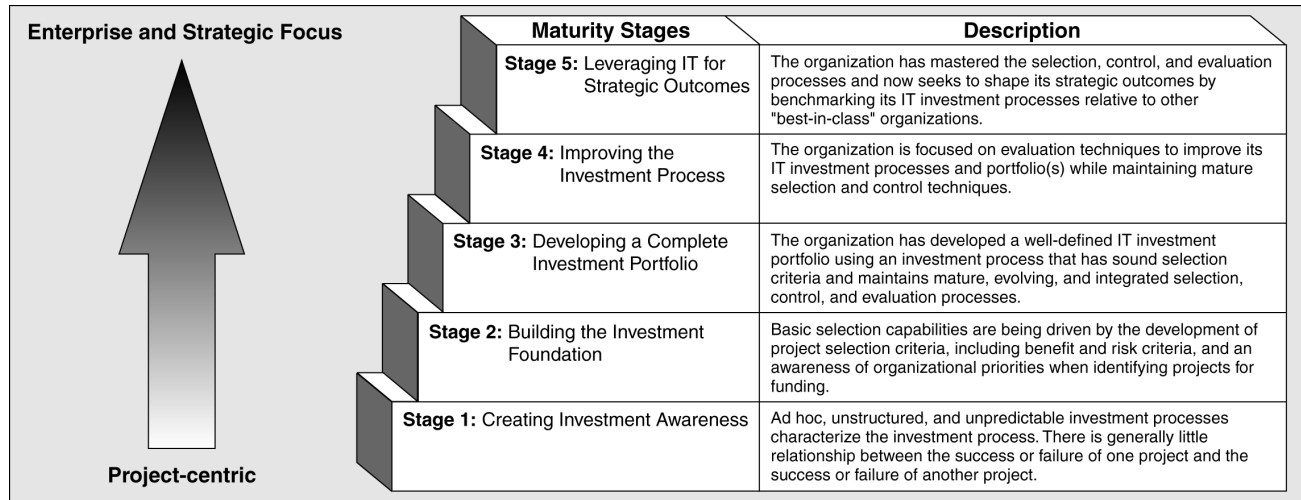|		
○ incomplete or obsolete policies and procedures; ad hoc practices	◐ policies or procedures for key functions; only selected practices in place.	● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

IT Investment Management—Overview

IT investment management provides a framework for implementing the processes that are critical to the effective selection, control, and evaluation of a portfolio of IT investments. The maturity stages, listed below, represent steps toward achieving a stable and mature IT investment management process.

Enterprise and Strategic Focus

Project-centric

Maturity Stages	Description
Stage 5: Leveraging IT for Strategic Outcomes	The organization has mastered the selection, control, and evaluation processes and now seeks to shape its strategic outcomes by benchmarking its IT investment processes relative to other "best-in-class" organizations.
Stage 4: Improving the Investment Process	The organization is focused on evaluation techniques to improve its IT investment processes and portfolio(s) while maintaining mature selection and control techniques.
Stage 3: Developing a Complete Investment Portfolio	The organization has developed a well-defined IT investment portfolio using an investment process that has sound selection criteria and maintains mature, evolving, and integrated selection, control, and evaluation processes.
Stage 2: Building the Investment Foundation	Basic selection capabilities are being driven by the development of project selection criteria, including benefit and risk criteria, and an awareness of organizational priorities when identifying projects for funding.
Stage 1: Creating Investment Awareness	Ad hoc, unstructured, and unpredictable investment processes characterize the investment process. There is generally little relationship between the success or failure of one project and the success or failure of another project.

Source: GAO.

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IT Policies, Procedures, and Practices

IT Investment Management—Overview

Critical processes in stages 1 and 2 include:

Stage 1
- **IT spending without disciplined investment processes**—characterizes organizations that are not yet involved in ITIM activities

Stage 2
- **Instituting the investment board**—entails creating and defining the membership and guiding policies, operations, roles, responsibilities, and authorities for one or more IT investment boards within the organization.

- **Meeting business needs**—entails ensuring that IT projects and systems support the organization's business needs and meet users' needs. It involves identifying business and users' needs for each IT project and having users participate in project management throughout the project's life cycle.

- **Selecting an investment**—entails ensuring that a well-defined and disciplined process be used to select new IT proposals and reselect ongoing investments.

- **Providing investment oversight**—entails monitoring the progress of all IT projects and systems relative to cost, schedule,risk, and benefit expectations and taking corrective action when these expectations are not being met.

- **Capturing investment information**—involves identifying IT assets and creating a comprehensive repository of investment information for decision makers to use to evaluate the impacts and opportunities created by proposed (or continuing) IT investments.

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IT Policies, Procedures, and Practices

IT Investment Management—Review

We evaluated the bureau's IT investment management using GAO's guide, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity.*[6]

We reviewed the bureau's current IT investment management practices. We also evaluated the investment processes used on the Data Access and Dissemination System and Field Support Systems.

We assessed the bureau's investment processes at maturity stage 2. We did not evaluate maturity stage 1 because it is characterized by a lack of processes, and the bureau has passed that stage. We also did not evaluate maturity stages 3, 4, or 5 because bureau officials reported that they are working to achieve maturity stage 2 and had not yet implemented critical processes associated with the higher maturity stages.

[6]GAO, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity (Version 1.1)*, GAO-04-394G (Washington, D.C.: March 2004).

