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INFORMATION TECHNOLOGY

OMB Leadership Critical to Making Needed Enterprise Architecture and E-government Progress

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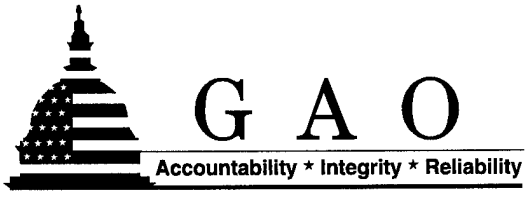

Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss the status and relationship of two critically important components of the federal government's efforts to improve performance and accountability through information technology (IT)—enterprise architectures and electronic (e-) government.

Enterprise architectures are high-level blueprints for transforming how a given entity, whether it be a federal agency or a federal function that cuts across agencies, operates. Without enterprise architectures to guide and constrain IT investments, such as e-government initiatives, stovepipe operations and systems can emerge, which in turn can lead to needless duplication, incompatibilities, and additional costs. E-government refers to a mode of operations (using people, process, and technology—particularly Web-based Internet technology) to enhance access to and delivery of government information and service to citizens, business partners, employees, other agencies, and other levels of government. It has the potential to help build better relationships between the government and its customer bases by making interaction smoother, easier, and more efficient. Together, enterprise architectures provide a vital means to a desired end—successful delivery of e-government applications, which in turn promise improved government performance and accountability.

This hearing on enterprise architectures and e-government is timely for two reasons. First, the president has made expanding e-government integral to his recent five-part management agenda for making the federal government more focused on citizens and results. Under the Office of Management and Budget's (OMB) leadership, the president's fiscal year 2003 budget proposes 24 e-government initiatives, most involving multiple agencies. These initiatives have laudable goals, including elimination of redundant, nonintegrated business operations and systems that, according to OMB, could produce several billions of dollars in savings from improved operational efficiency and, perhaps even more important, improved service to citizens, private-sector businesses, and state and local governments.

At the same time, these initiatives face various challenges, one of which is the second reason for the timeliness of this hearing. That is, the success of these initiatives hinges in large part on whether

they are pursued within the context of enterprise architectures. Currently, approved architectures for most of these initiatives do not yet exist. Overcoming this obstacle would be a formidable undertaking even if federal agencies were now successfully using enterprise architectures to manage their respective operational and technological environments. Unfortunately, this is not the case, as our recent report for this subcommittee and others shows.[1]

Our testimony today will address

- our framework for advancing and measuring enterprise architecture management maturity,
- a snapshot of the state of enterprise architecture management maturity across the federal government,
- the role of enterprise architectures in the successful implementation of e-government initiatives, and
- the need for strong OMB leadership in helping the maturity of enterprise architecture management for both individual agencies and federal e-government initiatives.

Hierarchical in nature, our initial version of a management framework for enterprise architecture management maturity[2] defines five distinct stages. Associated with each are practices that constitute the core elements of effectively managing any endeavor—namely, practices that (1) demonstrate an enterprise architecture commitment, (2) provide the capability to meet this commitment, (3) demonstrate satisfaction of the commitment, and (4) verify satisfaction of the commitment.

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[1] U.S. General Accounting Office, *Information Technology: Enterprise Architecture Use across the Federal Government Can Be Improved,* GAO-02-6 (Washington, D.C.: Feb. 19, 2002). This report was addressed to the Senate Committee on Governmental Affairs and the full House Committee on Government Reform, as well as this subcommittee.

[2] Our framework is based on the core elements found in *A Practical Guide to Federal Enterprise Architecture* (version 1.0), published by the federal Chief Information Officers Council in February 2001, and developed in collaboration with us and others.

Employing this framework, we analyzed 116 agencies' self-reported architecture management information, and produced a snapshot in time of the federal government's state of affairs. This snapshot shows that architecture use in the federal government is largely a work in progress, with much left to be accomplished. Nevertheless, there are reasons for optimism, and our recent work at selected agencies shows at least pockets of progress. One factor accounting for the overall immature state of affairs has been that agency leaders have not traditionally understood the purpose and value of enterprise architectures, thus not giving them the priority attention they deserve and require.

E-government applications have already been introduced in federal agencies. As these applications evolve and become more sophisticated, resulting in fundamental business process transformation in federal agencies, and as they extend beyond a single federal agency, their success will become more dependent on whether they are defined and introduced within the context of enterprise architectures.

OMB has been a proponent of enterprise architectures, and has recently devoted increased attention to them; in moving forward, however, it can and should play a larger role. We believe that the tools presented in our report—the maturity framework itself and benchmark data about 116 departments, component agencies, and independent agencies—provide important baseline information against which targeted improvement across the government can be defined and measured. Accordingly, we have made recommendation to OMB for adopting and employing them. OMB has agreed to consider our recommendations. We believe that it should move quickly in implementing them, not only because of their importance to attaining more architecture-centric decisionmaking within individual agencies, but also because they will contribute to OMB's ability to effectively establish the architectural context needed to successfully pursue the president's e-government initiatives.

Background

Enterprise architecture development, implementation, and maintenance is a basic tenet of effective IT management. Used in concert with other IT management controls, they can greatly increase the chances for optimal mission performance. We have found that attempting to modernize operations and systems without an architecture leads to operational and systems duplication, lack of integration, and unnecessary expense. Our best practices research of successful public and private-sector organizations has similarly identified enterprise architectures as essential to effective business and technology transformation.[3]

Expanded use of e-government, which involves people, processes, and technology, is one avenue that the federal government is pursuing to transform how it does business internally and externally with citizens, private-sector businesses, and state and local governments. In fact, the president made e-government expansion one of the five key elements in his management and performance plan for making government citizen-centered, results-oriented, and market-based.

