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A Framework for Assessing and Improving Process Maturity

Exposure Draft

GAO

Accountability * Integrity * Reliability

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Abbreviations

BPI	business process improvement
CBSR	costs, benefits, schedule, and risks
CCA	Clinger-Cohen Act of 1996
CIO	Chief Information Officer
CFO	Chief Financial Officer
CMM	Capability Maturity Model
EO	Executive Order
FASA	The Federal Acquisition Streamlining Act of 1994
GPRA	Government Performance and Results Act of 1993
IT	information technology
ITIM	IT Investment Management
O&M	operation and maintenance
OMB	Office of Management and Budget
PIR	post-implementation review
PRA	Paperwork Reduction Act
R&D	research and development
ROI	return-on-investment
SEI	Software Engineering Institute
SIM	strategic information management
WWW	World Wide Web

Preface

If managed wisely, 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 technical novelty to a national resource where citizens can visit the Library of Congress or file their tax returns. Some organizations have realized substantial improvements in processing data and information by switching from centralized mainframe computing to decentralized personal computers linked by local area networks. The ability of software applications to locate and correlate relevant data in a data warehouse permits organizations to discover unknown fiscal or physical resource relationships and thus provide appropriate assistance where there had been none.

However, along with the potential to improve lives and organizations, IT projects can 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 Clinger-Cohen Act of 1996[1] was enacted to address many of the problems related to federal IT management. It requires federal agencies to focus more on the results achieved through IT investments while concurrently streamlining the IT acquisition process. This act also introduced more rigor and structure into how agencies select and manage IT projects. Among other things, the head of each agency is required to implement a process for maximizing the value of the agency's IT investments and assessing and managing the risks of its IT acquisitions.

In 1997 we developed guidance, 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 and identifies specific areas where improvements can be made. The Information Technology Investment Management (ITIM) framework enhances this guidance by identifying critical processes for successful IT investment and organizing these processes into a framework of increasingly mature stages. This shift reflects both the maturation of the thinking in the area of IT investment management and the feedback we received from organizations based upon their experiences creating their IT investment mechanisms and processes. Such a maturity framework can be used to analyze an organization's IT

[1]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.

investment management process and determine the maturity of its investment process. In doing so, ITIM establishes three key benefits: (1) a rigorous, standardized tool for internal and external evaluations of an agency's IT investment management process; (2) a consistent and understandable mechanism for reporting the results of these assessments to agency executives, the Congress, and other interested parties; and (3) a road map agencies can use for improving their IT investment management process.

It should be noted, however, that the achievement of more mature IT investment management stages depends on performing other good management practices and attributes such as human capital, training, IT architecture, and software management.

The Information Technology Management Policies Group developed this guide under the direction of Dave McClure, Associate Director, Governmentwide and Defense Information Systems. Accompanying this document is an overview document, *Information Technology Investment Management: An Overview of GAO's Assessment Framework* (AIMD-00-155), that provides a brief description of ITIM. If you have any questions about the Information Technology Investment Management framework or the IT investment management approach, please contact John T. Christian, Senior Business Process Analyst, at (202) 512-6205 (*christianj.aimd@gao.gov*), or John P. Rehberger, Senior Information Systems Analyst, at (202) 512-3687 (*rehbergerj.aimd@gao.gov*).

An electronic version of this guide is available from GAO's World Wide Web server at the following address: http://www.gao.gov/special.pubs/10_1_23.pdf. Additional copies of this exposure draft can be obtained from Room 1100, 700 4th St. N.W., U.S. General Accounting Office, Washington, D.C. 20548, or by calling (202) 512-6000, or TDD (202) 512-2537. Please send comments by September 1, 2000, to John T. Christian, at

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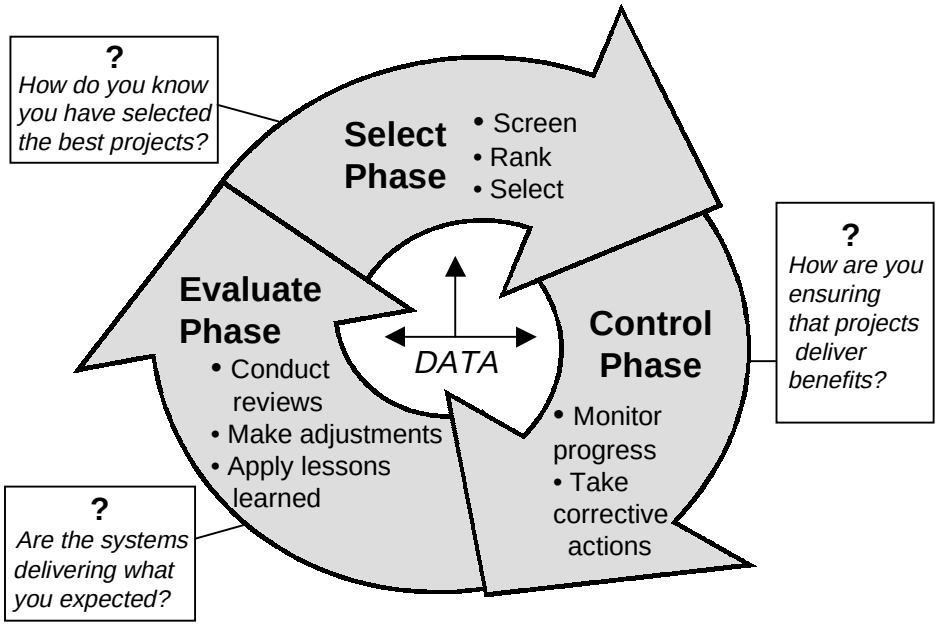
Introduction

The select/control/evaluate model has become a central tenet of the federal IT investment management approach. The model was initially identified in our Strategic Information Management (SIM) Executive Guide,[2] expanded in the Office of Management and Budget's IT investment guidance,[3] and then refined in our subsequent guidance.[4] It provides a systematic method for agencies to minimize risks while maximizing the returns of IT investments. Figure 1 illustrates the central components of this model.

Figure 1: Fundamental Phases of the IT Investment Approach



- During the *selection* phase the organization (1) selects those IT projects that will best support its mission needs and (2) identifies and analyzes

[2] *Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology* (GAO/AIMD-94-115, May 1994).

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

[4] *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making* (GAO/AIMD-10.1.13, February 1997).

each project's risks and returns before committing significant funds to a project.

- During the *control* phase the organization ensures that, as projects develop and as investment costs rise, the project is continuing 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.

- Lastly, during the *evaluation* phase, actual versus expected results are compared once projects have 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 select/control/evaluate model presented in the SIM executive guide also provides the key foundation for our IT investment decision-making assessment guide.[5] That assessment guide was developed to provide a method for evaluating and assessing how well a federal agency selects and manages its IT resources and to identify specific areas where improvements can be made. As such, it expands upon the select/control/evaluate process model to incorporate organizational process, supporting data, and relevant executive decisions.

The assessment guide is being used by agencies and management consulting firms to design and implement IT investment processes and by our evaluators to assess these processes. These experiences have identified strengths and some opportunities for improvement for this guide. For example, the comprehensive list of assessment questions contained in the guide thoroughly covers IT investment management issues. These questions help evaluators determine the presence or absence of IT investment process activities. Users of the guide, however, expressed an interest in a prioritization of the relative importance of the different process components. This can become a significant issue because (1) many agencies must prioritize the use of their limited resources for improving their internal processes and (2) improvements in some specific processes can provide greater benefits to an organization than improvements in other processes.

Additionally, users of the guide expressed an interest in a tool that would assist them in measuring the interim stages of development while the

[5] *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making* (GAO/AIMD-10.1.13, February 1997).

agency is implementing a complete IT investment management process. Our evaluations of the investment management processes in the private sector and at several federal agencies indicate that IT investment management implementation is a step-by-step process that occurs over time and depends heavily on organizational commitment, leadership, persistence, and management priority.

A Maturity Framework Offers Benefits for Refining the IT Investment Approach

To address the issues described above, we searched for an approach that would enhance the current investment management guidance. We decided to use a maturity framework because

- it offers a comprehensive model for assessing processes within an organization, including engineering, management, and organizational processes;
- it can be applied to multiple types of disciplines, such as IT asset acquisition, human capital, and systems engineering;
- maturity models have been proven to be a highly effective evaluative technique for the Software Engineering Institute, which is highly regarded for its collection of Capability Maturity Models[SM] (e.g., *Capability Maturity Model for Software*[6]);
- a maturity framework can serve as a valuable tool for organizations to improve their technical development and management processes; and
- other researchers have also proposed similar IT management maturity model approaches.[7]

For further information on the development of ITIM, please refer to appendix I

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

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

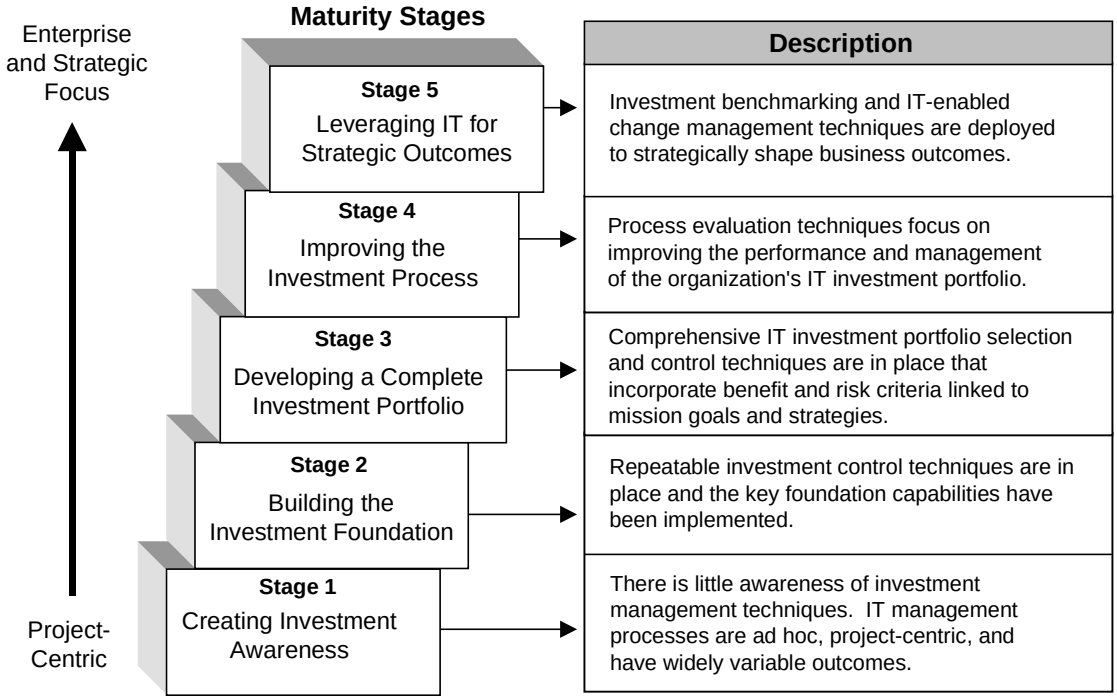
[7]Giga Information Group, Inc., *Total Economic Impact, Part 2: Defining and Measuring IT Value* (P-1297-009).

Overview of ITIM

The ITIM Maturity Stages

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 2.1 shows the five ITIM stages and a brief description of each stage.

Figure 2.1: The Five Stages of Maturity Within ITIM



The following paragraphs provide a more detailed description of the general characteristics and practices found at each stage of maturity.

ITIM 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 members and thus its success might be difficult to repeat. Investment and development processes that are important for success may be known, but only to isolated teams; this process knowledge is not widely shared or institutionalized.

The unpredictable nature of project outcomes means that even if an organization does recognize that a given project is in trouble, the organization has only a limited ability to address and resolve the project's problems. Additionally, a focus on project results in terms of business benefits is often missing in Stage 1 organizations.

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 at times inconsistent. Organizations, when evaluated using ITIM, are assumed to initially have Stage 1 investment maturity.

ITIM Stage 2: Building the Investment Foundation

The primary focus of Stage 2 maturity is on attaining repeatable, successful IT project-level investment control processes and basic selection processes. For an organization to develop an overall 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 the absence of predictable and repeatable investment control processes, selected investments will be subjected 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 process improvement efforts.

Most IT investments require a relentless focus on interim results and successful risk management strategies to ultimately succeed. As such, an organization can begin by (1) focusing on gaining control of its existing collection of projects and (2) following a disciplined process for regularly tracking and overseeing each project's cost and schedule milestones and improving project outcomes over time. Supporting these activities requires the creation of an IT asset inventory to ensure that the organization knows certain basic information about its IT assets such as the location, cost, and ownership.

Stage 2 selection-related processes are designed to establish basic selection capabilities that can evolve into 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.

ITIM Stage 3: Developing a Complete Investment Portfolio

Establishing a consistent, well-defined IT investment portfolio perspective is the critical focus for Stage 3 maturation along with maintaining mature control processes and initiating basic evaluation processes. Once new IT proposals can be selected and developed on schedule and on budget per Stage 2, the organization needs to consider criteria for how it should develop an IT investment portfolio. An IT investment portfolio is not just a collection of projects but a conscious, proactive look at how the organization expends its limited resources on IT, what beneficial impacts these investments have on the organization, and a continuous search for investments that will better achieve the organization's mission.

Defining IT investment portfolio selection criteria (1) enables the organization to widen its criteria from primarily cost and schedule to include benefit and risk criteria and (2) communicates organizational priorities to the IT project management community. Investment analysis efforts focus on ensuring that each investment submitted for funding supports the organization's missions, strategies, and goals. Portfolio development actions define the criteria and tasks needed to develop an IT investment portfolio. Finally, organizations with multiple IT investment boards must work to align the authority of these multiple IT investment boards and describe practices for supporting such a management structure.

ITIM 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 along with maintaining mature control and selection processes. A key tool for accomplishing this is the post-implementation review (PIR). The PIR is conducted after an investment is completed and examines the outcome of the investment relative to its plans and expectations. This examination typically identifies lessons learned from the investment and improves the understanding of the key variables in the investment's business case. Analyzing a number of PIRs serves as the basis for creating recommendations for changing and improving the IT investment processes.

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

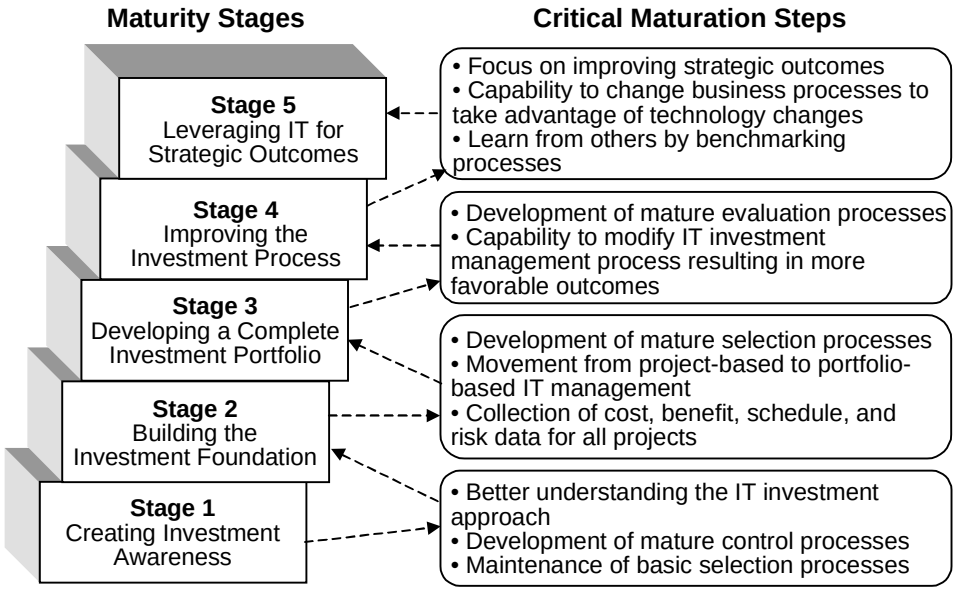
ITIM Stage 5: Leveraging Information Technology for Strategic Outcomes

Once an organization masters the selection, control, and evaluation processes, it seeks to shape its strategic outcomes by (1) learning from other organizations and (2) continuously improving the manner in which it uses IT to support and improve its business outcomes. 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 ITIM Stages of Maturity

Within ITIM, lower maturity stages provide the foundation for upper 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 figure 2.2).

Figure 2.2: ITIM Stages of Maturity and Critical Maturation Steps



Moving From Stage 1 to Stage 2

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

- one or more IT investment board(s) is created to oversee and select IT projects;
- an IT asset inventory is created to support executive decision-making;
- visibility into IT projects (from an investment perspective) increases;
- ongoing projects more predictably achieve their interim and final development and schedule milestones because of improved organizationwide system acquisition, development, and management practices;
- the organization creates and maintains better project-level cost accountability; and
- key customers (or end users) and business needs for each IT project are identified.

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 the organization matures, it learns from past decisions, better manages the causal factors that created the past problems, and thus improves the cost and schedule results in ongoing projects.

Beyond the 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 investment selection process is the major accomplishment demonstrated as an organization moves from Stage 2 to Stage 3 maturity. 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 and schedule goals. Thus, once the investment control processes have been established, an organization can build 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,

- the grouping of similar investments together and the development of the portfolio, and
- the creation of a mechanism to coordinate multiple IT investment boards (if multiple boards exist).

Beyond the creation of a mature selection process, the organization now adds the elements of benefit and risk management to its investment control process since it has installed the supporting tools for doing so as part of selection process maturation.

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 post-implementation reviews) 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 investment process improvement, the organization can also manage resource succession–that is, "de-selecting" current IT investments by migrating to successor IT investments or retiring obsolete and low-performing IT investments.

Moving From Stage 4 to Stage 5

An organization that is maturing from Stage 4 to Stage 5 has mature selection, control, and evaluation processes in place. The organization 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 others by means of benchmarking. Benchmarking is used by the organization because there may be external organizations that have 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.

Components of ITIM

ITIM Hierarchy

Like other maturity models, ITIM is subdivided into a hierarchy. Thus, ITIM is characterized by subdividing the IT investment management process into five **maturity stages**. Each maturity stage consists of **critical processes** that are defined by **core elements**. Each **core element** is 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 common attributes–its core elements–that when fulfilled, implement the critical process needed to attain a given maturity stage.