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IT Policies, Procedures, and Practices

IT Investment Management—Evaluation

Activity (Critical process)	Assessment	Comments
Instituting the investment board	◐	The bureau's Operating Committee and IT Governing Board (ITGB) serve as enterprisewide executive-level IT investment boards. The Operating Committee provides business direction and leadership, while the ITGB approves and oversees the implementation of the Census Bureau's IT investment management process and makes recommendations to the committee about each IT investment. However, the bureau lacks written procedures outlining the IT investment boards' operations and ensuring consistent investment management and decision-making practices.
Meeting business needs	●	The bureau has a process for ensuring that its investments support its business needs. Business needs and specific users are clearly identified for IT projects. Projects supporting key initiatives can be traced to strategic objectives. Identified users participate in project management during the project's life cycle.

○ incomplete or obsolete policies and procedures; ad hoc practices

◐ policies or procedures for key functions; only selected practices in place.

● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

IT Investment Management—Evaluation

Activity (Critical process)	Assessment	Comments
Selecting an investment	◑	New and ongoing IT projects are selected and reselected during the general budget cycle. The Operating Committee, ITGB and ad hoc investment review subgroups ensure that the selection process is compliant with OMB Exhibit 300 requirements. However, the bureau does not have organizationwide policies to ensure that a well-defined and disciplined process is used to select new IT proposals and reselect ongoing investments.
Providing investment oversight	◑	Investment oversight is provided through the Operating Committee, ITGB, and ad hoc investment review subgroups. Investment information is provided and reviewed annually, quarterly, and weekly. However, the bureau lacks written policies and procedures for monitoring the progress of all IT projects and systems.

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IT Policies, Procedures, and Practices

IT Investment Management—Evaluation

Activity (Critical process)	Assessment	Comments
Capturing investment information	◐	The bureau identifies and collects information about IT projects and systems through OMB Exhibit 300s, IT Business Plans, and shared network drives. However, the agency does not have a comprehensive and consistent repository of IT investment information that provides decision makers with data for evaluating the impacts and opportunities created by proposed (or continuing) IT investments.

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IT Policies, Procedures, and Practices

IT Investment Management—Impact of Weaknesses

Taking steps to improve the shortfalls listed above is important for the following reasons:

- Without written procedures, the bureau lacks assurance that the IT investment boards will provide investment management oversight and decision making in a consistent and repeatable manner.

- Without a well-defined and disciplined organizationwide policy for selecting new IT proposals and reselecting ongoing investments, the bureau cannot ensure that it is selecting and funding the IT investments that best result in mission-focused benefits.

- Without defined criteria and documented policies and procedures for monitoring the progress of all IT projects and systems, the bureau lacks assurance that consistent and appropriate actions will be taken when cost, schedule, and performance expectations are not met.

- Without a comprehensive repository of up-to-date investment information, the bureau cannot ensure that decision makers have the information they need to effectively manage the organization's IT investments.

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IT Policies, Procedures, and Practices
IT Investment Management—Conclusions and Recommendations

The Census Bureau has initiated basic IT investment management processes, but much remains to be done. Specifically, the bureau lacks a comprehensive, consistent, and repeatable approach to IT investment management. Until it develops and implements such an approach, the bureau cannot ensure that it is effectively and efficiently managing million and billion dollar investments in IT.

To strengthen its ability to manage IT investments, we recommend that the Secretary of Commerce direct the bureau to:
- develop written procedures to guide its IT investment boards' operations and use these procedures to ensure consistent investment management and decision-making practices,
- develop well-defined and disciplined written procedures that outline the process for selecting new IT proposals and reselecting ongoing investments and use these procedures in investment decision making,
- develop and implement defined criteria and documented policies and procedures for monitoring the progress of all IT projects and systems, and
- create a comprehensive repository that collects investment information that is up to date and accessible to decision makers.

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IT Policies, Procedures, and Practices

System Development/Management—Overview

Many organizations rely on software-intensive systems to perform their missions. The quality of this software and these systems is governed largely by the quality of the processes involved in acquiring, developing, managing, and maintaining them. Carnegie Mellon University's Software Engineering Institute (SEI), recognized for its expertise in software and system processes, has developed the Capability Maturity Model[R] Integration (CMMI[SM])[7] model and a CMMI appraisal methodology to evaluate, improve, and manage system and software development and engineering processes.

The CMMI model and appraisal methodology provide a logical framework for measuring and improving key processes that are needed for achieving high-quality software and systems. The model can help an organization set process improvement objectives and priorities and to improve its processes. SEI has found that organizations that implement such process improvements can achieve better project cost and schedule performance and develop higher quality products.

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[7]CMM is registered in the U.S. Patent and Trademark Office by Carnegie Mellon University. CMMI is a service mark of the Carnegie Mellon University.

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IT Policies, Procedures, and Practices

System Development/Management—Overview

The CMMI appraisal methodology calls for assessing up to 25 different process areas—clusters of related activities such as project planning, requirements management, and quality assurance—by determining whether key practices have been implemented and whether overarching goals have been satisfied.

Successful implementation of these practices and satisfaction of these goals result in the achievement of successive capability levels. CMMI capability levels range from 0 to 5. Level 0 means the process is either not performed or is only partially performed; level 1 means the basic process is performed; level 2 means the process is managed; level 3 means the process is defined throughout the organization; level 4 means the process is quantitatively managed; and level 5 means the process is optimized.