What is an Enterprise Architecture?

In simplest terms, an *enterprise* is any purposeful activity, and an *architecture* is the structure (or structural description) of anything; thus simply making an enterprise architecture a way to describe the structural composition of such activities as a federal agency or a government function that transcends more than one agency (e.g., grants management). Building on this, enterprise architectures consist of models, diagrams, tables, and narrative, which together translate the complexities of a given entity into simplified yet meaningful representations of how the entity operates (and intends to operate). Such operations are described in logical terms (e.g., business processes, rules, information needs and flows, users, locations) and technical terms (e.g., hardware, software, data, communications, and security standards and

[3] U.S. General Accounting Office, *Executive Guide: Improving Mission Performance through Strategic Information Management and Technology,* GAO/AIMD-94-115 (Washington, D.C.: May 1994).

protocols). These windows into the entity's operations are provided for the current, or "as is," environment, as well as for the target, or "to be," environment. A third element is a transition plan that charts the journey between the two.

Federal Enterprise Architecture Activities and Our Past Findings: A Brief History

The concept of enterprise architectures in the federal government can be traced back to the late 1980s, when the National Institute of Standards and Technology issued architectural guidance.[4] Shortly thereafter, our research of public and private-sector organizations identified these architectures as instrumental to organizational success in effectively leveraging IT in meeting mission goals.[5] We subsequently issued architecture guidance,[6] as did other federal entities.

The Clinger-Cohen Act of 1996,[7] which directs the chief information officers (CIOs) of major departments and agencies to develop, maintain, and facilitate the implementation of information technology architectures as a means of integrating agency goals and business processes with IT, served as an important catalyst in promoting greater awareness and use of architectures in the federal government. In response to the act, OMB, in collaboration with us, issued architecture development and implementation guidance.[8] OMB recently issued more stringent guidance directing that agency investments in IT be based on agency architectures.[9] Similarly, the CIO Council recently collaborated with us in issuing two additional guidance documents describing, respectively, assessment of whether

[4] National Institute of Standards and Technology, *Information Management Directions: The Integration Challenge,* Special Publication 500-167 (Gaithersburg, Md.: September 1989).

[5] U.S. General Accounting Office, *Meeting the Government's Technology Challenge: Results of a GAO Symposium,* GAO/IMTEC-90-23 (Washington, D.C.: February 1990).

[6] U.S. General Accounting Office, *Strategic Information Planning: Framework for Designing and Developing System Architectures,* GAO/IMTEC-92-51 (Washington, D.C.: June 1992).

[7] Clinger-Cohen Act of 1996, Public Law 104-106, section 5125, 110 Stat. 684.

[8] Office of Management and Budget, *Information Technology Architectures,* Memorandum M-97-16 (Washington, D.C.: June 18, 1997), rescinded with the update of OMB Circular No. A-130, Nov. 30, 2000.

[9] Office of Management and Budget, *Management of Federal Information Resources,* Circular No. A-130 (Washington, D.C.: Nov. 30, 2000).

agency-proposed IT investments are compliant with its enterprise architecture;[10] and an end-to-end set of steps for managing the development, implementation, and maintenance of enterprise architectures.[11]

We have been reviewing federal agencies' use of architectures since 1994, focusing initially on those agencies that were pursuing major systems modernization programs that were high-risk. These included the National Weather Service modernization,[12] the Federal Aviation Administration air traffic control modernization,[13] and the Internal Revenue Service (IRS) tax systems modernization.[14] We reported that these agencies' did not have complete architectures, and we made detailed recommendations to assist the agencies in developing, maintaining, and implementing them.

Since then, we have tracked the progress of these agencies and reviewed architecture management at other agencies, including the Department of Education,[15] the U.S. Customs Service,[16] and the Immigration and Naturalization Service.[17] We have also reviewed

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[10] Chief Information Officers Council, *Architecture Alignment and Assessment Guide* (Washington, D.C.: October 2000).

[11] *A Practical Guide to Federal Enterprise Architecture,* Version 1.0.

[12] U.S. General Accounting Office, *Weather Forecasting: Systems Architecture Needed for National Weather Service Modernization,* GAO/AIMD-94-28 (Washington, D.C.: March 11, 1994).

[13] U.S. General Accounting Office, *Air Traffic Control: Complete and Enforced Architecture Needed for FAA Systems Modernization,* GAO/AIMD-97-30 (Washington, D.C.: Feb. 3, 1997).

[14] U.S. General Accounting Office, *Tax Systems Modernization: Blueprint Is a Good Start but Not Yet Sufficiently Complete to Build or Acquire Systems,* GAO/AIMD/GGD-98-54 (Washington, D.C.: Feb. 24, 1998).

[15] U.S. General Accounting Office, *Student Financial Aid Information: Systems Architecture Needed to Improve Programs' Efficiency,* GAO/AIMD-97-122 (Washington, D.C.: July 29, 1997).

[16] U.S. General Accounting Office, *Customs Service Modernization: Architecture Must Be Complete and Enforced to Effectively Build and Maintain Systems,* GAO/AIMD-98-70 (Washington, D.C.: May 5, 1998).

[17] U.S. General Accounting Office, *Information Technology: INS Needs to Better Manage the Development of Its Enterprise Architecture,* GAO/AIMD-00-212 (Washington, D.C.: Aug. 1, 2000).

the use of architectures for certain agency functional areas, such as Department of Defense financial management[18] and combat identification systems.[19] These reviews have continued to identify the absence of complete and enforced architectures as a fundamental IT management weakness, leading to agency business operations, systems, and data that are incompatible, and forcing agencies either not to share data or to depend on expensive, custom-developed interface systems to do so. In response to our recommendations, some agencies have made progress. But this progress has taken a long time, and other agencies have yet to make similar strides.

