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INFORMATION TECHNOLOGY INVESTMENT MANAGEMENT

A Framework for Assessing and Improving Process Maturity

GAO-04-394G

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INFORMATION TECHNOLOGY INVESTMENT MANAGEMENT

A Framework for Assessing and Improving Process Maturity

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Highlights

Highlights of GAO-04-394G, an executive guide.

Why GAO Did This Study

In 2000, GAO published an exposure draft of *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity* (ITIM). Built around the select/control/evaluate approach described in the Clinger-Cohen Act of 1996—which establishes statutory requirements for IT management—the framework provides a method for evaluating and assessing how well an agency is selecting and managing its IT resources. The exposure draft reflected current accepted or best practices in IT investment management, as well as the reported experience of federal agencies and other organizations in creating their own investment management processes. This new version updates the exposure draft to take into account comments that GAO has received; GAO's experiences in evaluating several agencies' implementations of investment management processes and the lessons learned by these agencies; and the importance of enterprise architecture (EA) as a critical frame of reference in making IT investment decisions. Using the framework to analyze an agency's IT investment management processes provides: (1) a rigorous, standardized tool for internal and external evaluations of these processes; (2) a consistent and understandable mechanism for reporting the results of assessments; and (3) a road map that agencies can follow in improving their processes.

www.gao.gov/cgi-bin/getrpt?GAO-04-394G.

To view the full product, click on the link above. For more information, contact David Powner, 202-512-4299, pownerd@gao.gov., or Lester Diamond, 202-512-7957, diamondl@gao.gov.

What GAO Found

The ITIM framework is a maturity model composed of five progressive stages of maturity that an agency can achieve in its IT investment management capabilities. These maturity stages are cumulative; that is, in order to attain a higher stage of maturity, the agency must have institutionalized all of the requirements for that stage in addition to those for all of the lower stages. The framework can be used both to assess the maturity of an agency's investment management processes and as a tool for organizational improvement. For each maturity stage, the ITIM describes a set of critical processes that must be in place for the agency to achieve that stage. The figure below shows the five stages and lists the critical processes for each stage.

At the Stage 1 level of maturity, an agency is selecting investments in an unstructured, ad hoc manner. Project outcomes are unpredictable and successes are not repeatable; the agency is creating awareness of the investment process. Stage 2 critical processes lay the foundation for sound IT investment processes by helping the agency to attain successful, predictable, and repeatable investment control processes at the project level. Stage 3 represents a major step forward in maturity, in which the agency moves from project-centric processes to a portfolio approach, evaluating potential investments by how well they support the agency's missions, strategies, and goals. At Stage 4, an agency uses evaluation techniques to improve its IT investment processes and its investment portfolio. It is able to plan and implement the "de-selection" of obsolete, high-risk, or low-value IT investments. The most advanced organizations, operating at Stage 5 maturity, benchmark their IT investment processes relative to other "best-in-class" organizations and look for breakthrough information technologies that will enable them to change and improve their business performance.

The ITIM Stages of Maturity with Critical Processes

Maturity stages	Critical processes
Stage 5: Leveraging IT for strategic outcomes	- Optimizing the investment process - Using IT to drive strategic business change
Stage 4: Improving the investment process	- Improving the portfolio's performance - Managing the succession of information systems
Stage 3: Developing a complete investment portfolio	- Defining the portfolio criteria - Creating the portfolio - Evaluating the portfolio - Conducting postimplementation reviews
Stage 2: Building the investment foundation	- Instituting the investment board - Meeting business needs - Selecting an investment - Providing investment oversight - Capturing investment information
Stage 1: Creating investment awareness	- IT spending without disciplined investment processes

Source: GAO.

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Preface

Investments in information technology (IT) can enrich people's lives and improve organizational performance. For example, during the last decade the Internet has matured from being a means for academics and scientists to communicate with each other to a national resource where citizens can interact with their government in many ways, for example, by receiving services, supplying and obtaining information, asking questions, and providing comments on proposed rules. Although they have the potential to improve lives and organizations, IT projects can also become risky, costly, unproductive mistakes. As we have described in numerous reports and testimonies, federal IT projects too frequently incur cost overruns and schedule slippages while contributing little to mission-related outcomes.

The Paperwork Reduction Act (PRA)[1] requires federal agencies to be accountable for their IT investments and responsible for maximizing the value and managing the risks of their major information systems initiatives. The Clinger-Cohen Act of 1996[2] establishes a more definitive framework for implementing the PRA's requirements for IT investment management. It requires federal agencies to focus more on the results they have achieved through IT investments, while concurrently improving their IT acquisition processes. The Clinger-Cohen Act[3] also introduces more rigor and structure into how agencies are to select and manage IT projects. Among other things, it lays out specific aspects of the process that agency heads are to implement in order to maximize the value of the agency's IT investments and assess, manage, and evaluate the risks of its IT acquisitions.[4] The E-Government Act of 2002[5] provides additional guidance on IT management practices across federal agencies.

Through our research into IT management best practices and our evaluation of agency IT management performance, we have identified a set of essential and complementary management disciplines. These include

[1]44 U.S.C. § 3506(h).

[2]The fiscal year 1997 Omnibus Consolidated Appropriations Act, Pub. L. 104-208, renamed both Division D (the Federal Acquisition Reform Act) and E (the Information Technology Management Reform Act) of the 1996 DOD Authorization Act, Pub. L. 104-106, as the Clinger-Cohen Act of 1996.

[3]40 U.S.C. §§ 11312-11313.

[4]44 U.S.C. § 3506(h)(5); 40 U.S.C. §§ 11312-11313.

[5]E-Government Act of 2002, Public Law 107-347 (Dec. 17, 2002).

- investment management,
- strategic planning,
- software/system development and acquisition management,
- IT services acquisition management,
- human capital management,
- information security management, and
- enterprise architecture management.

Using the results of this research and evaluation, we have developed various management frameworks and guides. In 1997 we developed guidance,[6] based primarily on the Clinger-Cohen Act, that provides a method for evaluating and assessing how well a federal agency is selecting and managing its IT resources. This guidance also identifies specific areas where improvements can be made. The Information Technology Investment Management (ITIM) Framework enhances this guidance by identifying critical processes for successful investment and organizing these processes into a framework of increasingly mature stages.

Maturity models have been proven to be a highly effective evaluative technique for the Software Engineering Institute, which is well regarded for its collection of Capability Maturity Models SM (e.g., Capability Maturity Model for Software).[7,8] Other researchers have proposed similar approaches based on maturity models. [9]

[6]U.S. General Accounting Office, *Assessing Risk and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making*, GAO-AIMD-10.1.13 (Washington, D.C.: February 1997).

[7]Capability Maturity Model is a service mark of Carnegie Mellon University.

[8]M. Paulk et al., *Capability Maturity Model for Software* (Version 1.1), SEI-93-TR-024.

[9]Giga Information Group, Inc., *Total Economic Impact, Part 2: Defining and Measuring IT Value* (P-1297-009).

The maturity framework approach generally

- offers a comprehensive model for assessing process capability within an organization;
- can be applied to multiple types of disciplines, such as IT asset acquisition, human capital, and systems engineering; and
- can serve as a valuable tool for organizations to use to improve their technical development and management processes.

The initial ITIM exposure draft that we issued in May 2000[10] reflected both a maturation of thinking in the area of IT investment management and input we had received from organizations and federal agencies based on their experiences in creating their own investment mechanisms and processes. This updated version has been modified based on comments we received on the initial exposure draft and on our experiences in evaluating and learning from agencies that are implementing investment management processes. Moreover, this version of the ITIM is consistent with and supports other maturity frameworks, including GAO's Enterprise Architecture Management Maturity Framework (EAMMF).[11] Among other things, this version of the ITIM addresses the importance of an enterprise architecture (EA) as a critical frame of reference for organizations when they are making IT investment decisions.

The ITIM can be used to analyze an organization's investment management processes and to determine its level of maturity. Since its release in exposure draft in May, 2000, the ITIM has been GAO's primary tool for evaluating investment management capabilities. In addition, a number of agencies have used the framework as they worked to improve their investment processes.

If you have any questions about the Information Technology Investment Management Framework or the IT investment management approach,

[10]U.S. General Accounting Office, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity*, Exposure Draft, GAO-AIMD-10.1.23 (Washington, D.C.: May 2000).

[11]U.S. General Accounting Office, *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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David A. Powner
Director, Information Technology Management Issues

Section 1: Introduction

The Information Technology Investment Management Framework identifies—and organizes into a framework of increasingly mature stages—thirteen processes that are critical for successful investment. The original exposure draft of ITIM expanded the widely accepted federal management framework for IT investment decision making that was embodied in OMB and GAO guidance[12] and shifted the content from a guidance-based focus to an activity- and maturity-based focus. Such a maturity framework can be used either to analyze an organization's investment management process or to determine the maturity of its investment process. The framework provides three key capabilities that are of use to many federal agencies: (1) a rigorous, standardized tool for internal and external evaluations of an agency's IT investment management process; (2) a consistent and comprehensible mechanism for reporting the results of these assessments to agency executives, the Congress, and other interested parties; and (3) a road map that agencies can use for improving their investment management processes. It should be noted, however, that an organization's achievement of more mature investment management stages depends on its instituting other good management practices and attributes, such as strategic planning, project management, enterprise architecture (EA) management, human capital management, and software and system acquisition management.

In May 2000 we released an exposure draft of the ITIM framework for trial and comment. Since that time, the framework has been used by a number of federal agencies in developing and enhancing their investment management strategies. In addition, we have used it to evaluate several

[12]*Evaluating Information Technology Investments, A Practical Guide*, Executive Office of the President, Office of Management and Budget, November 1995, and U.S. General Accounting Office, *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making,* GAO/AIMD-10.1.13 (Washington D.C.: February 1997).

agencies.[13] This release includes lessons learned from our use of the framework in these evaluations and from lessons conveyed to us by users of the framework at a number of agencies. In order to validate the appropriateness of our changes and to gain the advantage of their experience, we provided this release for review to several outside experts who are familiar with the ITIM exposure draft and with investment management in a broad array of organizations, both public and private.

This version also includes a much fuller description of the relationship between ITIM and EA. Based on our experience, employing ITIM and EA in concert can greatly increase the chances that an organization's operational and IT environments will be pursued in a way that optimizes mission performance. The EA provides a clear and comprehensive picture of the structure of an entity, whether it is an organization or a functional or mission area. It defines an organization's operations in logical (i.e., information flows) as well as technical terms (i.e., hardware and software). The EA also describes these perspectives both for the organization's current or "as-is" environment and for its target or "to-be" environment as well as for a transition or sequencing plan for moving from the "as-is" to the "to-be" environment.

Changes from the Exposure Draft

Stage 2 has been the primary beneficiary of the lessons learned from the use of the framework, because most agencies that we have evaluated are still operating at Stage 2. In Stage 2 we have tried to clarify aspects of critical processes that previously have led to diverse interpretations. In addition, we have moved what was previously the critical process for Authority Alignment of IT Investment Boards from Stage 3 in the exposure draft into Stage 2 in this release; it is now part of the critical process for Instituting the Investment Board. Through our work, we have found that

[13]U.S. General Accounting Office, *Information Technology: INS Needs to Strengthen Its Investment Management Capability*, GAO-01-146 (Washington, D.C.: Dec. 29, 2000); *Information Technology: DLA Needs to Strengthen Its Investment Management Capability*, GAO-02-314 (Washington, D.C.: Mar. 15, 2002); *United States Postal Service: Opportunities to Strengthen IT Investment Management Capabilities*, GAO-03-3 (Washington D.C.: Oct. 15, 2002); U.S. General Accounting Office, *Bureau of Land Management: Plan Needed to Sustain Progress in Establishing IT Investment Management Capabilities*, GAO-03-1025 (Washington, D.C.: Sept. 12, 2003); U.S. General Accounting Office, *Information Technology: Departmental Leadership Crucial to Success of Investment Reforms at Interior*, GAO-03-1028 (Washington, D.C.: Sept. 12, 2003).

instituting multiple boards was not unusual for organizations working in Stage 2 and that these boards occasionally were not well aligned.

Stage 3 has been enhanced to better explain the organization and use of portfolio management for investments. In this area we gained knowledge from the experiences of others, both directly from individuals using IT portfolio management in agencies as well as from literature that has been released during the last few years. In addition, we moved the critical process for Postimplementation Review and Feedback from Stage 4 in the exposure draft to Stage 3 in this release. We did this so we could ensure that organizations that have completed Stage 3 are meeting the requirement for having selection, control, and evaluation processes in place, as required by the Clinger-Cohen Act.

Stages 4 and 5 have been modified only to reflect new names for critical processes and to relocate to Stage 3 the critical process for Postimplementation Review and Feedback. We have not gained substantial new experience in these stages, because few organizations are operating at these levels of maturity. We anticipate modifying these stages in the future, when we have learned more from organizations' experiences.

Investment Management Overview

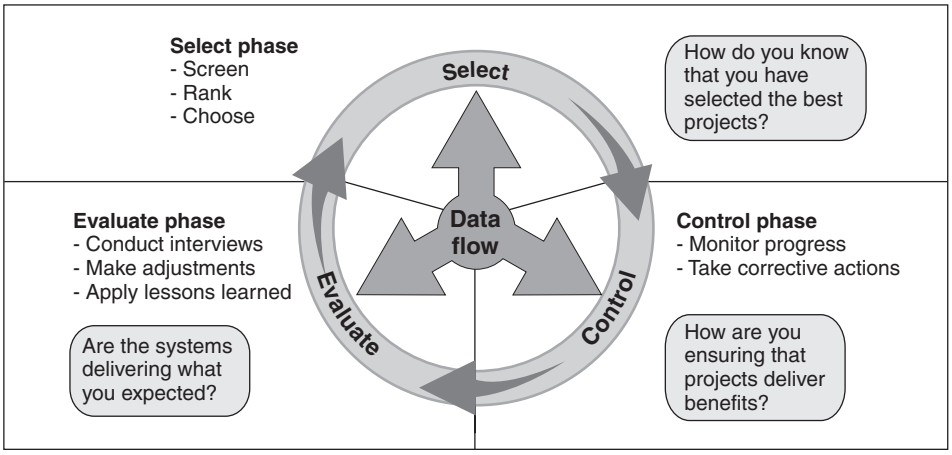
A central tenet of the federal approach to IT investment management has been the select/control/evaluate model. This model was initially identified in our Strategic Information Management (SIM) Executive Guide,[14] expanded in the Office of Management and Budget's IT investment guidance,[15] and then refined in our subsequent guidance.[16] It provides a systematic method for agencies to minimize risks while maximizing the returns of investments. Figure 1 illustrates the central components of this model.

[14]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).

[15]*Evaluating Information Technology Investments, A Practical Guide*, Executive Office of the President, Office of Management and Budget, November 1995.

[16]U.S. General Accounting Office, *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making*, GAO/AIMD-10.1.13 (Washington, D.C.: February 1997).

Figure 1: Fundamental Phases of the IT Investment Approach



Source: GAO.

During the select phase the organization (1) identifies and analyzes each project's risks and returns before committing significant funds to any project and (2) selects those IT projects that will best support its mission needs. This process should be repeated each time funds are allocated to projects, reselecting even ongoing investments as described below.

During the control phase the organization ensures that, as projects develop and investment expenditures continue, the project continues to meet mission needs at the expected levels of cost and risk. If the project is not meeting expectations or if problems have arisen, steps are quickly taken to address the deficiencies. If mission needs have changed, the organization is able to adjust its objectives for the project and appropriately modify expected project outcomes.

During the evaluate phase, actual versus expected results are compared after a project has been fully implemented. This is done to (1) assess the project's impact on mission performance, (2) identify any changes or modifications to the project that may be needed, and (3) revise the investment management process based on lessons learned.

The investment process does not end with the evaluation phase. A project can be active concurrently in more than one phase of the select/control/evaluate model. After a project has been designated for

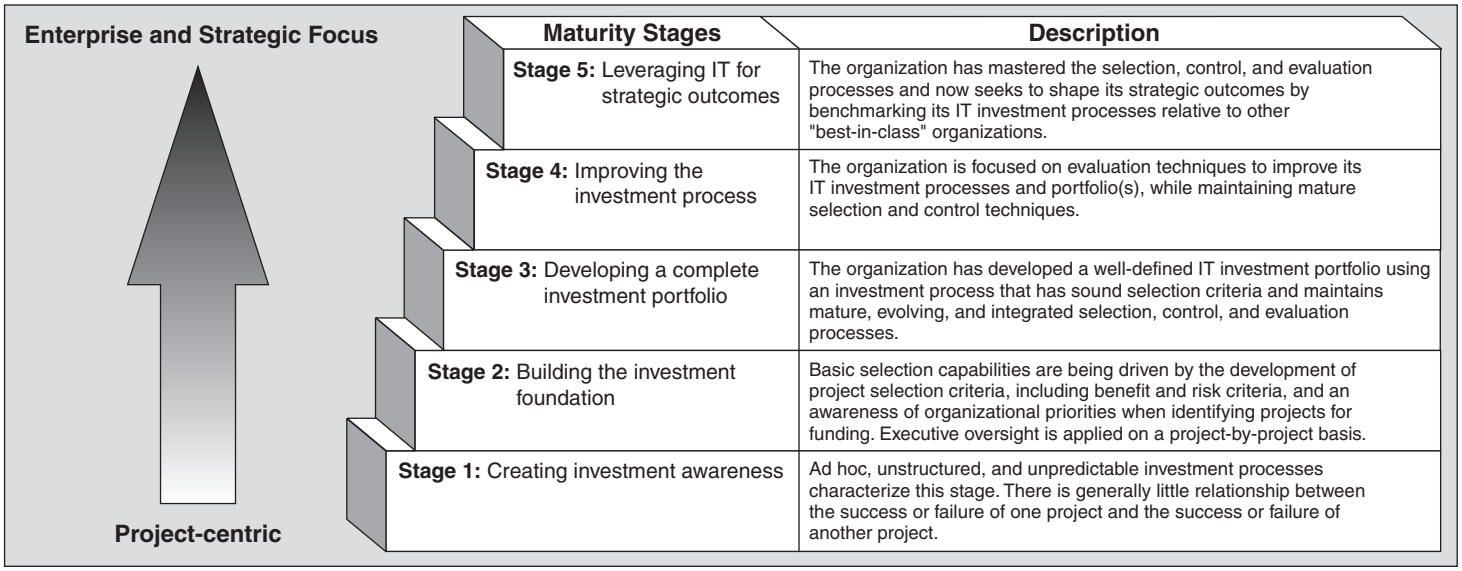
initial funding in the select phase, it becomes the subject of evaluation throughout the control phase for the purposes of reselection. Reselection is an ongoing process that continues for as long as a project is receiving funding. If a project is not meeting the goals and objectives that were originally established when it was selected, or if the goals have been modified to reflect changes in mission objectives—and corrective actions are not succeeding—a decision must be made on whether to continue to fund the project. Ultimately, "deselection" can be one of the most difficult steps to implement, but it is necessary if funds can be better utilized elsewhere. Once projects are operating and being maintained, they remain under constant review for reselection.

Section 2: Overview of ITIM

The Stages of Maturity

ITIM is comprised of five stages of maturity. Each stage builds upon the lower stages and enhances the organization's ability to manage its IT investments. Figure 2 shows the five ITIM stages and gives a brief description of each stage.

Figure 2: The Five Stages of Maturity Within ITIM



Source: GAO.

Stage 1: Creating Investment Awareness

Stage 1 is characterized by ad hoc, unstructured, and unpredictable investment processes. For example, in a Stage 1 organization, there is generally little relationship between the success or failure of one project and the success or failure of another project. If an IT project succeeds and is seen as a good investment, it is largely due to exceptional actions on the part of the project team, and thus its success might be difficult to repeat. Investment processes that are important for success may be known, but only to isolated teams; this process knowledge is not widely shared or institutionalized.

Most organizations with Stage 1 maturity have some type of project selection process in place as part of their annual budgeting activity.

However, the selection process is frequently rudimentary, poorly documented, and inconsistently applied.

The unstructured and unpredictable investment processes that characterize a Stage 1 organization also mean that even if it recognizes that a given project is in trouble, it may not have adequate processes to consistently address and resolve the project's problems. Additionally, a focus on project results in terms of business benefits is often missing in these organizations.

Stage 2: Building the Investment Foundation

One focus of Stage 2 maturity is to establish basic selection capabilities. Basic selection capabilities are driven by the development of project selection criteria, including benefit and risk criteria, and an awareness of organizational priorities when identifying projects for funding. No longer are projects being funded solely on an ad hoc basis. The basic selection processes established in Stage 2 lay the foundation for more mature selection capabilities in Stage 3. Therefore, the organization also focuses on defining and developing its IT investment board(s), identifying the business needs or opportunities to be addressed by each IT project, and using this knowledge in the selection of new IT proposals.

An organization working to complete Stage 2 should be starting to develop an ITIM decision-making process that utilizes its EA—to the extent that an EA exists. An organization's "as-is" architecture may provide some of the basic information that is needed by decision makers, such as what systems currently exist and what potential functional overlap may occur with a new investment. In addition, an organization's EA tool may serve as a repository for investment information, although this may require modifying the manner in which the tool is currently being used. Criteria for selecting new and ongoing investments should be established, and the requirement to comply with the target EA may serve as an important guide in investment decisions. In addition, to gain further confidence that each investment is providing specific value to the organization, an organization's policies and procedures should provide for identifying the business needs and the associated users of each IT project.

An equally important focus is to attain repeatable, successful IT investment control techniques at the project level. For an organization to develop a sound IT investment process, it must first be able to control its investments so that they finish predictably within established schedule and budget ranges. In addition, it must be able to identify potential exposures to risk

and put in place strategies to mitigate that risk. In the absence of predictable, repeatable, and reliable investment control processes, selected investments will be subject to a higher risk of failure despite rigorous analysis of the estimates used to justify them. Further, the absence of repeatable control processes will result in ineffective evaluation processes and contradictory efforts at process improvement.

To ultimately succeed, most IT investments require a relentless focus on interim results and successful risk management strategies, among other things. Taking this into account, an organization can begin by (1) focusing on gaining control of its existing collection of projects and (2) following a disciplined process for improving project outcomes over time by regularly tracking and overseeing each project's cost and schedule milestones and by monitoring expected benefits and risks. Supporting these activities requires collecting investment information to ensure that the organization knows fundamental facts about its IT assets, such as their location, cost, and ownership.

Stage 3: Developing a Complete Investment Portfolio

Stage 3 critical processes depend specifically on the successful implementation of Stage 2 critical processes. In order to operate successfully at Stage 3, the organization must have in place the structure and repeatability of the project-centric management processes described above. In addition, the project-specific performance data being used for oversight and reselection in Stage 2 are crucial for the successful management of the investment portfolio. The critical focus for Stage 3 maturation is to establish a consistent, well-defined perspective on the IT investment portfolio and to maintain mature, integrated selection (and reselection), control, and evaluation processes. These processes will be evaluated during postimplementation reviews (PIR). Once IT projects have been selected and are meeting their scheduled performance expectations—as outlined in Stage 2—the organization needs to develop an IT investment portfolio using an investment process that is consistent with its EA and employs sound selection criteria.

The development and use of portfolio selection criteria enable the organization to expand its focus from being primarily project-oriented to including the broader portfolio perspective. The portfolio perspective drives the organization to focus on the benefits gained from the synergies to be found among the investments in the entire collection, rather than just from the sum of the individual investments. Instead of focusing exclusively on the balance between the costs and benefits of individual investments, in

Stage 3 decision makers also must consider the interaction among investments and the contribution to organizational mission goals and strategies that could be made by alternative portfolio selections. The development of the portfolio selection criteria communicates organizational priorities to the IT project management community and ensures that each investment submitted for funding supports the organization's mission, strategies, and goals, as well as project-specific outcomes. The critical process for Creating the Portfolio describes how the organization should use the portfolio selection criteria to develop an IT investment portfolio. Individual investments are reviewed and evaluated following their implementation in order to compare actual results with performance expectations.

An organization's policies and procedures should provide for specifying the relationship between its architecture and its investment decision-making authority. The links between the EA and the investment portfolio should be explicitly defined. In addition, when operating at this stage, organizations should be working to align their EA with their IT portfolio selection criteria.

Stage 4: Improving the Investment Process

An organization at Stage 4 maturity is focused on using evaluation techniques to improve its IT investment processes and portfolio(s) while maintaining mature control and selection processes. At this stage, the organization should also regularly analyze its investment portfolio(s) to ensure that its investments continue to be aligned with the most current version of its architecture, since small changes in either an investment itself or in the EA may have occurred over time without being recognized in periodic selection/reselection decisions. As described in Stage 3, postimplementation reviews typically identify lessons learned from an investment and determine whether the benefits anticipated in the business case for the investment have been achieved. Analyzing a number of PIRs serves as a basis for creating recommendations for changing and improving IT investment processes.

Portfolio categories are used to organize the lessons learned and the recommendations gleaned both from PIRs conducted during Stage 3 and from other sources of process or investment information. The information within these categories is then used to fine-tune the investment processes and the portfolios. Additionally, at Stage 4 maturity the organization has the capacity to conduct IT succession activities and thus can plan and implement the "deselection" of obsolete, high-risk, or low-value IT investments.