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IT Policies, Procedures, and Practices

System Development/Management—Overview

To evaluate system development/management capabilities, we appraised two projects, the Decennial Master Address File pilot and the Master Address File/Topologically Integrated Geographic Encoding and Referencing system redesign.

We applied the CMMI model and its related appraisal methodology. Our appraisers were all SEI-trained software and information systems specialists. We evaluated the projects' processes at capability level 2, because bureau officials had set a goal of achieving level 2. In conjunction with project officials, we selected eight core process areas that are critical to sound program management:

- project planning
- project monitoring and control
- requirements management
- process and product quality assurance

- configuration management
- measurements and analysis[8]
- verification
- risk management

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[8]We did not perform a full appraisal of measurement and analysis on the Decennial Master Address File project because project officials reported that they had not yet implemented this process area.

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IT Policies, Procedures, and Practices

System Development/Management—Overview

The process areas we evaluated address key aspects of system development/ management.

- **Project planning:** The purpose of this process area is to establish and maintain plans that define the project activities. This process area involves developing and maintaining a plan, interacting with stakeholders, and obtaining commitment to the plan.

- **Project monitoring and control:** The purpose of this process area is to provide an understanding of the project's progress, so that appropriate corrective actions can be taken if actual performance deviates significantly from the plan. Key activities include monitoring the project, communicating status, taking corrective action, and determining progress.

- **Requirements management:** The purpose of this process area is to manage the product components and to identify inconsistencies among requirements and the project's plans and work products. This process area includes managing all technical and nontechnical requirements and any changes to these requirements as they evolve.

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IT Policies, Procedures, and Practices

System Development/Management—Overview

- **Process and product quality assurance:** The purpose of this process area is to provide staff and management with objective insights into processes and associated work products. This includes the objective evaluation of project processes and products against approved descriptions and standards. Through quality assurance, the project team is able to identify and document noncompliance issues and provide appropriate feedback to project staff.

- **Configuration management:** The purpose of configuration management is to establish and maintain the integrity of work products. This process area includes both the functional processes used to establish and track work product changes and the technical systems used to manage these changes. Through configuration management, accurate status information and data are provided to developers, end users, and customers.

- **Measurements and analysis:** The purpose of this process area is to develop and sustain a measurement capability that is used to support management information needs. This process area includes identifying measures, performing data collection, analysis, and storage of the measures, and reporting these values. This process allows users to objectively plan and estimate project activities and to identify and resolve potential issues.

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System Development/Management—Overview

- **Verification:** The purpose of verification is to ensure that selected work products meet specified requirements. This process area involves preparing for and performing tests and identifying corrective actions. Verification of work products substantially increases the likelihood that the product will meet the customer, product, and product-component requirements.

- **Risk management:** The purpose of this process area is to identify potential problems before they occur, so that risk-handling activities may be planned and invoked as needed across the life of the product or project in order to mitigate adverse impacts on achieving objectives. Early and aggressive detection of risk is important, because it is typically easier, less costly, and less disruptive to make changes and correct work efforts during the early phases of the project.

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IT Policies, Procedures, and Practices
System Development/Management—Evaluation

Activity (Process area)	Assessment	Comments
Project planning	◐	The bureau's Software Development and Maintenance policy addresses project planning. One of the project teams we evaluated performed all and the other performed most of the practices associated with this process, including establishing a work breakdown structure and a project plan. However, one project team did not fully implement other practices, including establishing a budget or maintaining its schedule.
Project monitoring and control	◐	The bureau's policy addresses project monitoring and control. Both project teams performed many of the practices associated with this process, including monitoring commitments against plans and periodically reviewing the project's progress. However, these projects did not fully implement other practices. For example, one project team did not adequately manage corrective actions to closure and neither project team adequately evaluated adherence to the process.

○ incomplete or obsolete policies and procedures; ad hoc practices	◐ policies or procedures for key functions; only selected practices in place.	● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

System Development/Management—Evaluation

Activity (Process area)	Assessment	Comments
Requirements management		The bureau's policy addresses requirements management. Both project teams performed many of the practices associated with this process, including managing changes to requirements. However, these project teams did not fully implement other practices. For example, one team did not monitor and control the process, and the other did not adequately evaluate adherence to the overall requirements management process.
Process and product quality assurance		The bureau's policy addresses process and product quality assurance. Both project teams performed many of the practices associated with this process, including resolving noncompliance issues and maintaining records of quality assurance activities. However, these project teams did not fully implement other practices. For example, one team did not adequately monitor and control the process, and the other did not adequately evaluate adherence to the quality assurance process.

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IT Policies, Procedures, and Practices

System Development/Management—Evaluation

Activity (Process area)	Assessment	Comments
Configuration management	◑	The bureau's policy addresses configuration management. One of the project teams performed all and the other performed most of the practices associated with this process, including creating baselines and tracking change requests. However, one project team did not fully implement other practices, such as objectively evaluating adherence to the configuration management process.
Measurement and analysis	○	The bureau's policy does not address measurement and analysis, but the organization governing one of the projects established a measurement and analysis policy. However, neither project team implemented the majority of measurement and analysis practices, including storing and analyzing measurement data.