Brief Overview of E-government Efforts

As we testified in July 2001,[20] advances in the use of IT and the Internet are continuing to change the way all levels of government communicate, use and disseminate information, deliver services, and conduct business. These advances offer great potential in helping build better relationships between government and the public by facilitating timely and efficient interaction. Accordingly, governments are increasingly turning to the Internet to conduct paperless acquisitions, provide interactive electronic services to the public, and tailor or personalize information. States and localities have been in the forefront of using electronic government, at least in terms of having Web sites: a survey in the fall of 2000 found that about 83 percent of local governments had such sites, but that few were providing interactive, on-line service delivery (although they planned to do so in the future).[21] And the public is certainly on board: in a November 2001 poll, over 75

[18] U.S. General Accounting Office, *Information Technology: Architecture Needed to Guide Modernization of DOD's Financial Operations*, GAO-01-525 (Washington, D.C.: May 17, 2001).

[19] U.S. General Accounting Office, *Combat Identification Systems: Strengthened Management Efforts Needed to Ensure Required Capabilities*, GAO-01-632 (Washington, D.C.: June 25, 2001).

[20] U.S. General Accounting Office, *Electronic Government: Challenges Must Be Addressed With Effective Leadership and Management*, GAO-01-959T (Washington, D.C.: July 11, 2001).

[21] Survey conducted by the International City/County Management Association and Public Technology, Inc.

percent of all Americans reported having used a government Web site, and 90 percent favored increased government investment in information-sharing initiatives aimed at apprehending and prosecuting criminals and terrorists.[22]

Federal agencies have already implemented an array of e-government applications, including using the Internet to collect and disseminate information and forms, buy and pay for goods and services, submit bids and proposals, and apply for licenses, grants, and benefits. In fact, a study of 22 countries' e-government efforts showed that the U.S. federal government had developed an extensive on-line presence. However, this study also judged the U.S. federal government as below average with respect to e-government delivery mechanisms, such as single point of entry and customer-relations management.[23]

The Government Paperwork Elimination Act (GPEA)[24] promotes e-government expansion by requiring that by October 21, 2003, federal agencies provide the public, when practicable, the option of submitting, maintaining, and disclosing required information electronically. The act makes OMB responsible for ensuring that agencies meet this implementation deadline. OMB, in turn, required each agency, by October 2000, to develop and submit an implementation plan and schedule. In testimony last year on GPEA implementation, the director of OMB stated that "agency progress in going electronic is mixed."[25] Our own reviews of agency GPEA implementation plans found many omissions and

[22] Hart-Teeter poll reported in The Council for Excellence in Government: *E-Government: To Connect, Protect, and Serve Us* (February 2002). The nationally representative survey polled 961 American adults, including an "oversample" of 155 Internet users; it has a 3.5 percent margin of error.

[23] Accenture, *eGovernment Leadership: Rhetoric vs. Reality–Closing the Gap* (April 2001).

[24] Public Law 105-277, Div. C, title XVII, October 1998.

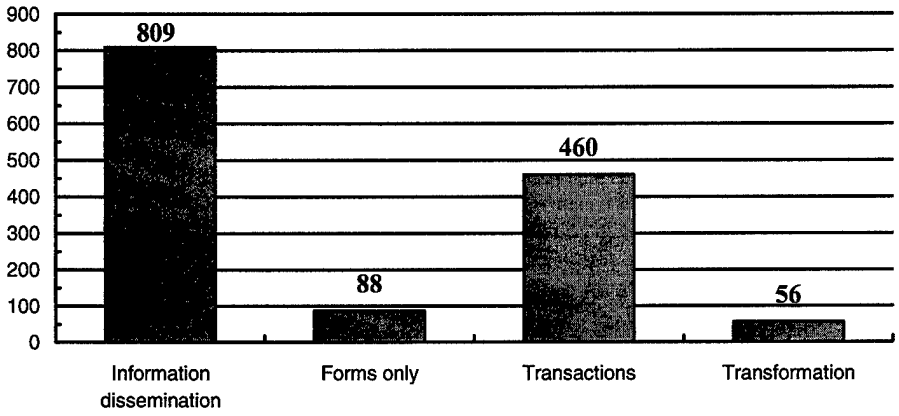
[25] House Committee on Government Reform. Statement of Mitchell E. Daniels, Jr., director, OMB, 107th Cong., 21 June 2001.

inconsistencies, which indicates that many agencies may be at risk of not meeting GPEA objectives.[26]

We later testified, in 2001, that federal agencies had implemented or were in the process of implementing a wide spectrum of e-government initiatives. This variety is illustrated by figure 1, which depicts the types of federal e-government initiatives reported by 37 departments and agencies. The category with the greatest number of initiatives is "information dissemination"—reported by the General Services Administration (GSA) and the federal CIO Council to be the least technically complex; it involves implementing applications on the Internet that make electronic information readily accessible. In the next category—"forms"—agencies provide downloadable electronic forms. The "transaction" category is a more complex implementation of e-government and includes initiatives such as submitting patent applications via the Internet. Finally, in the last category—"transformation"—the e-government initiative is expected to transform the way the government operates. For example, the Navy's Virtual Naval Hospital initiative is to provide a digital science library, and is designed to deliver expert medical information to providers and patients at the point of care.