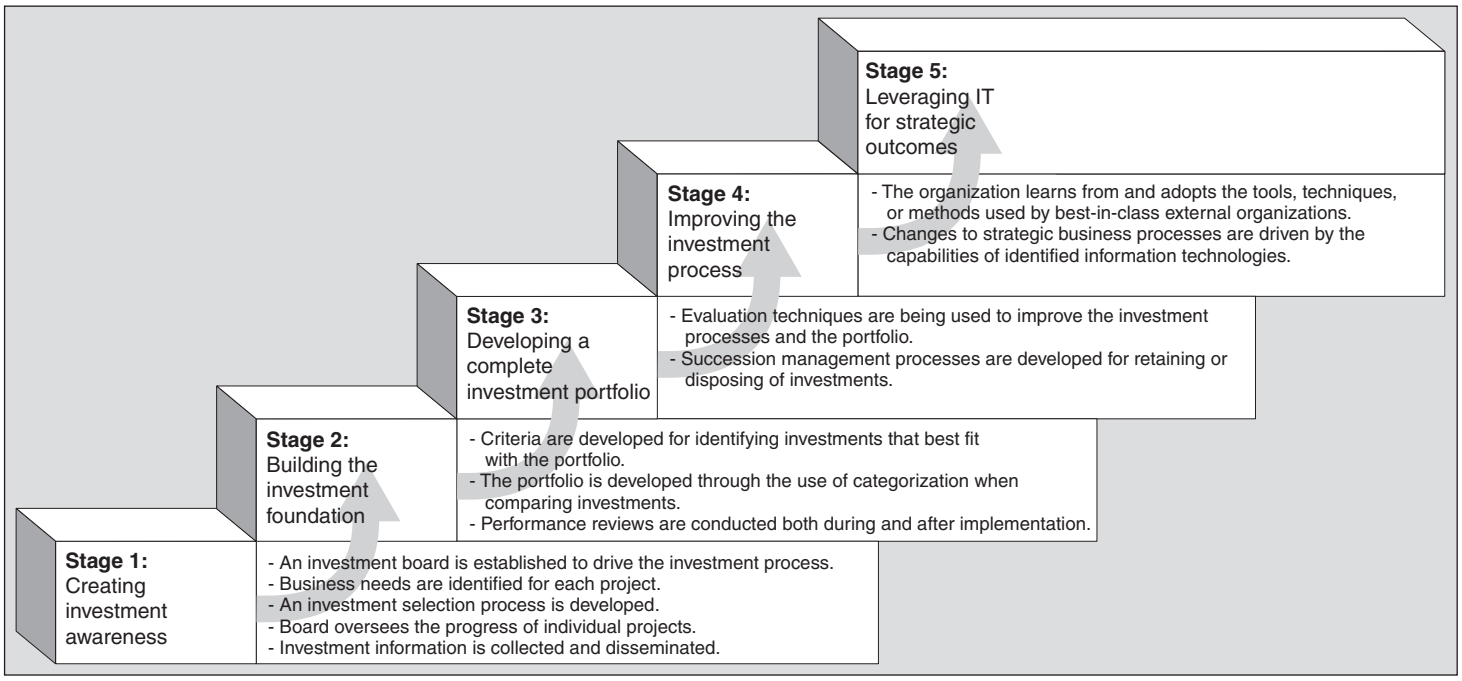
Stage 5: Leveraging Information Technology for Strategic Outcomes

Once an organization has mastered the selection, control, and evaluation processes, it seeks to shape its strategic outcomes by (1) using its EA as a critical frame of reference to ensure alignment with the target architecture, (2) learning from other organizations, (3) continuously improving the manner in which it uses IT to support and improve its business outcomes, and (4) focusing on flexibility and becoming a more agile organization that relies on its architecture for its vision of the future and the ITIM as a critical means for implementing it. Thus, an organization with Stage 5 maturity benchmarks its IT investment processes relative to other "best-in-class" organizations and conducts proactive monitoring for breakthrough information technologies that will allow it to significantly change and improve its business performance.

Progressing through the Stages of Maturity

Within ITIM, lower maturity stages provide the foundation for higher maturity stages. Thus, an organization increases its IT investment maturity and management capability as it progresses through the ITIM maturity stages. The following section describes the critical maturation steps that occur as an organization moves from one stage to the next (see fig. 3).

Figure 3: Critical Maturation Steps Required to Move to the Next Stage



Source: GAO.

Moving from Stage 1 to Stage 2

Investment control processes are the essential proficiencies that an organization establishes as it moves from ITIM Stage 1 to Stage 2. As investment control processes become better established,

- one or more investment board(s) is created to oversee and select IT projects;
- investment information such as costs, benefits, schedule, risk assessments, performance metrics, and system functionality is collected to support executive decision making;
- the organization gains a better perspective on the IT projects in which it is investing;

- communicating the status of ongoing projects improves organizationwide system acquisition, development, and management practices;
- the organization creates and maintains better project-level cost information; and
- key customers (or end users) and business needs for each IT project are identified, and the users are engaged in this process.

Critical to maturing project-level IT investment control processes is the ability to recognize the need for and to take swift corrective action when a project is having trouble meeting its schedule expectations and cost estimates. As it moves through Stage 2, an organization develops robust methods to collect data from the project-level management processes and aggregate it appropriately to provide executive management with the information it needs to execute its oversight responsibilities. As the organization matures, it also learns from past decisions and better manages the causal factors that created past problems, thus improving the performance results of ongoing projects.

Beyond investment control processes, the organization also begins to implement basic selection processes. The core business needs for each IT project are identified and the basic portfolio development processes are used to select new IT proposals.

Moving from Stage 2 to Stage 3

Creation of a mature IT process for selecting investments is the major accomplishment that an organization demonstrates as it moves from Stage 2 to Stage 3 maturity. In addition, well-developed investment control processes lead to greater certainty about future IT investment outcomes and greater confidence that IT investments, when they are selected, will achieve their expected cost, schedule, and performance goals, as well as their expected functionality. Thus, once the investment control processes have been established, an organization can build on these fundamental investment processes to create mature portfolio selection processes. Mature selection processes include

- the creation and maintenance of portfolio selection criteria,
- the analysis associated with examining the merits of each IT investment in the context of the portfolio,

- the use of an EA to help align IT investments with strategic objectives, and
- the grouping of similar investments together and the development of the portfolio.

Beyond the creation of a mature selection process, the organization now refines the elements of benefit and risk management in its investment control process, because it has installed the supporting tools for doing so as its selection process matures. Individual investments are reviewed and evaluated following their implementation and are judged based on how well they meet their performance expectations.

Moving from Stage 3 to Stage 4

As an organization reaches Stage 4 maturity, it has created mature IT investment evaluation processes and established a complete IT investment management process. In this stable environment, the organization can take the lessons it has learned from evaluating its investment processes (i.e., based on postimplementation reviews in Stage 3) and change these processes with predictably beneficial results. By doing so, it also creates the environment and the mechanisms for continuous improvement in Stage 5. In addition to improving its investment processes, an organization operating in Stage 4 can manage resource succession—that is, "de-selecting" current IT investments—by migrating to successor investments or retiring obsolete and low-performing ones and by making these decisions in the context of the portfolio created in Stage 3 and a well understood EA sequencing plan and "to-be" architecture. Together, the portfolio, sequencing plan, and "to-be" architecture provide a full picture of the current state of an organization's investments, its vision of the future, and its plan for getting there. In this context, the obsolescence of systems can be anticipated, and the declining benefits of specific systems can be viewed in the light of alternative investments.

Moving from Stage 4 to Stage 5

An organization that is moving from Stage 4 to Stage 5 has mature selection, control, and evaluation processes in place. It now seeks ways to (1) institutionalize the continuous improvement of these processes and (2) improve its strategic business outcomes. It accomplishes these goals by examining and learning from other organizations by means of benchmarking. Benchmarking is used because there may be external organizations with specific processes that are more innovative or more efficient than its own processes. Beyond benchmarking, the organization leverages IT to significantly change and improve its business performance and outcomes.

Section 3: Components of ITIM

ITIM Hierarchy

Like other maturity models, ITIM is subdivided into a hierarchy. Each maturity stage consists of critical processes that are composed of a number of key practices. These hierarchical components are described below.

Maturity Stages

Each of the four maturity stages beyond Stage 1 is a plateau of well-defined critical processes. The five maturity stages represent the steps toward achieving a mature, comprehensive IT investment management process.

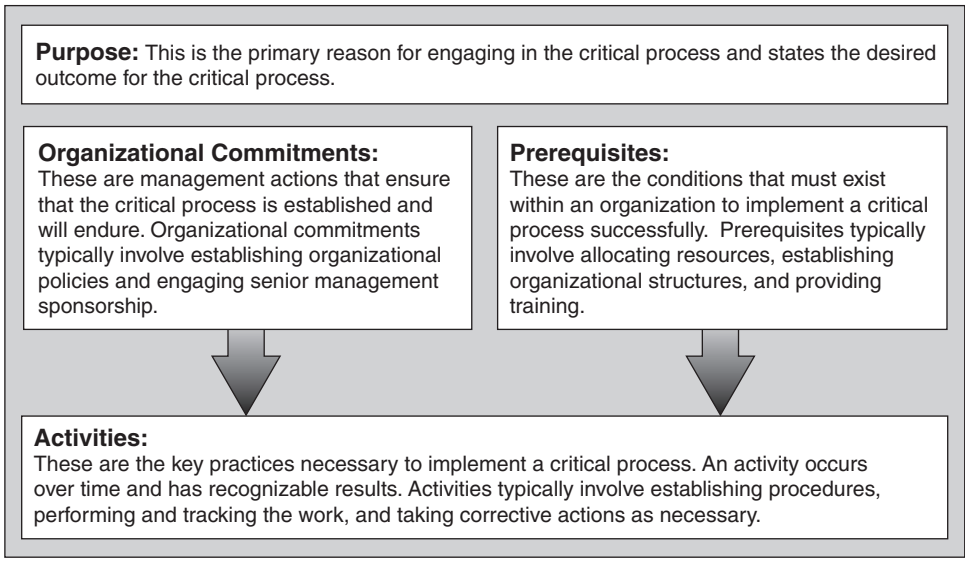
Critical Processes

With the exception of Stage 1, each maturity stage is composed of multiple critical processes, such as the processes used to create an IT investment portfolio. Each critical process contains a set of key practices that, when fulfilled, implement the critical process needed to attain a given maturity stage.

Key Practices

The key practices are the tasks that must be performed by an organization in order to implement and institutionalize a critical process effectively. Key practices fall into three categories: organizational commitments, prerequisites, and activities. An explanation and a description of the relationship among these different types of key practices is shown in figure 4. In Section 5, each key practice is listed, followed by commentary and additional information that may assist an organization in understanding or interpreting how it could be implemented.

Figure 4: The Components of an ITIM Critical Process



Source: GAO.

Section 4: Uses of ITIM

ITIM identifies critical IT investment processes, establishes the presence or absence of these critical processes in an organization, assesses an organization's IT investment management capability and maturity, and offers recommendations for improvement. Used in this way, ITIM can be a valuable tool that (1) supports organizational self-assessment and improvement and (2) provides a standard against which an evaluation of an organization can be conducted.

Principles Guiding the Use and Interpretation of the Framework

Regardless of the specific reason for using ITIM, the following principles[17] should guide each interpretation and use of this framework.

- The ITIM is a generic framework intended for broad use. The way in which an organization implements the framework will vary, depending on its needs for improving its investment processes and its managerial and professional judgment.

- The ITIM is a road map for improvement and describes the characteristics of an IT investment management process that one would expect to see at each maturity stage. The maturity stages prescribe the order in which to improve the processes, but not how an organization is to improve its processes.

- The ITIM may not exhaustively describe the necessary conditions for successful investment management in all organizations. Other components of the investment management process may exist and could be considered for addition to this framework as greater context sensitivity develops to the issues surrounding the process of IT investment management.

- Each ITIM critical process will generally go through a step-by-step evolution—consisting of introduction, adoption, development, and finally full implementation—within an organization as that organization changes over time, modifies necessary functions and operations, and reaches a particular maturity stage. ITIM does not address all factors that can affect investment success. For example, organizational processes and other factors—such as strategic planning, availability of

[17]These principles were derived from the principles found in SEI's *Software Acquisition Capability Maturity Model.*[SM]

funding, risk assessments, and specific technology implementations—can strongly influence an organization's investment success.

- There is no one right way to implement the ITIM, because the framework describes the characteristics of mature and successful IT investment management processes, not specific implementation techniques. Because of this, the framework is technology independent. For example, no specific tools, methods, or technologies are mandated by its use. Appropriate tools, methods, and technologies should be made available to support the processes that an organization develops within ITIM.

Tool for Organizational Improvement

ITIM offers organizations a road map for improving their IT investment management processes in a systematic and organized manner. These process improvements are intended to

- improve the likelihood that investments will be completed on time, within budget, and with the expected functionality,
- promote better understanding and management of related risks,
- ensure that investments are selected based on their merits by a well-informed decision-making body,
- implement ideas and innovations to improve process management, and
- increase the business value and mission performance of investments.

ITIM can be implemented as a tool for organizational improvement in a variety of ways. For example, an organization can create a separate improvement program, employ external assistance and support, or use the framework as a managerial support tool. Regardless of the implementation technique, the following important factors should be considered when using ITIM as an organizational improvement tool:

- Many organizations will have a variety of selection, control, and evaluation processes in place. ITIM can help these organizations understand the relationships among these processes and determine the key opportunities for immediate improvements.

- The framework uses a structured approach that identifies the key practices for creating and maintaining successful investment management processes. However, it describes what to do, not how to do it. Thus, specific implementation methods can and will vary by organization, based on specific attributes of the organization, such as size, complexity, and culture.

- The developmental nature of a maturity model means that process maturation is cumulative. Lower-stage processes provide the foundation for upper-stage processes. As additional critical processes are introduced into the organization and implemented, the organization attains greater process capabilities and maturity. As the organization incorporates additional processes at each successive stage of maturity, it must maintain the lower-stage critical processes that it has previously implemented.

- The framework depends on good project management to form the foundation of good performance measurement and the project-level control processes that underlie mature investment control processes.

- Where one exists, the use of an EA is a critical frame of reference for making investment decisions, and only investments that move the organization toward its target architecture—as defined by its sequencing plan—should be approved unless a waiver is provided and/or a decision is made to modify the EA.

- Critical processes initially may be implemented and practiced within individual bureaus or divisions before they are implemented and are mature across the organization.

- Business process improvement initiatives are usually not themselves considered to be IT investments; they are considered to be parallel efforts that may or may not be linked to investments. Thus, ITIM assessments do not evaluate individual initiatives. However, if such initiatives include IT investments, then the investments should be subject to the organization's investment management process.

- Change management should be a cornerstone of process improvement, because culture affects the nature of investment decisions. Investment decisions are about change, and change affects an organization's culture. For example, a decision can be creative or cautious, strategic or tactical. Culture emanates from the values of the organization.

Tool for Assessing the Maturity of an Organization

Just as ITIM can be used as a tool for organizational improvement, it can also be used as a standard against which to judge the maturity of an organization's IT investment management process. For example, ITIM can be used to support assessments to help ensure compliance with industry standards or acceptable practices, independent reviews of organizational maturity by oversight bodies, or other external IT process reviews. Regardless of the specific use, however, the following important factors should be considered when using ITIM as an organizational assessment tool:

- An assessment using the framework can be conducted for an entire organization (e.g., an executive branch department) or for one of its lower-level divisions (e.g., a branch, bureau, or agency). However, the unit or scope of analysis (e.g., branch, bureau, agency, or department) must be defined before an ITIM assessment is conducted. Additionally, the assessed maturity stage for a lower-level division is not necessarily indicative of the maturity stage of a higher-level division or of the organization as a whole.

- The use and interpretation of ITIM by organizations may vary with their size, culture, and organizational structure—as well as other factors. The overriding objective of the framework is to enable senior managers to systemically maximize the benefits of IT investments through the use of a structured investment process. In achieving this objective, different organizations may choose different specific implementations of the ITIM, which may be influenced by the factors mentioned above. For example, although ITIM addresses the organizational need to align and coordinate multiple investment boards, an organization with only one IT investment board would not need to perform the key practices associated with board alignment. Also, small organizations—or those with highly centralized IT management—may not require as extensive written guidance as large organizations, because their investment management processes are executed by a small, cohesive cadre of managers. Ultimately, each organization must use its best judgment in determining how to implement ITIM within its own context.

- An organization may be concurrently implementing key practices that are associated with several maturity stages. In fact, key practices associated with higher stage critical processes are frequently initiated while the organization as a whole is at a lower stage of maturity. However, organizational maturity is determined by assessing at what

maturity stage the organization implements all of the key practices for all of the critical processes associated with a given stage of maturity—in addition to all of those associated with lower maturity stages. For example, performing key practices in only some of the Stage 3's critical processes does not mean that the organization has attained Stage 3 maturity.

Limitations and Boundaries

The purpose of ITIM is to describe and improve an organization's IT investment management processes so that the strategic plans and decisions that it makes can and will be supported by highly effective investments. However, like other assessment tools, the framework has its limitations and boundaries. For example, while strategic planning and executive decision making can greatly influence an organization's performance, the framework does not evaluate these. If IT plans and business plans are linked, there is a high likelihood that investment decisions will be closely aligned with the business.

Similarly, performance measures that are created and used to guide the organization and its activities are an integral part of controlling the expenditures on an investment and can be viewed as maturing in parallel with the IT investment management processes. However, this guide does not describe in detail[18] the development or implementation of these measures.

In addition, the framework does not address IT acquisition (e.g., which type of contract to use or how best to conduct price negotiations, etc.) as a separate investment management step. While they are important, the primary purpose of acquisition-related activities is to support the execution of the investment decisions that are made by the IT investment board(s)[19] Thus, one would expect that the acquisition aspects of project development would be embedded in the project proposal and analysis steps within the framework. Alternatively, the acquisition strategy might be

[18]For additional guidance on developing performance measures, see U.S. General Accounting Office, *Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investment*, GAO/AIMD-98-89 (Washington D.C.: March 1998).

[19]For more information on procurement within the context of a capital budget, see OMB's *Capital Programming Guide, Version 1.0* (July 1997).

part of the project's risk assessment (i.e., the risks of pursuing various acquisition alternatives).

Finally, organizations selecting ITIM as an assessment tool should

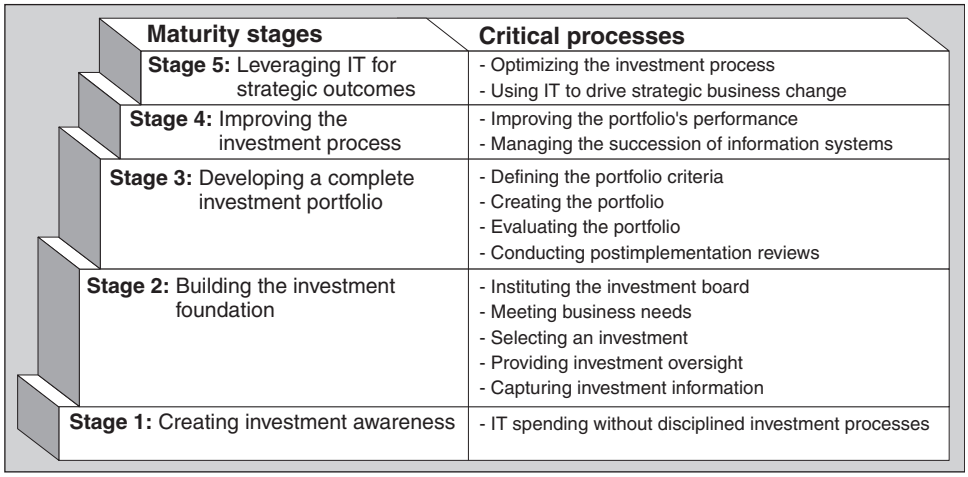
- become proficient with the related GAO and OMB guidance on IT investment.[20] This is particularly important for those seeking to apply ITIM in the federal government. Understanding this guidance provides greater insight into the developmental history, key issues, and critical success factors associated with the IT investment approach.
- become familiar with generally accepted capital decision-making approaches and associated analytical tools;
- become familiar with the concepts associated with EA management;
- receive training to become familiar with the basic concepts behind maturity models; and
- have experience using standardized assessment tools to assess organizations.

For further guidance on how to conduct an ITIM evaluation, refer to appendix II of this document.

[20]U.S. General Accounting Office, *Assessing Risk and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making*, GAO-AIMD-10.1.13 (Washington, D.C.: February 1997); U.S. General Accounting Office, *Assessing Risk and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making*, GAO-AIMD-10.1.13 (Washington, D.C.: February 1997); *Evaluating Information Technology Investments*, *A Practical Guide*, Executive Office of the President, Office of Management and Budget, November 1995.

Section 5: Critical Processes for the ITIM Stages

Figure 5: The ITIM Stages of Maturity with Critical Processes

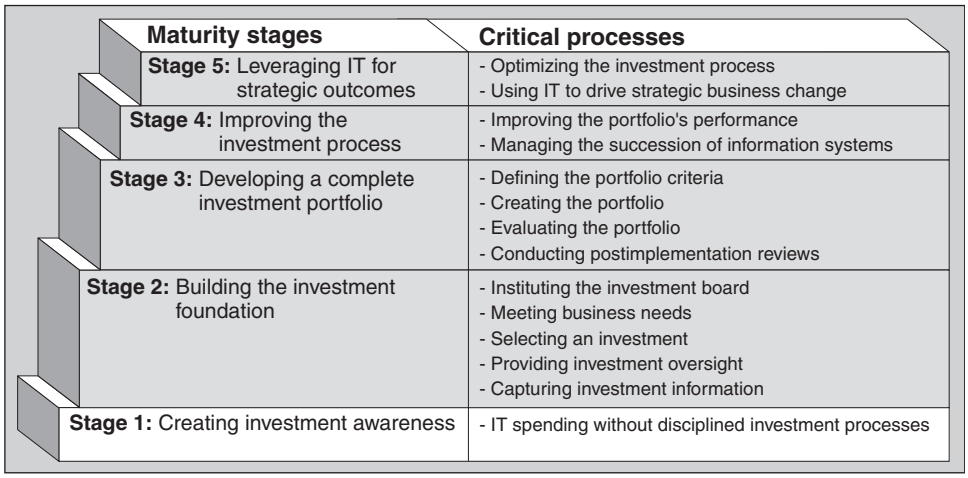


Source: GAO.

The following subsections describe each maturity stage in greater detail. The first subsection describes only the attributes of Stage 1 because no critical processes are associated with this stage. Each subsequent subsection describes one of the stages. In each subsection, the stage is briefly introduced and its associated critical processes are identified, along with a list of applicable criteria. For each critical process, a brief introduction and purpose is presented, along with a map showing the associated key practices (organizational commitments, prerequisites, and activities) that make up the critical process and a discussion and interpretation of the key practice. For easy reference, each page heading in section 5 indicates which stage and critical process are being discussed on that page.

Stage 1: Creating Investment Awareness

Figure 6: The ITIM Stages of Maturity with No Stage 1 Critical Processes



Source: GAO.

The following section provides a description of the conditions and characteristics associated with an organization operating at ITIM Stage 1. Within ITIM, Stage 1 is different from the other maturity stages because

- there are no critical processes associated with Stage 1; and
- it is typified by the absence of an organized, executable, and consistently applied IT investment management process.

The following description of an ITIM Stage 1 organization is not intended to be comprehensive; rather, it provides an overview of the general conditions and problems that typically confront a Stage 1 organization.

Generally, an ITIM Stage 1 organization has ad hoc or undisciplined IT investment management processes. This often contributes to escalating project costs, unmitigated risks, frequent slippages in project schedules, and low-value mission or business benefits. Furthermore, while the organization may have "pockets of excellence" in IT investment

management, the variability in these processes across the organization may lead to inconsistency in IT project outcomes.

Select Process

The Stage 1 organization's focus is more often on a project's funding requirements and lower level organizational requirements rather than on (1) its value toward achieving the organization's mission goals, (2) its technical and economic risks, (3) its performance problems, or (4) cost and schedule overruns. IT is treated as an expense item in most organizations' budgets, and it may be intertwined with other administrative and management support funding needs. Also, multiyear IT projects that are "in the budget pipeline" are reviewed each year largely in terms of marginal increases or decreases to the previous year's funding base, regardless of cost, schedule, and performance results to date.

In short, while some IT projects within a Stage 1 organization may be funded because they link to a defined business or mission purpose, many projects are funded despite the absence of critical information that demonstrates expected and achieved improvements in program, business, or mission performance.

Control Process

Stage 1 organizations typically have unstructured, ill-timed, and inconsistent IT investment management controls. Senior executives and line managers may rarely review IT projects' performance data, and thus the organization lacks an early warning method for quickly detecting and rectifying major problems. Instead, project crises are handled as they arise, focusing only on quick fixes rather than considering possible systemic causes of the problems. As a result, the success of individual projects is unpredictable and may often be the result of extraordinary efforts by individuals or the project team.

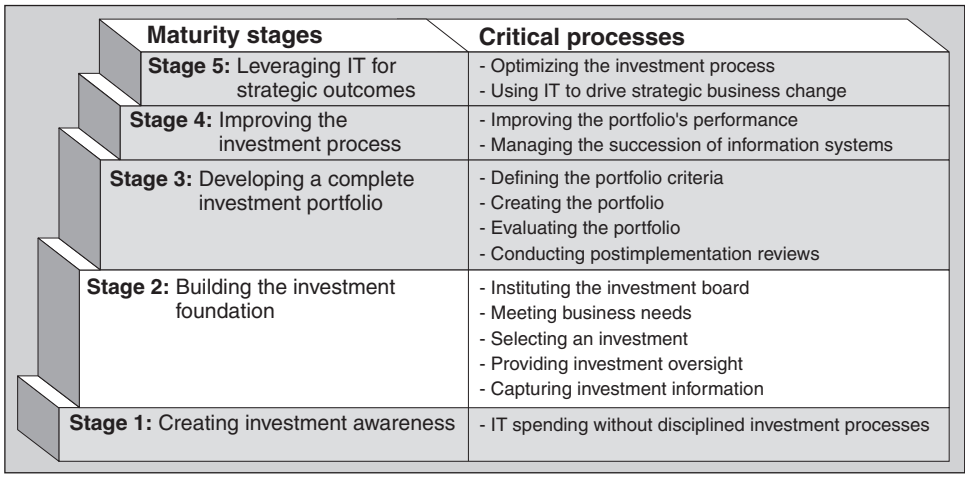
Additionally, a Stage 1 organization rarely would have an up-to-date and complete collection of investment information. For example, although it might have an IT hardware (equipment) inventory, it might lack a comprehensive list of systems, software applications and tools, and licensing agreements. Without a complete inventory of IT information, an organization cannot develop an adequate investment control process.