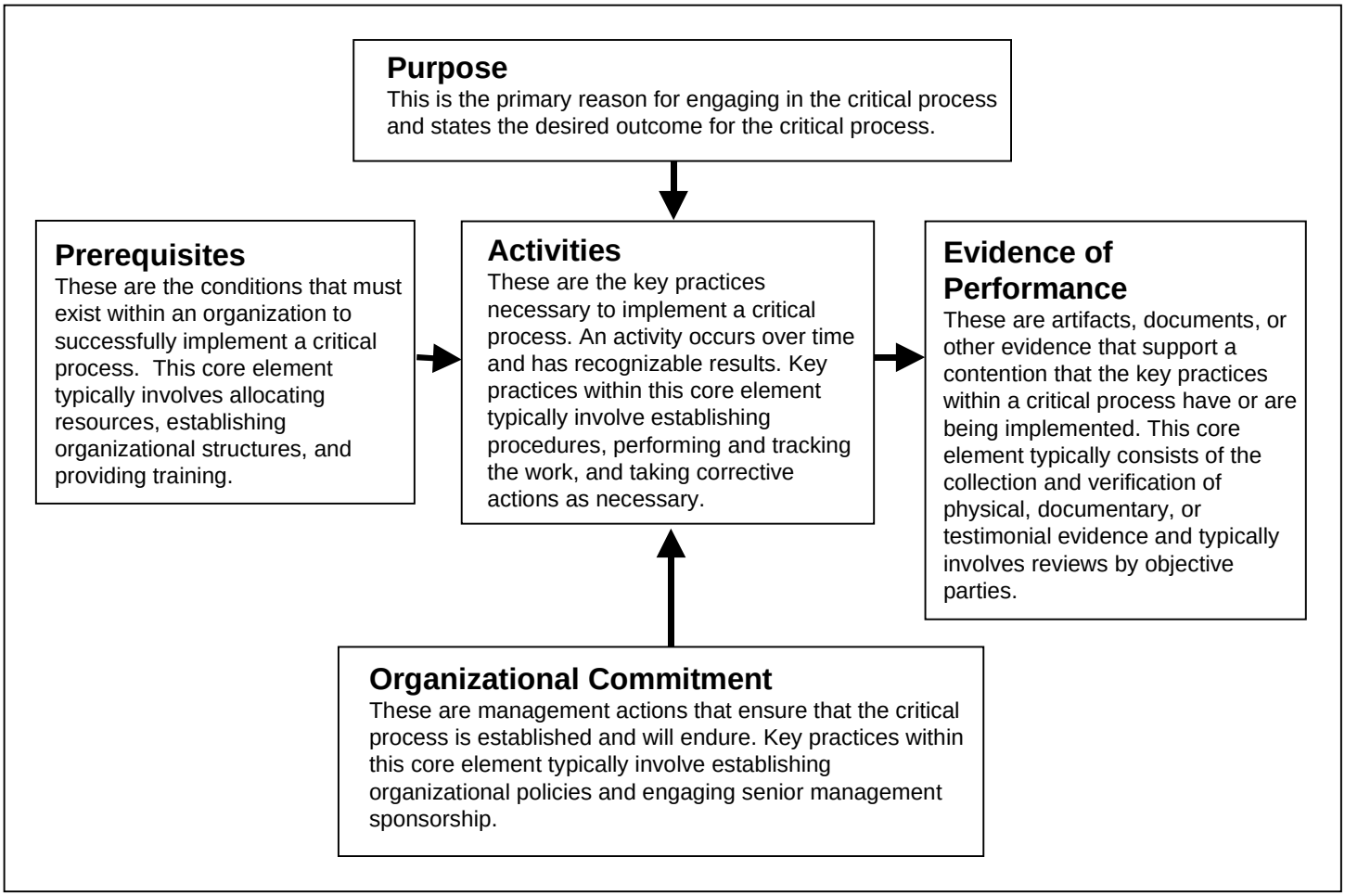
Core Elements

The core elements provide the common framework for each critical process. The five types of core elements (purpose, organizational commitment, prerequisites, activities, and evidence of performance), their relationship to each other, and an explanation of each core element are presented in figure 3.1.

Key Practices

The key practices are the tasks within a core element that must be performed by an organization in order to effectively implement and institutionalize a critical process. In Section 5, each key practice is followed by commentary about the key practice and additional information that may assist the organization in understanding or interpreting how the key practice could be implemented.

Figure 3.1: The Components of an ITIM Critical Process



Principles Guiding the Use and Interpretation of ITIM

Regardless of the specific reason for using ITIM, the following principles[8] should guide each interpretation and use of this framework.

- ITIM is a *generic framework* intended for broad use. Implementation and improvement needs may vary, depending on the specific context.

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

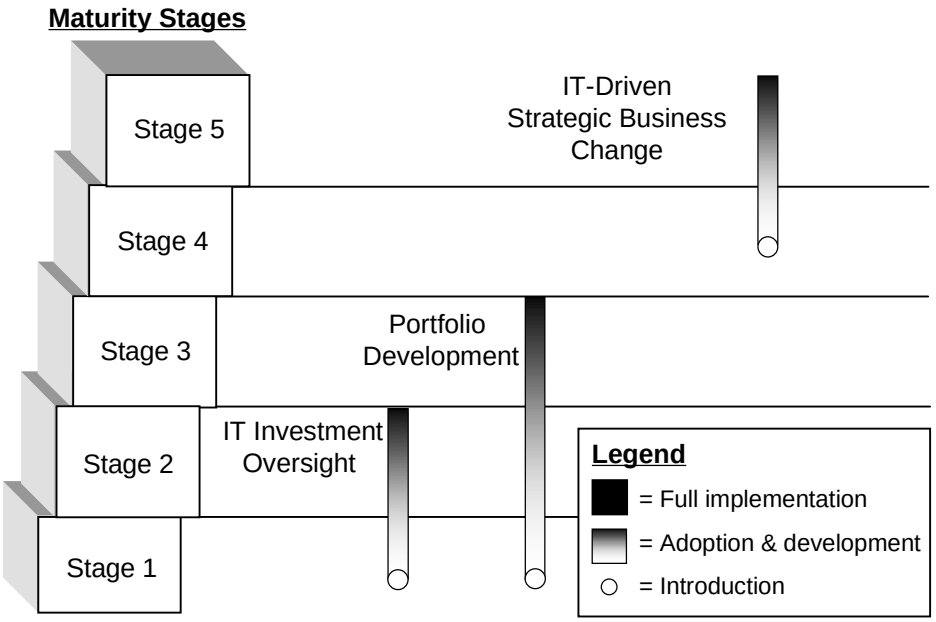
- ITIM is *a framework for organizational improvement*. Specifically, ITIM focuses on building the IT investment management process of an organization.

- ITIM serves as an *improvement roadmap* 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 of processes to improve, but not *how* an organization is to improve its processes.

- ITIM describes critical processes and key practices. This list may not be exhaustive, however. *Other investment management process components 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.

- Critical processes are *typically adopted over time*. Each critical process will generally go through a step-by-step evolution of introduction, adoption and development, and finally full implementation within an organization as the organization changes and modifies necessary functions and operations and reaches a particular maturity stage (see figure 3.2).

Figure 3.2: Critical Processes Are Typically Introduced at a Lower Stage Before Reaching Full Implementation



- ITIM *does not address all the factors* that can affect investment success. Examples of topics excluded from ITIM are strategic planning, funding availability, and specific technology implementations.

- ITIM takes a *process management approach*. The value of any product or service is largely governed by the quality of the management process used to create, develop, acquire, and maintain it and by the direct applicability of the product or service to achieving the organization's strategic plan.

- *Any process can be improved*; continuous improvement efforts are necessary to increase efficiency and improve effectiveness.

- There is *no "one right way"* to implement ITIM. ITIM describes the characteristics of mature and successful IT investment management processes, not specific implementation techniques.

- ITIM is *technology independent*. For example, no specific tools, methods, or technologies are mandated by ITIM. Appropriate tools, methods, and technologies should be made available to support the processes developed within ITIM.

- *Professional judgment* must be applied when interpreting ITIM in the context of a particular organization.

Uses of ITIM

ITIM identifies key IT investment processes, measures the presence or absence of these key processes, creates an assessment of an organization's IT investment management capability and maturity, and offers recommendations for improvement. As such, ITIM can be a valuable tool that (1) supports organizational self-assessment and improvement and (2) provides a standard against which an external evaluation of an organization can be conducted.

ITIM as a Tool for Organizational Improvement

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

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

The implementation of ITIM as a tool for organizational improvement can be achieved in a variety of ways. For example, an organization can create a separate improvement program, employ external assistance and support, or use it 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 currently in place across the organization. ITIM can help these organizations understand the relationships among these processes and determine the key opportunities for immediate improvements.
- ITIM is a structured approach that identifies the key practices for creating and maintaining successful IT investment management processes. However, ITIM describes *what* to do, not *how* to do it. Thus, specific implementation methods can and will vary by organization.

- 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. The maturity progression also means that as the organization incorporates additional processes at each successive stage of maturity, previously implemented lower stage critical processes must be maintained.

- ITIM is not a substitute for good project management. While ITIM takes an enterprisewide focus, good project-level management forms the foundation for successful IT investments.

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

- Within ITIM, business process improvement (BPI) initiatives are not considered to be IT investments but instead are considered to be parallel efforts that may or may not be linked to IT investments. Thus, ITIM assessments do not evaluate individual BPI initiatives. However, if such initiatives do have IT investments, then these IT investments should be subject to the organization's IT investment management process.

ITIM as a 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 the IT investment management process maturity of a given organization can be judged. For example, ITIM can be used to support external inspections to 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 ITIM assessment 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 conducting an ITIM assessment. 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.

- ITIM is applicable to organizations of different sizes. Some of the processes described in ITIM may be implicitly conducted by smaller organizations. For example, although ITIM addresses the organizational need to align and coordinate multiple IT investment boards, clearly a smaller organization with only one IT investment board would implicitly perform this critical process.

- An organization may be concurrently implementing key practices associated with several maturity stages. In fact, key practices associated with upper 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** key practices for **all** of the critical processes associated with a given stage of maturity and any lower maturity stages. For example, performing key practices in just several Stage 3 critical processes does not mean the organization has attained Stage 3 maturity.

- The key practices describe *what* is to be done not *how* it is to be done. Alternative practices may accomplish the underlying purpose of a critical process. The key practices should be interpreted rationally to judge whether the purpose of the critical process is effectively achieved.

Limitations and Boundaries of ITIM

ITIM, like other assessment tools, has its limitations and boundaries. For example, while strategic planning and decisions can greatly influence the performance of an organization, ITIM does not evaluate strategic plans and decisions made by the organization's executives. Rather the purpose of ITIM is to describe and improve the IT investment management processes so that the strategic plans and decisions that are made can and will be effectively supported by highly effective IT investments.

Similarly, performance measures created and used to guide the organization and its activities are a factor in some ITIM processes and can be viewed as maturing in parallel to the IT investment management processes. However, in general, activities related to the ongoing development and implementation of performance measures are largely outside the scope of ITIM.[9]

[9]For additional guidance on developing performance measures, see *Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investments* (GAO/AIMD-98-89, March 1998).

Also, ITIM 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 important, the primary purpose of acquisition-related activities is to support the execution of the IT investment decisions that are made by the IT investment board(s).[10] Thus, one would expect that the acquisition aspects of project development would be embedded in the IT project proposal and analysis steps within ITIM. Additionally, the acquisition strategy might be part of the project's risk assessment (i.e., the risks of pursuing various acquisition alternatives).

Finally, individuals selecting ITIM as an assessment tool should do the following:

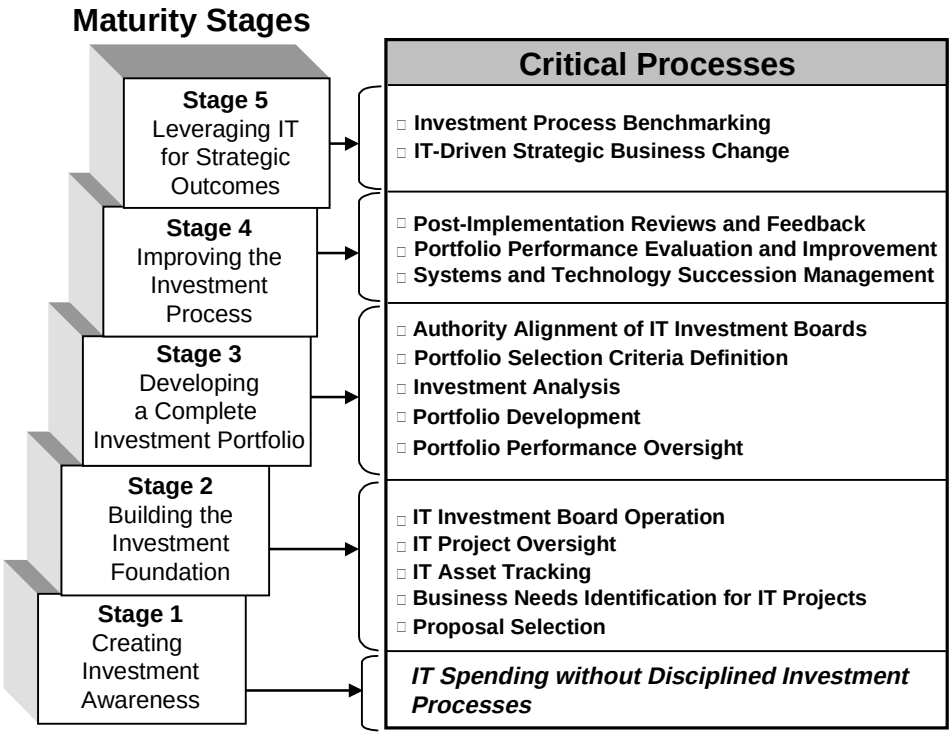
- Become proficient with the related GAO and OMB IT investment guidance mentioned in the introductory section. This is particularly true for those seeking to apply ITIM in the federal government sector. Understanding this guidance provides greater insight into the developmental history, key issues, and critical success factors associated with the IT investment approach.
- Become familiar with generally accepted capital decision-making approaches and associated analytical tools.
- Receive maturity model training to become familiar with the basic concepts behind maturity models.
- Have experience assessing organizations using standardized assessment tools.

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

Critical Processes For The ITIM Stages

Figure 5.1 shows the five ITIM stages of maturity and the critical processes that define each maturity stage.

Figure 5.1: The ITIM Stages of Maturity With Critical Processes



The following subsections describe each ITIM maturity stage in greater detail. The first subsection only describes the attributes of ITIM Stage 1, since no critical processes are associated with this stage. Each following subsection describes one of the ITIM stages. In each subsection, the ITIM 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 is presented along with a map depicting the associated core elements (purpose, organizational commitment, prerequisites, activities, and evidence of performance) and key practices for the critical process. Following the map, each core element presents the associated key practices (printed in bold text) and a discussion and interpretation of the key practice. For ease of use as a reference document, the page

headings for section 5 indicate which stage and critical processes is being discussed on each page.

ITIM Stage 1: Creating Investment Awareness

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 in that:

- it is assumed to be the default stage for an organization that has not undergone an ITIM assessment,
- 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.Overall, an ITIM Stage 1 organization has *ad hoc* or undisciplined IT investment management processes. This often contributes to escalating project costs, unmitigated risks, frequent project schedule slippages, 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 results in inconsistency in IT project outcomes and results.

Selection 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 agency mission goals, (2) its technical and economic risks, (3) its performance problems, or (4) cost and schedule overruns. IT is treated largely as an expense item in the budget and 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

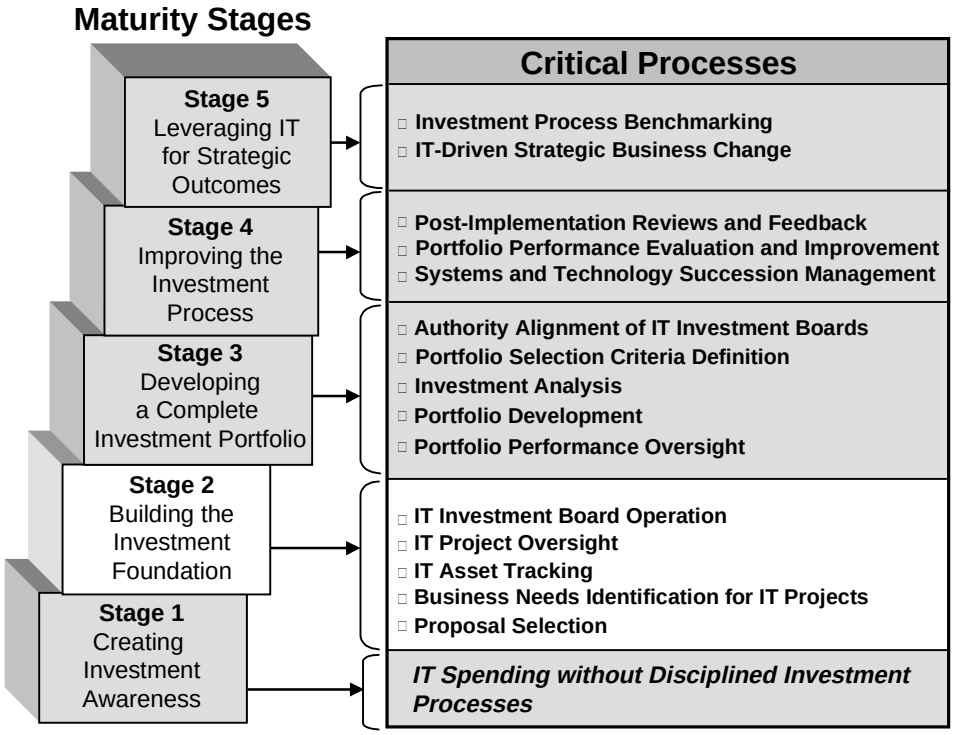
Stage 1 organizations typically have unstructured, ill-timed, and inconsistent IT investment management controls. Senior executives and line managers may rarely review IT projects' performance data and thus, the organization lacks an early warning method to quickly detect and rectify major problems.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

Additionally, a Stage 1 organization rarely would have an up-to-date and complete inventory of its IT assets. For example, although it may have an IT hardware (equipment) inventory, the organization might lack a comprehensive list of systems, software applications and tools, or licensing agreements. Such an incomplete asset inventory precludes an adequate investment control process.

Evaluation Process

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

ITIM Stage 2: Building the Investment Foundation



Stage 2 builds the foundation for current and future IT investment success by establishing mature IT control processes and basic IT selection processes. As such, this stage is defined by the following five critical processes:

- **IT Investment Board Operation** is the process for creating and defining 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), p. 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, p. 3; *Capital Programming Guide*, version 1.0, Office of Management and Budget, p. ii.