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IT Policies, Procedures, and Practices
System Development/Management—Evaluation

Activity (Process area)	Assessment	Comments
Verification		The bureau's policy addresses verification, and both project teams performed practices associated with this process, including conducting peer reviews. However, these project teams did not perform other practices. For example, one of the project teams did not adequately monitor and control the process, and neither team defined its verification environment.
Risk management		The bureau's policy does not address risk management, but the organization governing one of the project teams implemented a risk management policy and the other project team had risk management procedures in place. Additionally, both teams performed many of the practices associated with this process, including identifying, evaluating, and categorizing risks. However, these project teams did not implement other practices; for example, neither team fully monitored and controlled the risk management process.

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IT Policies, Procedures, and Practices

System Development/Management—Impact of Weaknesses

Taking steps to improve the shortfalls listed above is important for the following reasons:

- Without an adequate project planning process, the bureau lacks assurance that reasonable plans and tools for managing projects—including project life-cycle phases and schedules—have been developed and are in use.

- Without an adequate project monitoring and control process, the bureau lacks assurance that management can effectively monitor projects' actual progress and take appropriate corrective action if performance deviates significantly from plans.

- Without an adequate requirements management process, the bureau cannot ensure that it will be able to identify inconsistencies between requirements and plans, increasing the likelihood that products will not meet customer needs.

- Without an adequate process and product quality assurance process, the Bureau cannot ensure that it will be able to provide staff and management with objective insight into processes throughout the project's life cycle.

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IT Policies, Procedures, and Practices

System Development/Management—Impact of Weaknesses

Further:

- Without an adequate configuration management process, the bureau cannot ensure the integrity of plans and other work products throughout a project's life cycle.

- Without an adequate measurement and analysis process, the bureau cannot ensure that project information provided to management is measured, analyzed, and recorded so that management can effectively monitor actual performance and take appropriate corrective actions.

- Without an adequate verification process, the bureau cannot ensure that products will be built to meet the customer and product requirements, increasing the likelihood that products will not meet customer needs.

- Without an adequate risk management process, the bureau cannot ensure that risks are identified, analyzed, tracked, and mitigated. Therefore, potential problems are more likely to become actual problems and have adverse effects on objectives.

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IT Policies, Procedures, and Practices
System Development/Management—Conclusions and Recommendations

Individual project teams within the bureau have taken the initiative to improve their system development and management processes but have not yet fully implemented many of the key practices that make up a sound project management process. Unless the bureau adopts a consistent approach to improving system development and management processes, project teams will continue to manage systems in an ad hoc manner and risk the cost overruns, schedule slippages, and performance shortfalls that plague other government system development projects.

To strengthen agencywide system development and management capabilities, we recommend that the Secretary of Commerce direct the bureau to institutionalize a process improvement initiative, such as the CMMI maturity framework, and establish goals for projects to reach successive capability levels in selected process areas, including

- project planning
- project monitoring and control
- requirements management
- process and product quality assurance

- configuration management
- measurements and analysis
- verification
- risk management

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Overview

An enterprise architecture (EA) serves as a blueprint to guide and constrain systems modernization efforts. The maturity stages listed below represent incremental steps toward advancing an organization's ability to manage the development, maintenance, and implementation of an EA.

Stage 1: Creating EA awareness

> The organization is becoming aware of the value of an EA, but has not yet established the management foundation needed to develop one.

Stage 2: Building the EA management foundation

> The organization moves from basic awareness to building the foundation for effectively managing the development, maintenance, and implementation of an EA.

Stage 3: Developing EA products

> The organization moves from building the EA management foundation to developing EA products.

Stage 4: Completing EA products

> The organization moves from developing to completing EA products.

Stage 5: Leveraging the EA for managing change

> The organization uses EA products to guide and constrain investment decisions in a way that effectively supports achievement of business and systems modernization.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Overview

The maturity stages are comprised of core elements.

Stage	Core Element
Stage 1: Creating EA awareness	Agency is aware of EA.
Stage 2: Building the EA management foundation	Adequate resources exist.
	Committee or group representing the enterprise is responsible for directing, overseeing, or approving EA.
	Program office responsible for EA development and maintenance exists.
	Chief architect exists.
	EA is being developed using a framework, methodology, and automated tool.
	EA plans call for describing the "as is" environment, the "to be" environment, and a sequencing plan.
	EA plans call for describing the enterprise in terms of business, performance, information/data, application/service, and technology.
	EA plans call for business, performance, information/data, application/service, and technology descriptions to address security.
	EA plans call for developing metrics for measuring EA progress, quality, compliance, and return on investment.
Stage 3: Developing EA products	Written and approved organization policy exists for EA development.
	EA products are under configuration management.
	EA products describe or will describe the enterprise's business, performance, information/data, application/service, and the technology that supports them.
	EA products describe or will describe the "as is" environment, the "to be" environment, and a sequencing plan.
	Business, performance, information/data, application/service, and technology descriptions address or will address security.
	Progress against EA plans is measured and reported.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Overview

EA Maturity Stage and Core Elements:

Stage 4: Completing EA products	Written and approved organization policy exists for EA maintenance.
	EA products and management processes undergo independent verification and validation.
	EA products describe the "as is" environment, the "to be" environment, and a sequencing plan.
	EA products describe the enterprise's business, performance, information/data, application/service, and the technology that supports them.
	Business, performance, information/data, application/service, and technology descriptions address security.
	Organization chief information officer has approved current version of EA.
	Committee or group representing the enterprise or the investment review board has approved current version of EA.
	Quality of EA products is measured and reported.
Stage 5: Leveraging the EA for managing change	Written and approved policy exists for IT investment compliance with EA.
	Process exists to formally manage EA change.
	EA is integral component of IT investment management process.
	EA products are periodically updated.
	IT investments comply with EA.
	Organization head has approved current version of EA.
	Return on EA investment is measured and reported.
	Compliance with EA is measured and reported.