[26] U.S. General Accounting Office, *Electronic Government: Better Information Needed on Agencies' Implementation of the Government Paperwork Elimination Act*, GAO-01-1100 (Washington, D.C.: Sept. 28, 2001) and U.S. General Accounting Office, *Electronic Government: Selected Agency Plans for Implementing the Government Paperwork Elimination Act*, GAO-01-861T (Washington, D.C.: June 21, 2001).

Figure 1: Numbers of Federal e-government Initiatives, by Type, as of January 2001.[a]

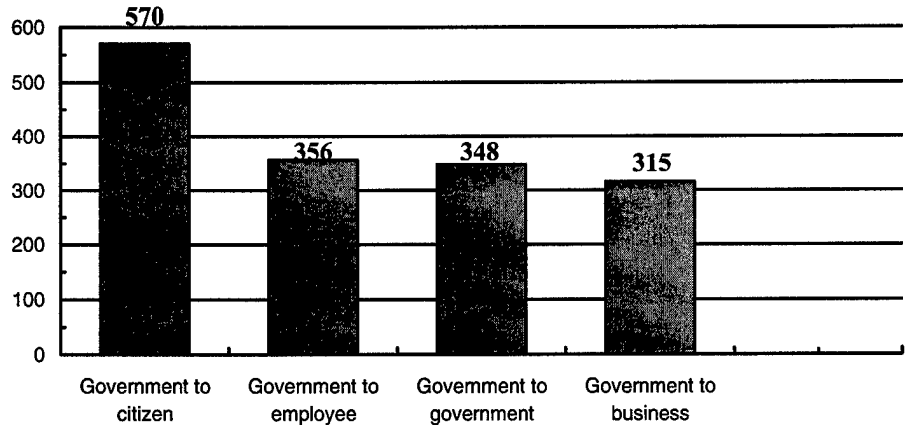


[a] *Transactions* are defined as end-to-end completed electronically. *Transformation* is defined as government's taking a global focus, government involvement being minimal, and citizens not needing to know the government entity to obtain services.

Source: General Services Administration in cooperation with the Federal CIO Council, *An Inventory of Federal e-Government Initiatives* (Washington, D.C.: January 2001).

Figure 2 depicts the constituencies targeted by the e-government initiatives; the greatest number are aimed directly at the American citizen.

Figure 2: Numbers of Federal e-government Initiatives, by Constituent Category, as of January 2001.



Source: GSA in cooperation with the Federal CIO Council, *An Inventory of Federal e-Government Initiatives* (Washington, D.C.: January 2001).

We also testified at this time that e-government implementation faced many challenges. These challenges included, among other things, the need for architectures to guide and constrain e-government investments.[27]

Subsequently, the OMB director created an e-government task force to identify priority actions aimed at improving service to individuals, service to businesses, intergovernmental affairs (state-federal), and federal agency-to-agency efficiency and

[27] The challenges we identified were (1) sustaining committed executive leadership, (2) building an e-government business case, which includes development of an enterprise architecture, (3) maintaining a citizen focus, (4) protecting personal privacy, (5) implementing appropriate security controls, (6) maintaining electronic records, (7) maintaining a robust technical infrastructure, (8) IT workforce management, and (9) ensuring uniform service to the public. See GAO-01-959T.

effectiveness. The task force produced 24 initiatives, which were approved by the president's management council in October 2001.[28] Criteria for settling on the 24 were expected value to citizens, potential for improvements in agency operational efficiency and savings, and likelihood of deploying within 18-24 months. According to the task force report, these initiatives could generate several billions of dollars in savings by reducing operating inefficiencies, redundant spending, and excessive paperwork. Further, the report states that the initiatives will provide service to citizens in minutes or hours, compared with today's standard of days or weeks, and will make available over $1 billion in savings from aligning redundant IT investments. Table 1 provides examples of these initiatives.

[28] Twenty-three initiatives were approved last October, with a 24th, *e-Payroll/HR,* being added later. An additional 25th initiative, called *Federal Architecture,* is included in OMB's February 2002 *E-Government Strategy.* It plans to map government processes by line of business.

Table 1: Sample e-government Initiatives.

Name	Function	Category	Proposed agency managing partner
EZ Tax Filing	Make it easier for citizens to file taxes in Web-enabled environment	Government to citizen	Internal Revenue Service
One-Stop Business Compliance Information	Provide information on laws and regulations; offer "wizards" and tutorials enabling citizens to determine if rules apply to them; permits can be completed, submitted, approved on-line, to extent possible	Government to business	Small Business Administration
Disaster Assistance and Crisis Response	Serve as a single application point for all disaster assistance programs	Government to government	Federal Emergency Management Agency
Enterprise Human Resources Integrations	Eliminate need for paper employee records, enable strategic decisions regarding human capital and financial resources; allow electronic transfer of data, better protect employee rights and benefits, and improve governmentwide reporting and data analysis; enable faster security clearances	Internal efficiency and effectiveness	Office of Personnel Management