Evaluate Process

Finally, a Stage 1 organization rarely, if ever, (1) evaluates IT investment outcomes or (2) identifies lessons learned from its projects. If such evaluations are conducted, they often are triggered only in response to outside pressures (e.g., an audit or a budget oversight review), and they tend to be poorly staffed and conducted without a formal process that delineates method, scope, and responsibilities.

Stage 2: Building the Investment Foundation

Figure 7: The ITIM Stages of Maturity with Stage 2 Critical Processes



Source: GAO.

Stage 2 builds the foundation for current and future IT investment success by establishing basic IT selection and control processes. This stage is defined by five critical processes. Each critical process is described below, followed by a set of "Criteria," and a listing of documents that establish criteria supporting the use of the critical process in ITIM.

- **Instituting the Investment Board** is the process for creating and defining the membership, guiding policies, operations, roles, responsibilities, and authorities for one or more IT investment boards within the organization.

Criteria: *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making* (hereafter referred to as *IT Assessment Guide*) (AIMD-10.1.13), 32, (CCA, OMB M-97-0(2)); *Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology* (hereafter referred to as *SIM Executive Guide*) (AIMD-94-115), Practices 2, 10; Evaluating *Information Technology Investments*, version 1.0 (hereafter referred to as *OMB IT Investment*

Guide), Office of Management and Budget, 3; *Capital Programming Guide*, version 1.0, Office of Management and Budget, ii.

- **Meeting Business Needs** is the process for developing a business case that identifies the key executive sponsor and business customers (or end users) and the business needs that the IT project will support.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 15, 16, 17; *SIM Executive Guide* (AIMD-94-115), Practices 4, 9; OMB M-97-16.

- **Selecting an Investment** introduces a defined process that an organization can use to select new IT project proposals and reselect ongoing projects.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 23-25, (CCA, PRA, EO 13011, OMB A-11, OMB A-130, OMB A-109, OMB A-94, OMB M-97-0(2))

- **Providing Investment Oversight** is a pivotal process whereby the organization monitors projects against cost and schedule expectations as well as anticipated benefits and risk exposure.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 52, (CCA, PRA, *FASA*, EO 13011, OMB A-11, Part 3); *OMB IT Investment Guide*, *10*.

- **Capturing Investment Information** is the process by which specific details about a particular investment are captured and maintained to provide asset-tracking data to executive decision makers.

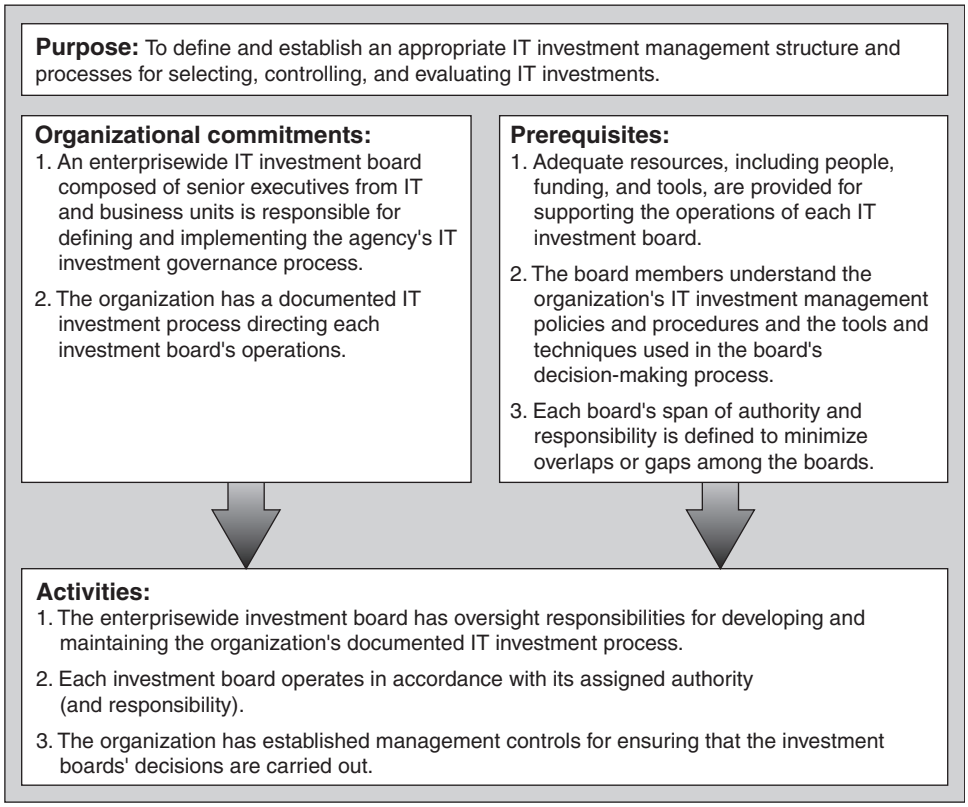
  Criteria: IT Assessment Guide (AIMD-10.1.13), 8, 19; PRA; E.O. 13103; *Capital Programming Guide*, ii.

Instituting the Investment Board

The IT investment board is a key component in the investment management process. This critical process defines the membership, guiding policies, operations, roles, responsibilities, and authorities for each designated board and, if appropriate, each board's support staff. This definition provides the basis for each board's investment selection, control, and evaluation activities. The organization may choose to make this board the same board that provides executive guidance and support for the EA. This overlap of responsibilities may enhance the ability of the board to ensure that investment decisions are consistent with the architecture and that it reflects the needs of the organization.

Depending on its size, structure, and culture, an organization may have more than one IT investment board. This critical process is based on the assumption that, for managerial reasons, the key practices in this critical process will be implemented consistently across each of these boards and that the organization will tailor each board's operations as part of this implementation.

Figure 8: Instituting the Investment Board



Source: GAO.

Purpose

To define and establish an appropriate IT investment management structure and the processes for selecting, controlling, and evaluating IT investments.

Organizational Commitments

Commitment 1: An enterprisewide IT investment board composed of senior executives from IT and business units is responsible for defining and implementing the organization's IT investment governance process.

The enterprisewide investment board is created to (1) define the investment board's structure and accompanying processes and (2) implement the processes as they are defined. This board is comprised of senior executives, including the organization's head or a designee,[21] the Chief Information Officer (CIO) or other senior executive representing the CIO's interests, and heads of business units and supporting units such as financial management. When the CIO is represented on the board by another senior executive, this executive must have knowledge of the CIO's management responsibilities and be able to fully represent the technical criteria that are being applied in the investment decision process. In cases where lower-level investment boards, comprised of individuals from across the organization, are chartered to carry out the responsibilities of the enterprisewide IT investment board within their own business units, the enterprisewide IT investment board still must maintain ultimate responsibility for the lower-level boards' activities. These subordinate boards should have the same broad representation as the enterprisewide board, though at the subordinate unit's level.

The enterprisewide IT investment board is responsible not only for major systems that affect multiple departments and users. These enterprisewide investments should be elevated to the enterprisewide IT investment board to ensure buy-in from senior executives and users representing various departments. The enterprisewide IT investment board should be actively involved in all IT investments and proposals that are high cost or high risk or have significant scope and duration.

[21]The organization head typically has ultimate responsibility for submitting a budget request to the organization's authorizing budget office (e.g., OMB in the federal government) and thus may rework or adjust the IT budget recommendations made by the investment board. An effective investment environment exists when the organization head with the senior executives and the CIO exhibit a corporate responsibility and serve as corporate officers on the investment board, instead of competing for their individual interests.

Commitment 2: The organization has a documented IT investment process directing each investment board's operations.

The organization uses the available IT investment process guidance[22] and defines the unique manner in which the guidance will be implemented. The guidance should lay out the roles of key boards, working groups, and individuals involved in the organization's IT investment processes, and it should explain the procedures for assigning responsibility for decision making for a given investment or proposal. The guidance should specify that individual business or operational units retain decision-making authority for unit-specific IT decisions while still following enterprisewide standards and procedures, and it should outline the significant events and decision points within the processes; identify external and environmental factors that will influence the processes (i.e., legal constraints, the behavior of key suppliers or customers, or industry norms); and specify the manner in which IT investment-related processes will be coordinated with other organizational plans, processes, and documents—including, at a minimum, the strategic plan, budget, and EA.

In IT organizations that have multiple IT investment boards, the enterprisewide investment process guide should document the policies and procedures that define each IT investment board's span of authority and describe how investment board activities are to be coordinated.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, are provided for supporting the operations of each IT investment board.

Executive management is typically responsible for creating the investment board(s), defining their scope and resources, and specifying their membership. Establishing an investment management working group can benefit both the IT investment boards and IT project managers by

[22]U.S. General Accounting Office, *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making* GAO/AIMD-10.1.13 (Washington D.C.: February 1997); U.S. General Accounting Office, *Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology* (GAO/AIMD-94-115, May 1994); *Evaluating Information Technology Investments*, *A Practical Guide*, Executive Office of the President, Office of Management and Budget, November 1995. *Capital Programming Guide*, *version 1.0*, Office of Management and Budget, (July 1997). E-Government Act of 2002, Public Law 107-347 (Dec. 17, 2002).

coordinating requests for information and verifying and providing responses.

Prerequisite 2: The board members understand the organization's IT investment management policies and procedures and the tools and techniques used in the board's decision-making process.

Members of the investment board should have an understanding of the board's policies and procedures and the experience and skills to carry them out. Thus, the organization should consider introducing investment concepts to board members with little or no investment decision-making experience or relevant education in this area. Orientation sessions might be provided to board members in areas such as economic evaluation techniques, capital budgeting methods, performance measurement strategies, and risk management approaches. In addition, board members should be made aware of the specific processes for which they are responsible.

Knowledge building and/or orientation sessions might include

- briefings specifically designed for new board members,
- educational forums,
- formal seminars, and
- executive training programs offering in-depth courses.

Prerequisite 3: Each board's span of authority and responsibility is defined to minimize overlaps or gaps among the boards.

When multiple boards execute the organization's IT investment governance process, criteria aligning these boards must be defined such that there are no overlaps or gaps in the boards' authorities and responsibilities. These criteria can be based on cost, benefit, schedule, and risk thresholds, the number of users affected, the function of the business unit (e.g., CIO, human resources, or program office), the life cycle phase of an IT investment (e.g., proof of concept, full scale development, or operations and maintenance), or other comparable and useful measures. An example would be to manage investments with less than a $100,000 life cycle cost at the lowest departmental level, but to have investments with more than $100 million in life cycle costs managed by the enterprisewide investment board.

Activities

Activity 1: The enterprisewide investment board has oversight responsibilities for the development and maintenance of the organization's documented IT investment process.

As the board responsible for defining and implementing the organization's IT investment management process, the enterprisewide IT investment board should also have responsibility for developing the organization-specific IT investment guide. The board's work processes and decision-making processes (i.e., schedules, agendas, authorities, decision-making rules, etc.) are described and documented in the guidance. In addition, after the guide has been developed, the enterprisewide investment board must actively maintain it, making sure that it always reflects the board's current structure and the processes that are being used to manage the selection, control, and evaluation of the organization's IT investments.

Activity 2: Each investment board operates in accordance with its assigned authority and responsibility.

For the whole IT investment management process to function smoothly and effectively, each investment board must operate within its assigned authority and responsibility, so that investments are properly aligned with the organization's objectives and are reviewed by the appropriate board.

Activity 3: The organization has established management controls for ensuring that investment boards' decisions are carried out.

Establishing management controls helps to ensure that management will carry out the decisions made by the IT investment board. Without these controls in place, decisions made by the investment board might not be implemented because of conflicting priorities. To ensure adherence to management controls, the structure of the relationship between upper management and the investment board must be documented and agreed to by both parties,. The investment board must have the confidence of upper management when selecting new proposals and ongoing projects for funding.

Meeting Business Needs

IT projects and systems should be tightly aligned with the business needs of the organization, providing support for highly visible core business processes. These strategically aligned IT projects and systems provide the highest value and most obvious investment benefits to an organization and are hallmarks of successful return on investment.

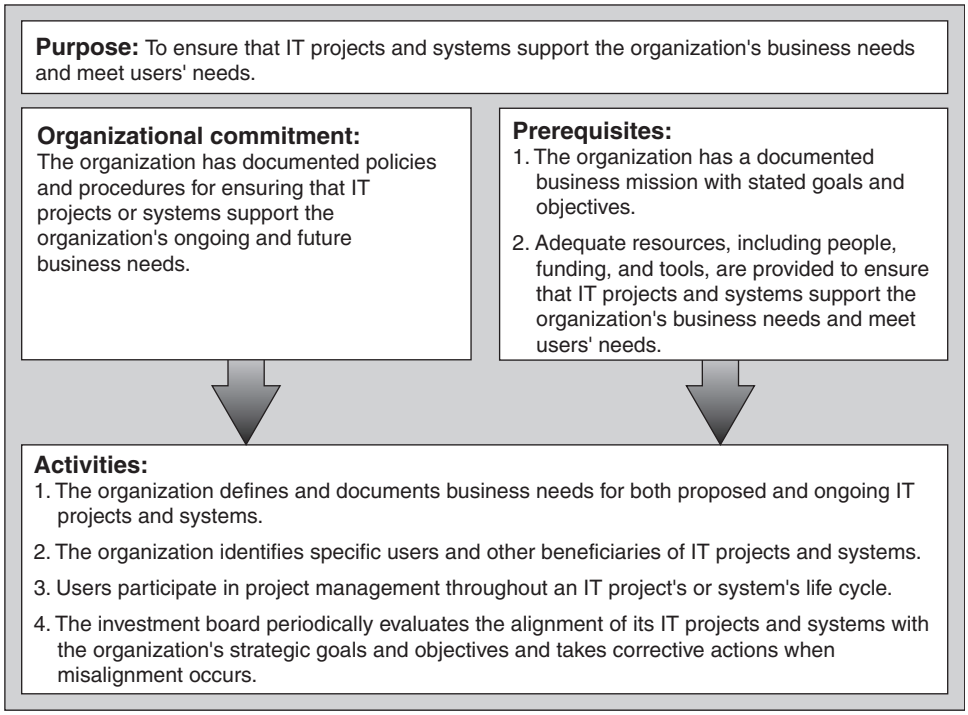
To achieve such a robust level of support, the organization must continually identify the business necessity for its IT projects and systems. Periodic identification of the business needs ensures that the correct and appropriate IT projects and systems are funded and that they directly support the organization's strategic plan. The frequency of this business verification may range from every quarter for an R&D project to every 3 years for systems in operations and maintenance; the appropriate interval depends upon the pace of functional changes in the system and the evolution of users' needs. Identifying business needs ensures that IT projects and systems will maintain an alignment with the organization's strategic plans and its business goals and objectives.

To the extent that the organization has planning documents—such as a strategic plan or a target enterprise architecture—these documents should be used as a source of agreed upon business needs. In addition, other business needs may surface through the investment process itself. In all cases, these business needs should be aligned with specific strategic objectives of the organization.

The essence of identifying business needs is for the business case for every IT project and system to be periodically reviewed and verified with respect to the business need(s) it is supporting. If an IT project or system is out of alignment with its strategic plan, then the IT investment needs to be resynchronized with the strategic plan or the overall strategic plan needs to be changed. Based upon the business case review, the most promising IT projects and systems are identified for continued investment. The investment board addresses whether business and user needs continue to be met in a cost-effective and risk-insured manner.

This critical process establishes a mechanism for verifying the business case (such as business requirements and rules, congressional mandate, and the organizational users) that drives continued support for each IT system. Ensuring that an essential link exists between the organization's business objectives and its IT strategy and that a defined partnership exists between the sponsoring unit and the IT solution providers strengthens and institutionalizes the organization's investment management process.

Figure 9: Meeting Business Needs



Source: GAO.

Purpose

To ensure that IT projects and systems support the organization's business needs and meet users' needs.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for identifying IT projects or systems that support the organization's ongoing and future business needs.

The organization has policies and procedures that outline a systematic process for identifying, classifying, and organizing its business needs and the IT projects used to support these needs. In many cases, this can be covered in the internal guidance that is used for documenting business cases for IT investments. These policies and procedures typically specify that

- a systematic process for identifying, classifying, and organizing business needs is linked to the business planning process,
- business needs or opportunities should be stated in functional terms or in terms of desired business improvement and not in product- or technology-specific terms,
- each IT project or system fits within the organization's EA and established security standards
- IT projects or resources that do not support an identified business need (and the associated customers or end users) are further examined for possible termination,
- there is a procedure by which similar needs or opportunities within different operating units are reconciled, and
- meeting business needs occurs regularly as part of the strategic planning cycle.

Prerequisites

Prerequisite 1: The organization has a documented business mission with stated goals and objectives.

The business mission, containing the stated goals and objectives is typically identified in

- strategic management or business plans (e.g., agency strategic plans prepared for GPRA),
- business process architecture documents,
- process improvement initiatives, or
- performance measurement plans.

Defining these goals and objectives, however, is largely outside the scope of ITIM. (See also Section 4: Limitations and Boundaries of ITIM.)

Prerequisite 2: Adequate resources, including people, funding, and tools, are provided for ensuring that IT projects and systems support the organization's business needs and meet users' needs.

These resources typically involve

- funding for these activities;
- managerial attention to this process;
- an executive sponsor for the project;
- staff support for carrying out these activities; and
- supporting methods, analytical tools, and processes.

Activities

Activity 1: The organization defines and documents business needs for both proposed and ongoing IT projects and systems.

Each IT project is directly or indirectly linked to at least one of the organization's business needs or mission goals; a direct link is of greater value than an indirect link. This link can be established in a variety of ways. For example, an organization can

- identify a project's business purpose as part of the project's initiation activities,
- define an executive sponsor for each project, or
- obtain validation from external groups supporting the business value of the project.

The business needs for each IT project will generally be documented in the business case for the project.

Activity 2: The organization identifies specific users and other beneficiaries of IT projects and systems.

Each major IT project or system will have end users or customers who will benefit from the system. A given project or system may address the needs of multiple sets of end users or customer groups. The primary end users or customers will be formally identified by the organization.

Identifying the end users early in the process assists the IT staff developing the IT project or system in focusing on the specific, well-defined goals of delivering value to end users. So that they may accomplish their particular

work, end users depend directly on the IT staff to deliver a project's capability and to provide a system's functionality.

Activity 3: Users participate in project management throughout an IT project's or system's life cycle.

End user involvement will vary during the different stages of a project's system life cycle. During the project's conception, end users should be heavily involved in developing the business case and in defining how the system will help to meet business needs or opportunities. They will be heavily involved again during user acceptance testing. During other phases of development, they will play a more limited role.

In the final phases of the system's life cycle, especially during the operational phase of the system, end users should play a major role in helping to identify and document any benefits that are realized from the system's implementation. Users should also participate in the operational analysis of the system. The analysis should involve collecting information about the system's performance and comparing it with the initial performance baseline.

Activity 4: The investment board periodically evaluates the alignment of its IT projects and systems with the organization's strategic goals and objectives and takes corrective actions when misalignment occurs.

This activity permits the investment board to assess a project's or system's outcomes and its value in comparison to predefined expectations, in preparation for determining whether or not and how well the IT project or system is meeting the organization's expectations. After deployment, a system's success is measured by its ability to continually meet a business or user need.

The length of the period for collecting IT system data prior to review and analysis varies from one organization to another. An organization could, for example, annually review one-third or one-half of its operational IT systems. Another organization could decide to review all operational IT systems every 3 years. The essential point is that operational IT systems are investments that need to be reviewed on a regular basis to ensure that they are still providing value to the organization in a cost-effective and risk-insured manner.

Using historical data, system expectations, and other factors as criteria, the investment board evaluates every IT system to determine its value to the organization. The review cycle should reflect the risk and volatility of the project or system being evaluated. Periodic evaluation of each IT project or system permits the investment board to determine the ongoing value that each investment is providing to the organization and its end users. These periodic evaluations are critical to determining whether or not to continue to fund an IT system.

When an investment is found to be out of alignment with the organization's strategic goals and objectives, immediate action must be taken at the project level, with oversight provided by the investment board, to realign the project or system. But even a successful system will eventually begin to provide diminishing returns as it becomes more expensive to maintain. In addition, changing business requirements also can make a system obsolete.

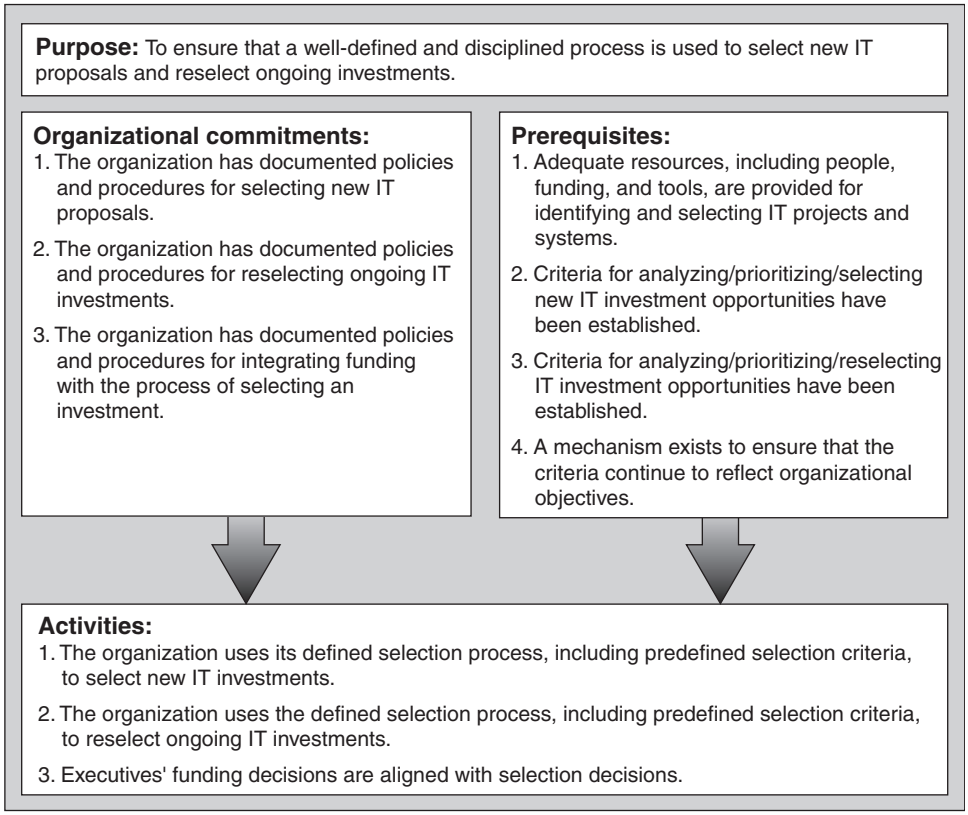
Selecting an Investment

The purpose of this critical process is (1) to predefine a method for selecting new IT proposals and (2) use this method to select new proposals. Within ITIM, "new" proposals include both (1) previously submitted IT proposals that were not originally selected for funding and (2) IT proposals that have never been submitted.

Defining and implementing a selection process is a basic step toward implementing the mature IT critical processes for proposal and project selection in Stage 3. The key activities implemented within this critical process include (1) concurrent review of IT proposals by the organization's executives, (2) the use of predefined selection criteria to analyze the proposals, and (3) decision making by executives to fund some proposals and not others. The EA, where it exists, should be reflected in the selection criteria. Investments may come up outside of the EA, in which case their value must be considered under the same criteria as all other investments. Investments that are not consistent with the current EA should either be assimilated into the EA or be provided a waiver.

Reselection of ongoing projects is a very important part of this critical process. If a project is not meeting the goals and objectives that were established in the original selection, the investment board must make a decision on whether to continue to fund it.

Figure 10: Selecting an Investment



Source: GAO.

Purpose

To ensure that a well-defined and disciplined process is used to select new IT proposals and reselect ongoing investments.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for selecting new IT proposals.

The organization has policies and procedures that outline a structured method for identifying, evaluating, prioritizing, and selecting its new IT proposals.

Using a structured method to select new IT projects accomplishes several objectives. First, a structured method provides the organization's

investment board, business units, and IT developers (whether they are internal IT staff or contractors) with a common understanding of the process and the cost, benefit, schedule, and risk criteria that will be used to select IT projects. Second, whether a business unit identifies a business need and develops an IT proposal itself or the organization's IT group develops the proposals, organizational roles and responsibilities will be defined for each participating unit involved in the project selection process. Lastly, the data required for decision making and the decision-making procedures should be predefined.

A documented selection process can help to ensure consistency when an organization is considering multiple investments for funding. Transparency in the process can help to create an environment that is objective, fair, and rational. Thus, potential investments will be judged solely on the merits of their contributions to the strategic goals of the organization without undue influence from outside the process.

Commitment 2: The organization has documented policies and procedures for reselecting ongoing IT investments.

The organization has policies and procedures that outline a structured method for identifying, evaluating, prioritizing, and reselecting ongoing projects.