- **IT Project Oversight** is a pivotal process whereby the organization monitors all projects relative to cost and schedule expectations.

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

- **IT Asset Tracking** is the process by which the IT inventory is created and maintained to provide asset tracking data to executive decisionmakers.

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

- **Business Needs Identification for IT Projects** is the process for identifying the key customers (or end users) and near-term business needs that each IT project will support.

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

- **Proposal Selection** – introduces an organization to defined processes used to select new IT project proposals.

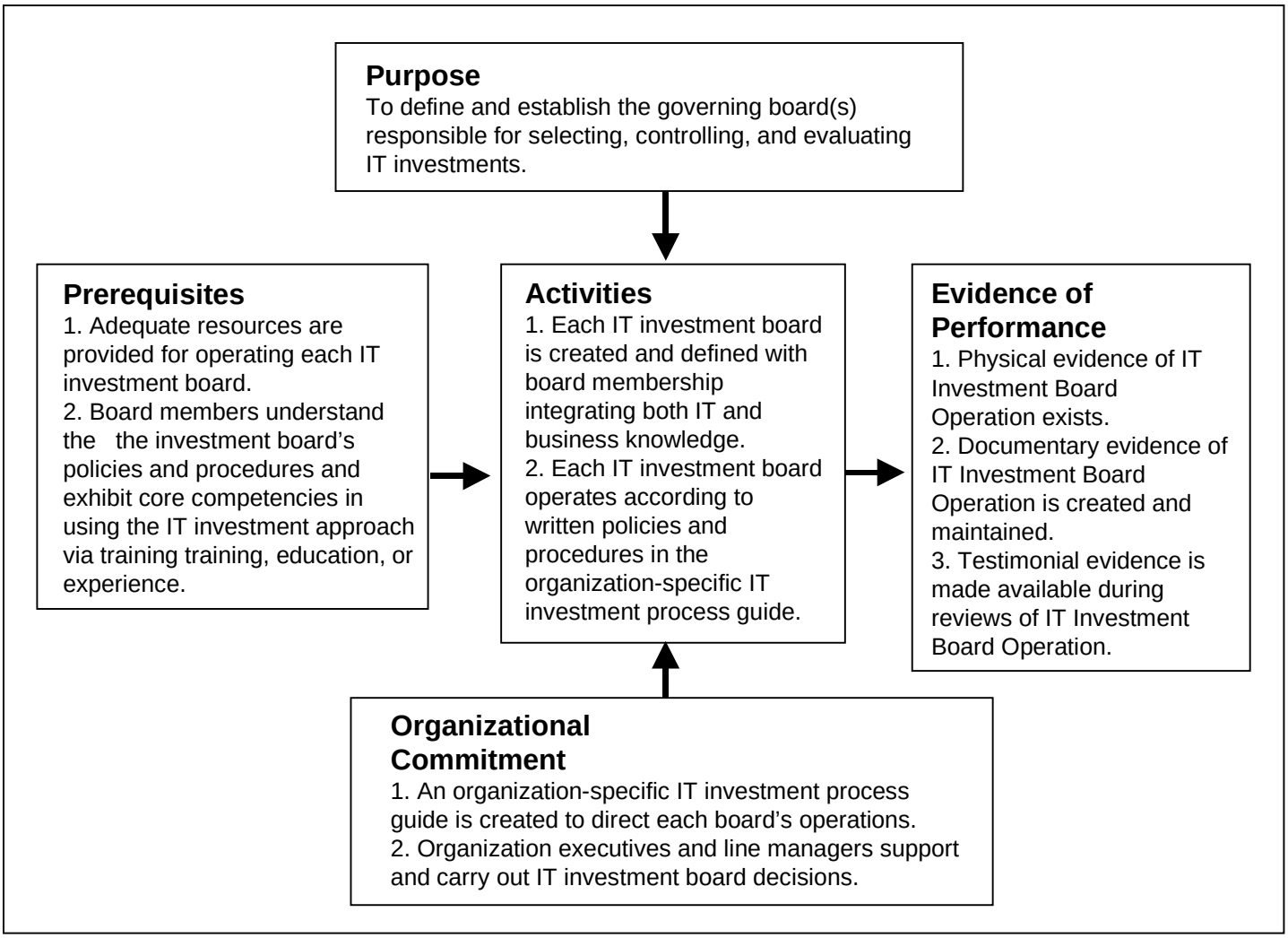
  Criteria: Based on *IT Assessment Guide (*AIMD-10.1.13), p. 23-25, (CCA, PRA, EO 13011, OMB A-11, OMB A-130, OMB A-109, OMB A-94, OMB M-97-0(2))

IT Investment Board Operation

The IT investment board is a key component in the IT 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 IT investment selection, control, and evaluation activities throughout this maturity model.

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 the board's operations as part of implementing this critical process.

Figure 5.2: IT Investment Board Operation



Purpose

To define and establish the governing board(s) responsible for selecting, controlling, and evaluating IT investments.

Organizational Commitment

Commitment 1: An organization-specific IT investment process guide is created to direct each board's operations.

Each organization must take the available general IT investment process guidance[11] and define the unique manner in which this guidance will be implemented within the organization. This process guide should include

- specifics about the roles of key people within its IT investment processes;
- an outline of the significant events and decision points within the processes;
- an identification of the external and environmental factors that will influence the processes (i.e., legal constraints, the behavior of key suppliers or customers, or industry norms); and
- the manner in which IT investment-related processes will be coordinated with other organizational plans and processes.

This process guide will be a key document that the organization will use to initiate and manage its IT investment processes. For example, this guide forms the foundation for each IT board's operating policies and procedures and can also serve as the foundation for many of the policies that are required in many other critical processes within ITIM.

This process guide can serve multiple purposes. For example, it can serve, in part or in whole, as the document for which the other required policies in ITIM are based (e.g., the policy for setting up and managing the IT asset inventory). Additionally, this process guide can be the basis for any other IT management policies and procedures beyond the key ones identified in ITIM. An example of other management procedures would be the development of an initial IT project screening mechanism used by larger

[11] *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-making* (GAO/AIMD-10.1.13, February 1997); *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).

organizations to ensure that each IT project is sufficiently complete before being reviewed by the IT investment board.

Commitment 2: Organization executives and line managers support and carry out IT investment board decisions.

For each IT investment board to be effective, it must have the formal, acknowledged support of the organization's executives and line managers and these managers must execute the board's decisions. Examples of this organizational support may be indicated by

- language in executive employment contracts;
- memoranda between executives and subordinate line managers; and
- formal, signed policy endorsement by executives and managers.

Prerequisites

Prerequisite 1: Adequate resources are provided for operating each IT investment board.

These resources typically involve

- top management participation in creating the board(s) and defining their scope,
- resources and staff support (including external experts or process advisors) to support the execution of this critical process, and
- an investment management center that can benefit both the IT investment board and IT project managers.

Prerequisite 2: Board members understand the investment board's policies and procedures and exhibit core competencies in using the IT investment approach via training, education, or experience.

Board members should understand the board's policies, roles, rules, and activities and be capable of carrying out their responsibilities competently. Thus, education and training for members with little or no investment decision-making experience is needed in areas such as economic evaluation techniques, capital budgeting methods, performance measurement strategies, and risk management approaches.

Knowledge building and/or training may include

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

Activities

Activity 1: Each IT investment board is created and defined with board membership integrating both IT and business knowledge.

The organization creates and documents the prescribed activities of the IT investment board(s). The investment board(s) should

- have final project funding decision authority over (or provide a direct recommendation to the agency head for) projects within their scope of authority,
- be comprised of key business unit executives and business support executives (i.e., financial management and information systems executives), and
- ensure executive sponsorship and responsibility for the organization's major IT projects and investments.

An organization may also create IT investment boards at other organizational tiers that, for example, correspond to its business or mission area structure. The policies and procedures that describe the roles of these boards may be addressed as a precursor to the Stage 3 critical process "Authority Alignment of IT Investment Boards."

Additionally, each defined board (particularly in a larger organization) may wish to create one or more working groups to carry out the authorized activities of the board. However, the boards themselves are ultimately responsible for the execution of their designated activities.

Activity 2: Each IT investment board operates according to written policies and procedures in the organization-specific IT investment process guide.

The board's work processes and decision-making processes (i.e., schedules, agendas, authorities, decision-making rules, etc.) are described and documented. The board should be an active decision-making body

meeting regularly (e.g., monthly or quarterly). Project funding decision-making should occur at least once a year. The mechanics of the decision-making processes should be as simple and comprehensible as possible while taking into account the activities needed for the board to be effective.

Examples of output from the IT investment board may include

- project funding decision documents,
- executive actions memorandums,
- project review decisions, and
- board meeting minutes.

Evidence of Performance

Evidence 1: Physical evidence of IT Investment Board Operation exists.

Physical evidence could include, for example:

- board meetings,
- working group meetings, and
- board member training classes.

Evidence 2: Documentary evidence of IT Investment Board Operation is created and maintained.

Documentary evidence could include, for example:

- standard policies and procedures,
- an organization-specific IT investment process guide,
- board meeting minutes including attendance, discussions, and decisions,
- project review decision papers,
- decisional documents and memorandums,
- executive action memoranda between the board and subordinate line managers, and

- a formal, signed policy endorsement by executives and managers.

Evidence 3: Testimonial evidence is made available during reviews of IT Investment Board Operation.

Testimonial evidence could include, for example:

- board member interviews and
- working group member interviews.

IT Project 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 cycle. While the board should not micromanage each project in order to provide effective oversight, it should maintain adequate visibility over performance and progress and use this visibility to review each project's progress toward predefined cost and schedule expectations as well as anticipated benefits and risk exposure. The board should expect that each project development team is responsible for meeting project milestones within the expected cost parameters 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 cognizant IT 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.

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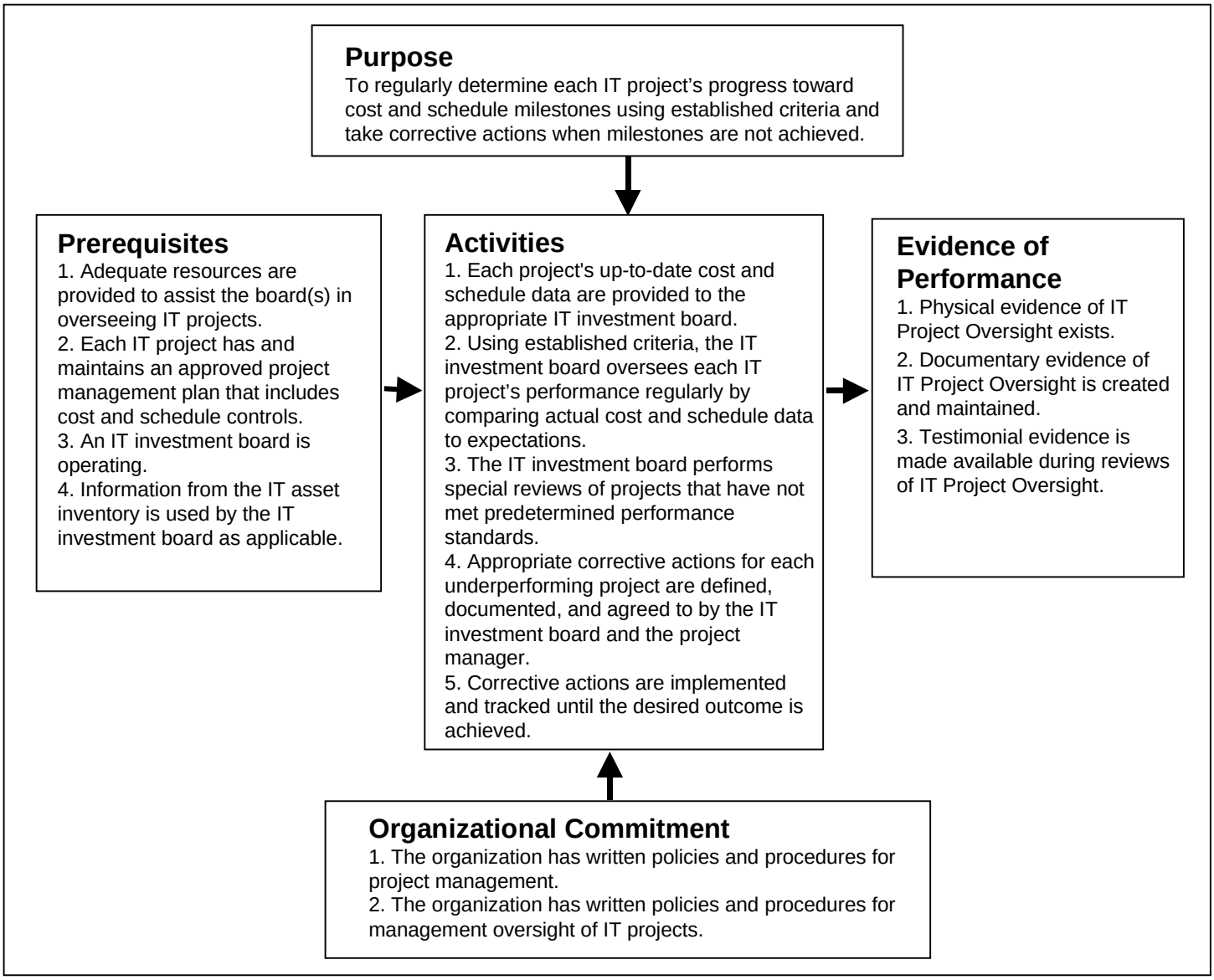
Figure 5.3: IT Project Oversight



Purpose

To regularly determine each IT project's progress toward cost and schedule milestones using established criteria and take corrective actions when milestones are not achieved.

Organizational Commitment

Commitment 1: The organization has written policies and procedures for project management.

These policies and procedures typically specify the following:

- A documented project management plan for the entire life cycle is developed, used, and maintained as the basis for tracking the project. The project management plan incorporates other plans such as a software development plan or system integration and test plan.
- The project manager is continually aware of the project's status and associated development and acquisition issues.

Commitment 2: The organization has written policies and procedures for management oversight of IT projects.

These policies and procedures typically specify the following:

- Each IT investment board's responsibilities when performing project oversight activities within its domain.
- The procedural rules for IT investment board operation and decision-making during project oversight.
- The threshold criteria that the IT investment board(s) uses when analyzing actual-versus-expected project performance as part of its oversight function. This threshold is typically defined on the basis of the cost or schedule measures (e.g., currently more than 10 percent over expected cost). This predefined threshold will be a major factor in determining remedial actions.
- Decisions that are required when the project deviates or varies significantly from the project management plan.
- Changes to the project's commitments are made with the involvement of affected groups. Examples of these affected groups include
    - system engineering,

- software engineering (including all subgroups, such as software design),
- hardware engineering,
- project planning and estimating,
- project stakeholders and champions,
- business units, and
- customers and end users.

- Each IT investment board oversees all project commitment changes and new project commitments made to individuals and groups external to the organization.
- The responsibilities of the project manager.

Prerequisites

Prerequisite 1: Adequate resources are provided to assist the board(s) in overseeing IT projects.

These resources can include

- a manager and staff to be assigned specific responsibilities for monitoring IT projects and
- tools to support board(s) operations may include project metric summary reports and decision support applications.

Prerequisite 2: Each IT project has and maintains an approved project management plan that includes cost and schedule controls.

Each IT project management team creates and maintains a project management plan.[12] This plan documents a variety of project decisions, assumptions, and expectations including the project performance expectations.[13] Part of these expectations could include a cost and schedule baseline control system such as earned value management system, milestone-based accomplishment expectations, or other such

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

[13]See *Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investments* (GAO/AIMD-98-89, March 1998) for additional guidance on performance measurement.

control system as is commensurate with the project's size, importance, cost, and risk.[14]

Prerequisite 3: An IT investment board is operating.

An investment board has the primary management oversight responsibility and is the central decision-making body in this critical process.

(See also Stage 2–IT Investment Board Operation for a description of the roles and responsibilities of the investment board.)

Prerequisite 4: Information from the IT asset inventory is used by the IT investment board as applicable.

The asset inventory is necessary to ensure that each board is aware of all of the IT projects and resources for which it is responsible.

(See also Stage 2–IT Asset Tracking for a description of the activities associated with developing an IT asset inventory).

Activities

Activity 1: Each project's up-to-date cost and schedule data are provided to the appropriate IT investment board.

The cost and schedule data (both expected and actual) for each IT project are collected and distributed to the appropriate IT investment board. These data may be collected by the board itself or collected and distributed in some other manner (i.e., through a centralized third party). These data will be key to assisting each cognizant IT board in its decision-making.

Activity 2: Using established criteria, the IT investment board oversees each IT project's performance regularly by comparing actual cost and schedule data to expectations.

The board typically oversees the project's performance periodically or at major milestones to interpret the project cost and schedule status data with respect to historic project data and project expectations.

[14]See the Defense Department's Earned Value Management Web site at *http://www.acq.osd.mil/pm* and *Planning, Budgeting, and Acquisition of Capital Assets*, (Office of Management and Budget Circular No. A-11, Part 3, July 1999) for additional guidance on earned value management.

Project oversight

- is conducted at least at the major life-cycle milestones for all projects;
- differs in its degree of depth depending on the size, cost, and importance of the project;
- must compare estimated schedule time frames versus actual schedules, including schedule slippage and/or compressions;
- must compare estimated costs versus costs spent or obligated to date, any changes in funding, and the impact of these changes, and
- may have other staff attending such as an independent audit team, quality assurance group, or an IV&V contractor who is responsible for ensuring that project information is valid and verifying that corrective actions have been taken.

Project oversight should also address each of these project management issues:

- Method–problems that have arisen concerning the project development methodology (including contractor management issues).
- Technical–technical issues or problems concerning such components as hardware, software, or telecommunications.
- Business/project alignment–evaluation of benefits delivered to date and 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: The IT investment board performs special reviews of projects that have not met predetermined performance standards.

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;
- results for the current lifecycle phase to expected life cycle performance;

- 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 their specified deliverables (e.g., schedule, costs, functionality, technical solutions).

Executives should ensure that there are incentives for identifying and raising problems to the appropriate decision-making level and that there are no incentives for covering up significant problems.

Activity 4: Appropriate corrective actions for each underperforming project are defined, documented, and agreed to by the IT investment board and the project manager.

The IT investment board should decide on corrective actions to apply to each project for which deficiencies or problems have been identified (e.g., actual costs exceed estimated costs, the schedule has slipped, requirements have changed).