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Enterprise Architecture Management—Overview

We evaluated the bureau's policies and management of its IT enterprise architecture using GAO's EA assessment guide.[9] We assessed the Bureau's enterprise architecture at maturity stages 1, 2, and 3.

We did not evaluate maturity stages 4 or 5 because bureau officials reported that they had not yet implemented all of the core elements for these stages. However, they noted that they had begun to implement some of the core elements in these advanced maturity stages.

[9]GAO-03-548G.

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IT Policies, Procedures, and Practices
Enterprise Architecture Management—Evaluation

Activity (Core element)	Assessment	Comments
Agency is aware of EA	●	The bureau is aware of enterprise architecture concepts.
Adequate resources exist	◗	The bureau provides funding for personnel, consultants, and tools to support its enterprise architecture, but this funding varies from year to year and, according to the Chief Architect, can fall below the level needed to accomplish project goals.
Committee or group representing the enterprise is responsible for directing, overseeing, or approving EA	●	The bureau has established a committee (chaired by the CIO) to direct, oversee, and approve its enterprise architecture effort.

◯ incomplete or obsolete policies and procedures; ad hoc practices	◗ policies or procedures for key functions; only selected practices in place.	● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
Program office responsible for EA development and maintenance exists	●	The bureau has established a program office with responsibility for developing and maintaining the enterprise architecture.
Chief architect exists	●	The bureau has a chief architect for its enterprise architecture.
EA is being developed using a framework, methodology, and automated tool	●	The bureau is developing its EA using a framework, a methodology, and an automated tool.

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IT Policies, Procedures, and Practices
Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
EA plans call for describing the "as is" environment, the "to be" environment, and a sequencing plan	●	Bureau EA plans call for describing the "as is" environment, the "to be" environment, and a sequencing plan.
EA plans call for describing the enterprise in terms of business, performance, information/data, application/ service, and technology	●	Bureau EA plans call for describing the enterprise in terms of business, performance, information, applications, and technology infrastructure.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
EA plans call for business, performance, information/data, application/ service, and technology descriptions to address security	●	Bureau EA plans call for business, performance, information, application, and technology descriptions to address security.
EA plans call for developing metrics for measuring EA progress, quality, compliance, and return on investment	●	Bureau plans call for developing metrics for measuring EA progress, quality, compliance, and return on investment.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
Written and approved organization policy exists for EA development	◐	The bureau has a detailed business plan guiding its EA development, which is approved by the Chief Information Officer. However, it does not yet have a policy for EA development that is signed by the Bureau director.
EA products are under configuration management	●	Bureau EA products are under configuration management.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
EA products describe or will describe the enterprise's business, performance, information/data, application/ service, and the technology that supports them	●	Bureau EA products describe the enterprise's business, information, applications, and technology infrastructure. The Bureau plans for future EA products to describe the enterprise's performance.
EA products describe or will describe the "as is" environment, the "to be" environment, and a sequencing plan	●	Bureau EA products describe the "as is" and the "to be" environments and will describe the sequencing plan.

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IT Policies, Procedures, and Practices

Enterprise Architecture Management—Evaluation

Activity (Core Element)	Assessment	Comments
Business, performance, information/data, application/ service, and technology descriptions address or will address security	●	The bureau's EA business, information, application, and technology descriptions address security, and efforts are under way to continue to integrate security with the enterprise architecture. The bureau plans for future EA products that describe the enterprise's performance to address security.
Progress against EA plans is measured and reported	●	The bureau measures and reports on its progress against its EA plans.

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IT Policies, Procedures, and Practices
Enterprise Architecture Management—
Impact of Weaknesses

Taking steps to improve the two EA shortfalls described above is important for the following reasons:

- Without adequate resources, the bureau's EA office will not be able to accomplish its goals of expanding and improving the architecture.

- Without a written policy endorsing the EA, the bureau may not be able to get the support it needs to fully implement the EA and to realize its benefits. A written policy could lead to enhanced support for the EA and increased use and benefits throughout the agency. Based on our experience in reviewing other agencies, not having an effective architecture program can be attributable to limited senior management understanding and commitment and to cultural resistance to using an architecture. The result can be an inability to implement modernized systems in a way that minimizes overlap and duplication and maximizes integration and mission support.

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IT Policies, Procedures, and Practices
Enterprise Architecture Management—
Conclusions and Recommendations

The bureau has made important progress in managing its enterprise architecture program and has identified critical next steps to further expand, use, and achieve benefits from its architecture. However, the EA initiative lacks the senior management commitment—both in terms of resources and policy endorsement—that it needs to be truly effective. Unless the bureau demonstrates this senior level commitment, the EA initiative will likely be limited in how much progress it can continue to make.

To support the agency in its efforts to develop and implement an effective enterprise architecture, we recommend that the Secretary of Commerce direct the bureau to

- determine an adequate level of resources to accomplish planned EA activities in order to ensure continued improvements to the bureau's EA model and
- establish a written policy endorsing and enforcing the bureau's enterprise architecture.