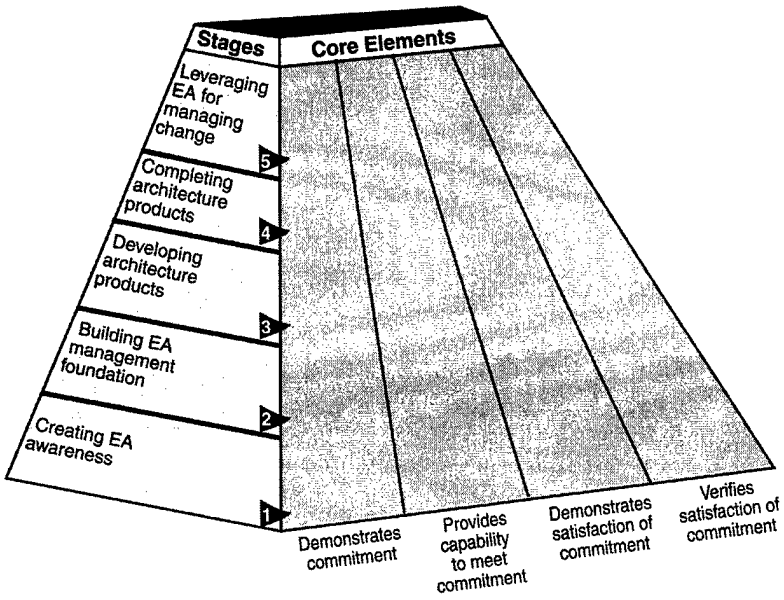
Source: *E-Government Strategy: Simplified Delivery of Services to Citizens.*

The 24 initiatives form the core of OMB's strategy for accomplishing the president' e-government expansion agenda–one of the five key elements in the president's management agenda and performance plan issued in August 2001.

A Five Stage Framework for Enterprise Architecture Maturity

As part of our recent report on the state of enterprise architecture management in the federal government,[29] we developed an initial version of a framework for defining and measuring architecture management progress. This framework defines five stages of maturity, beginning at the bottom with stage 1, *Creating EA Awareness,* and rising ultimately to stage 5, *Leveraging EA for Managing Change.* Figure 3 provides a simplified depiction of the framework.

Figure 3: A Simplified Depiction of our Enterprise Architecture Maturity Framework.



Source: GAO.

[29] GAO-02-6.

The stages build, from 1 to 5, such that each stage includes all of the elements of the prior stage. Each stage in briefly summarized below. A more detailed description is in our report.[30]

Stage 1, Creating Architecture Awareness, signifies either no architecture plans, or plans that do not yet demonstrate awareness of the architecture's value. While some core elements may have been initiated, such actions are ad hoc and unstructured, and do not provide the needed foundation for successful development.

Stage 2, Building Architecture Management Foundation, focuses on assigning roles and responsibilities and establishing plans for developing architecture products; this would include a chief architect and a staffed program office. Also required is a steering committee—with representatives of both business and IT—to oversee development. An architecture framework and automated tool should also have been selected.

Stage 3, Developing Architecture Products, addresses the creation of properly scoped components of the architecture. While products are not yet complete, plans provide for an architecture that characterizes the agency in business, data, applications, and technology terms. They also describe the current condition, target state, and sequencing plan for making the transition.

Stage 4, Completing Architecture Products, is just that; CIO-approved, properly scoped products exist for use in selecting and controlling IT investments. Further, agency policy requires that IT investments comply with the architecture.

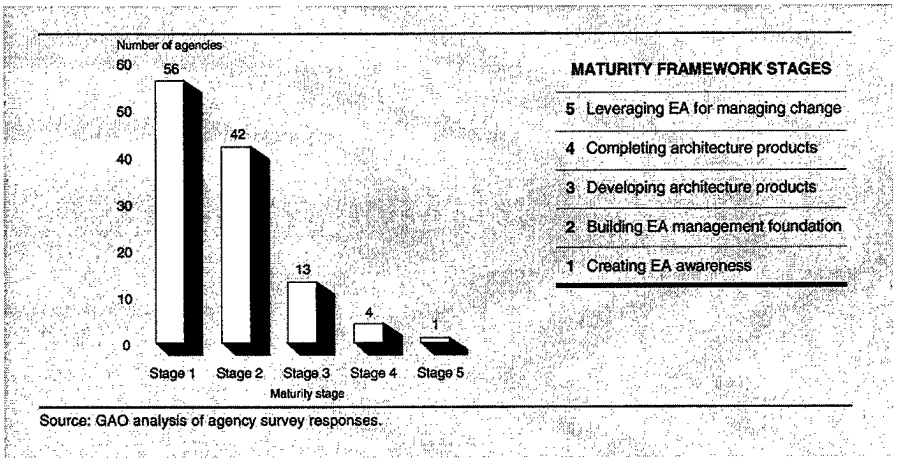
Stage 5, Leveraging the Architecture for Managing Change, entails evolving the architecture products according to an approved policy for architecture maintenance. The architecture is approved by the steering committee, investment review board, or agency head. Finally, it is being used for IT investment decisionmaking, and metrics about the architecture's use and value are being captured.

[30] GAO-02-6.

Federal Enterprise Architecture Maturity Is Limited, But Positive Signs for Progress Exist

As our report details, the state of EA maturity governmentwide is not good.[31] About half of the 116 agencies surveyed had reached at least stage 2, having a management foundation in place. This means that half had not, remaining in stage 1. At the other end of the spectrum, only 5 of the 116 agencies[32] reported that they were satisfying the core elements needed to be considered effective architecture managers, meaning that they have approved architectures that are being used to some extent in selecting and controlling IT investments (stage 4 or 5). Figure 4 depicts the number of agencies at each stage.

Figure 4: Number of Agencies at Each Stage of Enterprise Architecture Maturity, and Stage Definitions.



Source: GAO analysis of agency survey responses.

Despite this immature state of affairs, embedded in the agency responses to our survey are signs that near-term progress is possible. For example, about 75 percent of the agencies have established an enterprise architecture program office, and about

[31] GAO-02-6.

[32] The Customs Service, Department of the Army, Internal Revenue Service, Office of Personnel Management, and Patent and Trademark Office.

75 percent have likewise selected an architecture framework and automated tool.