Corrective actions will usually involve one of the following alternatives:

- modifying the project (e.g., objectives, scope, deliverables, time frames);
- working only on one module and stopping work on the rest of the project (until a milestone is reached or as not to exceed a set period of time);
- temporarily stopping the project to permit external work (e.g., related projects) to be completed (until a milestone is reached or not to exceed a set period of time);
- canceling the project; or
- accelerating the project's development (e.g., accelerating hardware deployment across the organization).

Future "cascading" actions resulting from these decisions should be clearly identified for decisionmakers to consider when choosing a corrective action.

Activity 5: Corrective actions are implemented and tracked until the desired outcome is achieved.

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 may be conducted prior to returning to the original project plan (i.e., reinstatement of funding) to ensure that all corrective actions have achieved the intended results and to determine whether additional changes or modifications are still needed.

Indicators of this activity might include

- a record of underperforming projects being satisfactorily corrected,
- evidence of unrecoverable projects being terminated,
- a record of independent review results and follow-up action plans, or
- accelerated roll-out of implementation.

Evidence of Performance

Evidence 1: Physical evidence of IT Project Oversight exists.

Physical evidence could include, for example

- the collection and delivery of each project's cost and schedule data to the board,
- a board review of a project's cost and schedule data (e.g., meeting minutes or review summaries), and

IT investment board decisions on corrective actions.

Evidence 2: Documentary evidence of IT Project Oversight is created and maintained.

Documentary evidence could include, for example

- a written project management policy,
- a written policy for management reviews of IT projects,

- approved project management plans,
- historic project data and project expectations,
- corrective action memoranda, and
- IT asset inventory reports.

Evidence 3: Testimonial evidence is made available during reviews of IT Project Oversight.

Testimonial evidence could include, for example

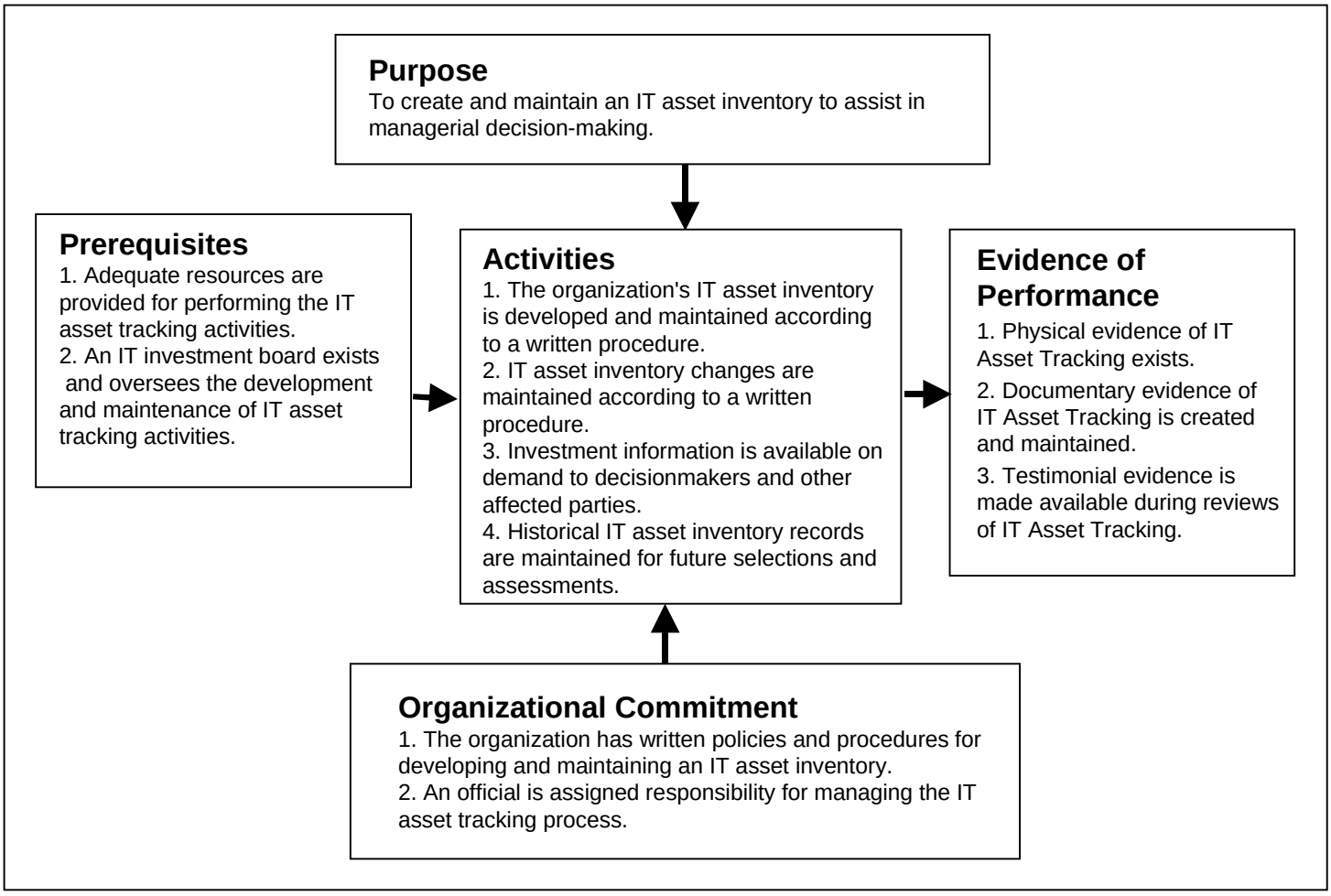
- interviews of other staff (such as an independent audit team, quality assurance group, or IV&V contractor) in attendance at project reviews and
- project manager interviews.

IT Asset Tracking

To make good IT investment decisions, an organization must know where its IT assets (i.e., personnel, systems, applications, hardware, software licenses, etc.) are located and how funds are being expended toward acquiring, maintaining, and deploying these assets. This critical process identifies IT assets within the organization and creates a comprehensive inventory of them. This inventory is used to track the organization's IT resources to provide insights and trends about major IT cost and management drivers.

This inventory can take many forms (e.g., a catalog, list, or a balance sheet), but regardless of form, the inventory should identify each IT asset and its associated components. This inventory does not have to be centrally located; it can be managed on a distributed basis. The guiding principle for developing the inventory is that it should be accessible where it is of the most value to IT investment decisionmakers. The inventory is particularly important when executing the IT Project Oversight, Proposal Selection, Investment Analysis, and Systems and Technology Succession Management critical processes. Additionally, beyond serving as a tool to aid in IT investment decision-making, the IT asset inventory can also assist the organization with software licensing management, hardware life cycle management, and system architecture plans.

Figure 5.4: IT Asset Tracking



Purpose

To create and maintain an IT asset inventory to assist in managerial decision-making.

Organizational Commitment

Commitment 1: The organization has written policies and procedures for developing and maintaining an IT asset inventory.

These policies and procedures typically specify:

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

For systems, inventory data elements could be part of the organization's configuration management process. They could also include schedule data, such as dates of installation, last upgrade, last maintenance, and last security patch. For personnel, inventory data elements could include knowledge, skills, abilities, salary, and last performance appraisal.

Commitment 2: An official is assigned responsibility for managing the IT asset tracking process.

A designated official is necessary to adequately manage the process. The official will ensure that an IT asset inventory is developed and maintained so that assets are accurately tracked. Staff or external advisors may be assigned to assist the official in conducting IT asset tracking and in verifying and validating IT asset inventory data.

Prerequisites

Prerequisite 1: Adequate resources are provided for performing the IT asset tracking activities.

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 inventory database;
- inventory reporting, updating, and query tools; and
- a method for communicating inventory changes to affected parties.

Prerequisite 2: An IT investment board exists and oversees the development and maintenance of IT asset tracking activities.

An IT investment board

- authorizes the establishment of an IT asset inventory and the identification of essential data elements and component items,
- oversees changes to the IT asset inventory, and
- oversees the on demand requests and notification of parties using the IT asset inventory–which may include the investment board members, accounting or finance groups, business units, and the budget office.

(See Stage 2–IT Investment Board Operation for a description of the roles and responsibilities of each investment board.)

Activities

Activity 1: The organization's IT asset inventory is developed and maintained according to a written procedure.

A standard, documented procedure is used so that developing and maintaining the inventory is a repeatable event, which produces inventory data that are timely, sufficient, complete, and comparable. The inventory can be prepared by the IS support component of an organization with the verification and validation performed by the designated official.

An IT asset inventory typically includes

- hardware (e.g., computers, monitors, printers, storage devices, telecommunication devices, cables);
- software (e.g., operating systems, databases, applications);

- personnel (e.g., development staff, training and support staff, operations and maintenance (O&M) staff);
- professional services (e.g., development and support contracts, leasing contracts, service contracts); and
- software licensing agreements.

Activity 2: IT asset inventory changes are maintained according to a written procedure.

Changes and updates to the inventory are maintained in an orderly, documented manner. Maintaining the integrity of the inventory is important to ensure that the inventory is a useful decision-making tool. Proper maintenance procedures may be indicated by

- the designation of an individual or organizational entity responsible for maintaining the integrity of the inventory and
- regularly recorded changes and updates.

Activity 3: Investment information is available on demand to decisionmakers and other affected parties.

The IT inventory is only of value to the extent that decisionmakers and stakeholders can and do use it. Knowledge of the contents of the inventory by staff and managers throughout the organization can avoid asset duplication and reconcile overlapping resources. For example, an inventory report 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 4: Historical IT asset inventory records are maintained for future selections and assessments.

The inventory, as it is maintained, becomes an archival source of information that can be used during future project selections and investment evaluations.

Evidence of Performance

Evidence 1: Physical evidence of IT Asset Tracking exists.

Physical evidence could include, for example

- the IT asset inventory;

- inventory database tools including bar coding tags and detectors; and
- inventory reporting, updating, and query tools.

Evidence 2: Documentary evidence of IT Asset Tracking is created and maintained.

Documentary evidence could include, for example

- written policy and procedures for developing and maintaining an IT asset inventory;
- an IT asset inventory report including records for categories such as hardware, software, personnel, professional services, and software licensing agreements;
- records of IT asset inventory changes and updates; and
- inventory reports that have been produced.

Evidence 3: Testimonial evidence is made available during reviews of IT Asset Tracking.

Testimonial evidence could include, for example

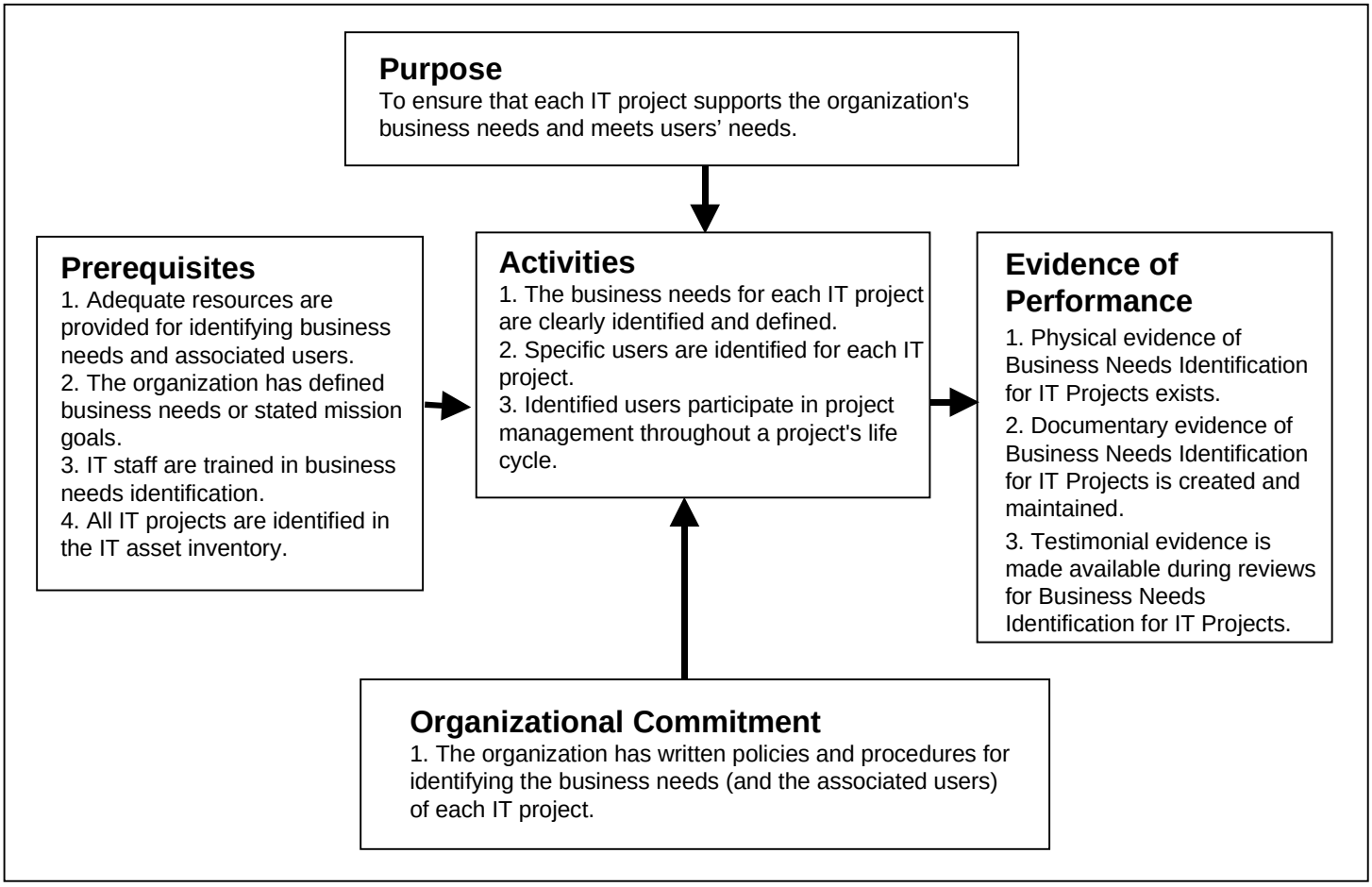
- interviews with people using the IT asset inventory such as investment board members, accounting or finance groups, business units, and the budget office;
- inventory staff interviews; and
- organization staff interviews.

Business Needs Identification for IT Projects

The benefits of IT projects and investments accrue to customers or end users performing an organizational business process. We will refer to both of these types of beneficiaries as users.

This critical process establishes the mechanism for identifying the business needs and the associated users that drive each IT project. Thus, this critical process creates the link between the organization's business objectives and its IT strategy and creates the partnership between the benefiting community and the IT solution providers. This critical process can also help (1) identify the sponsoring executive(s) or organization(s) and (2) establish the performance measures (e.g., reducing cycle time, increasing quality) by which each project's benefits will be assessed.

Figure 5.5: Business Needs Identification for IT Projects



Purpose	**To ensure that each IT project supports the organization's business needs and meets users' needs.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for identifying the business needs (and the associated users) of each IT project.** 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 internal guidance used for documenting business cases for IT investments. These policies and procedures typically specify that • this systematic process 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 fit within (or be waived from) the organization's enterprise IT architecture, • 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, • the procedure by which similar needs or opportunities within different operating units are reconciled, and • business needs identification occurs regularly as part of the strategic planning cycle.
Prerequisites	**Prerequisite 1: Adequate resources are provided for identifying business needs and associated users.** These resources typically involve • funding for these activities; • managerial attention to this process; • staff support for carrying out these activities; and

- supporting methods, analytical tools, and processes.

Prerequisite 2: The organization has defined business needs or stated mission goals.

These mission goals and business needs are 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 needs or goals, however, is largely outside the scope of ITIM. (See also, the section above entitled, Limitations and Boundaries of ITIM.)

Prerequisite 3: IT staff are trained in business needs identification.

The purpose of every IT project is to support identified business needs, opportunities, or mission goals. Thus, the IT personnel who provide these solutions must also be capable of understanding the business needs of their end users and the organization's work process customers. Examples of this training may include

- relevant conference attendance,
- organizational requirements for ongoing education, or
- staff rotation through supported business units.

Prerequisite 4: All IT projects are identified in the IT asset inventory.

To ensure that each IT project is supporting one or more business needs or mission goals, the organization must formally identify each IT project. This identification should be reflected in the IT Asset Inventory.

(See also Stage 2–IT Asset Tracking for a description of the activities associated with developing an IT asset inventory.)

Activities

Activity 1: The business needs for each IT project are clearly identified and defined.

Each IT project is directly or indirectly linked to at least one of the organization's business needs or mission goals, with a direct link being 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: Specific users are identified for each IT project.

Every IT project will have at least one set of benefiting end users or customers. A given project may indeed address the needs of multiple sets of end users or customer groups. However, the identified end users or customers will be formally identified by the organization.

Activity 3: Identified users participate in project management throughout a project's life cycle.

Since they are critical to each IT project's success, end users or customers must participate in each project. This participation can involve

- being identified as a participant in an integrated project management team (e.g., a multidisciplinary team comprised of business, IT, financial, and other members);
- using a project charter to create a contract-like relationship between the end users or customers and the IT project team;
- bringing in end user or customer representatives to participate in intermediate testing of the system being developed;
- placing customer or end user representatives on the development team;

- creating an internal financial charge-back mechanism for IT development projects; or
- placing the IT project under the management of the end user's or customer's sponsor.

Evidence of Performance

Evidence 1: Physical evidence of Business Needs Identification for IT Projects exists.

Physical evidence could include, for example,

- process improvement initiatives,
- training classes,
- the management of IT project efforts by its sponsor,
- end user/customer participation in intermediate testing,
- end user/customer membership on an IT project development team, and
- an internal financial charge-back mechanism for IT development projects.

Evidence 2: Documentary evidence of Business Needs Identification for IT Projects is created and maintained.

Documentary evidence could include, for example,

- a written policy and process (e.g., a business case methodology) for establishing the business needs of each IT project;
- defined business processes or stated mission purposes (documented in a strategic management or business plan (e.g., agency strategic plans prepared for GPRA), business process architecture documents, or performance measurement plans);
- contract-like relationship in IT project charters; and
- IT project membership that includes end users/customers.

Evidence 3: Testimonial evidence is made available during reviews for Business Needs Identification of IT Projects.