A policy-driven, structured method for reselecting ongoing projects for further funding can also accomplish several objectives. A structured method provides the organization's investment board with a common understanding of how ongoing projects will be reselected for continued funding. Each ongoing project should be judged based on its success in meeting the investment outcomes that were stated in the policies and procedures for reselection. The information needed for decisions on project reselection should be predefined.

A documented reselection process ensures consistency when an organization is considering multiple investments for additional funding. Again, transparency in the process will create an environment that is objective, fair, and rational. Thus, ongoing investments will be judged solely on the merits of their current contributions to the strategic goals of the organization without undue influence from outside the process.

Commitment 3: The organization has policies and procedures for integrating funding with the process of selecting an investment.

The process of selecting investments is not feasible unless the policies and procedures for selection and reselection take into account how much funding is available for IT investments. No decision to fund a project can be considered valid without considering what funds are available. It is therefore vitally important to include procedures for project funding in the documented policies and procedures for selecting investments.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, are provided for identifying and selecting IT projects and systems.

These resources typically involve:

- managerial time and attention to the process, including project sponsorship;
- staff support, including, at a minimum, a designated official to manage the process; and
- supporting tools, methods, and equipment for organizing and analyzing the proposals.

Prerequisite 2: Criteria for analyzing, prioritizing, and selecting new IT investment opportunities have been established.

The organization has created a process for comparing projects within the portfolio of IT investments. Any decision-support process should be based on predetermined criteria. In order to maintain consistency, the criteria should include quantitative or qualitative measures for comparing projects. Projects are compared with one another based on criteria such as investment size, project longevity, technical difficulty, project risk, business impact, customer needs, cost-benefit analysis, organizational impact, and expected improvement. The results of such a comparison will help the investment board analyze the potential risk and return of investing in a particular project and prioritize the portfolio of projects using a scoring mechanism that considers strengths and weaknesses. After a careful analysis of the various projects vying for funding, senior executives should be able to prioritize the list of IT investment proposals based on supporting documentation.

Prerequisite 3: Criteria for analyzing, prioritizing, and reselecting IT investment opportunities have been established.

The organization has created a process for analyzing and prioritizing ongoing projects within its IT investment process. Any decision-support process for analyzing ongoing operations and maintenance projects should be based on predetermined criteria. There should be consistent quantitative or qualitative measures for analyzing projects for reselection or, if necessary, termination. If corrective actions cannot be implemented to maintain the desired investment outcome, the project should be identified, based on developed criteria, for termination. The results of such an analysis will help the investment board determine the potential risk and return of continuing to fund an ongoing project and to prioritize the projects based on decision criteria. After a careful analysis of the various ongoing projects competing for continued funding, senior executives should be able to prioritize the list of existing IT investments for reselection based on supporting documentation.

Prerequisite 4: A mechanism exists to ensure that the criteria continue to reflect organizational objectives.

The organization has created a process for ensuring that the criteria change as organizational objectives change. During project selection, decision makers use various criteria to help them assess a system's projected outcomes, resource allocations, and benefits and costs. Because criteria are usually presented in a hierarchical structure, decision makers are able to apply judgments based on the criteria/objectives deemed important to achieving specific goals. As organizational goals and objectives change—and the criteria for selecting projects changes with them—decision makers need to have management structures and tools in place to help them reassess their decision criteria and the effects of those criteria on decisions, results, and outcomes.

Activities

Activity 1: The organization uses its defined selection process, including predefined selection criteria, to select new IT investments.

The organization uses a structured process for submitting IT proposals that require funding or organizational support. This activity typically occurs within the context of the organization's cyclical budgeting process. A designated official manages the data submission and screening activities that are associated with the process.

Activity 2: The organization uses the defined selection process, including predefined selection criteria, to reselect ongoing IT investments.

The part of the process during which organizations tend to need the most help is in determining which projects to reselect and which to terminate. Competing priorities and differing objectives make it extremely difficult for IT decision makers to determine where to allocate their scarce IT funds. Faced with a changing laundry list of important and potential IT projects that exceeds budget parameters, managers need a predefined selection process that will help them choose among new and ongoing projects. To help ensure the selection and continuation of the most promising projects, ongoing projects should be reviewed continually along with new projects and go/no-go decisions should be made using predefined selection criteria.

Activity 3: Executives' funding decisions are aligned with selection decisions.

The organization's executives have discretion in making the final funding decisions on IT proposals. However, their decisions should be based upon the analysis that has taken place in the previous activities. Additionally, as part of the decision-making process, there should be evidence that some proposals are judged less meritorious than others and thus do not get funded.

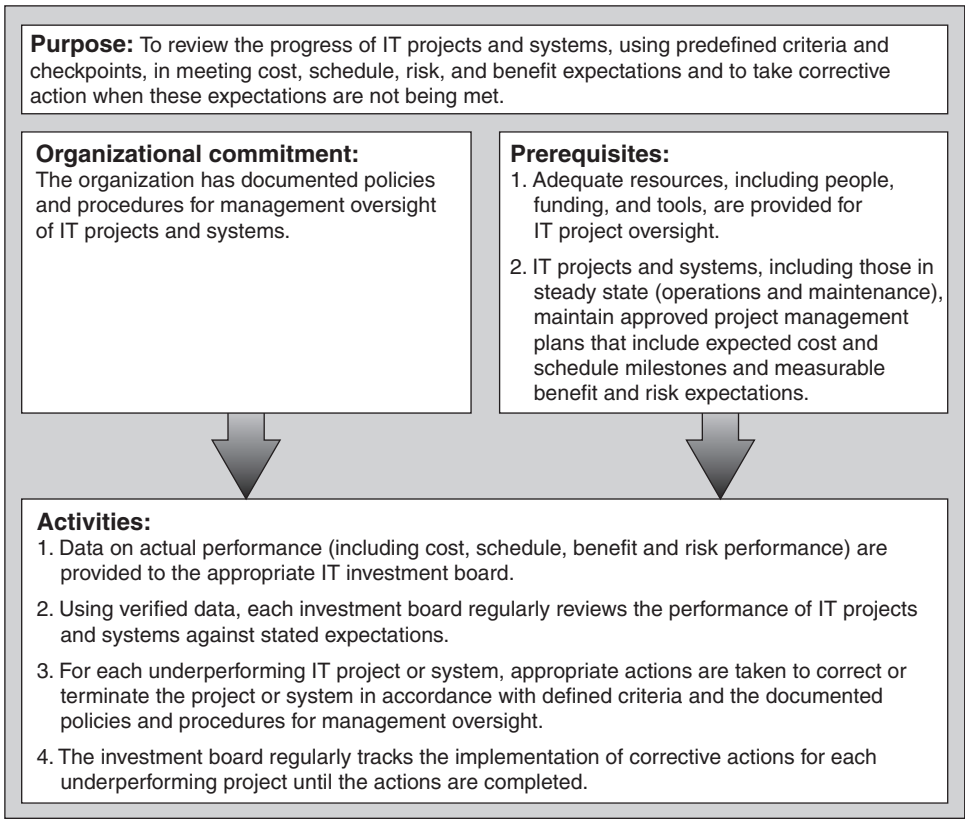
Providing Investment Oversight

The purpose of this critical process is to ensure that the organization provides effective oversight for its IT projects throughout all phases of their life cycles. While the board should not micromanage each project in order to provide effective control, it should maintain adequate oversight and observe each project's performance and progress toward predefined cost and schedule expectations as well as each project's anticipated benefits and risk exposure. The board should expect that each project development team will be responsible for meeting project milestones within the expected cost parameters that have been established by the project's business case and cost/benefit analysis. The board should also employ early warning systems that enable it to take corrective actions at the first sign of cost, schedule, and performance slippages.

The investment board has ultimate responsibility for the activities within this critical process. However, in larger organizations, the board may authorize designated subgroups to carry out some of these activities. The

investment board must ensure that projects maintain alignment with the EA, where one exists.

Figure 11: Providing Investment Oversight



Source: GAO.

Purpose

To review the progress of IT projects and systems, using predefined criteria and checkpoints, in meeting cost, schedule, risk, and benefit expectations and to take corrective action when these expectations are not being met.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for management oversight of IT projects and systems.

These policies and procedures typically specify

- each investment board's responsibilities when providing investment oversight within its domain,
- the procedural rules for the investment board's operation and for decision making during project oversight,
- the threshold criteria that the investment board(s) uses when analyzing project performance as part of its oversight function (threshold is typically based on cost or schedule measures—for example, currently more than 10 percent over expected cost—and will be a major factor in determining whether to take remedial actions),
- that corrective actions are required when the project deviates or varies significantly from the project management plan,
- that changes to the project's commitments to meet cost, schedule, performance, or other expectations be made with the involvement of affected groups, including
  - enterprise architecture,
  - system engineering,
  - software engineering (including all subgroups, such as software design),
  - hardware engineering,
  - project planning and estimating,
  - information assurance,
  - project stakeholders and champions,
  - business units, and
  - customers and end users.

- that each investment board oversee all changes to new and existing project commitments that it has made to individuals and groups external to the organization,

- the procedures for escalating/elevating unresolved and/or significant issues,

- the conditions under which a project would be terminated and the funds redirected to other "successful" projects.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, are provided for IT project oversight.

The organization performs an assessment of the resources needed to oversee its IT projects and systems. These resources should include

- managers and staff who are assigned specific responsibilities for monitoring IT projects and systems,

- tools to support board(s)' oversight operations, which may include project summary reports on various metrics and decision support applications.

Prerequisite 2: IT projects and systems, including those in steady state (operations and maintenance),[23] maintain approved project management plans that include expected cost and schedule milestones and measurable benefit and risk expectations.

[23]"Steady state" means maintenance and operation costs at current capability and performance level, including costs for personnel, maintenance of existing information systems, corrective software maintenance, voice and data communications maintenance, and replacement of broken IT equipment.

Each IT project management team creates and maintains a project management plan[24] for the project or system for which it is responsible. This plan documents a variety of project decisions, assumptions, and expectations, including project performance.[25] These expectations could include a cost and schedule baseline control system, such as the earned value management system, milestone-based accomplishment expectations, or other such control systems as are commensurate with the project's size, importance, cost, and risk.[26]

Each project that is in its operations and maintenance (O&M) phase should have its own distinct project management plan, one that is different from plans for new investments. This requirement is due in large part to the differences in how each investment is managed. O&M projects typically do not have milestones, and their cost structure is more predictable.

Activities

Activity 1: Data on actual performance (including cost, schedule, benefit, and risk performance) are provided to the appropriate IT investment board.

For an organization to establish control of projects in Stage 2, it is essential that all performance data including cost, schedule, benefits, risks, and system functionality (both expected and actual) for each IT project are collected and distributed to the appropriate IT investment boards. In addition, to monitor the long-term value of a project or system, the organization needs to collect and distribute this information to the appropriate IT investment board during agreed-upon stages of the project's life cycle.

These performance data may be collected by the board itself or collected and distributed in some other manner (e.g., through a centralized third

[24]See IEEE 1058 *Standard for Software Project Management Plans* for an example of additional guidance on creating a project management plan.

[25]See U.S. General Accounting Office, *Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investments*, GAO/AIMD-98-89 (Washington D.C.: March 1998) for additional guidance on performance measurement.

[26]For additional guidance on earned value management, see the Defense Department's Earned Value Management Web site at http://www.acq.osd.mil/pm and *Capital Programming Guide Supplement to Part 7 of Circular No. A-11* (Office of Management and Budget Circular No. A-11, July 2003).

party). These data will be key to assisting each IT board in its decision making.

IT projects in development, by definition, provide little current benefit, but they may provide benefits to the organization upon completion. The potential benefits of an IT project are enumerated in the project's business case; they are used to conduct an [expected] benefit/cost analysis and to persuade executives to select the project as a good investment. These potential benefits will be realized after implementation is complete. Measuring the actual benefit of a project while it is in development is a challenge. One way to measure the benefit of development work is to approximate it. Measuring a project's actual cost and schedule progression (i.e., evaluating earned value, which is a measure of the amount of preplanned work that is actually performed in relation to the funds expended) renders an approximate value of the project to the organization.

Activity 2: Using verified data, each investment board regularly reviews the performance of IT projects and systems against stated expectations.

The board typically oversees the project's performance by conducting reviews at predetermined checkpoints and/or major milestones, in order to interpret the data on project cost and schedule with respect to historic project data and expectations.

Project oversight

- is conducted at least at the major life cycle milestones for each project;
- is managed to limit changes in scope, such as increasing functionality requirements (scope creep);
- differs in its degree of depth depending on the size, cost, and importance of the project;
- must compare estimated schedule time frames to actual schedules, including schedule slippages and/or compressions;
- must compare estimated costs with funds spent or obligated to date, any changes in funding, and the impact of these changes; and

- ensures that project information and data are valid and that corrective actions are verified by qualified and independent audit teams, quality assurance groups, or internal verification and validation (IV&V) contractors.

Project oversight should also address each of the following project management issues:

- *Development/Acquisition*. Problems (e.g. contractor management) stemming from the selection of a specific project development and implementation approach.

- *Technical.* Technical issues or problems concerning such components as hardware, software, or telecommunications.

- *Benefits*. Evaluation of benefits delivered to date and the relationship of the project to specific business objectives.

- *Risks*. Assessment of the risks encountered to date and how expected risks are to be managed.

Activity 3: For each underperforming IT project or system, appropriate actions are taken to correct or terminate the project or system in accordance with defined criteria and the documented policies and procedures for management oversight.

Using estimated and actual cost and schedule data, the organization should identify projects that are not meeting their cost and/or schedule performance expectations. The following are examples of data that could be compared:

- actual cost data to planned cost data;

- the current number and scope of requirements to the original requirements established for the project;

- the current conditions and assumptions to the projects' initial assumptions and context; and

- the actual performance of the software development organization to its specified deliverables (e.g., schedule, costs, functionality, technical solutions).

Senior executives should ensure that there is a support and reward structure in place for identifying issues and raising them to the appropriate decision-making level and that there are no incentives for covering up significant problems. Go/no-go criteria can be a helpful tool in supporting management oversight.

Activity 4: The investment board regularly tracks the implementation of corrective actions for each underperforming project until the actions are completed.

The investment board ensures that

- corrective actions and related efforts are executed by the project management team and tracked by the investment board until the desired outcomes occur, and

- if the corrective actions are significant enough, an independent review is conducted before returning to the original project plan (i.e., reinstatement of funding) to ensure that all corrective actions have achieved their intended results and to determine whether additional changes or modifications are still needed.

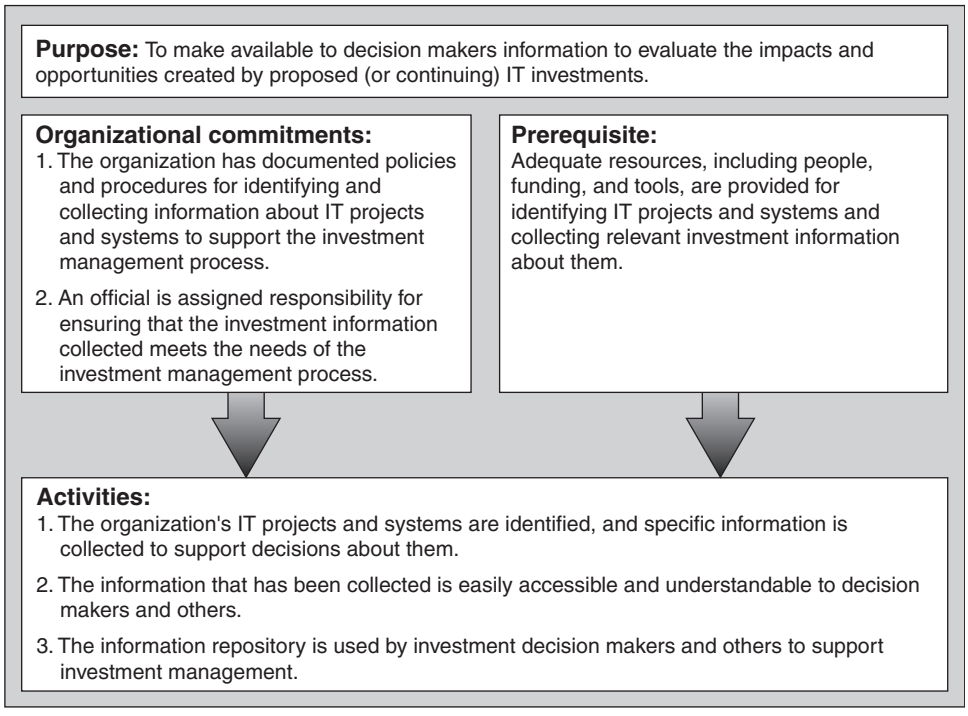
Capturing Investment Information

To make good IT investment decisions, an organization must be able to acquire pertinent information about each investment and store that information in a retrievable format, to be used in future investment decisions. During this critical process the organization identifies its IT assets and creates a comprehensive repository of investment information. This repository of IT investment information is used to track the organization's IT resources to provide insights and trends about major IT cost and management drivers. The information in the repository serves to highlight lessons learned and to support current and future investment decisions. This critical process may be satisfied by the information contained in the current EA, augmented by additional information (e.g., financial information, risks, benefits, etc.) that the investment board may require to ensure that informed decisions are being made.

This repository can take many forms (e.g., a catalog, a list, IT system and software inventories, or a balance sheet), but regardless of form, the collection method should identify each IT investment and its associated components. An organization's "as-is" architecture, along with its sequencing plan, can provide a resource for developing a list of existing

investments. In addition, the EA tool may provide an opportunity for gathering all of the necessary information in one place. This information does not have to be centrally located; it can be managed on a distributed basis. The guiding principle for developing the information source is that it should be accessible where it is of the most value to those making decisions about IT investments. The information is particularly important when executing the critical processes for Providing Investment Oversight, Selecting an Investment, Creating the Portfolio, and Managing the Succession of Information Systems. Additionally, beyond serving as a tool to aid in IT investment decision making, the IT information can also assist the organization with software licensing management, hardware life cycle management, and system architecture plans.

Figure 12: Capturing Investment Information



Source: GAO.

Purpose

To make available to decision makers information to evaluate the impacts and opportunities created by proposed (or continuing) IT investments.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for identifying and collecting information about IT projects and systems to support the investment management process.

These policies and procedures typically specify

- that responsibility for submitting, updating, and maintaining relevant inventory information for each project or asset is explicitly assigned;
- the process to be followed for the collection of information, access to the information, and support for maintaining the information; and
- the data elements required for each IT-related item, including
- the cost (e.g., history of actual development costs, annual operating and maintenance costs, and expected life cycle costs) of each item;
- the owner of each item;
- the physical location of each item; and
- the logical (e.g., architectural) location of each item.

For systems, specific IT data elements could be part of the organization's configuration management process. These data elements could include schedule data, such as dates of installation, last upgrade, last maintenance, and last security patch.

As in other critical processes of the ITIM, large and small organizations may implement this key practice differently. For example, the amount of administration and supporting infrastructure needed to collect information on projects and systems depends in large part on the size of the organization. A smaller organization that has a limited number of systems may be able to utilize systems that were created for other purposes, creating reports on an ad hoc basis. Larger organizations, however—in which IT-related information might be expected to be more extensive and decentralized—may require a dedicated system to acquire the relevant

information and make it available to decision makers in a more structured manner. In a large, decentralized organization the collection and reporting of investment information on an ad hoc basis would likely be unmanageable.

Commitment 2: An official is assigned responsibility for ensuring that the information collected during project and systems identification meets the needs of the investment management process.

A designated official is needed to adequately manage this process. The official will ensure that a process is developed and maintained for collecting IT investment information so that assets can be accurately tracked. Staff or external advisors may be assigned to assist the official in conducting IT asset tracking and in verifying and validating IT investment data.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, are provided for identifying IT projects and systems and collecting relevant investment information about them.

These resources typically involve

- managerial attention to the process;
- staff support including, at a minimum, a designated official to manage the process; and
- supporting tools and equipment for tracking IT assets which may include
  - an IT information database;
  - IT data reporting, updating, and query tools; and
  - a method for communicating changes in IT information to affected parties.

Activities

Activity 1: The organization's IT projects and systems are identified, and specific information is collected to support decisions about them.

A standard, documented procedure is used so that developing and maintaining the information is a repeatable event, producing IT data that are timely, sufficient, complete, and comparable. The information may be prepared by the information systems support component of an organization, and the verification and validation may be performed by a designated official or by another organizational unit, depending on the needs of the organization.

An IT project and system data repository typically includes an inventory listing of software licenses, planned IT projects, and existing systems with their own unique identifiers. The repository may also include information on

- how the project or system fits into the EA;
- the organizational unit that is responsible for the project;
- interfaces and dependencies with other projects and systems;
- the current life cycle phase of the project or system (e.g., being prototyped, under development, being operated and maintained, etc.) and associated life cycle events (e.g., current development, modernization, or enhancement efforts under way);
- the costs to date for the project or system and anticipated future costs;
- the general category of the project or system (e.g., infrastructure, software application, hardware replacement); and
- anything else that would be relevant to investment decision making about the project or system.

For example, a large project could be implemented using an incremental investment approach. Such an approach would require that the project's increments or useful segments be identified as part of the repository. This information would help decision makers select and prioritize the project's useful segments and align them with other projects and systems.

Activity 2: The information that has been collected is easily accessible and understandable to decision makers and others.

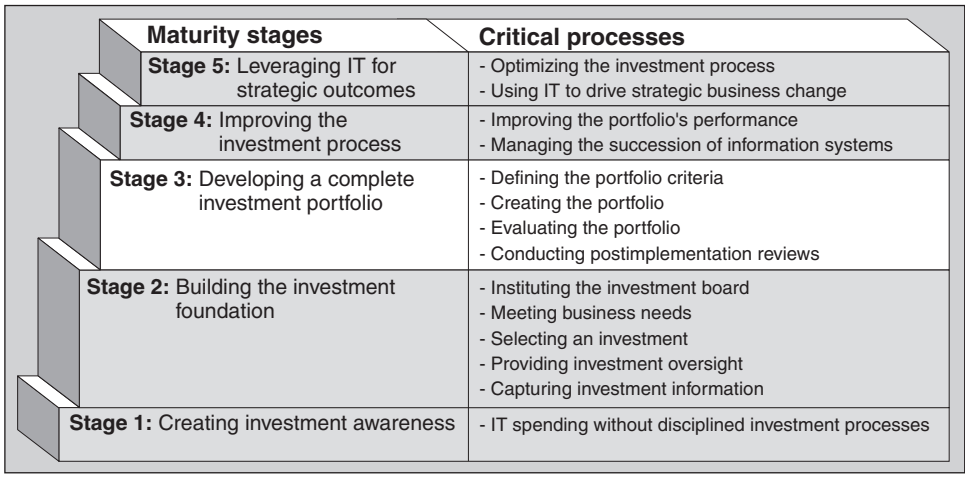
The repository of information about the IT investment is of value only to the extent that decision makers and stakeholders can and do use it. Knowledge of the contents of the repository by staff and managers throughout the organization can help them to avoid duplication of effort and reconcile overlapping resources. For example, a report in the repository can be used to better manage the licensing of an organization's application software by showing individually licensed applications that may be candidates for group licensing.

Activity 3: The information repository is used by investment decision makers and others to support investment management.

In order to continue to make informed investment decisions, it is important to maintain up-to-date information. Maintaining the integrity of the repository is important to ensuring that it remains a useful decision-making tool. As projects and systems change (i.e., additions, updates, and/or deletions), this information should be documented in the repository. An individual or organizational unit should be designated to maintain the repository.

Stage 3: Developing a Complete Investment Portfolio

Figure 13: The ITIM Stages of Maturity with Stage 3 Critical Processes



Source: GAO.

During Stage 3, the investment board enhances the IT investment management process by developing a complete investment portfolio. Taking a portfolio perspective enables the organization to consider its investments in a comprehensive manner, so that the investments address not only the strategic goals, objectives, and mission of the organization, but also the impact that projects have on one another. The organization develops its IT investment portfolio by combining all IT assets, resources, and investments that it owns, considering new proposals along with previously funded investments, and identifying the appropriate mix and synergies of IT investments that best meet its mission needs, organizational needs, technology needs, and priorities for improvement. This maturity stage is comprised of the following four critical processes:

- **Defining the Portfolio Criteria** is the process of developing quantitative or qualitative factors such as cost, benefit, schedule, and risk in order to compare and select projects for inclusion in the investment portfolio(s).

Criteria: IT Assessment Guide (AIMD-10.1.13), 27-29, 45-46 (CCA); *OMB IT Investment Guide*, 7-9.

- **Creating the Portfolio** is the process of comparing worthwhile investments and then combining the investments selected into a funded portfolio.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 32-35 and 52, (CCA, OMB A-94, OMB A-130, OMB M-97-0 (2), *Capital Programming Guide*, 16-17; (CCA, OMB M-97-0 (2), *OMB IT Investment Guide*, 6-7.

- **Portfolio Review** is the process that builds upon the Providing Investment Oversight critical process from Stage 2 by adding the element of portfolio performance to the organization's control process activities.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 52-55, (CCA, PRA, FASA, EO 13011, OMB A-11, Part 3); *Information Technology Investment* (AIMD-96-64), 65; *IT Assessment Guide* (AIMD-10.1.13), 61-62, (CCA, GPRA, CFO, OMB A-127, OMB A-123).

- **Conducting Postimplementation Reviews** (PIR) is the process for reviewing IT projects in order to learn from past investments and initiatives by comparing actual results to estimates. PIRs also serve as vehicles for evaluating the entire ITIM process.