Further, in several cases, agencies have satisfied some elements of a higher stage (say, stage 3), but are still categorized lower (stage 2) because, in such an example, not *all* of the stage 3 tasks have been satisfied. Over 80 percent of the agencies, in fact, reported performing one or more core elements associated with a higher stage of maturity. Specifically:

- Of the 56 agencies in stage 1, 35 are performing core elements that meet at least one criterion found in stages 2–5.
- About half of the 116 agencies must satisfy only one additional core element to advance to the next stage. In fact, 8 of the 53 agencies in this category could jump two stages by satisfying just one more element. One agency—the Defense Contract Audit Agency—could climb *three* stages, from stage 2 to stage 5, by satisfying just one additional core element: placing their EA products under configuration management.[33]

It is also important to remember that the self-reported agency data that we used are as of a specific point in time, a snapshot; responses were received by us between June and October 2001. Anecdotal evidence suggests that if such a picture were taken today, it would reflect a somewhat better situation. For example:

- The Immigration and Naturalization Service has been working to implement our recommendations for correcting its enterprise architecture management weaknesses,[34] and it has made some progress since responding to our survey in July 2001. Judged at stage 1 on the basis of its responses to us at that time, it now reports that it has satisfied the single element it was missing in order to be at stage 2–an automated architecture tool. Further, INS reports completing the initial version of its current, "as is" architecture for data, application,

[33] Configuration management is a means for ensuring the integrity and consistency of program and project products throughout their life cycles.

[34] GAO/AIMD-00-212.

and technology. It is currently focusing on developing its target ("to be") architecture, and plans to complete this work—along with a transition plan—by October 1, 2002.

- The National Aeronautics and Space Administration, judged as being at stage 2 level of maturity because it reported not satisfying one stage 3 core element—having the architecture products that it was developing under configuration control—has since addressed this weakness. Accordingly, it would now be considered stage 3.

- Judged as a stage 1 agency based on the information it reported, the Department of Veterans Affairs has made progress in two important areas necessary to building the foundation for effective EA management. Specifically, it now has an acting chief architect and is recruiting a permanent one, and is in the process of establishing an EA program management office.

Additionally, it is important to recognize that enterprise architectures are *living* documents; to be effective change management tools, they must be continuously maintained, meaning new versions will be created to reflect shifts in business priorities and strategies and emerging technologies. Such revision and update also signal agency architecture maturity progression.

IRS is a case in point. Judged a stage 4 agency on the basis of information it submitted last July and remaining so today, IRS has nonetheless continued to evolve its architecture, subsequently producing updated versions. On the basis of IRS officials' briefings to us, the latest version is more robust and content rich than previous versions, including, for example, an enterprisewide focus, multiple levels of business decomposition, and a detailed logical data model.

Enterprise Architecture Progress: Benefits and Challenges

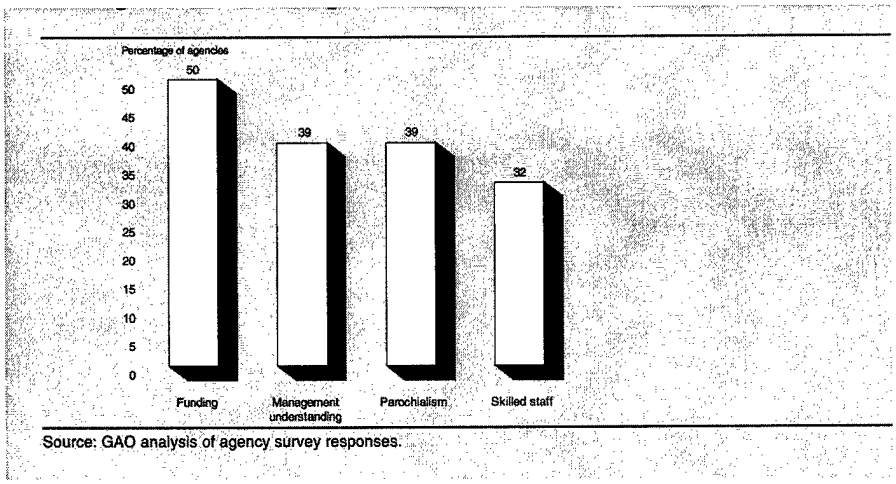
In the absence of enterprise architectures, agency operations and systems have been allowed to "morph" over time in isolation from one another, thus producing standalone, subagency islands of processes and automation. As we have repeatedly reported, the result is suboptimization of the whole (the agency) in favor of the needs of the parochial parts (agency components). These

undesirable consequences of "architecture-free" past practices point to the benefits to be realized from having and using enterprise architectures.

Our survey of agency enterprise architecture management efforts highlighted these benefits. Specifically, about 40-50 percent of the agencies responding cited the following benefits from enterprise architectures: (1) lower system-related costs, (2) enhanced productivity and improved efficiency, and (3) improved organization and change management. Further, about 25 percent cited improved systems interoperability as an additional benefit.

Given these impressive benefits, why has progress across the federal government been so meager? When asked about challenges and potential barriers to developing and using enterprise architectures, the four areas most often cited by agencies that responded to our inquiry were lack of funding, limited management understanding, parochialism, and shortage of skilled staff. Ironically, these are some of the very challenges facing OMB in implementing its e-government initiatives. (See figure 5.)

Figure 5: Federal Agencies' Frequently Identified EA Management Challenges.



Source: GAO analysis of agency survey responses.