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IT Policies, Procedures, and Practices

Information Security—Overview

Information security protects an organization's computer-supported resources and assets. Such protection ensures the integrity, appropriate confidentiality, and availability of an organization's data and systems. **Integrity** means that data have not been altered or destroyed in an unauthorized manner. **Confidentiality** means that information is not made available or disclosed to unauthorized individuals, entities, or processes. **Availability** means that data will be accessible or usable upon demand by an authorized entity.

Key activities for managing information security risks include:

- **Risk assessment**—identifying security threats and vulnerabilities to information assets and operational capabilities, ranking risk exposures, and identifying cost-effective controls

- **Awareness and training**—promoting awareness of security risks and educating users about security policies and procedures, as well as providing security training to staff

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IT Policies, Procedures, and Practices

Information Security—Overview

Key activities, continued:

- **Controls**—implementing the controls necessary to deal with identified risks to information systems, physical facilities, and networks, in order to protect them

- **Evaluation**—monitoring the effectiveness of controls and awareness activities through periodic evaluation

- **Central management**—coordinating security activities through a centralized group

Information security is of special importance to the Census Bureau because under law, with certain limited exceptions, the bureau must protect from disclosure the data it collects about individuals and establishments.[10] Specifically, the bureau may not disclose or publish any private information that identifies an individual or establishment.

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[10]U.S. Code, Title 13, Section 9.

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IT Policies, Procedures, and Practices

Information Security—Overview

We evaluated the bureau's policies and procedures on information security by comparing them to the requirements in the Federal Information Security Management Act of 2002[11] and to guidelines issued by OMB and the National Institute of Standards and Technology. We assessed selected bureau systems' security plans, risk assessments, and certification and accreditation packages. We interviewed bureau and Commerce security officials on security policies and practices. We also analyzed reports on the bureau's information security program by the Department of Commerce's Office of the Inspector General.

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[11] Federal Information Security Management Act of 2002, Title III, E-Government Act of 2002, P.L. 107-347, Dec. 17, 2002.

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IT Policies, Procedures, and Practices

Information Security—Evaluation

Activity	Assessment	Comments
Risk assessment	◐	The bureau's security policy calls for system owners to conduct risk assessments on all major applications in an effort to identify and manage threats, vulnerabilities, and risks. The bureau reported that these risk assessments were completed by December 2003. However, in early 2004, the bureau revised its risk assessment policy to address documentation weaknesses that had been identified by the Inspector General, and it instructed system owners to reassess their systems. The bureau's Information Security Chief plans to work with system owners to improve their risk assessments, as part of an effort to improve certification and accreditation (C&A) packages by September 2005.
Awareness and training	◐	The bureau's policy calls for general security training for all employees and contractors and for more specialized security training tailored to certain job descriptions. The bureau has implemented multiple security awareness and training programs. However, the bureau does not yet have a program in place for identifying employees who need specialized security training or for providing this training.

○ incomplete or obsolete policies and procedures; ad hoc practices

◐ policies or procedures for key functions; only selected practices in place.

● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

Information Security—Evaluation

Activity	Assessment	Comments
Controls— information system security	◑	The bureau's policy requires system owners to assess systems risks, address any identified weaknesses, and obtain system certification and accreditation (C&A). The bureau completed C&A packages for many of its systems, but the Inspector General recently reported that selected systems' C&A packages were incomplete and inaccurate. The Information Security Chief plans to recertify and accredit Bureau systems by the end of September 2005.
Controls— physical security	●	The Department of Commerce manages the physical security of the bureau's facilities. Commerce's security policy calls for facility managers to conduct periodic risk assessments of their facilities to identify vulnerabilities and corresponding countermeasures. The Commerce office of security tracks completion of these risk assessments and closure of all countermeasures. Currently, all 47 bureau facilities are up to date on required risk assessments.

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Information Security—Evaluation

Activity	Assessment	Comments
Controls— network access	◑	The bureau's security policy calls for system owners to identify network and logical access controls and the security office and system owners use network scanning tools to identify potential system vulnerabilities. However, in September 2004, the Inspector General reported that some systems' testing and verification of network security controls was inadequate. A security official advised us that they are planning to address network access issues by procuring additional system penetration tools in order to better test systems. However, the security office does not have an estimated timeframe for completing this activity.
Evaluation	◑	The bureau's IT security office is responsible for overseeing systems security; it uses a database to track the status of systems' certification and accreditation and to track any deficiencies (including network and system control weaknesses) until they are closed. However, this database does not effectively track all of the key information needed to effectively oversee security controls and does not allow for effective version control. To assist in managing system documentation, the security office plans to migrate to a new security oversight management tool by September 2005.

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Information Security—Evaluation

Activity	Assessment	Comments
Central management	●	The bureau's Information Technology Security Office, within the Office of the Chief Information Officer (CIO), is the central management office with responsibility for information security policies and procedures. This office is responsible for ensuring that IT security procedures, standards, and guidance are implemented, while the CIO approves policy. The Chief of Information Security also coordinates with other Bureau directorates to ensure that security policies are enforced. This office coordinates efforts with Commerce's Office of Security at the Census Bureau, which is responsible for physical and personnel security.

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IT Policies, Procedures, and Practices

Information Security—Impact of Weaknesses

The bureau has activities under way and planned to address each of the security areas, but the agency has not established milestones for completing all of its planned activities.