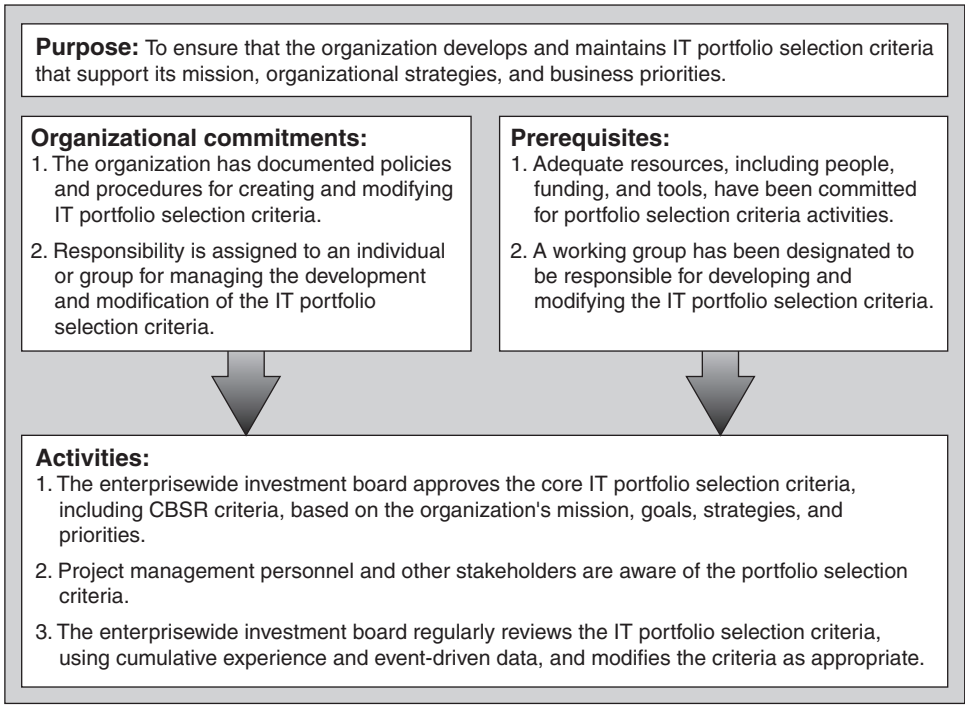
  Criteria: IT Assessment Guide (AIMD-10.1.13), 70-72 (CCA, PRA, EO 13011, GPRA, CFO, OMB A-130); *OMB IT Investment Guide*, 12; *Information Technology Investment* (AIMD-96-64), 66.

Defining the Portfolio Criteria

Portfolio selection criteria are a necessary part of an IT investment management process. Developing an IT investment portfolio involves defining appropriate IT investment CBSR criteria to ensure that the organization's strategic goals, objectives, and mission will be satisfied by the selected investments. If an EA, including a sequencing plan, exists, it should be used as the foundation for developing and updating the portfolio selection criteria. Portfolio selection criteria reflect the strategic and enterprisewide focus of the organization and build on the criteria that are used to select individual IT projects. When IT projects are not considered in the context of a portfolio, criteria based on narrow, lower-level requirements may dominate enterprisewide selection criteria. IT projects

sometimes are selected on the basis of an isolated business need, the type and availability of funds, or the receptivity of management to a project proposal. Portfolio selection criteria build on the criteria that are used to select individual projects. The portfolio criteria focus on alignment with the organization's mission, organizational strategy, and line-of-business priorities. In Stage 3, portfolio selection criteria are used by the organization's investment board to select IT investments in the context of all other investments. These criteria should also be applied as uniformly as possible throughout the organization to ensure that decision making is consistent and that processes become institutionalized. When an organization's mission or business needs and strategies change, these criteria should be re-examined.

Figure 14: Defining the Portfolio Criteria



Source: GAO.

Purpose

To ensure that the organization develops and maintains IT portfolio selection criteria that support its mission, organizational strategies, and business priorities.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for creating and modifying IT portfolio selection criteria.

The organization has policies and procedures that outline a systematic process for creating and modifying the selection criteria. In smaller or highly centralized organizations, there may not be as critical a need to institute elaborate polices and procedures to manage portfolio criteria. If the investment decision-making process is managed for the entire organization by a compact group, and if the objectives for the organization's IT investments are well understood and stable, portfolio selection criteria might be established once and then modified incrementally year-to-year by this same small group. In large, decentralized organizations with diverse and evolving objectives, it is much more critical to solicit input to the development of portfolio selection criteria and to have a documented process for doing so.

For larger organizations, policies and procedures would typically specify

- the objectives for the portfolio management process;
- a link to the organization's strategic plans, budget processes, and enterprise IT architecture;
- the key information elements required to create or modify the selection criteria;
- a description of the roles and responsibilities for creating, modifying, and prioritizing the selection criteria;
- suggested investment and proposal selection criteria;
- a record of previous selection criteria, their weights and rankings, and how they were developed;
- triggers for initiating a change in the selection criteria; and
- a list of people to whom the selection criteria should be distributed.

Commitment 2: Responsibility is assigned to an individual or group for managing the development and modification of the IT portfolio selection criteria.

An individual or a working group shall be assigned the responsibility of developing the selection criteria and any subsequent modifications to those criteria. The assignment of responsibility is critical because it creates a point of focus for the successful implementation of this critical process. Those individuals who are assigned the task of developing and modifying the criteria should have a good working knowledge of investment management. Past experience in investment management can be beneficial when developing the selection criteria. Developing the right criteria with which to analyze a portfolio of projects is essential for making sound investment decisions.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, have been committed for portfolio selection criteria activities.

These resources typically involve

- the time and attention of the executives involved in the process,
- staff to support the activities within this process, and
- supporting tools and equipment.

Prerequisite 2: A working group has been designated to be responsible for developing and modifying the IT portfolio selection criteria.

A working group is designated to develop and modify the selection criteria. This group should incorporate the organization's mission, strategy, and priorities into the criteria. Thus, this group might be the IT investment board or a subset of the board that includes the CIO or some other member of the executive management team. While a working group may develop draft criteria, final approval should fall to the investment board or to an individual or group that has been designated by the board.

Activities

Activity 1: The enterprisewide investment board approves the core IT portfolio selection criteria, including cost, benefit, schedule and risk (CBSR) criteria, based on the organization's mission, goals, strategies, and priorities.

The selection criteria should be linked directly to the organization's broader mission, goals, strategies, and priorities. This ensures that the selected IT investments will support these larger organizational tenets and purposes. It is important that the criteria also take into account the organization's IT architecture in orders to (1) avoid unwarranted overlap across investments, (2) ensure maximum systems interoperability, and (3) increase the assurance that investments align with strategy as captured in the EA.

An organization often chooses to establish multiple portfolios to facilitate the investment process. This grouping of investments with similar characteristics can enable the organization to clarify the value of certain types of investments—such as infrastructure or e-government systems—by developing criteria that focus on the contribution each type of investment makes to the organization. Also, the organization can determine beforehand how to distribute funding across the portfolios. Ultimately, the investment board should assess each investment as part of the single enterprise portfolio—that is, the aggregation of all of the smaller portfolios. The selection criteria used for assessing and ranking individual investments and proposals should generally include the four essential investment elements: cost, benefit, schedule, and risk. The assessment may also include other criteria, which serves to enhance the evaluation of each investment's strategic alignment and synergy with other projects. Organizations typically focus on these four areas and develop multiple measures under each broad element.

- *Cost* may include life cycle costs broken apart into initial costs, ongoing development costs, and indirect costs.

- *Benefit* may include tangible benefits and intangible benefits estimated using a variety of techniques (e.g., cost/benefit analyses using net present value, return on investment calculations).

- *Schedule* may include the life cycle schedule and the schedule of benefits.

- *Risk* may include investment, organizational, funding, and technical risks.

The organization must determine how these criteria are to be used to select IT investments for the portfolio. Costs and benefits are both affected by risks. A risk-adjusted return on investment could combine all of these categories. The selection criteria also may include a description of an investment's or proposal's minimum or maximum acceptable CBSR thresholds (e.g., a minimum acceptable return on investment hurdle rate or a maximum acceptable schedule length).

An organization could use a weighting schema when creating the selection criteria. The organization would then derive weights for each of the broad categories, as well as any subelements related to each category. This would help the organization prioritize those subelements that it considers the most significant (e.g., an organization that has limited experience developing systems may give technical risk a greater weight than projected cost). Alternatively, other risk analysis methods might incorporate the same "weighting" effect.

The mixture of weights among the ranking criteria will vary from organization to organization. The weighting schema used should take into account the organization's unique mission, capabilities, and limitations. The organization may also create different weighting schemas for different kinds of investments (e.g., operational, infrastructure, applications development investments, R&D). These weights may need to be refined over time as the organization gains more operational experience using the weighting schema. Additionally, as a starting point, the organization may want to borrow selection criteria used by other comparable organizations.

Ultimately, the criteria should reflect the priorities of the organization. Often, the most senior investment decision makers are involved in the development of these criteria.

Activity 2: Project management personnel and other stakeholders are aware of the portfolio selection criteria.

The criteria should be distributed to each IT investment board and all of the IT project managers, organizational planners, and any other interested parties. The selection criteria should be clearly addressed in funding submissions for IT projects.

In a large organization with multiple IT investment boards, a lower-level board may add its own criteria that would deal with lower-level requirements, but the portfolio-level criteria would always take precedence.

Activity 3: The enterprisewide investment board regularly reviews the IT portfolio selection criteria, using cumulative experience and event-driven data, and modifies the criteria as appropriate.

The IT criteria for selecting investments may be changed based on (1) historical experience; (2) changes in the organization's strategic direction, business goals, or priorities; or (3) other factors, such as increased IT management capabilities or technological changes. Ultimately, however, the task of modifying the criteria will be based on the experience and judgment of the enterprisewide investment board.

Creating the Portfolio

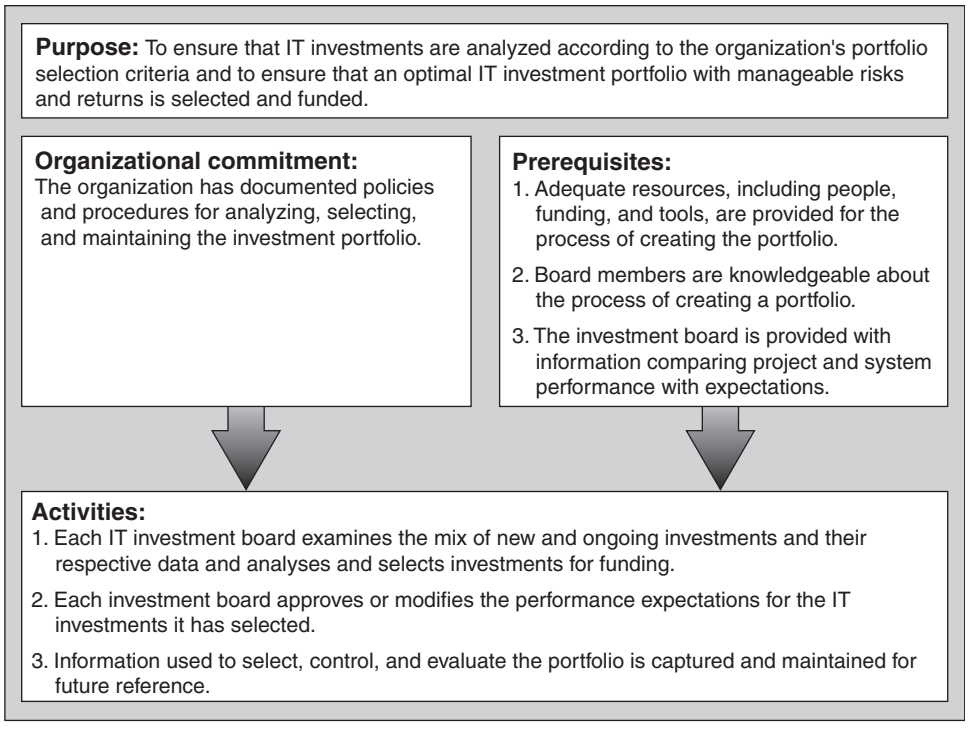
Individual IT investments vary in type and purpose. Some investments may involve purchasing hardware, others developing software, and still others operating or maintaining IT systems. The organization may choose to organize its investment process by considering investments within smaller portfolios (as described in Defining the Portfolio Criteria). These subordinate portfolios can help facilitate the prioritization of investments within business or service categories. The development of the portfolio is an ongoing process that includes decision making, prioritization, review, realignment, and reprioritization of projects that are competing for resources and funding. The process for creating the portfolios should ensure that each IT investment board manages investments according to an organizational, strategic-planning perspective. The boards should collectively analyze and compare all investments and proposals to select those that best fit with the strategic business direction, needs, and priorities of the entire organization. This is the fundamental process through which investments are selected into the portfolio.

Additionally, each organization has practical limits on funding, the risks it is willing to take, and the length of time for which it is willing to incur costs for a given investment before benefits are realized. To address these practical limits, the process of creating the portfolio primarily uses categorization to aid in investment comparability and CBSR oversight. Categorization involves grouping investments and proposals into predefined logical categories. Once this is accomplished, investments and

proposals can be compared to one another within and across the portfolio categories, and the best overall portfolio can then be selected for funding.

Fundamental to the comparison of investments is an appropriate analysis of each investment. During Stage 2, the primary basis for comparison is CBSR, and each investment's performance is compared with those dimensions. However, in Stage 3 the basis for comparison expands to include more factors related to alignment, such as the degree of correlation to the organization's planning, market position, financial objectives, and business environment. Also, characteristics of each investment that could potentially influence the value of other investments in the portfolio—and at the same time be influenced by other investments—should be taken into consideration. This process may be greatly aided by establishing EA compliance as a fundamental requirement for selection and by ensuring that the final portfolio is consistent with the EA as a whole.

Figure 15: Creating the Portfolio



Source: GAO.

Purpose

To ensure that IT investments are analyzed according to the organization's portfolio selection criteria and to ensure that an optimal IT investment portfolio with manageable risks and returns is selected and funded.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for analyzing, selecting, and maintaining the investment portfolio.

As part of the process for selecting an investment portfolio, each IT investment board should have policies and procedures in place to help them select the most promising proposals and to ensure that the most feasible investments are considered. These policies should include specific screening criteria to help identify and expedite the selection of the most promising projects. To the extent possible, in order to help minimize risk, the organization should have a policy in place to ensure that projects are proposed in useful segments or "modules" that are short in duration, small in scope, and useful, even though the project may, at some point, be discontinued There should also be a documented process for reconciling differences between the IT investment portfolio and the organization's EA. Reconciliation may include an EA waiver or modifying the EA to include the delinquent investment. Also, as part of the process for selecting the portfolio, a structured and proven investment analysis (e.g. Return on Investment and Benefit/Cost Analysis) should be required. The results from the analysis should be used to help support portfolio decisions and ensure that the organization is aware of the financial as well as other internal and external effects.

The organization's policies and procedures for analyzing and developing IT investment portfolios typically

- provide common definitions for IT investment portfolio categories,
- apply to each IT investment board as each develops its comprehensive IT investment portfolio, and
- stipulate conditions that should be met for investment funding decisions where exceptions are made.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, are provided for the process of creating the portfolio.

These resources typically involve

- managerial time and attention to focus on creating the portfolio,
- staff support for carrying out activities within this critical process, and
- supporting tools and equipment to be used by the staff in creating the portfolio.

Prerequisite 2: Board members are knowledgeable about the process of creating a portfolio.

Understanding the principles behind the portfolio creation process is critical to successfully executing this process. Thus, it may be necessary to train board members to ensure that they are familiar with the goals of the process and can carry out their responsibilities competently.

Knowledge building and/or training may be provided ranging from

- in-depth courses for new members to
- a mandatory annual overview for all board members of the investment process, current process modifications, operational procedures for selecting investments, control, and evaluation.

Prerequisite 3: The investment board is provided with information comparing project and system performance with expectations.

The organization has defined the common portfolio categories that will be used across the organization when each IT board creates its portfolio of IT investments (if the organization has more than one board). The creation of these common categories (1) aids in the comparison of similar investments across the organization and (2) helps the boards create a common set of definitions.

Common portfolio categories should enhance decision making during the portfolio creation process. The organization should use categories that mirror its business strategy and goals. Organizations also need to consider their EA when developing their IT portfolio. By using the organization's EA framework to identify and establish the "as-is" environment, the "to-be" environment, and the transition plan, decision makers have an explicit and

meaningful structural frame of reference for making better IT decisions. For example, the portfolio categories might be established by

- aligning IT spending with the strategic goals of the organization—which types of projects, across which groups and which service lines;
- defining spending levels for the portfolio categories, for example, XX percent to technology development, XX percent to new services, XX percent to infrastructure projects, XX percent to technology enhancements and improvements; and
- prioritizing IT projects within the portfolio categories.

Establishing portfolio categorization allows projects to be prioritized within their own portfolio categories. Moreover, it keeps dissimilar projects from competing against each other (for example, O&M projects do not compete against new services projects). At the end of the budget cycle, resource spending should be more consistent with planned or desired IT budgets.

The organization may also want to define a set of thresholds for each common portfolio category. These thresholds should be meaningful to the organization and useful when making investment decisions, and they should differentiate the categories. A small organization with relatively few investments may want to use a simple set of portfolio categories. An organization using functional categories could define thresholds for each category, such as

- the maximum investment cost variances, both annually and in total;
- the minimum benefit that a given investment is expected to deliver, such as return on investment;
- the maximum length of time an investment should take; and
- a maximum risk score derived using an industry-accepted risk assessment tool.

Activities

Activity 1: Each IT investment board examines the mix of new and ongoing investments and their respective data and analyses and selects investments for funding.

After the investments have been assigned to portfolio categories, the investment board completes the selection process by examining the portfolio's mix of investments and making final investment decisions that are justified by sound management principles. To provide decision makers with an understanding of the relative costs, benefits, schedules, and risks of each investment and proposal compared to the others, the organization may use a scoring model or decision support tool. Typically, such a model or tool compares the costs, benefits, schedules, and risks of each investment or proposal against the organizational investment criteria and assigns each investment proposal a score. These scores may then be used to rank all investments. This ranked list of investments may then provide a starting point for the decision-makers to apply their judgment and knowledge of the organization's imperatives as they select investments for the portfolio. (See also GAO's *Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investments* (AIMD-98-89, March 1998) for additional guidance on performance measurement.)

The investment board may have to reconcile imbalances between total IT funding expectations and funds required for the qualified IT investments within each portfolio category. For example, the investment board may find that the funding requests for investments within the O&M category are higher than expected and that the funding requests for investments within the R&D category are lower than expected. The investment board can address this problem by (1) leaving the outcome as it is, (2) modifying the mix of investments, (3) modifying investment-level funding, or (4) using some combination of these options.

The investment board can also use other applicable sources of information when comparing investments and determining each investment's funding. While the investment board should strongly consider the organizational priorities created by the selection criteria, it may also want to take into account

- the qualifications, abilities, and achievements of the project team;
- the unique or significant links between the investment and the organization's mission, strategies, and plans;
- the historical data, data on similar investments, or their own investment management experiences; or

- other organizational objectives.

Activity 2: Each investment board approves or modifies the performance expectations for its selected IT investments.

The board modifies or approves annual performance expectations, including CBSR for each investment. Because some investments may span multiple years, and most organizations select investments on an annual or biennial cycle, the investment board needs to approve each investment's performance expectations on an annual basis (e.g., performance expectations for a particular investment are to meet or exceed the performance goals by the end of the first year). Investment expectations should also take into account each investment's past performance, in addition to serving as the basis for future board reviews, control process activities, and postimplementation reviews.

Activity 3: Information used to select, control, and evaluate the portfolio is captured and maintained for future reference.

The organization creates a repository for capturing information (e.g., investment performance expectations and portfolio category thresholds) related to the portfolio creation process. This repository can be a part of a larger IT investment management information system or a component of the information collection and may be centrally located or distributed within the organization. Storing the information facilitates its use as part of control process activities, during investment evaluations, future selection decision making, and future training for board members.

The ability to effectively capture information on past and present IT decisions can enable an organization to make better decisions on IT investments during control process activities, as well as during the evaluation and selection process. In theory, IT investment decisions are only as good as the information that supports them. Data should be validated before they are used in the decision-making process. An IT information system that delivers information that is up to date, encompassing, and presented in a useful format enhances the decision process. Organizations sometimes base IT decisions more on judgment, intuition, partial data, and ad hoc studies than on objective, systematic, IT-related information that is routinely collected and analyzed. Organizations should focus on identifying effective approaches for collecting, analyzing, and utilizing IT information, as well as other strategic information.

Evaluating the Portfolio

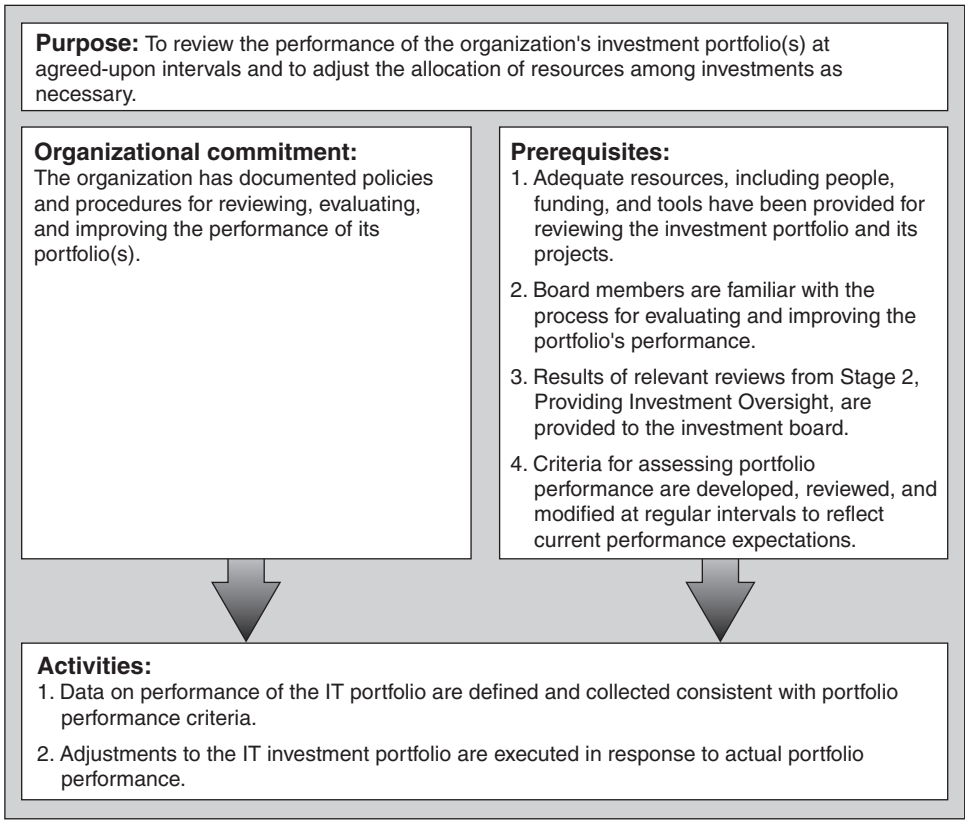
This critical process builds upon the Stage 2 critical process, Providing Investment Oversight, by adding the elements of portfolio performance to an organization's investment control capacity. Compared to less mature organizations, Stage 3 organizations will have the foundation they need to control the risks faced by each investment and to deliver benefits that are linked to mission performance. In addition, a Stage 3 organization will have the benefit of good performance data that have been generated by Stage 2 processes. Executive-level oversight of risk management outcomes and incremental benefit accumulation provides the organization with increased assurance that each IT investment will achieve the desired results. Expanding this focus to the entire portfolio provides the organization with longer-term assurances that the IT investment portfolio will deliver mission value at acceptable cost.

The investment board's role is not to micromanage each investment, but instead to ensure appropriate executive-level involvement and participation in monitoring each investment's progress toward achieving performance expectations. As part of its oversight responsibilities, the board should also ensure that the investments in the portfolio continue to maintain alignment with the EA, where one exists. These investment (and portfolio) expectations are the baseline for periodic performance reviews that examine the costs incurred; the benefits attained; the current schedule; the accuracy of project reporting; and the risks that have been mitigated, eliminated, or accepted to date. For this reason, this critical process does not simply focus on, for example, the size and attributes of the benefits for a given investment because benefit expectations were defined during the process for selecting investments. Instead, this process focuses on how the investment board monitors and controls the investment portfolio to ensure that the overall portfolio provides the maximum benefits at a desired cost and at an acceptable level of risk. One way the investment board performs this executive-level involvement is by reviewing the adequacy of the risk management reviews conducted by the investment board's working group.

Organizations have different approaches for managing and controlling the performance expectations of projects. In some organizations the review board designates a working group to review and make decisions on projects based on their performance at specified project checkpoints or gates. At these checkpoints, funding and go/no-go decisions are made and projects are prioritized based on their investment categories. The checkpoints provide for an in-depth review of each project by the working group. This approach focuses on designated senior officials reviewing the

projects throughout the year. The review board periodically evaluates the portfolio—once or twice a year—to ensure that the working group's decisions are sound. These reviews should be conducted from an enterprisewide portfolio perspective, not at the individual project level.

Figure 16: Evaluating the Portfolio



Source: GAO.

Purpose

To review the performance of the organization's investment portfolios at agreed upon intervals and to adjust the allocation of resources among investments as necessary.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for reviewing, evaluating, and improving the performance of its portfolio(s).

The documented policies and procedures typically specify that the IT investment board is responsible for reviewing, evaluating, and ultimately improving the performance of the investment portfolio. The policies and procedures could designate a working group, composed of the project manager, the executive sponsor, and members of the affected business unit, to first review performance and then report the results to the investment board. Actual investment data should be used as the basis for the review. Other potential policies and procedures might include having the project manager maintain information on the current status of the investment and its performance outcomes to date and the scope and frequency of portfolio performance reviews.