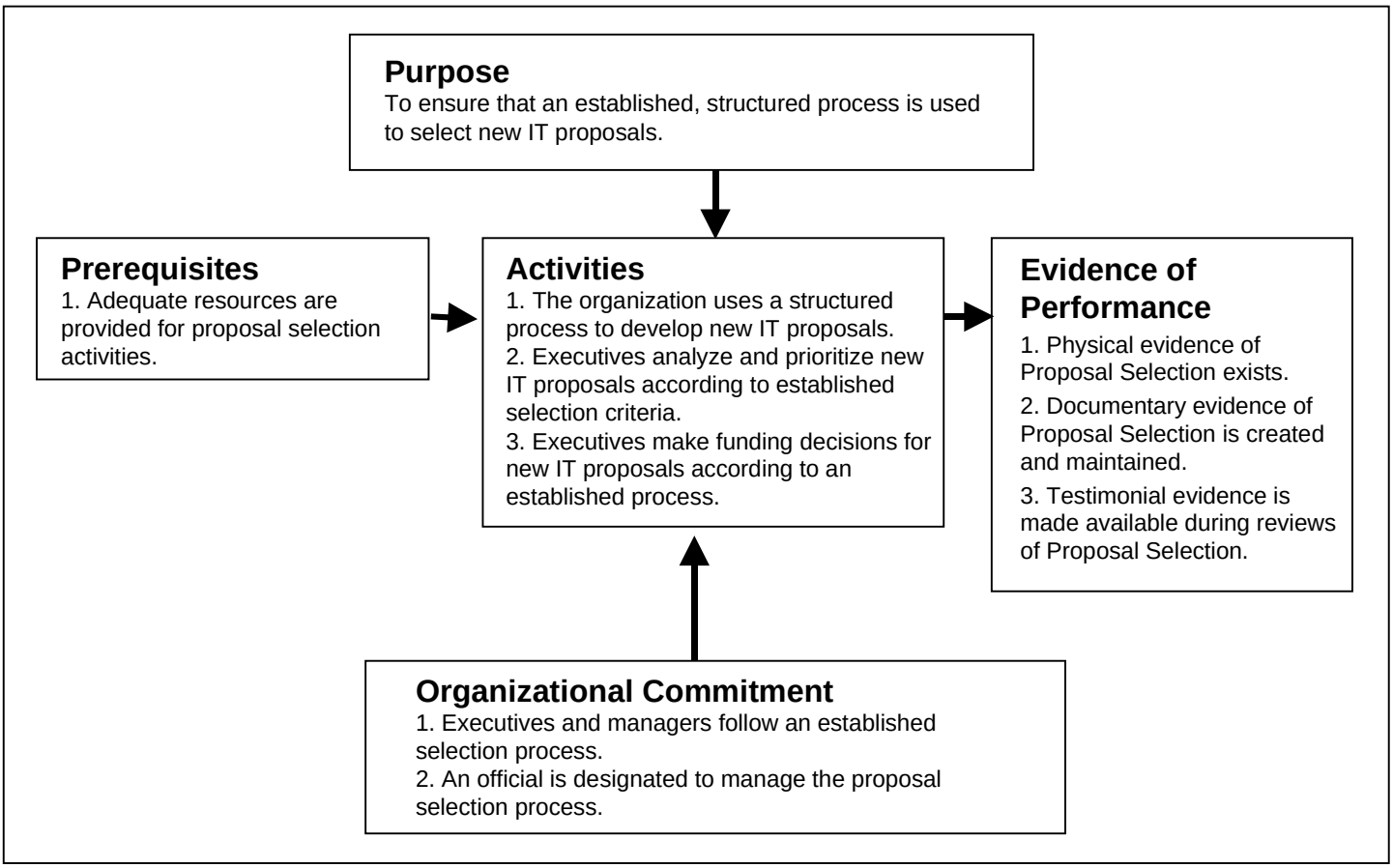
Testimonial evidence could include, for example,

- training instructor interviews,
- IT project sponsor interviews, and
- end user/customer representative interviews.

Proposal Selection

The purpose of this critical process is to establish a process for selecting IT proposals. A proposal selection process is a basic step toward implementing a mature IT proposal and project selection process in Stage 3. The key activities implemented within this process are (1) concurrent review of IT proposals by the organization's executives, (2) the use of predefined selection criteria to analyze the proposals, and (3) structured decision-making by executives to fund some proposals and not fund others.

Figure 5.6: Proposal Selection



Purpose	**To ensure that an established, structured process is used to select new IT proposals.**
Organizational Commitment	**Commitment 1: Executives and managers follow an established selection process.** To ensure that the most meritorious proposals within an organization are selected fairly, executives and line managers must accept and fully support the proposal selection process. They should have confidence that their proposals will be objectively assessed as a result of the process. Executives must understand the purpose behind the proposal selection process and be able to competently execute their duties within the process. As a basic step toward a mature selection process, this critical process can be performed with or without the creation of an IT investment board. **Commitment 2: An official is designated to manage the proposal selection process.** A designated official is necessary to adequately manage the process, particularly in an organization with little or no experience with IT investment management. The designated official will ensure that • the managers and staff in the organization are aware of the key events in the process, • proposals are collected and presented uniformly to senior management, and • feedback is provided to the affected parties.
Prerequisites	**Prerequisite 1: Adequate resources are provided for proposal selection activities.** These resources typically involve • managerial time and attention to the process; • 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.

Activities

Activity 1: The organization uses a structured process to develop new IT proposals.

The organization will use an organized, structured process for requesting IT proposals that require funding or organizational support. This activity will typically occur within the context of the organization's cyclical budgeting process. A designated official will manage the data submission and screening activities associated with the process.

Activity 2: Executives analyze and prioritize new IT proposals according to established selection criteria.

Executives receive and compare the submitted proposals to one another using previously agreed upon selection criteria such as cost and schedule. They should generally incorporate some type of cost/benefit analysis with respect to the strategic goals and missions of the organization. *(These selection criteria serve as the starting point for the development of the more mature decision-making criteria in Stage 3.)* Once the proposals have been compared using the selection criteria, the executives prioritize the new proposals.

Activity 3: Executives make funding decisions for new IT proposals according to an established process.

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 took place in the previous activities. Additionally, there should be evidence that some proposals are judged less meritorious than others and thus do not get funded as part of the decision-making process.

Evidence of Performance

Evidence 1: Physical evidence of Proposal Selection exists.

Physical evidence could include, for example

- the identification of a proposal selection process manager,
- new proposals being collected and sent to the IT board,
- proposal comparison and prioritization by the IT board, and
- a board consensus on final funding decisions.

Evidence 2: Documentary evidence of Proposal Selection is created and maintained.

Documentary evidence could include, for example:

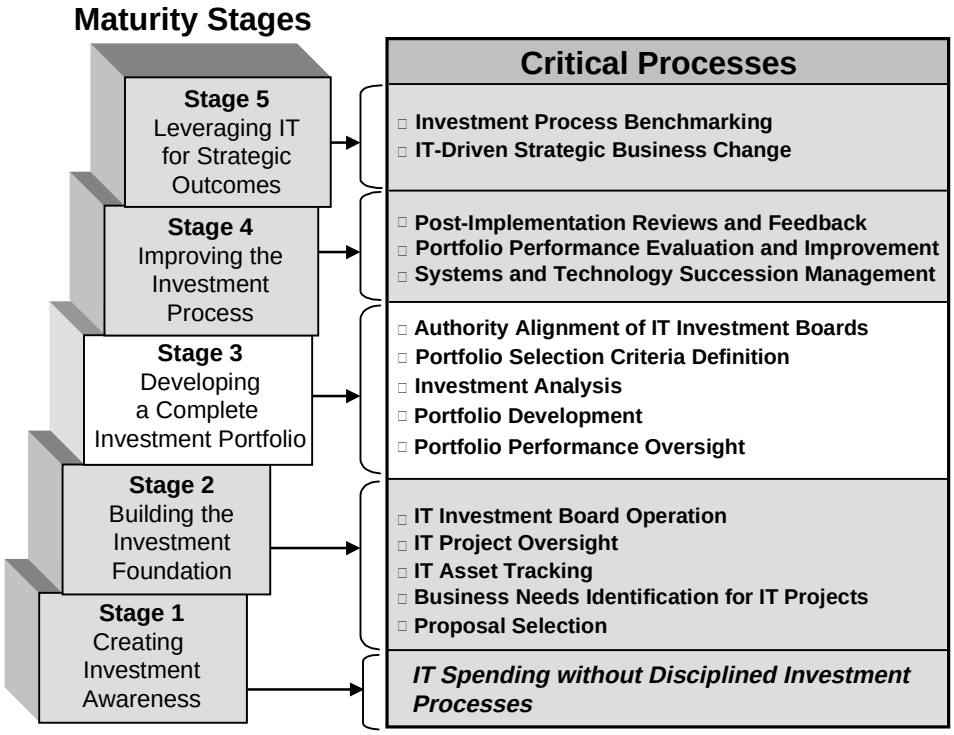
- a documented proposal selection process,
- a proposal solicitation memorandum, and
- final funding decision memorandum.

Evidence 3: Testimonial evidence is made available during reviews of Proposal Selection.

Testimonial evidence could include, for example:

- board member interviews,
- proposal team interviews, and
- proposal selection manager interviews.

ITIM Stage 3: Developing a Complete Investment Portfolio



During Stage 3, the IT 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 the strategic goals, objectives, and mission of the organization. The organization develops its IT investment portfolio by combining all IT assets, resources, and investments owned by an organization, considering new proposals along with previously funded investments and identifying the appropriate mix of IT investments that best meet its mission needs and improvement priorities. As such, this maturity stage is comprised of the following five critical processes:

- **Authority Alignment of IT Investment Boards** is the process for coordinating the responsibilities and activities of the IT investment boards when an organization uses multiple boards.

  Criteria: *Information Technology Investment* (AIMD-96-64), p. 25; *IT Assessment Guide* (AIMD-10.1.13), p. 9-10.

- **Portfolio Selection Criteria Definition** is the process used by decisionmakers to create and communicate to the organization the criteria used to select and fund IT investments.

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

- **Investment Analysis** is the process for examining the fundamental cost, benefit, schedule, and risk characteristics of each IT investment before they are funded and combined with other investments into a portfolio.

  Criteria: *IT Assessment Guide* (AIMD-10.1.13), p. 52, (CCA, OMB A-94, OMB A-130, OMB M-97-0(2)); *OMB IT Investment Guide*, p. 6-7.

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

  Criteria: *IT Assessment Guide* (AIMD-10.1.13), p. 32-35, *Capital Programming Guide*, p. 16-17; (CCA, OMB M-97-0(2)).

- **Portfolio Performance Management** is a process that builds upon the Stage 2 IT Project Oversight critical process by adding the elements of investment benefit and risk management to the control process activities.

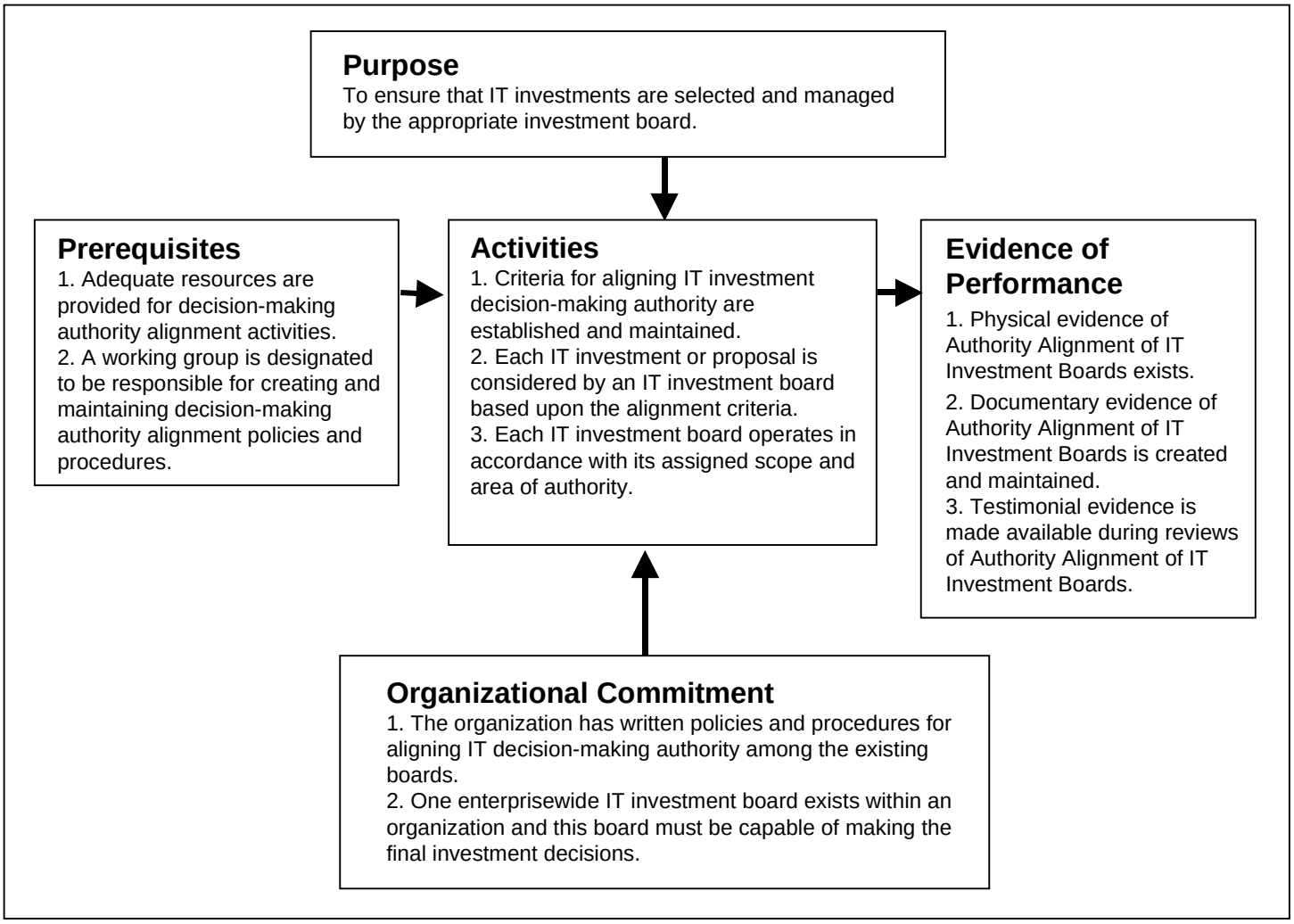
  Criteria: *IT Assessment Guide* (AIMD-10.1.13), p. 52-55, (CCA, PRA, FASA, EO 13011, OMB A-11, Part 3); *Information Technology Investment* (AIMD-96-64), p. 65; *IT Assessment Guide (*AIMD-10.1.13), p. 61-62, (CCA, GPRA, CFO, OMB A-127, OMB A-123).

Authority Alignment of IT Investment Boards

IT proposals and projects may originate from any organizational unit. Using decision parameters such as funding level requirements, degree of risk, type of investment, and organizational scope of expected benefits along with defining each IT investment board's scope of responsibility ensures that the organization selects IT proposals and projects as investments at the appropriate organizational level (e.g., corporate, division, office), by the appropriate IT investment board. For example, purchasing a dozen desktop computers for a specific work unit generally would not warrant the involvement of top executives. Conversely, designing or buying new software applications for organizationwide financial management activities typically requires broad executive sponsorship, participation, and review.

This critical process is based on the assumption that the organization has, or in the future might have, more than one IT investment board. For example, an organization may create one enterprisewide board to make strategic or organizationwide IT decisions and also may create lower level boards to make IT decisions unique to specific business entities. If the organization has only one IT investment board, then the common features, practices, and activities in this critical process should be implicitly executed by this single board.

Figure 5.7: Authority Alignment of IT Investment Boards



Purpose	**To ensure that IT investments are selected and managed by the appropriate investment board.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for aligning IT decision-making authority among the existing boards.**

The organization has documented policies and procedures that describe the processes for aligning and coordinating IT investment decision-making assignment and authority and for modifying these processes later.

These policies and procedures should specify the criteria for determining where in the organization different types of IT investment decisions are made. Typically, they should specify

- that individual business or operational units should retain decision-making authority for unit specific IT decisions (while still following enterprisewide standards and procedures);
- the relationship of the IT boards to the organization's enterprise IT architecture;
- that critical infrastructure investments and proposals (e.g., telecommunications, networks, large scale data processing) should usually be centrally controlled and monitored by the enterprisewide IT investment board;
- that cross-functional investments and proposals (e.g., organizationwide common applications) which could affect many departments and users across the organization should be raised to the enterprisewide IT investment board to ensure that the managers and users across these various departments buy into these investments and proposals;
- that IT investments and proposals with high cost or high risk or significant scope and duration should be considered by the enterprisewide IT investment board; and
- the procedure for passing decision-making assignment and authority for a given investment or proposal from one board to another.

Commitment 2: One enterprisewide IT investment board exists within an organization and this board must be capable of making the final investment decisions.

Regardless of the decision-making coordination mechanisms or hierarchy used by the organization, there can be only one enterprise level IT investment board and it must be capable of reviewing lower level board actions and invoking final decision-making authority over all IT investments. If disputes or disagreements arise over decision-making jurisdiction about a specific IT investment project, the enterprisewide board must be able to resolve the issue (i.e., by mediating disputes among unit-specific boards).

Prerequisites

Prerequisite 1: Adequate resources are provided for decision-making authority alignment activities.

These resources typically involve

- the attention and support of the managers and executives involved in the process and
- staff support for executing the activities.

Prerequisite 2: A working group is designated to be responsible for creating and maintaining decision-making authority alignment policies and procedures.

A designated working group–generally comprised of individuals from different parts of the organization–is identified and chartered with this responsibility. This working group will formulate the policies and procedures and senior management will then typically ratify the policies and procedures. This group is also expected to maintain and modify these policies and procedures as needed in consultation with and with the approval of senior executives.

Activities

Activity 1: Criteria for aligning IT investment decision-making authority are established and maintained.

The alignment criteria are used by the IT investment boards to redistribute IT investment assignment, decision-making, and review authority within the organization. These criteria can be based on cost, benefit, schedule, and risk (CBSR) thresholds, the number of users affected, business unit function (e.g., CIO, human resources, or program office), life cycle phase (e.g., research and development [R&D], full scale development, or O&M), or other comparable and useful measures. For example, an organization might decide that investments with less than a $100,000 lifecycle cost should be managed at the lowest departmental level, while investments

with more than $100 million in lifecycle cost should be managed by the enterprisewide investment board.

Activity 2: Each IT investment or proposal is considered by an IT investment board based upon the alignment criteria.

Based on the policy, criteria, and thresholds, decision-making authority for each IT investment or proposal is considered by a specific board at the appropriate organizational level. Once an IT investment is assigned to an investment board, it generally should not be reassigned. This promotes investment board ownership, investment responsibility, and the retention of an investment history.

Activity 3: Each IT investment board operates in accordance with its assigned scope and area of authority.