- Until the bureau identifies individuals who need specialized training and provides that training, it faces increased risk that individuals accessing systems may not have the information they need to protect these systems.

- Until the bureau identifies the tools it needs to test and verify network security controls, system owners risk being unaware of potential security threats and vulnerabilities, and they may not have adopted the controls they need to address them.

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Information Security—Conclusions and Recommendations

The bureau has policies and processes in place to manage information security, but important steps for ensuring that systems are secure remain to be carried out. Until the bureau completes these system security initiatives, it cannot ensure that information, systems, and networks are adequately protected from disclosure or attack.

In order to improve information security, we recommend that the Secretary of Commerce direct the bureau to

- establish milestones for

    - identifying staff with special security training needs and developing an effective training program for them,

    - identifying system penetration tools to aid network access security and testing network controls using these tools, and

- monitor progress against these milestones and the milestones that have already been established to address weaknesses in risk assessments, information system security controls, and oversight management tools, to ensure that these activities are completed in a timely manner.

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IT Policies, Procedures, and Practices

IT Human Capital—Overview

Human capital centers on viewing people as assets whose value to an organization can be enhanced by investing in them. As the value of people increases, so does the performance capacity of the organization—and therefore its value to clients and other stakeholders.

According to the Clinger-Cohen Act of 1996, to maintain and enhance the capabilities of IT staff, an organization should conduct four basic activities:

- **Requirements**—annually assess the knowledge and skills that an agency needs to effectively perform its IT operations to support its mission and goals

- **Inventory**—determine the knowledge and skills of current IT staff to identify gaps in needed capabilities

- **Workforce strategies and plans**—develop strategies and implement plans for hiring, training, and professional development to fill any gap between requirements and current staffing

- **Progress evaluation**—evaluate the progress made in improving IT human capital capability, and use the results of these evaluations to continuously improve the organization's human capital strategies

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IT Policies, Procedures, and Practices

IT Human Capital—Overview

We compared the bureau's policies and procedures for IT human capital to the Clinger-Cohen Act[12] and to our guide, *Human Capital: A Self-Assessment Checklist for Agency Leaders*.[13] We reviewed IT human capital practices in the areas of skills and knowledge requirements, skills and knowledge inventories, workforce strategies, and progress evaluations.

[12] Clinger-Cohen Act of 1996, 40 U.S.C. 11101-11704.

[13] U.S. GAO, *Human Capital: A Self-Assessment Checklist for Agency Leaders*, GAO/OCG-00-14G (Washington, D.C.: September 2000).

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IT Policies, Procedures, and Practices

IT Human Capital—Evaluation

Activity	Assessment	Comments
Requirements	◗	In 2000, the bureau's Human Capital Office and program area directorates identified requirements, including knowledge and skills, that its IT staff need to perform their responsibilities. However, the bureau has not reassessed its requirements to ensure that it identifies any new knowledge and skills it needs, such as skills supporting e-government initiatives.
Inventory	●	Commerce's CIO maintains an inventory of IT staff skills. In 2004, about 85 percent of the bureau's IT staff participated in an IT workforce assessment survey and reported on whether they had skills in 97 different IT areas. By April 2005, Commerce plans to make available a target-setting tool that the bureau can use to develop "what-if" scenarios. This tool will allow the bureau to identify both projected and desired future states of its IT workforce and to formulate a "gap analysis."

○ incomplete or obsolete policies and procedures; ad hoc practices	◗ policies or procedures for key functions; only selected practices in place.	● comprehensive, current policies and procedures; practices adhere to policies, procedures, and generally accepted standards

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IT Policies, Procedures, and Practices

IT Human Capital—Evaluation

Activity	Assessment	Comments
Workforce strategies and plans		The bureau has procedures that address gaps in its IT workforce. In practice, the bureau addresses gaps through recruiting, retention, and professional development programs. For example, the bureau offers special pay incentives to IT specialists, and staff can complete IT courses to improve their skills. However, the bureau has not completed a skills gap analysis and therefore has not developed strategies to fill any identified gaps.
Progress evaluation		The bureau annually evaluates its progress in human capital management planning, workforce development, and succession planning. However, because the bureau has not yet identified IT skills gaps or developed strategies to fill these gaps (as noted above), it is not yet able to evaluate the effectiveness of its strategies.

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IT Human Capital—Impact of Weaknesses

Taking steps to improve the shortfalls listed above is important for the following reasons:

- Until the bureau regularly assesses its IT requirements, it risks not identifying needed skills and knowledge in its IT workforce.

- Until the bureau completes a gap analysis, it lacks assurance that it is optimizing the use of its current IT workforce and therefore is unable to implement workforce strategies to fill any identified gaps. As a result, the bureau is at increased risk that it lacks the trained staff it needs to fulfill its mission objectives.

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IT Policies, Procedures, and Practices

IT Human Capital—Conclusions and Recommendations

The Census Bureau has implemented steps to manage its IT human capital, but more remains to be done to update requirements for IT skills and knowledge and to develop and implement strategies for filling any skill gaps. Until the bureau completes these activities, it is at increased risk that it will not have the skills it needs to effectively develop and manage its million- and billion-dollar investments in information systems and technology.