E-government Success Depends on Effective Use of Enterprise Architectures

As we testified last year,[35] opportunities abound for expanded use of e-government to provide faster, more convenient, and more efficient on-line information access and services to citizens. However, many challenges exist, and past mistakes serve to remind us that IT solutions carry with them risks as well as benefits. If not managed properly, these risks can become problems that rob the nation of promised IT investment value. The key to success is to proceed in a way that employs proven IT management best practices. Metaphorically, these practices are the horse that pulls the cart that contains the e-government initiatives. In the past, federal agencies have largely allowed the cart to get ahead of the horse. For OMB's e-government initiatives to succeed, this pitfall must be avoided.

One proven best practice is developing, maintaining, and using enterprise architectures to guide and constrain IT investments. When well developed, maintained, and used, they bring clarity and understanding to the interrelationships and interdependencies among business operations and the underlying IT infrastructure and applications that support the operations. Used in concert with other IT management best practices, they can greatly increase the chances for optimizing overall mission performance. As noted, attempting to modernize operations and systems without architectures leads to operational and systems duplication, lack of integration, and unnecessary expense.

OMB's recently released e-government strategy[36] includes an e-government federal architecture project, a goal of which was to develop, by March 15, 2002, certain enterprise architecture products for each of the 24 e-government initiatives.[37] Another goal is to collect and analyze available agency architecture information with an eye toward identifying new e-government initiatives. A final goal is to develop federal (i.e., governmentwide)

[35] GAO-01-959T.

[36] *E-Government Strategy: Simplified Delivery of Services to Citizens.*

[37] See the attachment to this statement for information on all of the initiatives.

architecture products in four focus areas: homeland security, economic stimulus, social services, and "back office" operations. These latter two goals are to be accomplished by April 30, 2002.[38]

The need for progress in the federal government's use of enterprise architectures is undeniable, and OMB's central role in holding agencies accountable and helping them to progress in this area is equally obvious. At stake is not only the ability of federal agencies to effectively transform their respective operations and supporting systems environments, and thus elevate their performance, but also the ability of agencies to effectively work together in implementing integrated e-government solutions, thereby advancing governmentwide mission effectiveness and efficiency.

OMB: The Lead Actor in Achieving Enterprise Architecture and E-government Progress

To its credit, OMB has taken important steps in the last year to promote and oversee agency development and use of enterprise architectures. We support these efforts. Nevertheless, OMB's approach has been to focus only on the 24 major departments and agencies, and to rely on the unverified, nonstandard status reporting of each. Restated, OMB is not using a structured, systematic approach to define and measure architecture progress and identify associated governmentwide challenges and solutions.

Also to OMB's credit, it has committed to developing enterprise architectures for its e-government initiatives, and has set challenging goals for doing so. Aside from the ambitious time frames it has established and the sheer breadth and magnitude of these architecture efforts, a challenge facing OMB is overcoming the less-than-stellar state of the government's enterprise architecture affairs, as our testimony and recent report show, particularly for those agencies that have lead responsibility for the initiatives. For example, as table 2 indicates, 2 of the 13 lead agencies for the 24 e-government initiatives are at an enterprise architecture stage of 1, 8 are at stage 2, 1 is at stage 3, and only 2 are at stage 4. None have reached stage 5.

[38] We have not conducted work to determine OMB's progress in meeting these goals.

Table 2: Enterprise Architecture Stages of the Agencies Having "Managing Partner" Status in the 24 OMB e-government Initiatives.

Department/Agency	EA stage	Initiative(s)
Department of Commerce	3	*International Trade Process Streamlining*
Department of Education	2	*Online Access for Loans*
Federal Emergency Management Agency	2	*Disaster Assistance and Crisis Response*
GSA	2	*e-Authentication*
		e-Travel
		Federal Asset Sales
		Integrated Acquisition Environment
		USA Services
Department of Health and Human Services	1	*Consolidated Health Informatics*
		e-Grants
Department of the Interior	2	*Geospatial Information One-Stop*
		Recreation One-Stop
IRS	4	*Expanding Electronic Tax Products for Business*
		EZ Tax Filing
Department of Labor	2	*Eligibility Assistance Online*
National Archives and Records Administration	[a]	*Electronic Records Management*
Office of Personnel Management (OPM)	4	*Enterprise HR Integrations*
		e-Payroll/HR
		e-Training
		Recruitment One-Stop
Small Business Administration	2	*One-Stop Business Compliance Information*
Social Security Administration	2	*e-Vital*
Department of Transportation	2	*Online Rulemaking Management*
Department of the Treasury	1	*Wireless Public SAFEty Interoperable COMmunications/Project SAFECOM*

[a]The National Archives and Records Administration was not included in our survey due to the size of its budget.

Source: *E-Government Strategy: Simplified Delivery of Services to Citizens.*

Strong OMB leadership is especially pivotal to ensuring that both agency-specific investments in IT and governmentwide investments in e-government are made within the context of enterprise architectures. To do less jeopardizes realizing the full potential and benefits of these investments. OMB has thus far demonstrated leadership on both fronts, but the importance of these investments requires it to go farther.

Accordingly, we have made recommendations to the director of OMB aimed at strengthening its enterprise architecture leadership through adoption of the maturity framework we developed, use of the baseline agency architecture information that we collected as a maturity benchmark, and periodic maturation reporting, all with the intent of bringing greater emphasis, and thus meaningful progress, to this important area. While these recommendations were made in the context of agency-specific architectures and investments, they have relevance to the OMB-led e-government architecture project and initiatives as well. OMB has agreed to consider implementing them. We encourage OMB to move swiftly in accepting and implementing these recommendations.