For the whole IT investment management process to function smoothly and effectively, each investment board must understand the established policies and procedures of the IT investment decision-making authority alignment and execute them within their scope and area of authority.

Evidence of Performance

Evidence 1: Physical evidence of Authority Alignment of IT Investment Boards exists.

Physical evidence could include, for example

- each IT investment board executing the decision-making authority alignment policy and
- the existence of an authority alignment policy working group.

Evidence 2: Documentary evidence of Authority Alignment of IT Investment Boards is created and maintained.

Documentary evidence could include, for example

- a written policy for decision-making authority alignment,
- specific criteria and thresholds for coordinating IT investment authority alignment, and
- IT board assignment memoranda/documents.

Evidence 3: Testimonial evidence is made available during reviews of Authority Alignment of IT Investment Boards.

Testimonial evidence could include, for example

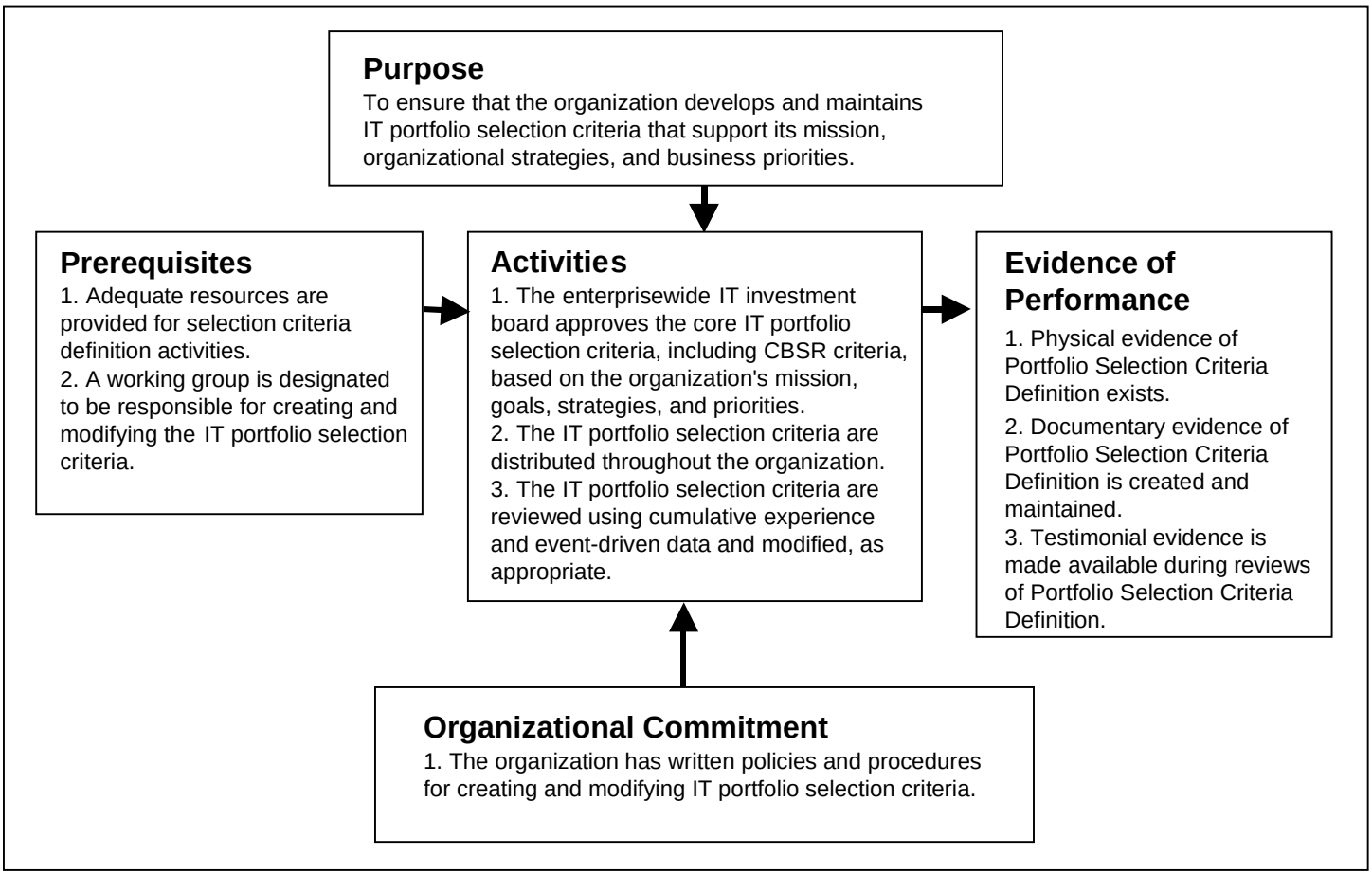
policy working group interviews and

investment review board interviews.

Portfolio Selection Criteria Definition

Portfolio selection criteria are a necessary part of an IT investment management process. Developing an IT investment portfolio involves defining appropriate IT investment cost, benefit, schedule, and risk (CBSR) criteria to ensure that the organization's strategic goals, objectives, and mission will be satisfied by the selected investments. Portfolio selection criteria reflect the strategic and enterprisewide focus of the organization and may be different from criteria 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 organizationwide 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. The portfolio selection criteria are used by the organization's IT investment board to select the IT investments that best support the organization's mission and clearly communicate to project managers the investment board's selection priorities. Additional criteria should address alignment with mission needs, organizational strategy, and line-of-business priorities. If an organization's mission or business needs and strategies change, these criteria should be re-examined. These criteria should also be applied as uniformly as possible throughout the organization to ensure decision-making consistency and process institutionalization.

Figure 5.8: Portfolio Selection Criteria Definition



Purpose	**To ensure that the organization develops and maintains IT portfolio selection criteria that support its mission, organizational strategies, and business priorities.**
Organizational Commitment	**Commitment 1: The organization has written 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. These policies and procedures typically specify • a working group, or person, that is designated to manage the criteria creation and modification process; • the 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; • suggested investment and proposal selection criteria; and • to whom the selection criteria should be distributed.
Prerequisites	**Prerequisite 1: Adequate resources are provided for selection criteria definition 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 is designated to be responsible for creating and modifying the IT portfolio selection criteria.** A group of people is designated to be responsible for managing the creation and modification of 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, a subset of this board to include the CIO or some other executive management team.

Activities

Activity 1: The enterprisewide IT investment board approves the core IT portfolio selection criteria, including 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 very important that the criteria also take into account the organization's IT architecture so as to (1) avoid unwarranted overlap across investments and (2) ensure maximum systems interoperability.

The selection criteria used for assessing and ranking individual investments and proposals should generally consist of the four essential investment elements: costs, benefits, schedule, and risks. Organizations typically establish broad categories related to the following four areas and then develop more specific sub-elements under each broad category.

- Cost may include lifecycle costs broken apart into initial costs, ongoing development costs, and indirect costs.
- Benefit may include tangible benefits and intangible benefits constructed using a variety of techniques (cost/benefit analyses using net present value, return on investment calculations).
- Schedule could include the lifecycle schedule and the schedule of benefits.
- Risk can include investment, organizational, funding, and technical risks.

The organization must determine how these criteria are applied and used to select IT investments for the portfolio. Costs and benefits are both affected by risks. A risk-adjusted return on investment type of calculation 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 should assign weights to each of the broad categories, as well as any sub-elements related to each category. This is done to help prioritize those sub-elements that the organization 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 agency'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.

Activity 2: The IT portfolio selection criteria are distributed throughout the organization.

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 IT project funding submissions.

In a larger organization with multiple IT investment boards, a lower level board may add its own criteria to these selection criteria. However, it cannot reduce this core selection criterion set.

(See Stage 3--Authority Alignment of IT Investment Boards for the activities associated with coordinating the responsibilities of multiple IT investment boards.)

Activity 3: The IT portfolio selection criteria are reviewed using cumulative experience and event-driven data and modified, as appropriate.

The IT investment selection criteria occasionally 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.

Evidence of Performance

Evidence 1: Physical evidence of Portfolio Selection Criteria Definition exists.

Physical evidence could include, for example

- an IT investment scoring model or decision support tool,

- meetings of the working group managing creation of portfolio selection criteria, and
- possession and use of IT portfolio selection criteria by project managers.

Evidence 2: Documentary evidence of Portfolio Selection Criteria Definition is created and maintained.

Documentary evidence could include, for example

- the written policy for creating and modifying the IT portfolio selection criteria;
- the IT portfolio selection criteria (including cost, schedule, benefit, and risk elements);
- the selection criteria weighting schema;
- a distribution list for selection criteria; and
- evidence of historic experience using selection criteria.

Evidence 3: Testimonial evidence is made available during reviews of Portfolio Selection Criteria Definition.

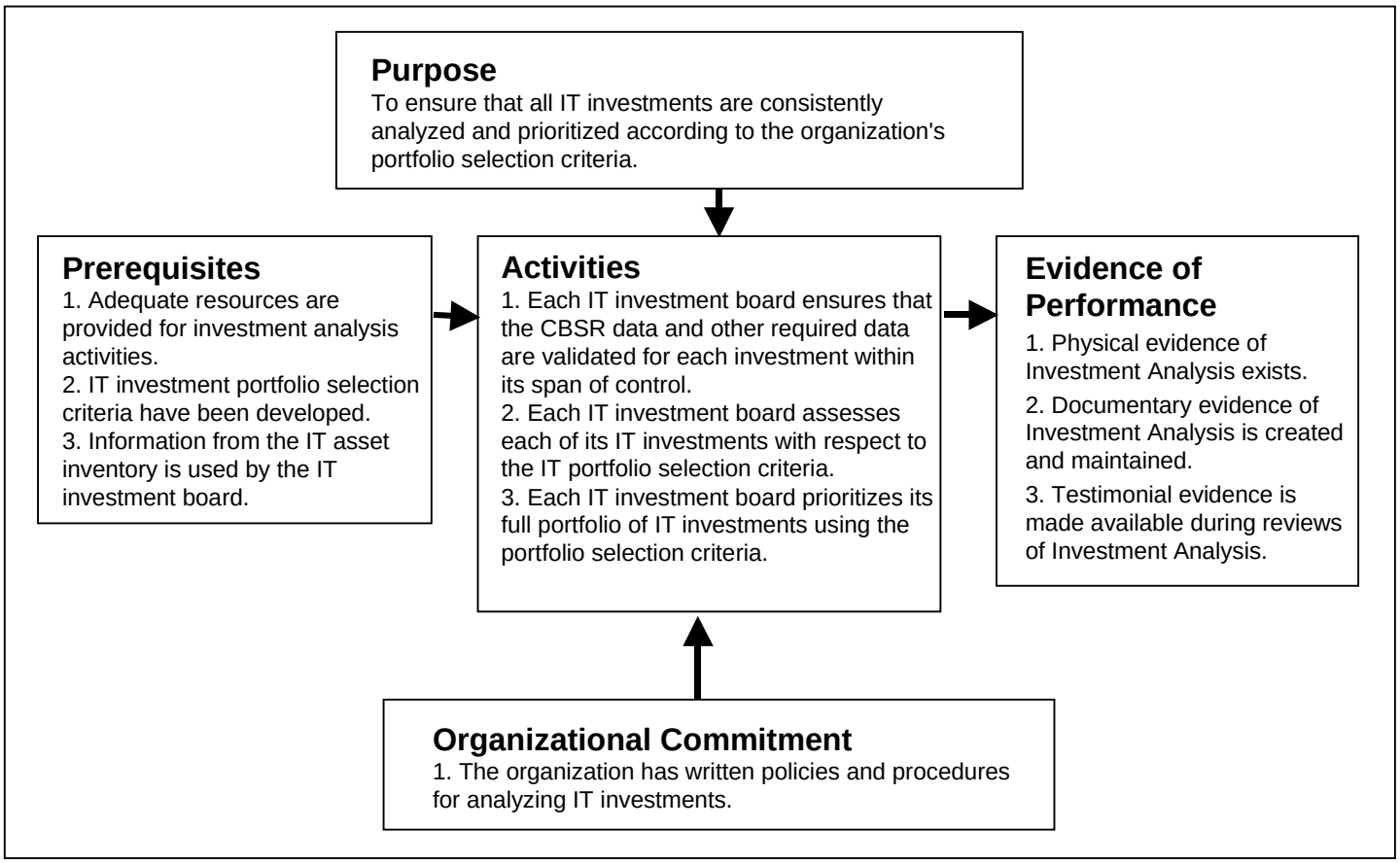
Testimonial evidence could include, for example

- working group interviews and
- project manager interviews.

Investment Analysis

IT investment analysis is one of the basic building blocks of the IT investment management approach. Many IT investments are a form of capital investment used by an organization to improve business performance, achieve its mission goals, and satisfy customers. This critical process establishes the mechanism for (1) analyzing each investment based on its expected costs, benefits, schedule and risks, (2) comparing each investment against the organization's portfolio selection criteria, and (3) creating a prioritized list of investments that align with mission improvement goals and organizational direction. With this critical process, the organization focuses on benefit measurement and risk management as significant factors with each investment.

Figure 5.9: Investment Analysis



Purpose

To ensure that all IT investments are consistently analyzed and prioritized according to the organization's portfolio selection criteria.

Organizational Commitment

Commitment 1: The organization has written policies and procedures for analyzing IT investments.

The organization has documented policies and procedures that describe the processes for analyzing IT investments under consideration. These policies and procedures typically specify the following:

- Each IT investment board must use investment analysis as the basis for decision-making to ensure that (1) the investments that will best serve the organization are selected and (2) all investments are fairly considered.
- Key tasks that decisionmakers should consider when analyzing investments relative to the IT portfolio selection criteria. For example, the scoring process–including explanations and definitions for scores–should be documented. This is important for composite scoring methodologies used for rating investments on any or all of the CBSR criteria.
- Investment projects with missing or invalid project management data will be corrected or removed from funding consideration.
- Decisionmakers should identify and address IT investments and proposals that are conflicting, overlapping, strategically unlinked, or redundant. To help do this, the IT investment board should take into consideration the organization's IT architecture.
- Initial investment and proposal information screening mechanisms should be considered by larger organizations or organizations with many IT investments and proposals.
- Investments should be "modularized" (e.g., managed and procured in well-defined useful segments or "modules" that are short in duration and small in scope) to the maximum extent achievable.

Prerequisites

Prerequisite 1: Adequate resources are provided for investment analysis activities.

These resources typically involve

- managerial time and attention to focus on investment analysis,

- staff support for carrying out activities within this critical process, and
- supporting tools and equipment to be used by the staff.

Prerequisite 2: IT investment portfolio selection criteria have been developed.

The Stage 3–Portfolio Selection Criteria Definition critical process must be implemented before this critical process can be accomplished.

Prerequisite 3: Information from the IT asset inventory is used by the IT investment board.

The asset inventory is necessary to ensure that each board is aware of all of the investments and resources for which it is responsible.

(See also Stage 2–IT Asset Tracking for a description of the activities associated with developing an IT asset inventory).

Activities

Activity 1: Each IT investment board ensures that the CBSR data and other required data are validated for each investment within its span of control.

The cognizant IT investment board is responsible for ensuring that the data submitted by each IT investment and IT proposal are valid. Once validated, these data will typically become the baseline performance expectations against which the investment will be measured in the future. Validation activities typically include

- ensuring the completeness, timeliness, and accuracy of the data;
- investigating the assumptions on which the investment is based;
- understanding the sensitivity of CBSR estimates to potential changes or disruptions (e.g., the risk of investment delay due to unseen significant demand for the manufacturer's hardware);
- receiving signed memoranda or meeting with potential end users, customers, and sponsors to assess support for the investment and identify similar external efforts (a potential verification and validation source);
- analyzing links between the investment and the organization's mission, strategies, and plans; and
- ensuring that the investment is not duplicative.

Though ultimately responsible for the results, IT investment boards in larger organizations may delegate much of this activity to supporting staff or working groups. For large, long-term, expensive, or important investments, the board may also have internal audit and quality control staff or external reviewers and experts analyze and comment on the validity of the investments' CBSR data.

Activity 2: Each IT investment board assesses each of its IT investments with respect to the IT portfolio selection criteria.

Using the validated investment or proposal data, the board assesses and reviews each individual investment relative to the established selection criteria. Depending on the size of the organization, supporting staff or working groups may first assess the investments using the criteria or the executives themselves may assess the investments. The output from this activity should be a list of the investments and their associated assessments.

One technique an organization may consider is the use of scoring to evaluate IT investments. With a scoring technique, the assessment body typically attaches numerical scores and "relative value" weights to each of the individual selection criteria. Investments are then assessed relative to these scores and then against weights associated with each individual criterion. Finally, the weighted scores are summed to create a numerical value for each investment. These scoring exercises, however, should not be used as surrogates for a thorough analysis and review of CBSR data.

Activity 3: Each IT investment board prioritizes its full portfolio of IT investments using the portfolio selection criteria.

Based on the output from the preceding assessment activity, the board creates a ranked list of all proposed and ongoing IT investments. This list will provide the basis for decision-making in the Portfolio Development critical process.

Evidence of Performance

Evidence 1: Physical evidence of Investment Analysis exists.

Physical evidence could include, for example

- examples of each IT board validating CBSR data for each investment;
- meetings with project staff, end users, customers, and sponsors;
- each IT board analyzing and scoring each IT investment; and

- each IT board prioritizing each IT investment.

Evidence 2: Documentary evidence of Investment Analysis is created and maintained.

Documentary evidence could include, for example,

- a written policy and procedure for analyzing IT investments,
- an investment scoring method (especially for composite scoring methods),
- IT investment validation data,
- a list of IT investments and associated scores, and
- a prioritized ranked list of IT investments.

Evidence 3: Testimonial evidence is made available during reviews of Investment Analysis.