The investment board or designated working group should use a predetermined performance threshold when analyzing actual versus expected performance. This threshold is typically defined on the basis of the measures (e.g., more than XX percent over expected cost). However, it can include some other significant organization-specific factors (e.g., the scope of an investment has grown to reach mission-critical importance). This predetermined threshold will be a major factor in defining the remedial action for underperforming investments. Changes to the investment's expectations and commitments are made with the involvement and agreement of the stakeholders and in concurrence with the investment board.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools have been provided for reviewing the investment portfolio and its projects.

These resources typically include

- staff members for managing information associated with tracking investment performance and
- tools to support the staff members' activities.

Prerequisite 2: Board members are familiar with the process for evaluating and improving the portfolio's performance.

Board members should be familiar with how to evaluate and improve portfolio performance. This knowledge is essential to successfully executing this process. If board members do not possess prior experience in evaluating performance, then training may be necessary to ensure that they are familiar with the evaluation process and can carry out their responsibilities competently.

Training may be provided, ranging from

- in-depth courses for new board members to
- a mandatory annual overview for all board members of the investment process, current process modifications, and operational procedures for investment selection, control, and evaluation.

Prerequisite 3: Results of relevant Providing Investment Oversight reviews from Stage 2 are provided to the investment board.

Throughout the control phase of investment management, it is important that decision makers have all relevant data on current projects available to review. This is a tenet of good portfolio management. The data could include any results stemming from periodic project oversight. The investment board oversees project performance through routine reviews at predetermined checkpoints and/or major milestones. The board or a designated third party performs the review. The investment board review compares actual results with predetermined performance expectations for items such as project cost and adherence to schedule.

Prerequisite 4: Criteria for assessing portfolio performance are developed, reviewed, and modified at regular intervals to reflect current performance expectations.

During the control phase, projects are periodically reviewed to assess their performance. Criteria for assessing portfolio performance must also be reviewed at regular intervals to reflect current performance expectations. Criteria that were developed to assess the original investment portfolio might no longer reflect the organization's strategic objectives. The IT working group on portfolio selection criteria should assess the relevance of the selection criteria at least once a year; among other things, the performance of the portfolio selected should be assessed against the current criteria.

Activities

Activity 1: IT portfolio performance measurement data are defined and collected consistent with portfolio performance criteria.

The IT investment board is responsible for monitoring each investment's performance. The IT investment board or its designated third party examines actual investment performance to date with each investment's expectations using the collected investment data. The board is notified of and reviews any differences between actual outcomes and expectations. Guidelines for executing this activity include

- using exception reporting techniques to better manage the volume of data produced by this activity,
- designing performance management systems to collect information used in this process,
- conducting this review during a formal project review activity,
- documenting annual and life cycle expectations as a basis for the comparison, and
- using historical organizational performance data and industry baseline data as a basis for comparison.

(See Stage 3: Creating the Portfolio for a description of portfolio-level CBSR expectation setting.)

Activity 2: Adjustments to the IT investment portfolio are executed in response to actual portfolio performance.

It is quite common for adjustments to be made to the investment portfolio based on actual performance results. The portfolio should be reevaluated on a continuing basis and adjustments made if necessary. The investment board identifies IT investments in its portfolio that are underperforming by comparing each investment's actual performance to stated expectations. If an investment in the portfolio has been identified as underperforming, the investment board must take action to address its poor performance. If the board is unable to improve the performance of the individual investment, it must consider other options, including terminating the project early because the goal of the investment board is to maintain the optimal performance of the portfolio.

The "balanced scorecard" approach is a tool that the IT investment board can use to measure the performance of its IT investments. This approach creates a measurement balance across the overall performance management framework. A balanced approach to measuring the contribution of IT to mission outcomes and performance improvement recognizes the broad impact of IT's supporting role. By measuring IT performance across the four major goal areas (strategic, customer satisfaction, internal business performance, and IT innovation and learning), the scorecard forces managers to consider measurement within the context of the whole organization. This limits the possibility of overemphasizing one area of measurement at the expense of others. In addition, measuring IT performance from different perspectives helps strengthen the analysis of both the tangible and the intangible benefits that are attributable to technology. (For more information, see GAO's *Executive Guide: Measuring Performance and Delivering Results of Information Technology Investments*, GAO/AIMD-97-163, September 1997.)

Another tool to consider when measuring performance is the Earned Value Project Management[27] method. This tool measures the actual work being performed against a detailed plan in order to accurately predict the final costs and schedule results for a given project. The tool requires that a plan for project performance measurement be created. The earned value, or work performed, is then measured against the actual costs of accomplishing the work, providing a measure of the project's true cost performance. The method provides project managers with a type of "early warning" system, allowing them to take corrective action should project spending outpace the physical work being accomplished. (*Earned Value Project Management*, Quentin W. Fleming, Project Management Institute, 2000.)

As a communication tool, organizations may choose to use a spreadsheet or graphic illustration such as a management "stoplight," with green, yellow, and red identifiers, to summarize performance metrics for each investment. The stoplight should be backed up by rigorous controls and measures to ensure the reliability and validity of the project metrics. A graphic illustration provides a simple way for board members to quickly

[27]For additional guidance on earned value management, see the Defense Department's Earned Value Management Web site at http://www.acq.osd.mil/pm and *Capital Programming Guide Supplement to Part 7 of Circular No. A-11* (Office of Management and Budget Circular No. A-11, July 2003).

understand the status of each investment and any potential emerging problem areas.

Some investments that the board reviews may exceed performance expectations (e.g., at lower cost, in less time, and with better benefits than expected). In these cases, the board may wish to accelerate an investment's funding or schedule, reallocate resources within the overall portfolio, or make some other type of adjustment.

Conducting Postimplementation Reviews

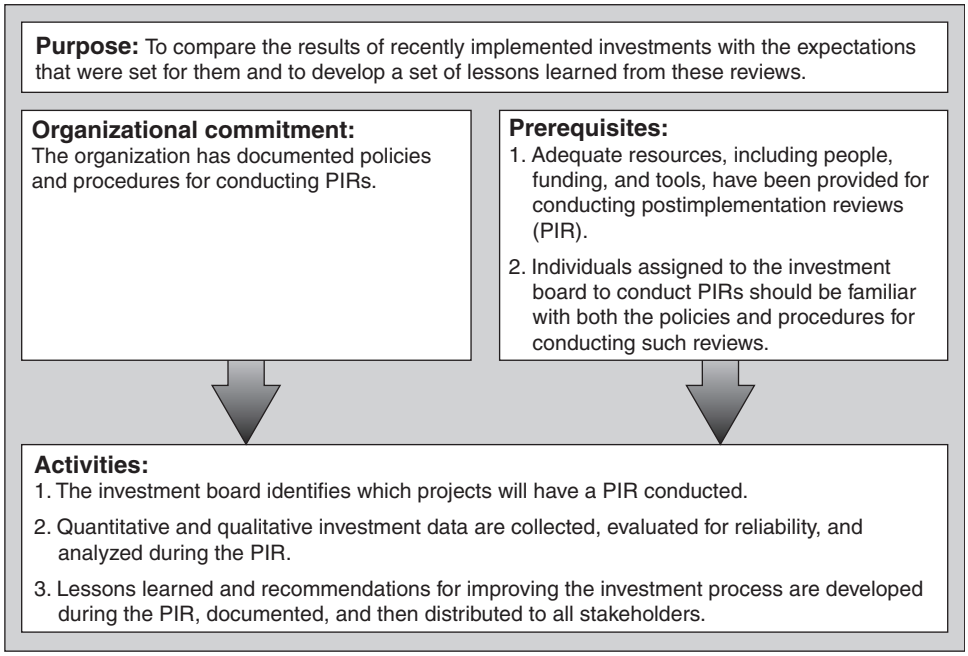
The purpose of a postimplementation review (PIR) is to evaluate an investment after it has completed development (i.e., after its transition from the implementation phase to the O&M phase) in order to validate actual investment results. This review is conducted to (1) examine differences between estimated and actual investment costs and benefits and possible ramifications for unplanned funding needs in the future and (2) extract "lessons learned" about the investment selection and control processes that can be used as the basis for management improvements. Similarly, PIRs should be conducted for investment projects that were terminated before completion, to readily identify potential management and process improvements.

When conducting a PIR, an organization should measure a project's success not only against the CBSR presented in the business case, but also against the organizational objectives that are associated with the project. In certain instances, this is difficult because project objectives are not always defined clearly and expressed in quantifiable terms that are agreed to by all stakeholders. Even when the objectives are precise and are agreed to by all stakeholders, there still might not be a unified view of the value generated by undertaking the project. Uncontrollable variables can also affect the outcome of a project, affecting the criteria by which success is judged. Therefore, sound project and investment management are essential when assessing the results of a project. In order to judge the project's results fairly, the PIR team may have to consider what the objectives were at the time the project was initiated.

The timing of a PIR can be problematic—a PIR conducted too soon after an investment has been implemented may fail to capture the full benefits of the new system. In contrast, if a PIR is conducted too late, institutional knowledge about the investment can be lost. As a general guideline, PIRs should be conducted within a range of 6 to 18 months after the investment begins its operational phase. However, this guideline should be adjusted

depending upon the nature of the project and the organization's expectations for when the benefits that are documented in the project plans should be realized.

Figure 17: Conducting Postimplementation Reviews



Source: GAO.

Purpose

To compare the results of recently implemented investments with the expectations that were set for them and to develop a set of lessons learned from these reviews.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for conducting PIRs.

The postmplementation review is used to evaluate the overall effectiveness of the organization's capital planning and acquisition process. The PIR is used to evaluate an investment following its implementation in order to validate actual investment results. An organization will have difficulty performing an effective PIR unless it has established policies and

procedures to assess the benefits and performance of its investments. Some of the more common policies and procedures governing an effective PIR include

- who conducts and participates in a PIR;
- types and sizes of investments for which a PIR is conducted;
- when it is appropriate to conduct a PIR;
- what information is presented in a PIR;
- the criteria and procedures for tailoring the standard PIR process;
- how conclusions, lessons learned, and recommended management action steps are to be disseminated to executives and others;
- where PIR information and documents are stored (electronically or otherwise) for later use; and
- when a PIR-like study should be conducted for other IT-related initiatives (such as a strategic shift in technology).

A PIR should generally cover

- investment expectations;
- actual investment results (e.g., end-user satisfaction, technical capability, mission and program impact, unanticipated benefits);
- cost and schedule deviations, such as additional "hidden" costs related to investments that have been made to enable the primary investment;
- environmental changes that affected the investment;
- a review of the assumptions that were made during the decision-making period;
- expected next steps for the investment;
- general conclusions and lessons learned; and

- recommendations to executives.

Prerequisites

Prerequisite 1: Adequate resources, including people, funding, and tools, have been provided for conducting PIRs.

These resources typically involve

- assigning a team to prepare and conduct each PIR,
- assigning one team member responsibility for leading the PIR, and
- tools to support each PIR, such as
  - investment documentation in an asset library,
  - spreadsheet programs and templates,
  - investment planning and scheduling programs, and
  - risk and benefit assessment methods and tools.

In most cases, the project team should actively assist the PIR team in conducting the PIR.

Prerequisite 2: Individuals assigned to the investment board to conduct PIRs should be familiar with both the policies and the procedures for conducting such reviews.

A PIR's success will largely depend on the credibility and competence of the individuals conducting the review. They should be familiar with established policies and procedures and be objective, well trained, and experienced in conducting PIRs. Training might include a class on assessing projects based on some developed criteria. Also, the team leader should have past experience conducting similar investment reviews.

Activities

Activity 1: The investment board identifies which projects will have a PIR conducted.

While it may not be necessary to conduct PIRs on all investments, an organization should review a mix of successful and less successful projects. By capturing this information and sharing it among those involved

in the investment process, the organization can enhance the success of the portfolio as a whole.

In accordance with organizational policy, an IT investment board will identify and designate the projects for which a PIR will be conducted. Projects need to be selected based on some type of selection criteria. Then one or more examining teams will conduct the PIR(s) on the selected projects. The standard PIR process may be tailored to the specific investment being reviewed.

Often a centralized group (e.g., quality assurance, audit committee, etc.) will conduct PIRs under the direction of the enterprisewide IT investment board. Owners or users of the investment under review can participate in its PIR. This approach enhances the consistency of the data collected and ensures coverage of the appropriate projects. However, there are other acceptable approaches that may be used. The organization should employ the approach that best meets its needs as constrained by its resources.

Activity 2: Quantitative and qualitative investment data are collected, evaluated for reliability, and analyzed during the PIRs.

As part of the objective analysis of the investment, quantitative PIR data are collected. These data should largely arise from the selection and control process activities that have been conducted previously. Specific types of quantitative data can include

- performance expectations and actual outcomes;
- updated performance data and explanations for changes;
- measures of business or mission objectives, such as operating costs, schedule, and product cycle time;
- measurements of improved technical capability; and
- contribution of the investments toward achieving both the strategy and the objectives of the organization's IT strategic plan.

In addition to quantitative investment data, qualitative information, such as the perspectives and insights of project participants and end users, may serve to validate or raise questions about the quantitative information and

the existing investment management processes used by the organization. Qualitative data can include

- surveys and interviews of end users, customers, project management, project staff, contractors, and developers;
- project management and staff interviews; and
- interviews with senior decision makers involved in investment oversight.

Some common techniques for performing analyses during a PIR can include

- conducting trend analysis using historical investment data,
- conducting a review of how benefits are realized,
- conducting means-end analysis to compare results with known causal factors, and
- performing force field analysis to understand the effects on the investment of major decisions that were made.

Activity 3: Lessons learned and recommendations for improving the investment process are developed during the PIR, documented, and then distributed to all stakeholders.

The investment board, with the assistance of the project team, conducts a review of the investment selection and control process in order to extract "lessons learned." Based on these lessons learned, recommendations can then be developed to (1) improve the investment process (i.e., select, control, and evaluate) and (2) improve the management of individual investments. Additional recommendations could include improving the development of the business case, refining the project/portfolio selection criteria, or determining whether or not the objectives of the project are being met.

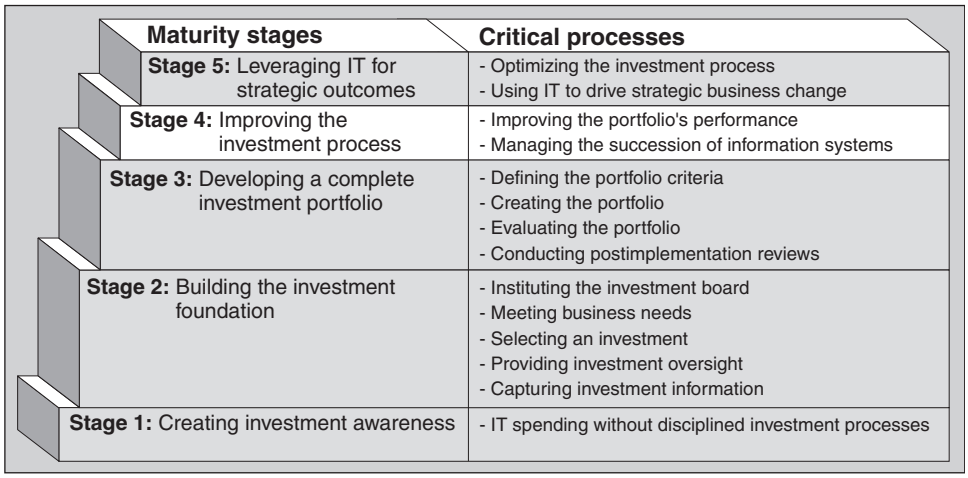
Once the PIR has been documented, it should be made available to all stakeholders and then archived for future reference. A positive outcome of identifying lessons learned and developing recommendations is having the

information available for future reference. Sharing experiences, both good and bad, promotes improvements to the overall investment process.

Using the collective results of PIRs from IT projects during different stages of their life cycles, organizations can learn valuable lessons and gain insights. The results from one project will often not provide enough information to allow significant modifications to be made to the investment decision-making process. PIRs help organizations focus their evaluation efforts on areas they deem important and avoid pitfalls and problems that others have experienced. Furthermore, PIRs help organizations address specific issues that may be impeding progress toward the effective management of an IT investment or the development of an assessment framework to fine-tune the IT investment process.

Stage 4: Improving the Investment Process

Figure 18: The ITIM Stages of Maturity With Stage 4 Critical Processes



Source: GAO.

The primary focus of Stage 4 is on improving the overall performance of an organization's IT portfolio. In addition, the critical processes associated with this stage help the organization to manage the succession of low-value operating IT systems to higher-value, follow-on investments. Thus, this stage comprises the following two critical processes:

- **Improving the Portfolio's Performance** is the process for evaluating the performance of the portfolio and using this information gained from the portfolio to improve both current IT investment processes and the future performance of the investment portfolio.

  Criteria: IT Assessment Guide (AIMD-10.1.13), 73, 78, 80 (CCA, GPRA, OMB A-130, OMB A-127, OMB A-123).

- **Managing the Succession of Information Systems** is the process for analyzing and managing the replacement of identified IT investments and assets with their higher-value successors.

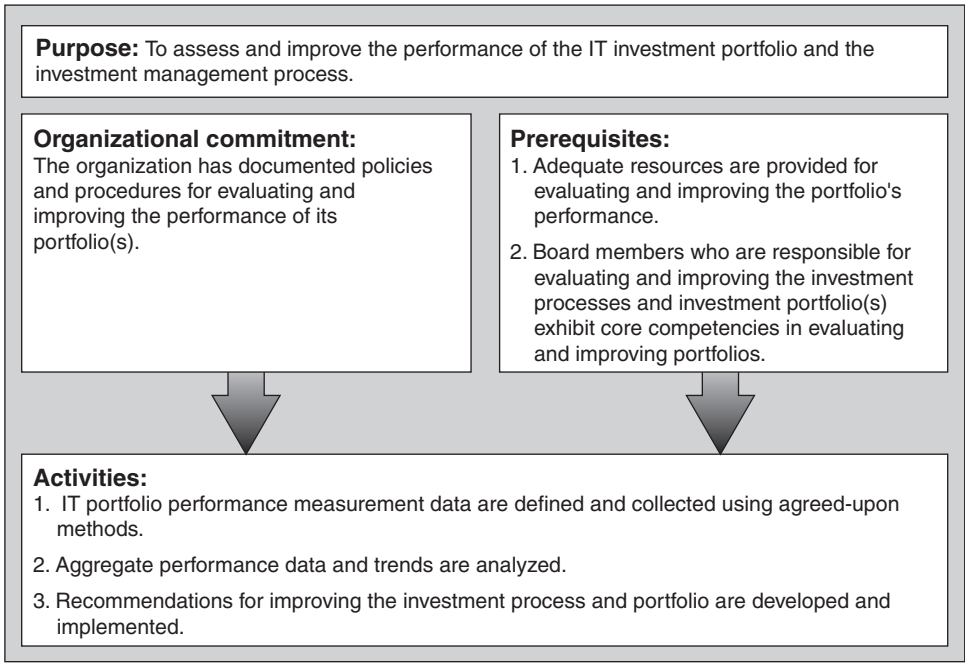
Criteria: SIM Executive Guide (AIMD-94-115); *Year 2000 Computing Crisis: An Assessment Guide* (AIMD-10.1.14), 10; *Capital Programming Guide*, 54-55.

Improving the Portfolio's Performance

Ultimately, an organization needs to know how well its collected pool of investments in information management and technology is contributing to improvements in mission performance. Improving the Portfolio's Performance is, at the level of the investment portfolio, the equivalent of Stage 3's PIR for an investment. This critical process seeks to determine how well a portfolio of IT investments is (1) helping to achieve the strategic needs of the enterprise, (2) satisfying the needs of individual units and users with IT products and services, and (3) improving IT business performance for users and for the enterprise as a whole. To determine these things, performance information for an organization's entire portfolio of investments should be compiled and analyzed and trends examined.

Key input for these reviews includes PIRs, the IT investment board's experiences, and results to date for major investments, extracted from control process activities. These data are generally project or investment-specific and often are not aggregated for general trend analysis.

Figure 19: Improving the Portfolio's Performance



Source: GAO.

Purpose

To assess and improve the performance of the IT investment portfolio and the investment management process.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for evaluating and improving the performance of its portfolio(s).

These policies and procedures typically specify

- that each IT investment board be responsible for managing a comprehensive portfolio evaluation and improvement process,
- that access to portfolio data be provided and confidential/sensitive data be appropriately controlled,
- that each portfolio be evaluated at least annually to assess its performance,

- a mechanism for assembling and aggregating the investment performance data,
- the key measures and methods used to assess portfolio performance (e.g., a "balanced scorecard" approach),
- methods for analyzing the performance data,
- methods for comparing portfolio performance and portfolio expectations, and
- a mechanism for reporting the results of the analysis.

Prerequisites

Prerequisite 1: Adequate resources are provided for evaluating and improving the portfolio's performance.

These resources can include

- support staff for executing the activities in this critical process,
- methods and tools to aid the teams conducting the PIRs, and
- current and historical portfolio data.

Prerequisite 2: Board members who are responsible for evaluating and improving the investment processes and investment portfolio(s) exhibit core competencies in evaluating and improving portfolios.

These board members should be familiar with the IT investment management approach. Training for this critical process may also include familiarizing executives with techniques for economic and process management analysis. Training in quality management analysis and tools may also be helpful.

Knowledge building and/or training may be provided, ranging from

- in-depth courses for new members to
- an annual overview, for all board members, of the investment process, current process modifications, and operational procedures for investment selection, control, and evaluation.

Activities

Activity 1: Comprehensive performance measurement data for IT portfolios are defined and collected using agreed-upon methods.

The portfolio of investments should be evaluated on its ability to meet the strategic needs of the organization, provide general user satisfaction with product and service delivery and management, and deliver effective and efficient IT business functions (e.g., applications development, infrastructure availability, project performance). A combination of quantitative data and supporting qualitative information can be used to construct a picture of the organization's IT portfolio performance. This can be analogous to developing a balanced scorecard for IT investments. (For more information, see GAO's *Executive Guide: Measuring Performance and Delivering Results of Information Technology Investments*, GAO/AIMD-97-163, September 1997.)

Data collection and information synthesis should focus on answering key portfolio performance questions, such as the following:

- Is IT spending in line with expectations?
- Are we consistently producing cost-effective results?
- How well is the portfolio being managed?
- Are users satisfied with the products and services that are being delivered?
- Are IT projects delivering their expected share of process improvements?
- How well are integrated project teams being used on major investment projects?
- Are quality IT products and services being delivered within general industry standards?
- Are accepted methods and tools being used on major systems investment projects?
- Is the IT infrastructure providing reliable and needed support for the organization?

Measures should be constructed to help objectively determine performance outcomes in these areas. In addition, the results of individual PIRs, as well as internal and external audits or reviews, should be examined. Other types of analyses, such as total cost of ownership, can also provide useful performance data on specific IT portfolio categories, such as infrastructure O&M.

Activity 2: Aggregate performance data and trends are analyzed.

Trend analysis and reports can help provide evidence that the investments in the IT portfolio have helped to achieve expected improvements in the effectiveness and efficiency of operations or service delivery. To make this a meaningful exercise, it is critical to develop baseline performance data.

Activity 3: Recommendations for improving the investment process and portfolio are developed and implemented.

Based on its analysis of the data, the organization develops recommendations for improving the investment process and the portfolio. After the board approves the recommendations, a plan should be put in place for implementing them. There are always problems in implementing change, but there are opportunities as well. Addressing problems or opportunities usually involves

- developing recommendations for the IT investment board;
- documenting the decision criteria, justification, and rationale for investment decisions;
- defining the expected benefits of the action recommended;
- making a decision on implementing each recommendation; and
- tracking the recommended action as it is implemented.

Managing the Succession of Information Systems

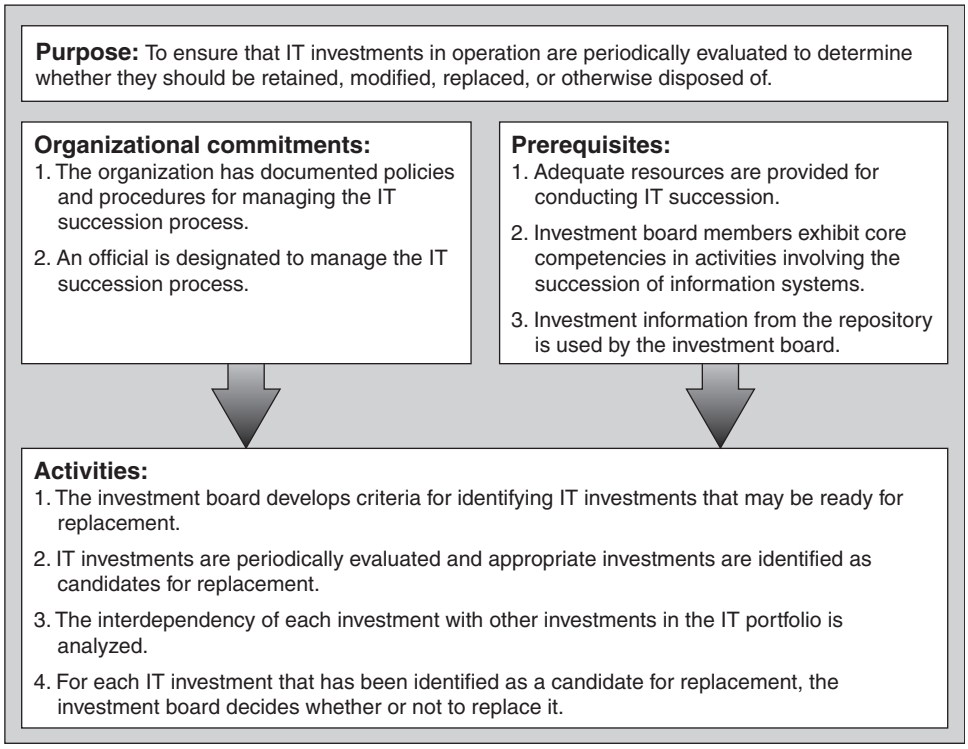
This critical process develops the capability for (1) planning and managing the migration of IT investments to their successors (i.e., replacement systems, software applications, and hardware) and (2) retiring low-value or high-cost IT investments. This critical process also enhances the organization's ability to forecast, plan, and manage the migration to new system investments. The target EA and sequencing plan can be useful

guides in evaluating which investments should be phased out and which ones should be retained by the organization. Using these guides allows an organization to make investment decisions that align with its EA. Such a strategy ultimately helps the organization plan for the future by aligning its investment decisions with its mission goals and objectives.