* * * * *

In conclusion, federal agencies' use of enterprise architectures is mixed, but overall insufficient to support informed IT investment decisionmaking. As a result, most agencies are at risk of investing in IT solutions that will not overcome, but rather will perpetuate, longstanding incompatibilities and duplication within agency operational and systems environments. This risk is amplified for investments that involve multiple agencies, such as OMB's e-government initiatives, because they too require effectively defined and effectively implemented architectures to be successful, and the reasons that have stymied agency-specific architecture efforts are an order of magnitude greater when more than one agency is involved.

Given that effective use of enterprise architectures is a key element to successfully investing in IT solutions, the burden is on OMB as the federal government's IT management leader to ensure that agencies meet their enterprise architecture obligations and that progress is made across the federal government. To do less

risks both unwise IT spending and missed opportunities. To assist OMB in shouldering this burden, we have provided it with important tools for defining, measuring, and promoting enterprise architecture maturation across federal agencies.

Mr. Chairman, this concludes our statement. We would be pleased to answer any questions that you or other members of the subcommittee may have at this time.

Contact and Acknowledgments

Should you have any questions about this testimony, please contact us by e-mail at *hiter@gao.gov* or *mcclured@gao.gov,* or by phone at (202) 512-3439 or (202) 512-6257. Other major contributors to this testimony included Mark T. Bird, John A. de Ferrari, Michael P. Fruitman, and Pamlutricia Greenleaf.

E-Government Initiatives

The following table provides information on each of the 24 OMB-sponsored e-government initiatives.

Name	Function	Category	Proposed agency managing partner
Consolidated Health Informatics	Provides a simplified, unified system for sharing and reusing medical record information among agencies and private providers and insurers.	Government to business	Department of Health and Human Services
Disaster Assistance and Crisis Response	Serves as a single application point for all disaster assistance programs.	Government to government	Federal Emergency Management Agency
e-Authentication	Builds and enables mutual trust needed for widespread use of electronic interactions between the public and government and across governments; provides a method for satisfactorily establishing identity.	Addressing Barriers to E-Government Success	GSA
e-Grants	Creates an electronic portal for grant recipients and grant-making agencies that will streamline federal grants management.	Government to government	Department of Health and Human Services
Electronic Records Management	Provides tools and guidance agencies need to manage their records electronically.	Internal efficiency and effectiveness	National Archives and Records Administration
Eligibility Assistance Online	Provides common Internet portal for identifying government benefits programs for which citizens may be eligible; targets high-need demographic groups.	Government to citizen	Department of Labor
Enterprise HR Integrations	Eliminates need for paper employee records, enables strategic decisions regarding human capital and financial resources; allows electronic transfer of HR data, better protects employee rights and benefits, and improves governmentwide reporting and data analysis; enables faster security clearances.	Internal efficiency and effectiveness	OPM
e-Payroll/HR	Simplifies/unifies payroll/human resources elements to consolidate and integrate these functions across government.	Internal efficiency and effectiveness	OPM
e-Training	Provides a repository of government-owned courseware, enabling economies of scale pricing and fostering development of communities of practice.	Internal efficiency and effectiveness	OPM
e-Travel	Provides a common travel management system for agency use.	Internal efficiency and effectiveness	GSA
e-Vital	Expands existing vital records on-line data exchange activity between the federal and state governments.	Government to government	Social Security Administration

E-Government Initiatives

Name	Function	Category	Proposed agency managing partner
Expanding Electronic Tax Products for Business	Reduces number of tax forms that employers must file, and provides timely and accurate information and more available electronic filing.	Government to Business	IRS
EZ Tax Filing	Makes it easier for citizens to file taxes in Web-enabled environment.	Government to citizen	IRS
Federal Asset Sales	Provides easier locating of asset sales, irrespective of agency involved, and allows bidding and purchasing electronically.	Government to business	GSA
Geospatial Information One-Stop	Provides access to the government's spatial data assets in one location, and promotes collaboration with state and local governments.	Government to government	Department of the Interior
Integrated Acquisition Environment	Allows agencies to share information so that procurement and other types of decisions can be more informed.	Internal efficiency and effectiveness	GSA
International Trade Process Streamlining	Creates a single site where exporters can be assisted electronically through entire export process.	Government to business	Department of Commerce
One-Stop Business Compliance Information	Provides information on laws and regulations; offers "wizards" and tutorials enabling citizens to determine if rules apply to them; permits can be completed, submitted, approved on-line, to extent possible.	Government to business	Small Business Administration
Online Access for Loans	Allows citizens and business to find appropriate loan programs.	Government to citizen	Department of Education
Online Rulemaking Management	Provides access to all government rulemaking, anytime, anywhere, by expanding an existing e-Docket system that permits use by other agency systems through "storefronts."	Government to Business	Department of Transportation
Recreation One-Stop	Provides a one-stop, searchable database of recreational areas nationwide; includes on-line campground reservations and purchase of recreational passes, maps, and other products.	Government to citizen	Department of the Interior
Recruitment One-Stop	Improves federal hiring process by improving automated employment information system; provides job-seekers with on-line status feedback and provides employees with a searchable resume database.	Internal efficiency and effectiveness	OPM
USA Services	Uses best practices in customer relationships to enable citizens to quickly obtain service on-line while improving responsiveness and consistency across government agencies.	Government to citizen	GSA

E-Government Initiatives

Name	Function	Category	Proposed agency managing partner
Wireless Public SAFEty Interoperable COMmunications/Project SAFECOM	Helps public safety agencies at all levels of government achieve interoperability and eliminate redundant wireless communications infrastructures.	Government to government	Department of the Treasury

And a 25th initiative, just announced last month called *Federal Architecture,* managed by OMB, will develop information and data and application interface standards to eliminate redundancies and yield improved operating efficiencies governmentwide.

Source: *E-Government Strategy: Simplified Delivery of Services to Citizens.*

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