Testimonial evidence could include, for example,

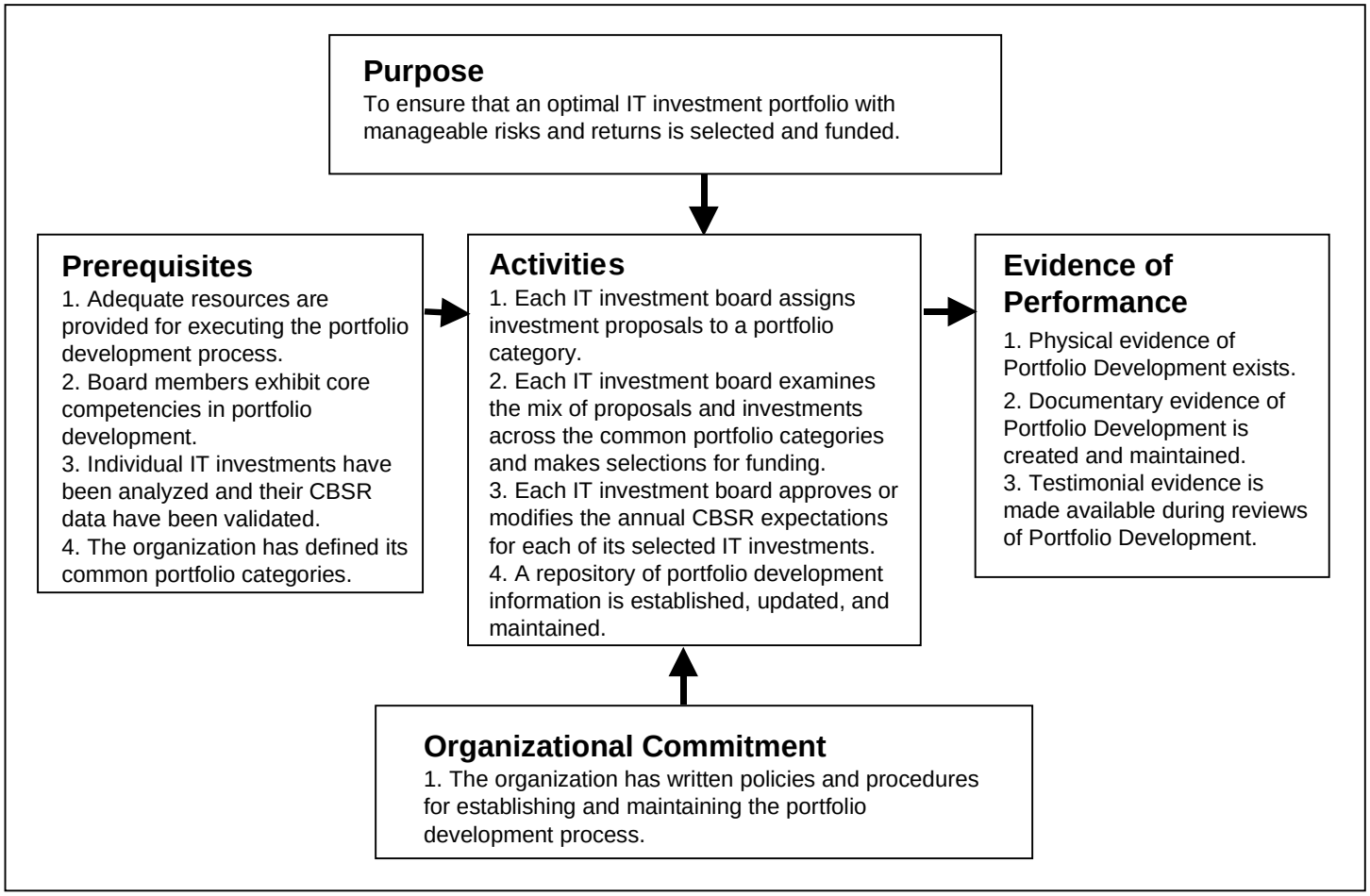
- IT board interviews and
- working group interviews.

Portfolio Development

Individual IT investments vary in type and purpose. Some investments may involve purchasing hardware, others involve developing software, and still others may involve operating or maintaining IT systems. The portfolio development process ensures that each IT investment board collectively analyzes and compares all investments and proposals to select those that best fit with the strategic business direction, needs, and priorities of the organization.

Additionally, each organization has practical limits on funding, the risks it is willing to take, and the length of time for which it will incur costs on a given investment before benefits are realized. To address these practical limits, the portfolio development process 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.

Figure 5.10: Portfolio Development



Purpose	**To ensure that an optimal IT investment portfolio with manageable risks and returns is selected and funded.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for establishing and maintaining the portfolio development process.** The organization's policies and procedures for developing IT investment portfolios typically • provide common definitions for IT investment portfolio categories, • apply to each IT investment board as each develops it comprehensive IT investment portfolio, • stipulate conditions that must be met for investment funding decisions where exceptions are made, and • include a mechanism for reconciling differences between the IT investment portfolio and the organization's enterprise IT architecture.
Prerequisites	**Prerequisite 1: Adequate resources are provided for executing the portfolio development process.** These resources typically involve • managerial time and attention to focus on portfolio development, • staff support for carrying out activities within this critical process, and • supporting portfolio development tools and equipment to be used by the staff. **Prerequisite 2: Board members exhibit core competencies in portfolio development.** Understanding the principles behind the portfolio development process is critical to successfully executing this process. Thus, training for board members may be necessary 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, and operational procedures for investment selection, control, and evaluation.

Prerequisite 3: Individual IT investments have been analyzed and their CBSR data have been validated.

The processes associated with the Stage 3–Investment Analysis critical process must be in place before the processes in this critical process can be accomplished.

Prerequisite 4: The organization has defined its common portfolio categories.

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 create a common set of definitions if the organization employs multiple boards.

Common portfolio categories should enhance decision-making during the portfolio development process. As such, the organization should use categories that are easy to understand and that correspond to the type of investment funding commonly pursued by the organization. For example, the organization may wish to define the categories on the basis of the investment lifecycle (e.g., R&D, full scale development, O&M), investment cost (e.g., <$1M, $1-5M, >$5M), risk (e.g., high, medium, or low), or functionality (e.g., finance, human resources, or program). IT investments would then be categorized by their current stage in their lifecycle as each IT board creates its portfolio.

The organization may also want to define a set of thresholds for each common portfolio category. These thresholds should be meaningful to the organization, useful when making investment decisions, and differentiate the categories from one another. For example, an organization using functional categories could define CBSR thresholds for each category, such as

- the maximum investment cost variances (e.g., both annually and in total),
- the minimum benefit that a given investment is expected to achieve (e.g., a return on investment “hurdle rate”),

- the maximum length of time an investment should take (e.g., the maximum allowable development time), and
- a maximum risk assessment score derived using an industry accepted risk evaluation tool.

A smaller organization with relatively few investments may want to use a simple set of portfolio categories.

Activities

Activity 1: Each IT investment board assigns investment proposals to a portfolio category.

The IT investments that have successfully completed the Investment Analysis process are assigned to portfolio categories. For example, each investment in its development phases might be assigned to a development category (with its associated investment analysis material being made available to the investment board). The board members then compare all development phase investments to one another within that category.

The key to this activity is whether or not an investment cleanly falls within a given category. If an investment does not fall within a category, either the investment should (1) be modified for further consideration or (2) not be funded. For example, an R&D category may have a schedule threshold that dictates that R&D investments must be completed in less than 1 year. Thus, if a high-risk R&D investment is scheduled to take 3 years for completion, (1) it could be sent back to the investment team for modularization into multiple 1 year investments with defined deliverables and expected benefits that could, in the future, be individually funded, (2) it could be otherwise modified for future consideration, or (3) it should not be funded. There may be unique and unusual circumstances where an investment that does not fit within a predefined portfolio category is deemed sufficiently important by the organization's management to be funded anyway. This type of special investment should receive an extraordinary level of management involvement, analysis, and monitoring during its life cycle.

(See Stage 3–Investment Analysis for activities associated with investment and proposal rank ordering.)

Activity 2: Each IT investment board examines the mix of proposals and investments across the common portfolio categories and makes selections for funding.

Once the investments are assigned to portfolio categories and each investment fits within each category, the investment board completes the selection process by examining the portfolio's mix of investments and making final investment decisions. Executive discretion and managerial judgment may be used during this part of the process.

To provide decisionmakers 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 are then summed and normalized to produce a cumulative score that establishes the investment or proposal's relative worth and allows comparison against all of the other investments, proposals and investments.

(See also the *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) 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 investment team,

- unique or significant links between the investment and the organization's mission, strategies, and plans, or
- historical data, data on similar investments, or their own investment management experiences.

Activity 3: Each IT investment board approves or modifies the annual CBSR expectations for each of its selected IT investments.

The board modifies or approves annual CBSR expectations for each investment. Since some investments may span multiple years and many organizations perform investment selection on an annual cycle, the investment board needs to annually approve each investment's expectations (e.g., the CBSR performance expectations for an investment to meet or exceed by the end of 1 year). These investment expectations should also take into account each investment's past performance.

Additionally, these investment expectations will serve as the basis for future board reviews, control process activities, and post-implementation reviews.

Activity 4: A repository of portfolio development information is established, updated, and maintained.

The organization creates a repository for storing information (e.g., investment CBSR expectations and portfolio category thresholds) related to the portfolio development process. This repository can be a part of a larger IT investment management information system or a component of the IT asset inventory and may be centrally or decentrally located 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.

Evidence of Performance

Evidence 1: Physical evidence of Portfolio Development exists.

Physical evidence could include, for example,

- evidence of managerial time and attention to portfolio development,
- staff support for portfolio development,
- portfolio development tools and equipment,
- board members knowledge about the portfolio development, and

- board-created performance expectations for each funded IT investment.

Evidence 2: Documentary evidence of Portfolio Development is created and maintained.

Documentary evidence could include, for example,

- a written policy for establishing and maintaining the portfolio development process;
- individual IT investment analysis reports;
- individual IT investment CBSR expectations;
- common portfolio categories, associated CBSR thresholds, and funded proposals and investments in each category;
- the annual performance expectations for each funded IT investment; and
- a repository of portfolio development activities.

Evidence 3: Testimonial evidence is made available during reviews of Portfolio Development.

Testimonial evidence could include, for example,

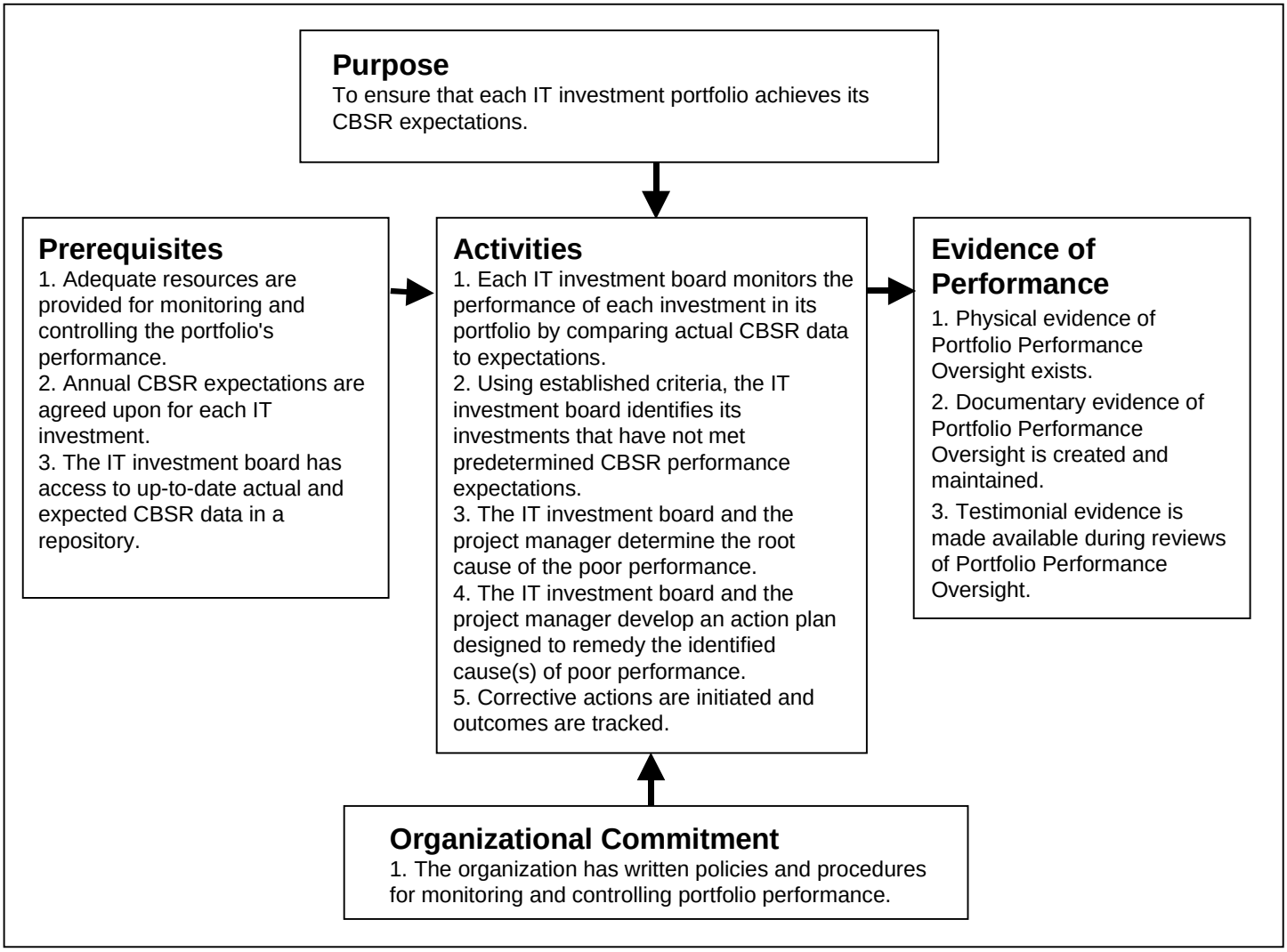
- IT board member interviews and
- working group/support staff interviews.

Portfolio Performance Oversight

This critical process builds upon the Stage 2–IT Project Oversight critical process by adding the elements of benefit measurement and risk management to an organization's investment control capacity. Compared to less mature organizations, Stage 3 organizations will have the foundation needed to control the risks faced by each investment and to deliver benefits linked to mission performance. 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 CBSR 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 CBSR expectations. These investment (and portfolio) expectations are the baseline for periodic performance reviews that examine the costs incurred, the benefits attained, the current schedule, and the risks mitigated, eliminated, or accepted to date. As such, this critical process does not focus on, for example, the size and attributes of the benefits for a given investment. Benefit expectations were defined during the investment selection processes. 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.

Figure 5.11: Portfolio Performance Oversight



Purpose	**To ensure that each IT investment portfolio achieves its CBSR expectations.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for monitoring and controlling portfolio performance.**

These policies and procedures typically specify the following:

- The IT investment board is responsible for managing and executing the policies and procedures for portfolio performance review.
- Actual investment CBSR data and investment CBSR expectations are used as the basis for reviewing portfolio performance. (See Stage 3–Portfolio Development for a description of CBSR expectation setting.)
- The predetermined performance threshold that the IT investment board(s) should use when analyzing actual-versus-expected IT investment performance. This threshold is typically defined on the basis of the CBSR measures (e.g., more than 10 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.
- The project manager maintains information about the current status of the investment and its CBSR performance outcomes.
- Changes to the investment's expectations and commitments are made with the involvement and agreement of the stakeholders.
- The scope and frequency of portfolio performance reviews.
- Investment performance is reviewed by a working group composed of
    - the IT investment board,
    - the project manager,
    - the executive sponsor, and
    - members of the customer groups (e.g., business units).

Prerequisites

Prerequisite 1: Adequate resources are provided for monitoring and controlling the portfolio's performance.

These resources typically include

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

Prerequisite 2: Annual CBSR expectations are agreed upon for each IT investment.

Each investment has had annual CBSR performance expectations set for it. These expectations should be set as part of the selection-related critical processes in this stage. However, they may arise from other processes if the selection-related critical processes in this stage have not yet been fully implemented.

(See Stage 3–Portfolio Development for a description of portfolio CBSR expectation setting.)

Prerequisite 3: The IT investment board has access to up-to-date actual and expected CBSR data in a repository.

A repository for investment performance data, potentially as part of the IT Asset Inventory, has been established to capture, organize, and maintain investment expectations and actual CBSR data obtained during investment reviews. For efficiency reasons, the organizations may want to combine this repository with databases from other critical processes.

Activities

Activity 1: Each IT investment board monitors the performance of each investment in its portfolio by comparing actual CBSR data to expectations.

The IT investment board is responsible for monitoring each investment's CBSR performance. The IT investment board examines actual investment performance to date with each investment's expectations using the collected investment CBSR 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 this activity,

- conducting this review during a formal project review activity,
- documenting annual and life cycle CBSR expectations as a basis for the comparison, and
- using historical organizational performance data and industry baseline data as a basis for comparisons.

(See Stage 3–Investment Analysis for a description of investment-level CBSR expectation setting and see Stage 3–Portfolio Development for a description of portfolio CBSR expectation setting.)

Activity 2: Using established criteria, the IT investment board identifies its investments that have not met predetermined CBSR performance expectations.

The board identifies underperforming IT investments in its portfolio by comparing each investment's recent actual CBSR data to its CBSR expectations.

Organizations may also wish to use a spreadsheet or a graphic illustration (e.g., a management "stoplight" with green, yellow, and red identifiers) to summarize this investment data. A graphic illustration provides a simple way for board members to quickly understand the status of each investment and potential emerging problem areas.

Some investments that the board reviews may exceed CBSR expectations (e.g., at lower costs, in less time, and provide better benefits than expected). For these investments, 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.

Activity 3: The IT investment board and the project manager determine the root cause of the poor performance.

For each investment that has not met its predetermined CBSR performance expectations, analysis is performed to determine the root cause of the poor performance. Depending on the size and importance of the investment within the portfolio and the severity of the deficiency, external reviewers or experts may be used to analyze the investment and deficiencies.

Beyond determining the cause of the deficiencies, it is important for the IT investment board and project management to come to some agreement

about the cause of the deficiencies. This will ensure that workable solutions are created.

Activity 4: The IT investment board and the project manager develop an action plan designed to remedy the identified cause(s) of poor performance.

Based on the analysis, the involved parties agree on the corrective actions to be executed as part of the action plan. Typical corrective actions include

- modifying the investment,
- resolving resource constraints or capability problems contributing to performance gaps,
- working only on one part and stopping work on the rest of the investment (until a milestone is reached or so as not to exceed a set period of time),
- temporarily stopping the investment to permit external work to be completed, or
- terminating the investment.

Activity 5: Corrective actions are initiated and outcomes are tracked.

The investment board is responsible for tracking the investment and ensuring that

- corrective actions as described in the action plan are executed by the project manager until the desired outcome is achieved and
- if the project's performance has been sufficiently poor, an independent review is conducted to ensure that all corrective actions have achieved the intended results and to determine whether additional changes or modifications are still needed.

Evidence of Performance

Evidence 1: Physical evidence of Portfolio Performance Oversight exists.