This critical process is significant because some IT investments can outlive their usefulness and yet acquire organizational inertia or entrenchment, consuming resources that begin to outweigh their benefits and obscuring the full cost of operations and maintenance. This inertia or entrenchment can often occur because these assets (1) have created important constituencies within the organization, (2) have a number of popular user features, even though the total system cost exceeds the total system benefits, or (3) have not had an alternative IT analysis performed. Organizations at this maturity stage develop investment "exit criteria" such that investments can be "deselected" appropriately. This critical process supports a migration to a forward-looking, solution-oriented view of IT investments.

This process differs from the reselection activity in Stages 2 and 3 in that it occurs solely in the O&M phase, whereas reselection can be considered during the implementation phase of the system development life cycle.

Figure 20: Managing the Succession of Information Systems



Source: GAO.

Purpose

To ensure that IT investments in operation are periodically evaluated to determine whether they should be retained, modified, replaced, or otherwise disposed of.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for managing the IT succession process.

The organization has documented policies and procedures that define how IT investments are identified, evaluated, and selected for succession. These policies and procedures typically specify

- that each investment board make IT replacement decisions within its business unit,

- that the enterprisewide investment board have final authority for making replacement decisions,
- the coordination of replacement decisions across multiple investment boards,
- the procedures for managing the migration of IT systems to their successors, and
- the procedures for disposing of retired IT systems.

Commitment 2: An official is designated to manage the IT succession process.

An official is designated to manage this process. While the IT investment board decides which investments to continue, change, replace, or retire, this official is responsible for managing the succession process and ensuring that the board's plans are executed.

Prerequisites

Prerequisite 1: Adequate resources are provided for conducting IT succession.

These resources typically involve

- the attention of executives involved in this process;
- staff, such as programmers and O&M, to support this process; and
- supporting tools and equipment for the staff to use.

Prerequisite 2: Investment board members exhibit core competencies in activities involving the succession of information systems.

To make competent replacement decisions, board members must have sufficient training to carry out their role. Because this critical process is similar in its core concepts to the project selection process, the IT succession training can be tied to selection-related training.

Knowledge building and/or training may be provided, ranging from

- in-depth courses for new members to

- an annual overview for all board members of the investment process, current process modifications, and operational procedures for investment selection, control, and evaluation.

Prerequisite 3: Investment information from the repository is used by the investment board.

A repository of investment information helps to ensure that each board is aware of all of the investments and resources for which it is responsible and of which system owner/manager(s) will be affected by system replacement decisions.

(See also Stage 2: Capturing Investment Information for a description of the activities associated with developing a collection of IT investment information.)

Activities

Activity 1: The investment board develops criteria for identifying IT investments that may be ready for replacement.

Each investment board develops the criteria that determine which types of investments are candidates for replacement. In an organization with multiple boards, the enterprisewide board should formulate the criteria first. The criteria should then cascade down to the lower boards. A lower level board may have separate criteria for investments strictly within its domain.

These candidates for replacement might include investments

- at, near, or exceeding their planned life cycles;
- in their O&M phases;
- that have encountered significant data conversion problems;
- that are based significantly on assumptions that are no longer valid (e.g., investments that were based on a type of technology that is now obsolete); and
- for which a replacement application or hardware technology is imminent or planned.

(See also Stage 2: Instituting the Investment Board for a description of the manner in which multiple investment boards interact.)

Activity 2: IT investments are periodically evaluated and appropriate investments are identified as candidates for replacement.

The defined criteria are applied to the IT portfolio to identify the replacement candidates. The analysis will generally be done case by case, looking at the continuing business case and mission benefits surrounding each candidate and the emerging technologies that are possible successors. The analysis should be based on the performance factors for each candidate under consideration (e.g., the ongoing costs of O&M, the risk of hardware loss due to unavailability of spare parts). This analysis may require managerial judgment to determine the merits of each particular case or the prospects for a particular candidate. Also, it is imperative that the investment's sponsor, manager, and/or owner be involved with this activity.

Beyond the normal process of retiring older systems, this activity may be triggered by a variety of other events. For example, after undergoing a significant strategic realignment or shift in its underlying IT architecture, the organization will probably want to engage in this activity to ensure that its IT resources are being utilized efficiently.

(See also Stage 2: Capturing Investment Information for a description of the activities associated with creating an inventory.)

Activity 3: The interdependency of each investment with other investments in the IT portfolio is analyzed.

Some of the investments that are identified as candidates for replacement may be interdependent with other investments and projects. The purpose of this activity is to identify potential interdependencies among investments and to assess the effects that replacing any of these investments would have on the others. Contingency plans should be prepared to mitigate any negative impact that replacing an investment might have on remaining investments. The board may find it necessary to revise the replacement plans for some investments based on an analysis of the effects replacement could have on other investments.

Activity 4: For each IT investment that has been identified as a candidate for replacement, the investment board decides whether or not to replace it.

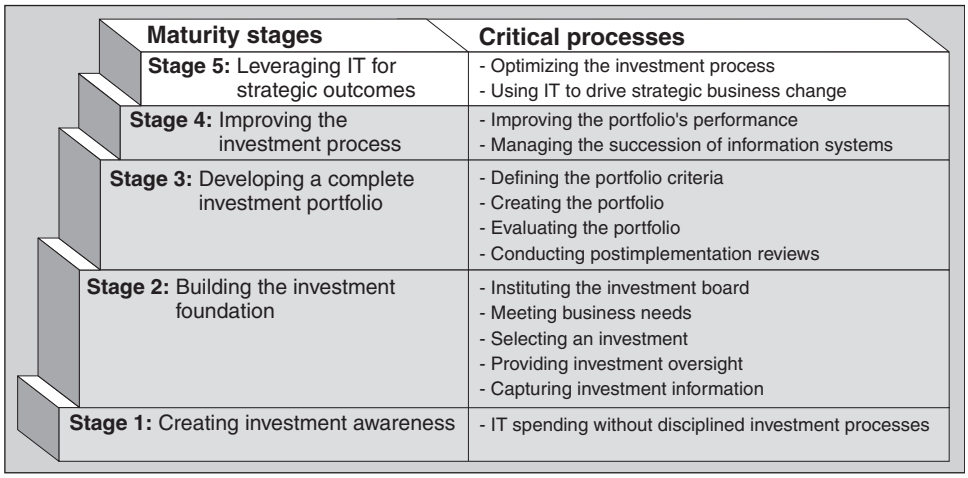
Decisions on whether to replace an investment will usually fall into the following categories:

- *Retain/continue*. Take no replacement actions and continue to operate and maintain the current investment.
- *Fix*. Propose repairs to the investment so that it once again meets a predefined level of performance or business need.
- *Enhance/improve*. Propose modifications to the investment so that it provides greater functionality, lasts longer, or costs less.
- *Replace*. Propose replacing the investment with a new or different investment.
- *Combine or disaggregate*. Propose combining the functionality or technical attributes of one or more investments or break an investment apart and manage each piece individually.
- *Retire/dispose*. Terminate the investment and dispose of it.

Succession plans are implemented as needed to ensure timely and effective replacement of investments within the context of the IT investment management process.

Stage 5: Leveraging Information Technology for Strategic Outcomes

Figure 21: The ITIM Stages of Maturity with Stage 5 Critical Processes



Source: GAO.

At Stage 5, an organization leverages its IT investment capabilities both to anticipate the effects of next-generation information technologies and to significantly drive strategic business transformation. As organizations harness the capability to run effective management processes for constantly selecting, controlling, and evaluating IT investment, they can more effectively examine how best to institute major business transformations to better achieve their missions. These transformations no doubt will include fundamental changes made possible through the application of new information technologies to support major innovation in customer interaction, service delivery mechanisms, and more effective knowledge management. One essential success factor is to institute effective processes capable of analytically sorting through technology choices of increasing complexity.

Organizations at Stage 5 are focused on continuous improvement and strategic decision making aimed at anticipating and utilizing technology options to drive desired business transformation outcomes. Two critical processes are central to this stage.

- **Optimizing the Investment Process** is the process used to exploit IT decision making to improve the value of an IT investment management process. Best practices of other organizations are captured to improve the IT investment process—leading to world-class outcomes. The focus of these activities is cross functional, broad, and strategic in nature.

  Criteria: CCA, Section 5123 (5); Benchmarking course material from CCI, Inc.; *Best Practices in Information Technology: How Companies Get the Most Value From Exploring Their Digital Investment*, James Cortada*; The Information Paradox: Realizing the Business Benefits of Information Technology*, John Thorpe*; Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness*, H. James Harrington*; Better Change: Best Practices for Transforming Your Organization*, PricewaterhouseCoopers.

- **IT-Driven Strategic Business Change** is the process for using information technology to strategically renovate and transform work processes and push the organization to explore new and better ways to execute its mission. The CIO should be directly involved in this process to ensure that IT strategy is tightly linked to the business strategy and that senior management is "on board" with the IT strategy so that funding does not become an issue.

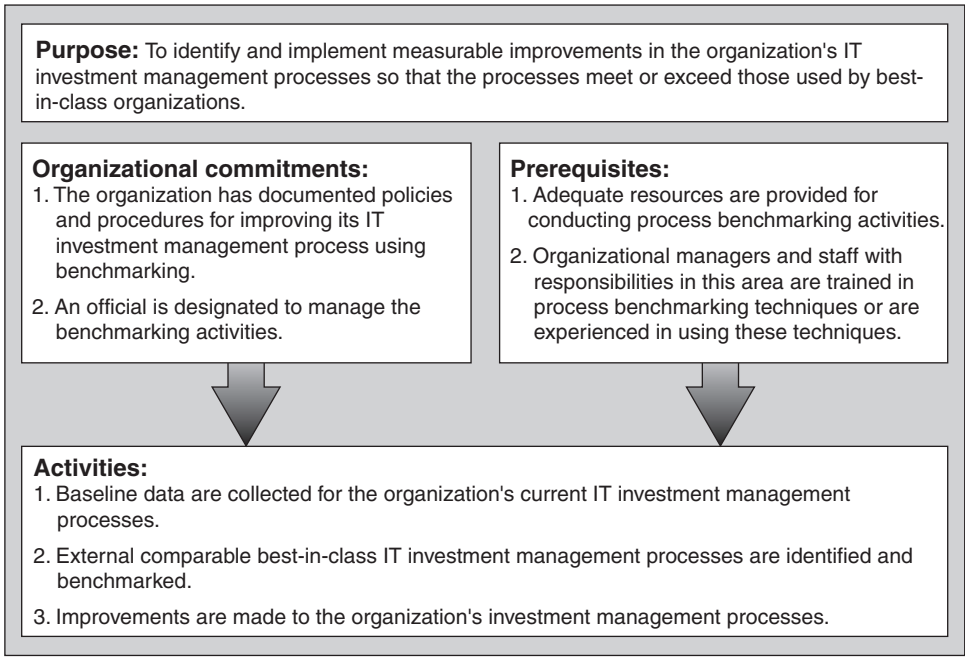
  Criteria: CCA, Section 5123 (5); *Breakthrough Process Redesign: New* Pathways *to Building Customer Value*, Charlene Adair and Bruce Murray; *Transforming the Public Sector*, David Osborne and Ted Gaebler; *The Innovator's Dilemma*, Clayton M. Christensen; *Quality is Free: The Art of Making Quality Certain*, Philip B. Crosby.

Optimizing the Investment Process

The purpose of this critical process is to measurably improve IT investment processes by learning from and adopting the tools, techniques, or methods used by best-in-class external organizations. Improvements can include using innovative investment oversight tools and techniques, changing the mechanics of investment management, or improving the "lessons learned" feedback mechanism. This process is part of an effort to continually improve the value of the organization's IT investments. Aspects of this process, such as measurement of the IT investment management process, can be implemented in earlier stages; at Stage 5, process measurement becomes an absolute necessity.

Process-based benchmarking—the first step in this critical process—is a structured technique for measuring an organization's IT investment management processes. It is different from traditional measurement-based benchmarking where an organization compares its performance, cost, and cycle time to those of competitors, to industry averages, or to a consultant's proprietary data. Once they are benchmarked, an organization's IT investment management processes can be modified and improved using the tools, techniques, or methods learned from "best-in-class" organizations. The performance gains resulting from implementing these process modifications can be measured and should result in IT investment management processes that meet or exceed those of the "best-in-class" organizations.

Figure 22: Optimizing the Investment Process



Source: GAO.

Purpose

To identify and implement measurable improvements in the organization's IT investment management processes so that the processes meet or exceed those used by best-in-class organizations.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for improving its IT investment management process using benchmarking.

These policies and procedures typically specify the following:

- As part of the benchmarking activity, performance measurements for the IT investment management process are collected and analyzed to form a process baseline. This baseline should include
  - the current, documented IT investment management process,
  - performance measurement definitions, and
  - the expected performance measurement range.
- Historical data are used to analyze current performance.
- Leading practices are identified in external organizations to be used as benchmarks for process improvements.
- Significant changes to business processes are approved by senior management.
- The baselines and benchmarks are revisited and updated periodically.

Commitment 2: An official is designated to manage the benchmarking activities.

The organization designates an official to manage this process. This official is responsible for managing the benchmarking activities, ensuring that team members are well trained, and serving as the focal point for this critical process. Whether this official has benchmarking as his or her sole duty may depend on the specific circumstances of the organization. A smaller organization, with relatively simple investment processes, may not require extensive external benchmarking, and so the effort to carry out this critical process may be limited. In a larger organization, with complex and multifaceted investment activities, benchmarking activities may be extensive and require more focused attention by the responsible official.

Prerequisites

Prerequisite 1: Adequate resources are provided for conducting process benchmarking activities.

These resources can include

- external organizations or individuals who are responsible for measuring investment process performance and
- tools to support investment process measurement.

Prerequisite 2: Organizational managers and staff with responsibilities in this area are trained in process benchmarking techniques or are experienced in using these techniques.

For the benchmarking results to be valuable and useful, benchmarking team members must know how to conduct benchmarking studies. To ensure that they are competent, team members must either have recent benchmarking expertise or receive training.

Activities

Activity 1: Baseline data are collected for the organization's current IT investment management processes.

The board tasks a group with measuring the current state of the investment management process in order to provide a baseline for evaluating expected and actual process changes. Creating this baseline usually involves identifying and gathering process data on the components of the investment management process. These data typically include

- the level of resources an organization expends in conducting IT investment activities;
- quantitative process results, such as returns on investment and tangible benefits achieved;
- qualitative process results, such as measures of customer satisfaction and contributions to mission achievement; and
- the predefined range of values expected from the performance measurement.

Activity 2: External comparable best-in-class IT investment management processes are identified and benchmarked.

The purpose of this activity is to find and learn from organizations with more efficient and effective investment management processes. Tasks for doing this include

- identifying best-in-class organizations;
- collecting data from internal, private, and public sources about best-in-class organizations;
- visiting several best-in-class organizations;
- developing working relationships with one or more of these organizations; and
- benchmarking components of the best-in-class organizations' investment management processes.

Activity 3: Improvements are made to the organization's investment management processes.

Once an organization has learned from the best-in-class external organizations, it must apply this knowledge to its own processes. Thus, the organization should

- decide on improvement goals and expectations;
- develop appropriate target activities that will result in measurable process improvement; and
- analyze, rank, and choose process improvement activities.

The organization then creates and executes an improvement action plan. This plan will vary with the type and scope of the benchmarking studies. Executives should review and approve the action plan before implementing it so that (1) they are aware of the process changes and (2) other parties who may be interested in the research and process changes can learn from these initiatives.

Using IT to Drive Strategic Business Change

In the earlier ITIM maturity stages, the organization invested in information technologies, making certain that a good business case had been defined within the context of the IT investment management process and its

enterprisewide investment portfolio. In Stage 5, the organization evolves its investment thinking toward managing IT-driven change of the overall business process. IT can provide the opportunity to change business processes and leverage the organization's human capital.

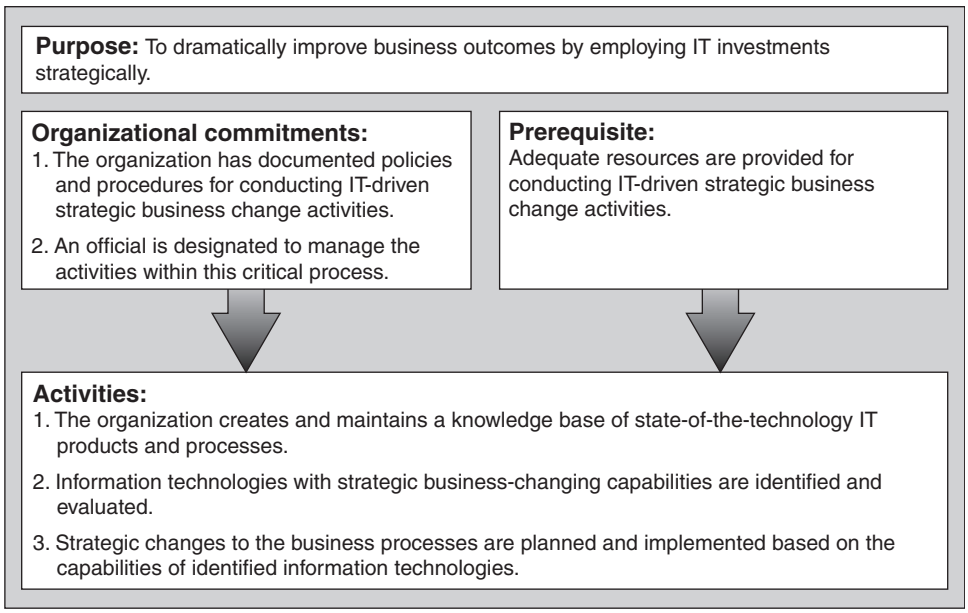
Information technologies can also provide opportunities for an organization to move dramatically in new directions in order to meet its goals.

Citizens and countries are using widely available computer encryption tools to secure their communications. These tools can be used for creating "digital signatures," which can support legally binding electronic transactions and help prevent fraud.

The Internet has created opportunities for (1) organizations to "move closer" to their customers; (2) business partners to reduce or eliminate the need for a third-party distribution network; and (3) government agencies to present one common and integrated service provider "face" for service requests and service delivery to the citizen (thus reducing the need for local offices despite the diversity of functions being executed at the agency). In addition, "smart munitions"—which can find their targets in any weather, be reprogrammed in flight, or be controlled in real time by a human far away from the target—are changing the way war is fought for some components of the military services.

Once an organization can competently manage its IT investments, it must proactively manage the potential of information technologies to profoundly influence the organization's strategic direction and outlook. The organization must develop mechanisms to actively scan its environment for new opportunities to utilize technology. This critical process describes the activities associated with employing IT investments strategically to change the organization's core processes.

Figure 23: Using IT to Drive Strategic Business Change



Source: GAO.

Purpose

To dramatically improve business outcomes by employing IT investments strategically.

Organizational Commitments

Commitment 1: The organization has documented policies and procedures for conducting IT-driven strategic business change activities.

The purpose of these policies and procedures is to define the activities and tasks to be carried out, the roles of the various parties when executing this critical process, and how these activities relate to the organization's ongoing business activities. Because business managers may be resistant to changing current business processes based on the promises of new technology, these policies should include incentives for management's participation in this critical process.

Commitment 2: An official is designated to manage the activities within this critical process.

An official is designated to initiate and manage a program to enhance awareness of state-of-the-technology and new information technologies, and to encourage the use of selected technologies to plan and manage changes to the organization's business processes.

Prerequisites

Prerequisite: Adequate resources are provided for conducting IT-driven strategic business change activities.

These resources typically include

- funding support for an IT state-of-the-technology laboratory, test center, or library;
- technical information and research;
- funding for employing external experts or reviewers;
- staff support for executing this critical process; and
- supporting tools and equipment.

Activities

Activity 1: The organization creates and maintains a knowledge base of state-of-the-technology IT products and processes.

The organization creates the capacity to follow and understand major technological events and trends. This capacity can be generated using one of several organizational structures (e.g., an advanced technology group, a cross-departmental group of experts, a group of external experts, or technology centers of excellence). A designated official is charged with managing this group, maintaining the knowledge base, and keeping the organization up to date on emerging technologies.

Activity 2: Information technologies with strategic business-changing capabilities are identified and evaluated.

Emerging trends, events, and technologies that have the potential to improve the organization's business are identified for further study (e.g., the growth of the Internet and the World Wide Web or the proliferation of wireless forms of communication). Particular attention should be paid to breakthrough technologies that have the capacity to radically improve the current working environment, business processes, products or services, or the organization's relationship with its customers (e.g., permitting staff to

telecommute or to create "virtual communities" across the Internet). Also, to ensure that this activity focuses on applicable information technologies, the organization should ensure that individuals with business knowledge and experience are involved as stakeholders in this activity.

Activity 3: Strategic changes to the business processes are planned and implemented based on the capabilities of identified information technologies.

Once it has been concluded that a set of technologies offers a significant opportunity, senior managers must make the decision to plan for and engage in the change to the business processes. If the change is significant enough, managers might wish to create a separate organizational entity that is (1) uniquely positioned to take advantage of the set of technologies and (2) independent of the current way of doing business.

As part of planning these changes to the business processes, the organization should engage in risk-reducing activities such as pilots, simulations, or the development of prototypes. These risk-reducing activities are particularly important for large, complex, expensive, or important process change initiatives. The organization may also want to seek external review or expertise when conducting these process change activities. When planning the change, the organization should involve stakeholders from business, IT support, oversight, and customer groups.

Glossary

acquisition: The acquiring by contract, with appropriated funds, of supplies or services (including construction) by and for the use of the federal government through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated. Acquisition begins at the point when agency needs are established and includes the description of requirements to satisfy agency needs, the solicitation and selection of sources, the awarding of contracts, contract financing, contract performance, contract administration, and those technical and management functions that are directly related to the process of fulfilling agency needs by contract.

action plan: A plan derived from recommendations that identifies the specific actions that will be taken to improve a process or a project and outlines a schedule for implementing those actions.

activity: An ITIM key practice that describes the actions necessary to implement a critical process. An activity occurs over time and has recognizable results. It typically involves establishing plans and procedures, performing the work, tracking it, and taking corrective actions as necessary.

alignment: The degree of agreement, conformance, and consistency among organizational purpose, vision, and values; structures, systems, and processes; and individual skills and behaviors.

assessment: An appraisal by a trained team of professionals to determine the state of an organization's current processes and to identify the high-priority process-related issues facing an organization. An assessment may also result in organizational support for process improvement.

asset: Property, funding, technical knowledge, or other valuable item owned by an organization. Investments typically create assets.

benchmarking: A structured approach for identifying the best practices from industry and government and comparing and adapting them to an organization's operations. Such an approach is aimed at identifying more efficient and effective processes for achieving intended results based on outstanding practices of other organizations.

benefit: A term used to indicate an advantage, profit, or gain attained by an individual or organization. Tangible benefits include benefits that can be explicitly quantified. Such benefits may include reductions in cost,

increases in productivity, decreases in cycle time, or improvements in quality of service. Intangible benefits include benefits that may be easy to identify but that can be difficult to quantify. These benefits may include more efficient decision making, greater data accuracy, improved data security, reduced customer burden, or increased organizational knowledge.

business case: A structured method for organizing and presenting a business improvement proposal. Organizational decision makers compare business cases when they are deciding to expend resources. A business case typically includes an analysis of business process performance and associated needs or problems, proposed alternative solutions, assumptions, constraints, and a risk-adjusted cost/benefit analysis.

business process: A collection of related structured activities—a chain of events—that produces a specific service or product for a particular customer or customers.

business process improvement: A systematic disciplined approach that critically examines, rethinks, and redesigns mission-delivery processes and subprocesses within a process management approach.