In order to improve the bureau's ability to manage its IT workforce, we recommend that the Secretary of Commerce direct the bureau to

- annually assess IT knowledge and skills to determine whether they meet current requirements, and
- use the planned gap analysis to identify workforce strategies to fill skills gaps and then evaluate these strategies to determine their effectiveness in improving human capital management.

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Agency Comments

In commenting on a draft of this briefing, Census Bureau officials, including the Chief Information Officer, Comptroller, and Chief, Information System Support and Review Office, stated that the bureau concurs with our findings and our recommendations.

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Comments from the Department of Commerce

THE DEPUTY SECRETARY OF COMMERCE
Washington, D.C. 20230

May 27, 2005

Ms. Colleen M. Phillips
Assistant Director
Information Technology Issues
U.S. Government Accountability Office
Washington, DC 20548

Dear Ms. Phillips:

The U.S. Department of Commerce appreciates the opportunity to comment on the U.S. Government Accountability Office draft report entitled *Information Technology Management: Census Bureau Has Implemented Many Key Practices, But Additional Actions Are Needed (GAO-05-661)*. I enclose the Department's comments on this report.

Sincerely,

David A. Sampson
(Acting)

Enclosure

U.S. Department of Commerce

Comments on the
U.S. Government Accountability Office
Draft Report Entitled *Information Technology Management: Census Bureau Has
Implemented Many Key Practices, But Additional Actions Are Needed*
GAO-05-661

Comments on Conclusions:

We agree with the draft report that the U.S. Census Bureau has developed policies and initiated
key practices in many areas that are important to successfully manage information technology.
These practices include investment management, system development/management, enterprise
architecture management, information security, and human capital management.

The report's findings, while accurate, do not acknowledge a number of steps being taken at the
Census Bureau to more broadly address the report's findings and other unrelated Information
Technology (IT) issues. The "Highlights" section of the Government Accountability Office
(GAO) report begins by stating *"The bureau has a decentralized approach to IT management."*
This is correct and has been the management approach at the Census Bureau for a long time.
However, what is not mentioned in the report and is of critical importance to improvement is the
very proactive and aggressive movement in the Census Bureau toward change. We are in the
process of introducing a corporate IT environment—one that will affect the Census Bureau
operationally as well as organizationally. We anticipate the improvements we will experience
over time from this undertaking will strengthen an already solid IT operation and further improve
upon our audit performance.

Also, the report did not clarify the system development/management perspective. For instance,
of 40 information technology management areas assessed by GAO for system
development/management, only one area—measurements and analysis—was found to be
incomplete or obsolete. What was not acknowledged was that the Census Bureau was being
assessed while in transition from the older SW-CMM standard (measurements and analysis is
embedded in the processes) to the new CMMI standard (measurements and analysis is a stand-
alone process) used by GAO.

Overall, we realize that improvements can be made and that additional actions are needed to
accomplish improvements to our management of information technology. These additional
actions are shown in the recommendations that follow.

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Comments on Recommendations for Executive Action

- "To strengthen the bureau's ability manage IT investments, we recommend that the Secretary of Commerce direct the bureau to

  o develop written procedures to guide its IT investment boards' operations and use these procedures to ensure consistent investment management and decision-making practices;
  o develop well-defined and disciplined written procedures that outline the process for selecting new IT proposals and reselecting ongoing investments and use these procedures in investment decision making;
  o develop and implement defined criteria and documented policies and procedures for monitoring the progress of all IT projects and systems; and
  o create a comprehensive repository that collects investment information that is up to date and accessible to decision makers."

  The Census Bureau concurs with the recommendation.

- "To strengthen agencywide system development and management capabilities, we recommend that the Secretary of Commerce direct the bureau to institutionalize a process improvement initiative, such as the Capability Maturity Model Integration framework, and establish goals for projects to reach successive capability levels in selected process areas, including project planning, project monitoring and control, requirements management, process and product quality assurance, configuration management, measurements and analysis, verification, and risk management."

  The Census Bureau concurs with the recommendation. The Census Bureau will continue its transition from the SW-CMM standard to the new CMMI standard bureauwide to strengthen its system development and management capabilities.

- "To support the bureau in its efforts to develop and implement an effective enterprise architecture (EA), we recommend that the Secretary of Commerce direct the bureau to

  o determine an adequate level of resources to accomplish planned EA activities in order to ensure continued improvements to the bureau's EA model; and
  o establish a written policy endorsing and enforcing the bureau's enterprise architecture."

  The Census Bureau concurs with the recommendation.

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- "To improve information security, we recommend that the Secretary of Commerce direct   ·
  the bureau to

    o establish milestones for identifying staff with special security training needs and
       developing an effective training program for them;
    o establish milestones for identifying system penetration tools to aid network access
       security and for testing network controls using these tools; and
    o monitor progress against these milestones and the milestones that have already
       been established to address weaknesses in risk assessments, information system
       security controls, and oversight management tools, in order to ensure that these
       activities are completed in a timely manner."

    The Census Bureau concurs with the recommendation.

- "In order to improve the bureau's ability to manage its IT workforce, we recommend that
  the Secretary of Commerce direct the bureau to

    o annually assess IT knowledge and skills to determine whether they meet current
       requirements; and
    o use the planned gap analysis to identify workforce strategies to fill skills gaps and
       then evaluate these strategies to determine their effectiveness in improving human
       capital management."

    The Census Bureau concurs with the recommendation.

GAO Contact and Staff Acknowledgments

GAO Contact

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Acknowledgments

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