Capability Maturity Model[SM]: A descriptive model of the stages through which an organization progresses as it defines, implements evolves, and improves its organizational processes. This model serves as a guide for selecting process improvement strategies by facilitating the determination of current process capabilities and the identification of the issues that are the most critical to quality and process improvement.

change management: Those activities involved in (1) defining and instilling new values, attitudes, norms, and behaviors within an organization that support new ways of doing work and overcome resistance to change; (2) building consensus among customers and stakeholders on specific changes designed to better meet their needs; and (3) planning, testing, and implementing all aspects of the transition from one organizational structure or business process to another.

cost: A term used to indicate the expenditure of funds for a particular investment alternative over an expected time period. Cost may include direct and indirect initial costs plus any periodic or continuing costs for operation and maintenance.

cost/benefit analysis: A technique used to compare the various costs associated with an investment with the benefits that it proposes to return. Both tangible and intangible factors should be addressed and accounted for in the analysis.

critical process: A structured set of key practices that, when performed collectively, contributes to the attainment of a maturity stage.

customer: Individual or organizational entity for whom the product or service is rendered. The customer may also be the end user.

end users: The individuals or groups who will operate the system for its intended purpose when it is deployed.

enterprise architecture (EA): An integrated framework for evolving or maintaining existing IT and acquiring new IT to achieve the organization's strategic and business goals. A complete enterprise architecture should consist of both logical and technical components. The logical architecture provides the high-level description of the organization's mission, functional requirements, information requirements, system components, and information flows among the components. The technical architecture defines the specific IT standards and rules that will be used to implement the logical architecture.

executive sponsor: The executive who champions the investment, sets the terms of reference, guides the project team, and receives the progress reports and recommendations.

failure: The inability of a system or component to perform its required functions within specified performance parameters.

information system: The organized collection, processing, transmission, and dissemination of information in accordance with defined procedures, whether automated or manual.

information technology (IT): The computers, ancillary equipment, software, firmware, and related procedures, services (including support services), and other resources that are used by an organization to accomplish a function.

institutionalization: The building of corporate culture that supports methods, practices, and procedures so that they are the ongoing way of doing business.

inventory: An organized and itemized list of assets (e.g., IT products, services, or contracts).

IT investment: The expenditure of resources on selected information technology or IT-related initiatives with the expectation that the benefits from the expenditure will exceed the value of the resources expended.

IT investment board: A decision-making body, made up of senior program, financial, and information managers, that is responsible for making decisions about IT projects and systems based on comparisons and trade-offs among competing projects, with an emphasis on meeting mission goals.

IT investment portfolio: The combination of all IT assets, resources, and investments owned or planned by an organization in order to achieve its strategic goals, objectives, and mission.

IT management: The processes and procedures used by IT project managers to direct, control, administer, and regulate a project team creating an IT asset in such a way that the resultant product meets its requirements upon delivery.

IT project: An organizational initiative that employs or produces IT or IT-related assets. Each project has or will incur costs, expects or will realize benefits, has a schedule of project activities and deadlines, and has or will incur risks.

key practices: The infrastructures and activities that contribute most to the effective implementation and institutionalization of a critical process.

succession management: An approach for determining when and how to replace current investments with other investments that provide greater benefits at lower costs.

maintenance: The process of modifying a system or component after delivery to correct faults, improve performance or other attributes, or adapt to a changed environment.

maturity model: A model of the stages through which organizations progress as they define, implement, evolve, and improve their processes. This model serves as a guide for selecting process improvement strategies by facilitating the determination of current process capabilities and the identification of the issues that are most critical to achieving quality and process improvement.

maturity stage: A well-defined evolutionary plateau toward achieving mature processes.

milestone: A scheduled event for which some individual is accountable. A milestone is typically used to measure progress.

mission: The enduring, chartered, long-term goal(s) of an organization.

modification: A change made to a system or component to improve performance or some other attribute or to adapt the system or component to function in a changed environment.

need: A capability shortfall such as those documented in a mission needs statement, deficiency report, or engineering change proposal. A new technology application or breakthrough may create a new expressed need by the customer.

organizational commitment: An ITIM key practice that describes the management actions that are necessary to ensure that the critical process is established and will endure. An organizational commitment typically involves establishing organizational policies and senior management sponsorship that drive the activities for the critical process.

outcome: The actual result, effect, or impact of a business initiative, program, or support function. Typically, actual outcomes are compared to expected outcomes.

performance measurement: The process of developing measurable indicators that can be systematically tracked to assess the progress that has been made in achieving predetermined goals and using such indicators to assess progress in achieving these goals.

policy: A guiding principle, typically established by senior management, that is adopted by an organization to influence and determine decisions.

portfolio: see IT investment portfolio.

portfolio management: The combination of practices, tools, and techniques that are used to measure, control, and increase the return on individual IT investments as well as on an aggregate enterprise level.

prerequisite: An ITIM key practice that describes the conditions that must exist within an organization to successfully implement a critical process. A prerequisite typically involves resources, organizational structures, and training. Along with organizational commitment, a prerequisite must be in place before a critical process's activities can be undertaken successfully.

procedure: A documented description of a sequence of actions to be taken in order to perform a given task.

process: A sequence of steps performed for a given purpose.

process maturity: The extent to which a specific process is explicitly defined, managed, measured, controlled, and implemented effectively. Maturity implies a potential for growth in capability and indicates the sophistication of an organization's processes and the consistency with which the organization conducts these processes.

project manager: The individual with business responsibility for an entire project. This individual typically directs, controls, administers, and regulates a project that involves developing or acquiring an information system.

project plan: A document that describes the technical and management approach to be followed for a project. The plan typically describes the work to be done, the resources required, the methods to be used, the procedures to be followed, the schedules to be met, and the way that the project will be organized.

project team: A group of people, each with assigned responsibilities, who work closely together to achieve the shared objective of delivering, operating, or maintaining an information system. The project team may work together on tasks that are highly interdependent. The project team may vary in size from a single individual assigned part time to a large organization assigned full time.

purpose: The desired outcome for a critical process.

Return on Investment (ROI): A financial management approach that is used to explain how well a project delivers benefits in relation to its cost. Several methods are commonly used to calculate a return on investment, including: Economic Value Added (EVA), Internal Rate of Return (IRR), Net Present Value (NPV), Payback, and the use of nominal qualitative measures.

risk: A term used to define the class of factors which (1) have a measurable probability of occurring during an investment's life cycle, (2) have an associated cost or effect on the investment's output or outcome (typically an adverse effect that jeopardizes the success of an investment), and (3) have alternatives from which the organization may chose.

risk management: An approach for addressing the risks associated with an investment. Risk management includes identification, analysis, prioritization, and control of risks. Especially critical are those techniques that (1) help define preventive measures to reduce the probability of negative events' occurring and (2) ensure that appropriate countermeasures are deployed to deal successfully with the consequences of these events.

schedule: A term used to define the time period corresponding to the life of the investment. The investment schedule typically contains associated phases and milestones that include: planning, proposal generation, acquisition or development, implementation, operations and maintenance, and succession.

selection criteria: Factors that are identified for use by an investment review board to identify and discriminate among investments for subsequent funding.

stakeholder: An individual or group with an interest in the success of an organization in delivering intended results and maintaining the viability of its products and services. Stakeholders influence programs, products, and services.

strategic plan: A document used by an organization to align its structure and budget with its priorities, missions, and objectives.

threshold: The limiting acceptable value of a measurement or technical parameter, typically a performance requirement.

validation: The process of determining whether or not the product delivered at the end of the development process satisfies predefined requirements.

verification: The process of determining whether or not the products of a given phase of development fulfill the requirements established at the start of the phase.

Conducting an ITIM Assessment

As described in the early sections of this guidance, ITIM may be used as a framework for the continuous improvement of an organization's IT investment management processes. It may also be used to evaluate the maturity of an organization's investment capabilities. This appendix describes the assessment process that individuals and teams may use when conducting an organizational review using the Information Technology Investment Management (ITIM) framework.

In the ITIM framework, maturity stages are achieved through implementation of critical processes. These critical processes were derived from our research on leading organizations, our reviews of federal agencies, and comments that we received from external reviewers during the ITIM development process.

Using ITIM to Assess IT Investment Decision-Making Processes

This framework is designed to complement either a formal audit methodology or an organization's self-assessment process. Using this assessment process, the review team completes the following phases:

- prepares both itself and the organization for the assessment,
- collects evidence of organization activities,
- evaluates the organization based on the ITIM framework, and briefs the organization on its findings.

Using this assessment approach provides a widely accepted, repeatable, criteria-based assessment process for organizations to use when they are conducting self-assessments of their IT investment management capabilities. It also provides the organization with an understanding of any gaps in its investment management processes that are identified during the assessment. However, before engaging in an assessment, individuals and teams should do the following:

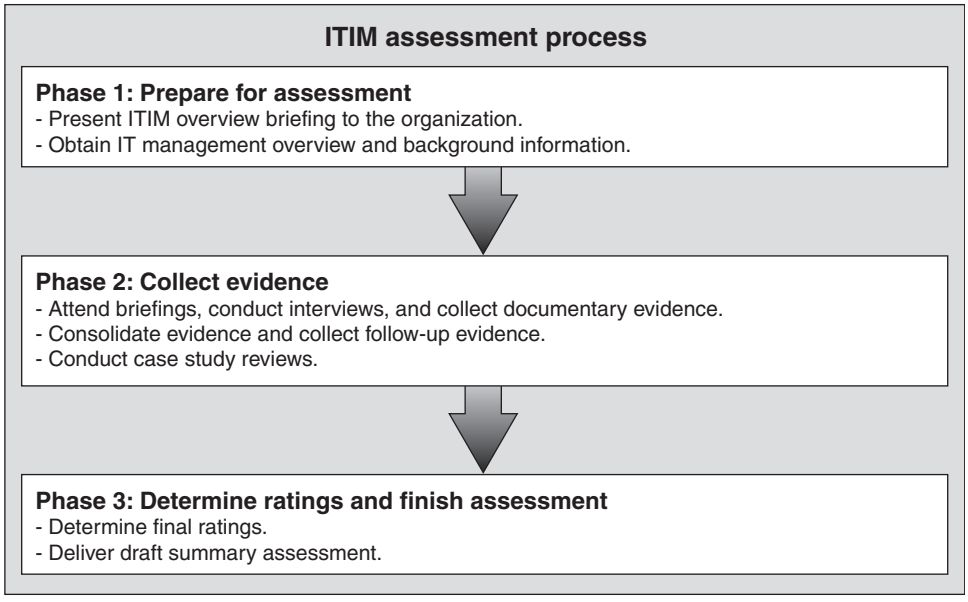
- Become proficient with the ITIM framework.
- Review the related GAO and OMB IT investment guidance (see GAO/AIMD-10.1.13; AIMD-99-32; AIMD-98-89; AIMD-94-115 and OMB A-130; A-11, M-97-12; M-97-02). Understanding this past guidance provides greater insight into the developmental history, key issues, and critical success factors associated with the IT investment approach.

- Become familiar with generally accepted capital decision-making approaches and associated analytical tools.
- Gain an understanding, through training or experience, of the basic concepts behind the development, maturation, and evolution of organizational management skills and capabilities (i.e., maturity models).
- Have experience assessing organizations using standardized assessment process and tools.

Summary of ITIM Assessment Process

Figure 24 summarizes the three phases of the ITIM assessment process. Each phase is necessary to ensure that the assessment team and organization management have sufficient understanding of the process and the ITIM approach, that appropriate evidence is collected to support the assessment, and that the conclusions are founded on the ITIM framework.

Figure 24: Phases in an ITIM Assessment



Source: GAO.

Phase 1: Prepare for Assessment

Present ITIM Overview Briefing to the Organization

The assessment process begins with the assessment team (hereafter referred to as the team) defining the scope of the assessment (i.e., department, agency, or bureau). The scope of the assessment will influence the location of the assessment (i.e., the physical place where most of the key people and activities are located), who will attend the team's briefing, and the extent of documentation required. After the scope of the assessment has been defined, the team conducts an overview briefing for the organization being assessed (hereafter referred to as the organization). This briefing covers the ITIM framework in general, the assessment process, and any organization-specific factors that are relevant to the job. The purpose of this briefing is to ensure that the organization understands

- ITIM and the assessment process (including some techniques for efficiently and effectively performing an ITIM assessment),
- the anticipated schedule of events,
- the importance of involving the right people,
- the general rules of data collection and evidence, and
- the expected reporting process.

In order for the assessment to return value to the organization, it is important that senior managers understand the ITIM framework and the assessment process. This understanding will facilitate the provision of appropriate information during the assessment and will demonstrate management commitment to the process. The key factors to consider are the role(s) of the participants in the organization's IT investment activities and its decision-making process.

The following organizational stakeholders should be considered:

- the Chief Information Officer (CIO),
- the Deputy CIO,
- representatives from the organization's IT investment board(s),
- representatives from the office of the Chief Financial Officer (CFO),

- representatives from the organization's budget and planning offices, and
- various IT managers.

This overview briefing should take place sufficiently early in the assessment process to allow the organization to learn from the presentation and prepare for the assessment. This means that the briefing should occur at least a month before the start of on-site assessment activities. As a result of the briefing, the organization should be able to expedite the assessment by collecting the expected documentation, identifying the management processes for observation, and providing access to appropriate, relevant staff for interviews.

Evidence of an IT Investment Management Process
A central component of any ITIM assessment is the team's collection of evidence about the organization's IT investment management process. The ITIM framework guides the team's collection efforts by listing examples of physical, documentary, and testimonial evidence for each ITIM critical process. The team should evaluate the variety of material with respect to the standards of evidence (sufficient, competent, and relevant) found in GAO's *Government Auditing Standards, 2003 Revision* (GAO-03-673G)—also known as the "Yellow Book").

Besides collecting documents, a typical ITIM assessment may include interviews with as many as 25 to 50 people as well as numerous group discussions and briefings. Even more people can participate through the use of assessment instruments such as case studies, questionnaires, and surveys (see Conduct Case Study Reviews below). The number of participants will depend on the scope of the assessment and the organization's size.

Obtain IT Management Overview and Background Information
In order for the assessment team to have a basis for understanding the existing investment processes, and to begin to understand the possible mapping of organizational processes on the framework, the organization's management should provide the team with an overview of their IT investment management process. It is incumbent upon the organization to ensure that its representatives have sufficient knowledge and experience in managing IT investments within the organization to accurately represent the organization and answer questions. The team should consider using an organizational liaison for the duration of the assessment to assist in identifying and gaining access to knowledgeable staff, providing access to

and delivering copies of requested documentation, and facilitating access to physical evidence.

The organization's overview briefings should provide a high-level perspective on how the organization manages its IT investments. The briefings are intended to provide the team with the following:

- An overview of the organization's IT investment management process (i.e., what the organization does—especially how it selects, controls, and evaluates its IT investments);
- An explanation of the organization's structure (who does what as documented in current organizational charts—especially any recent or anticipated changes);
- A description of how responsibility, accountability, and authority for the IT investment management process are distributed; and
- An index of relevant documents (the IT investment management processes contained in documented policies, procedures, and guidance, etc.). The index should describe how the organization's documents are laid out and how they relate to one another other.

The organization should also supply other documents and background information to the team to increase the team's efficiency and prevent misunderstandings during the assessment process. The following information may also be included:

- a list of current IT investments (often referred to as the investment portfolio);
- examples of the data, information, and analyses upon which investment decisions are based;
- descriptions of the decisions that are made during the investment process;
- an overview of the organization's mission and business processes (this may be contained in the organization's current strategic plan);
- a list, with definitions, of terminology unique to the organization; and

- the organization's current investment performance and process improvement plan.

Refine the Assessment Plan
Based on the initial information it receives from the organization, the team may refine its assessment plan. For instance, the team should reach consensus on which critical processes and/or maturity stages are applicable.

Phase 2: Collect Evidence

Attend Briefings, Conduct Interviews, and Collect Documentary Evidence
The purpose of this set of activities is to obtain supporting evidence in greater depth regarding the organization's implementation of the key practices and critical processes and to follow up on issues or questions arising from other evidentiary sources to date. The amount of additional information to be collected, and the level within the organization from which it must be obtained, will depend upon many factors, including

- the evidence obtained to date,
- the maturity of the organization's management processes,
- the organization's size and complexity, and
- the scope of the assessment.

A detailed, revised data collection plan should be developed based on the information required and the information that was received in the initial overview and background briefings. The team should focus on the gaps that remain.

Rather than proceeding sequentially through the critical processes, the team may find it more effective and efficient in some situations to use other approaches to collect evidence. These alternative approaches can include

- collecting evidence from one organizational component at a time for multiple critical processes (e.g., collect and review all of the IT investment-related policies from a central policy review committee);

- collecting evidence for a single stage from multiple organizational components (e.g., collect and review all evidence for Stage 2 at one time); or

- collecting evidence for one ITIM component across all organizational components (e.g., collect and review all evidence relating to Organizational Commitments).

If the organization states that it is implementing a critical process using some set of practices other than the ones described in ITIM, then these practices should be

- clearly delineated,

- formally approved by the organization, and

- convincingly supportive of the intent of the critical process that it is supposed to support.

The organization may also provide for the team an in-depth walkthrough of specific key practices within a critical process. This would provide the team with evidence of a critical process and would also support the documentary evidence associated with an assessment of a critical process.

Obtain Information on the Investment Process
Briefings at this point should be focused on those critical processes and key practices that were insufficiently documented following the initial background briefings. Processes and practices that are known to be missing in the organization may be skipped. Presenters should be encouraged to bring documentation to the briefings for distribution. In many instances the briefings may evolve into discussions as the team focuses on the supporting evidence of existing investment management processes.

Conduct Interviews
The purpose of these interviews is to collect supporting evidence from organization staff who directly participate in the IT investment management process (e.g., executives, managers, support personnel). Interviewing a variety of organization staff assists the team in determining the extent to which the investment process policies and procedures have been communicated throughout the organization. These interviews should also point the team to other documentary evidence (probably located

within investment projects) and guide the collection of evidence. (Also see *Conduct Case Study Reviews* below.)

Collect and Review Documentary Evidence
The purpose of this step is to review the documentary evidence of how investment management processes are actually implemented and determine how well the evidence correlates to the ITIM key practices. This activity is repeated for each key practice that is being carried out by the organization.

The team will typically begin by collecting broad, organization-level evidence (e.g., policy planning documents). This evidence will lead the team to lower-level, implementation-oriented documentation (e.g., meeting notes and working papers). In this step the team will

- determine what documentary evidence is available, based on information provided at briefings and interviews,
- request or collect documentary evidence,
- evaluate the documentary evidence, and
- organize the evidence according to the key practices within the ITIM framework.

Consolidate Evidence and Collect Follow-Up Evidence
Before the team can make rating judgments of the key practices, critical processes, and maturity stages under consideration, it must complete the following:

- determine whether or not the evidence provides a sufficient, competent, and relevant basis for making a rating judgment;
- assemble, organize, and analyze the collected evidence and consolidate it into a manageable summary of evidence according to the ITIM framework; and
- determine what follow-up evidence the team requires to make a rating judgment and develop a method to collect this evidence. The team must also decide how to proceed if (1) there is no other evidence available or (2) the available evidence is ambiguous and/or inadequate.

Invariably the team will identify the need for additional analyses or follow-up evidence to complete the assessment. To collect this evidence, the team can either send written questions or requests for specific evidence, or it can conduct follow-up interviews.

Determine the Sufficiency, Competency, and Relevance of the Evidence
In order to achieve accurate and reliable ratings in the assessment process, the following evidence guidelines must be met:

- There should be sufficient evidence collected from two or more (preferably independent) sources to support a rating.
- The evidence must be corroborative and directly relevant or logically linked to the key practice and the critical process.
- The evidence must provide adequate coverage and be competent. More specifically,
  - testimonial evidence must be from interviews with or presentations by the staff who perform the related investment management process;
  - original documentary evidence must be a direct result of executing the investment management process; and
  - physical observations must be made by team members or other credible, unbiased third parties.

Under some circumstances, the team may decide that confirmation from three or more separate evidentiary sources is needed. For example, the team may realize that a particular individual's interview is significant enough that it may cause a critical process to be rated as "not implemented." In this case, the team may decide that this interview, as a single source of evidence, warrants corroboration from other interviews. As a general rule, if there is any doubt about whether a rating is valid, the team should initiate additional information collection efforts.

Consolidate the Evidence
Consolidation helps the team to review and organize the large quantity of evidence that is typically acquired during an assessment. Evidence consolidation also provides an opportunity for the team to share

interpretations of the collected evidence and enables the team members to develop a consensus on rating.

During evidence consolidation, the team assesses its progress toward its goals and reviews the evidence it has collected up to that point. While no particular format is mandatory, these steps are typically followed (often they are repeated multiple times):

- Team members index, review, and assess the evidence collected to date.
- Team members identify key practices that require further clarification.
- Team members share opinions of the sufficiency of the evidence and develop preliminary ratings based on team consensus.

If the team cannot reach consensus, it must (1) identify the evidence needed to resolve the outstanding issues and (2) generate a plan for collecting the needed evidence.

Conduct Case Study Reviews

The team may choose specific IT investment projects for in-depth reviews to validate organization-level evidence and to better understand the organization's IT investment management process. The decision to conduct case studies will depend on additional evidence is required to document investment processes. By evaluating the actual investment processes used with a variety of investment projects, the team obtains a clearer picture of

- the investment processes as they have actually have been implemented,
- the consistency with which the investment processes are executed,
- evidence of whether the organization's policies and procedures have been communicated to the project level,
- the commitment that the organization has to its investment processes, and
- the beneficial effects that improvements in these processes might have on the performance of the organization.

Select Investment Projects

The team should select one or more investment projects in each major life

cycle phase (e.g., R&D, full-scale development, and O&M). At least one of the cases should include a high-cost and/or high-risk investment project. For each project, the team should follow the history of the investment project as it has cycled through the organization's IT investment process. Projects may be selected on the basis of whether the required documentation is available, though this approach may bias the conclusions that can be drawn from the evidence.

Select Participants
The team also needs to determine whom they expect to participate in these project-level reviews. In all cases, participants should come from the investment projects selected and the organizational groups that support those investment projects. It may also be necessary to include people from other organizational components (e.g., IT investment oversight staff).

Execute the Review(s)
These reviews will typically cover the following dimensions:

Process conformance—the degree to which the project being reviewed has gone through the organization's IT investment decision-making process.

Data sufficiency, quality, and completeness—the type, accuracy, and value of the data used to make investment decisions about the project.

Decisions implemented—the type of decision made and the degree to which it has been implemented.

Reconcile Differences
In some situations, the results of the case studies may contradict the preliminary ratings that the team has developed during the assessment of the organization. In this case, the team should investigate the contradiction(s), determine their root cause, and modify the preliminary rating(s) if necessary. As mentioned before, the purpose of the case studies or surveys is to provide additional corroborative evidence for the organizational ratings and conclusions that are reached during the organization-level ITIM assessment.

Phase 3: Final Ratings and Assessment

Determine the Final Ratings
Once evidence collection is complete, the team must assess the consolidated evidence and decide whether each key practice, critical process, and maturity stage has been successfully executed. The team

makes final rating judgments as a group. Developing a consensus, so that the majority agrees and no one is opposed, ensures that the decision is fair and that all the evidence has been considered.

ITIM is a hierarchical framework, so the rating of each higher-level component is entirely dependent on the components below it. That is, if any key practice is not executed satisfactorily, its corresponding critical process is not implemented satisfactorily, and the corresponding maturity stage cannot be considered complete. Because of this hierarchical prioritization, the team must begin by rating key practices and work its way up the hierarchy. The sequence of ratings is as follows:

- First, key practices are rated.
- Next, critical processes are rated.
- Last, the ITIM maturity stage is determined.

The team members should devise a method and a mechanism for tracking and documenting the rating judgments as they are being made. Besides creating a reproducible "audit trail," these supporting documents are useful when delivering summary results.

Determine a Rating for Each Key Practice
Key practices are rated as

- "executed" or
- "not executed."

An ITIM key practice is successfully "executed" if (1) the team judges that the key aspects of the practice are being carried out by the organization or (2) the organization presents the team with convincing evidence that an alternative practice achieves the same outcome. An ITIM key practice is "not executed" if there are significant weaknesses in the organization's execution of the practice and if no adequate alternative is in place. If the team has found no evidence of a practice during the assessment process, that result would support a key practice rating of "not executed."

If the team rates a key practice as "not executed," the organization should be given an opportunity to produce evidence that might mitigate or refute

the evidence that indicated this rating. By double-checking, the team avoids making ratings based on incorrect information.

Determine a Rating for Each Critical Process
Critical processes are rated as

- "implemented,"
- "not applicable,"
- "not implemented," or
- "not implemented, but improvements under way."

An ITIM critical process is "implemented" if all of its underlying key practices are successfully executed or if a satisfactory alternative is in place. An ITIM critical process is "not implemented" if there are significant weaknesses in the organization's execution of the underlying key practices and no adequate alternative is in place. An ITIM critical process is "not implemented, but improvements under way" if more than half, but not all, of its underlying key practices are rated as executed. For example, if well-defined policies and procedures have been developed, but no training has been established, the critical process would be rated as "not implemented, but improvements underway." This rating is intended to indicate that the organization has made progress in addressing the critical process, but the work has not been completed.

A critical process, like a key practice, can be implemented by alternative means. The crucial point in assessing an alternative approach is that the techniques used to fulfill the purpose of the critical process must be defined, implemented, and institutionalized. These are the same criteria that are described in the ITIM framework and used to assess the adequacy of an organization's execution of a key practice.

Determine the Investment Management Stage
All of the critical processes within a particular investment management maturity stage—and within each lower stage—must be rated as "implemented" or "not applicable" in order for the organization to achieve that stage. For example, for an organization to be rated as an ITIM Stage 3 organization, all of the critical processes within both Stage 2 and Stage 3 must be rated as being "implemented" or "not applicable" by the team.

Deliver the Draft Summary Assessment

The final step in the assessment process is the delivery of draft results to the organization. In addition, these draft results can form the basis for the development of a full audit report, if one is requested. The draft assessment, typically in the form of a briefing, contains

- an itemization of ITIM critical processes that have been assessed and rated;
- an identification of implemented critical processes, an identification of the achieved investment management stage, and graphical or summary representations of the above information;
- a rating of each key practice for each critical process that was assessed; and
- an evidence-based rationale for each rating determination.

The team can use the case study reviews to illustrate the ratings and conclusions that the team reached as a result of the assessment. In order to focus on the key practices needing improvement, the team typically will deliver draft ratings only for key practices that it judges to be "not executed." This approach optimizes time overall and ensures maximum time is spent corroborating investment management weaknesses and collecting additional evidence about them or about other areas.

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