Physical evidence could include, for example,

- each investment board monitoring the CBSR performance of each investment in its portfolio,
- portfolio monitoring tools such as a spreadsheet or a graphic communication device,
- each board identifying investments that are significantly underperforming their CBSR expectations,
- each board determining the root cause of the investment's performance discrepancies,
- each board and its project manager developing investment corrective action plans, and
- each board tracking the implementation of each investment's corrective action plan.

Evidence 2: Documentary evidence of Portfolio Performance Oversight is created and maintained.

Documentary evidence could include, for example,

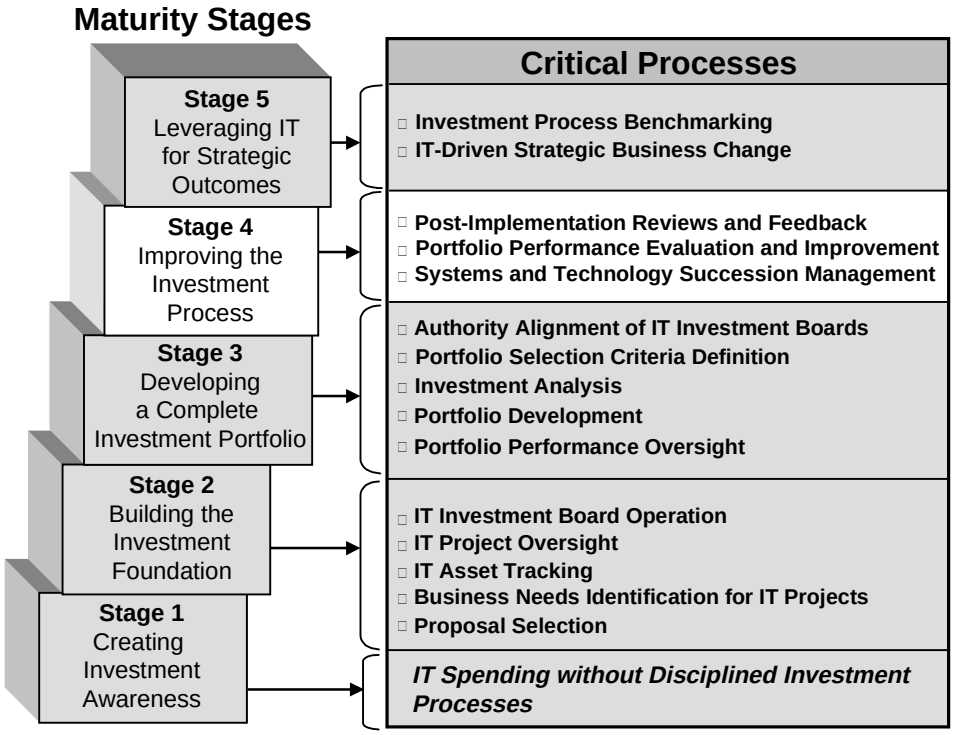
- portfolio monitoring reports,
- a written policy for managing portfolio performance,
- up-to-date investment CBSR data,
- investment exception reports or investment CBSR gap analysis reports,
- evidence of investment root cause analysis, and
- evidence of investment corrective action plan.

Evidence 3: Testimonial evidence is made available during reviews of Portfolio Performance Oversight.

Testimonial evidence could include, for example,

- board member interviews and
- project manager interviews.

ITIM Stage 4: Improving the Investment Process



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

Post-Implementation Reviews and Feedback is the process for conducting post-implementation reviews (PIRs) to learn from past investments and initiatives by comparing actual results to estimates.

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

Portfolio Performance Evaluation and Improvement is the process for evaluating portfolio performance and using this information to improve both current IT investment processes and future investment portfolio performance.

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

Systems and Technology Succession Management is the process for analyzing and managing the succession of identified IT investments and assets to their higher-value successors.

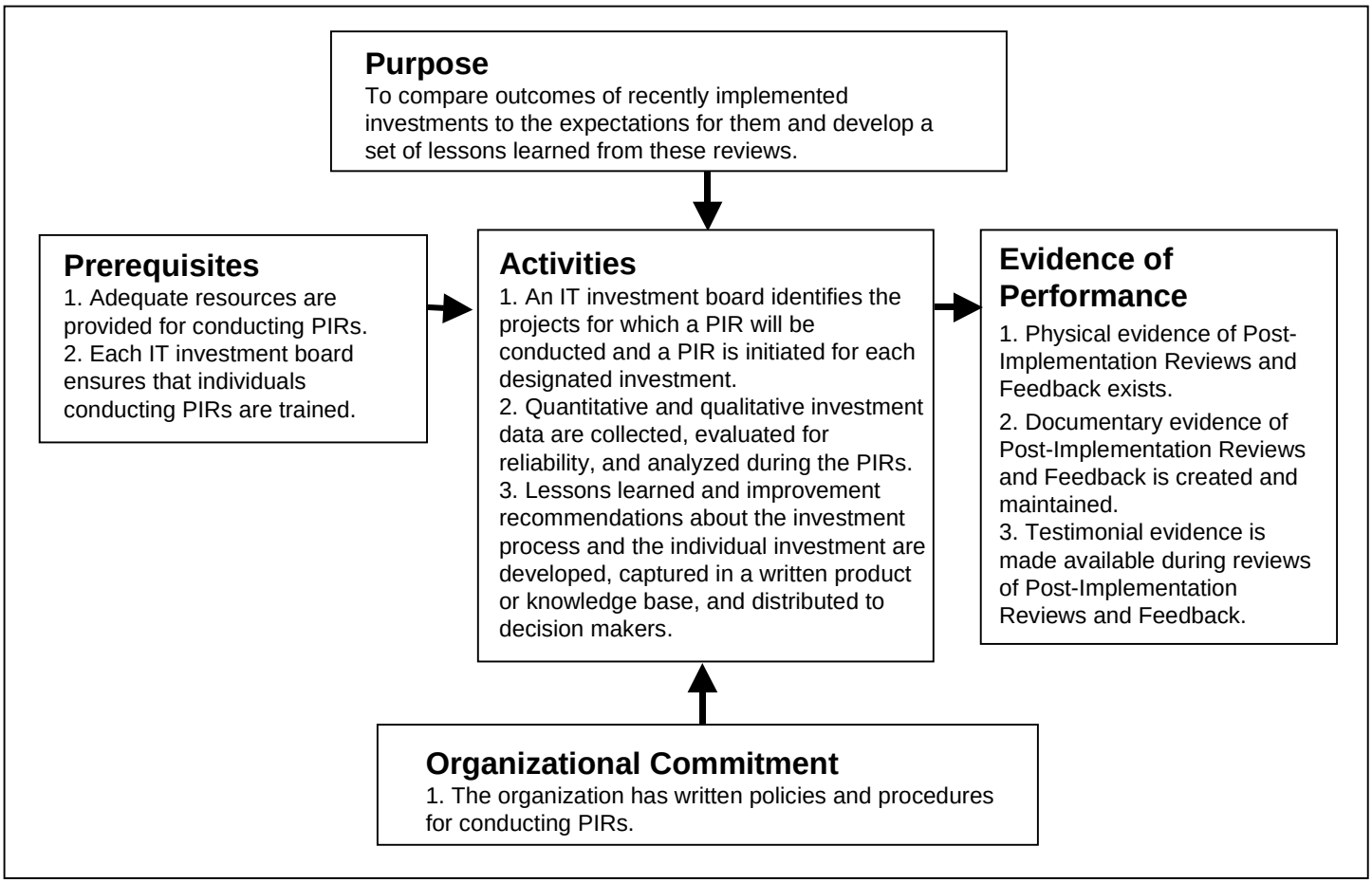
Criteria: SIM Executive Guide (AIMD-94-115); *Year 2000 Computing Crisis: An Assessment Guide* (AIMD-10.1.14), p. 10; *Capital Programming Guide*, pp. 54-55.

Post-Implementation Reviews and Feedback

The purpose of a post-implementation review (PIR) is to evaluate an investment after it has completed development (e.g., 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 versus 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.

The timing of a PIR can be problematic – a PIR conducted too soon after a investment has been implemented may fail to capture the full benefits of the new system. In contrast, the institutional knowledge about a investment can be lost if the PIR is conducted too late. 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 investment project and expectations for the timing of benefit realizations documented in the project plans.

Figure 5.12: Post-Implementation Reviews and Feedback



Purpose	**To compare outcomes of recently implemented investments to the expectations for them and develop a set of lessons learned from these reviews.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for conducting PIRs.**

These policies and procedures typically specify

- who conducts and participates in a PIR;
- type and size of investments for which a PIR is conducted;
- when it is appropriate to conduct a PIR;
- what information is presented in a PIR;
- if and when the standard PIR process can be tailored for a specific investment and the criteria and procedures for doing so;
- 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).

PIR contents should generally include

- investment expectations;
- actual investment results (e.g., end user satisfaction, technical capability, mission and program impact, unanticipated benefits);
- environmental changes that impacted the investment;
- a review of the assumptions made during the decision-making period;
- expected next steps for the investment;
- general conclusions (lessons learned); and
- recommendations to executives.

Prerequisites

Prerequisite 1: Adequate resources are provided for conducting PIRs.

These resources typically involve

- assigning a team to prepare and conduct each PIR with one team member assigned 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: Each IT investment board ensures that individuals conducting PIRs are trained.

The value of the PIR will depend to a large degree on the credibility and competence of the team members conducting the study. Thus, the PIR team must be objective, well trained, and experienced when they conduct the PIRs. Also, the team leader should have past experience conducting similar investment reviews.

Activities

Activity 1: An IT investment board identifies the projects for which a PIR will be conducted and a PIR is initiated for each designated investment.

In accordance with organizational policy, an IT investment board will identify and designate the projects for which a PIR will be conducted. One or more examining teams will then conduct the PIR(s) on the designated projects. The standard PIR process may be tailored to the specific investment being reviewed.

Typically, PIRs will be conducted by a centralized group under the direction of the enterprisewide IT investment board. This approach enhances the consistency of the resultant products and ensures coverage of the appropriate projects per the organization's PIR policy. However,

there are other acceptable approaches and the organization should employ an 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 previously conducted. Specific types of quantitative data can include

- CBSR expectations and actual outcomes,
- updated CBSR data and explanations for changes,
- objective measures of business or mission impact such as reduced operating cost or reduced product cycle time, and
- measurements of improved technical capability.

In addition to quantitative investment data, qualitative information, such as the perspectives and insights from the 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 of senior decisionmakers involved in investment oversight.

Some common techniques for performing analyses during a PIR can include

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

Activity 3: Lessons learned and improvement recommendations about the investment process and the individual investment are developed, captured in a written product or knowledge base, and distributed to decisionmakers.

Lessons learned from the PIRs should be used to recommend changes that improve the (1) investment process (e.g., selection, control, or evaluation) and (2) the management of individual investments. For example, recommendations may include suggested refinements of selection criteria for the selection or control tasks.

Once the PIR is completed, it should be compiled, archived, and distributed to affected parties, particularly those with decision-making authority who could most benefit from the recommendations and lessons learned.

Evidence of Performance

Evidence 1: Physical evidence of Post-Implementation Reviews and Feedback exists.

Physical evidence could include, for example,

- the training of PIR teams;
- actual PIR execution;
- quantitative investment data that have been collected, validated, and evaluated for reliability;
- qualitative investment data that have been collected, validated, and evaluated for reliability; and
- a PIR product or knowledge base.

Evidence 2: Documentary evidence of Post-Implementation Reviews and Feedback is created and maintained.

Documentary evidence could include, for example,

- the written policy for conducting PIRs;
- a portfolio-based PIR schedule;
- quantitative investment data, such as CBSR expectations, actual data, project plans and objectives, and business or mission impact measurements;

- qualitative investment data, such as records of contractor and developer discussions, end user interviews, customer surveys, project management and staff interviews;
- evidence of investment process and individual investment lessons learned;
- resulting recommendations for management action; and
- PIR product or knowledge base reports.

Evidence 3: Testimonial evidence is made available during reviews of Post-Implementation Reviews and Feedback.

Testimonial evidence could include, for example,

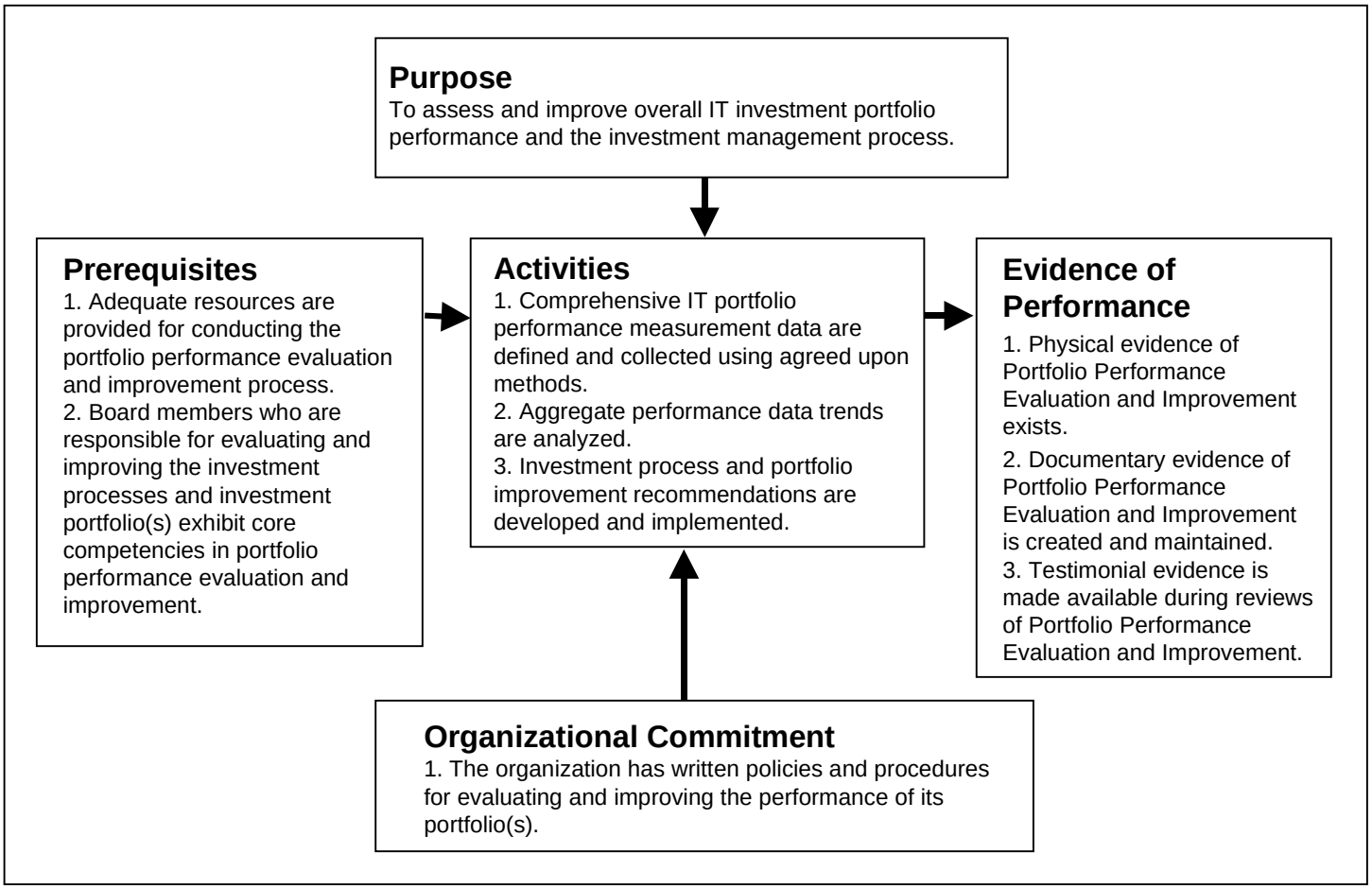
- PIR team member interviews,
- end user and customer interviews, and
- contractor and developer interviews.

Portfolio Performance Evaluation and Improvement

Ultimately, an organization needs to know how well its collected pool of investments in information management and technology are contributing to improvements in mission performance. Portfolio performance evaluation and improvement is the equivalent of a PIR for the investment portfolio. This critical process seeks to determine how well IT investments are (1) helping 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 the enterprise as a whole. To determine these things, performance information for an organization's entire portfolio of investments has to be compiled and analyzed and trends examined.

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

Figure 5.13: Portfolio Performance Evaluation and Improvement



Purpose	**To assess and improve overall IT investment portfolio performance and the investment management process.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for evaluating and improving the performance of its portfolio(s).** These policies and procedures typically specify the following: • each IT investment board is responsible for managing a comprehensive portfolio evaluation and improvement process, • access to portfolio data is provided and confidential/sensitive data are appropriately controlled, • each portfolio is 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 analysis results.
Prerequisites	**Prerequisite 1: Adequate resources are provided for conducting the portfolio performance evaluation and improvement process.** 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 portfolio performance evaluation and improvement.**

These members must be familiar with the IT investment management approach. Training for this critical process may also include familiarizing executives with economic and process management analysis techniques. 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 IT portfolio performance measurement data are defined and collected using agreed upon methods.

The portfolio of investments should be evaluated on its ability to meet 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 overall IT portfolio performance. This can be analogous to developing a balanced scorecard for overall IT investment performance. (For more information, see *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 overall 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 overall portfolio being managed?
- Are users satisfied with the products and services 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 types of 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 IT portfolio investments helped achieve expected improvements in operational or service delivery effectiveness and efficiency. The development of baseline performance data is critical to making this a meaningful exercise.

Activity 3: Investment process and portfolio improvement recommendations are developed and implemented.

Addressing problems or opportunities usually involves

- creating recommendations for the IT investment board;
- documenting the decision criteria, justification, and rationale;
- defining the expected benefits of the recommendation;
- making a decision on implementing each recommendation; and
- tracking the recommendation during implementation.

Evidence of Performance

Evidence 1: Physical evidence of Portfolio Performance Evaluation and Improvement exists.

Physical evidence could include, for example,

- annual overview of the investment process,

- collected portfolio performance data,
- staff analysis of aggregate portfolio data trends, and
- efforts toward investment process and portfolio improvement recommendations being developed and implemented.

Evidence 2: Documentary evidence of Portfolio Performance Evaluation and Improvement is created and maintained.

Documentary evidence could include, for example,

- a written policy for evaluating and improving its IT portfolio(s);
- portfolio performance measurement approach and method (including measures to be used);
- portfolio performance data, such as cost-effectiveness, improvements in user satisfaction, and investment performance; and
- portfolio trend analysis reports.

Evidence 3: Testimonial evidence is made available during reviews of Portfolio Performance Evaluation and Improvement.

Testimonial evidence could include, for example,

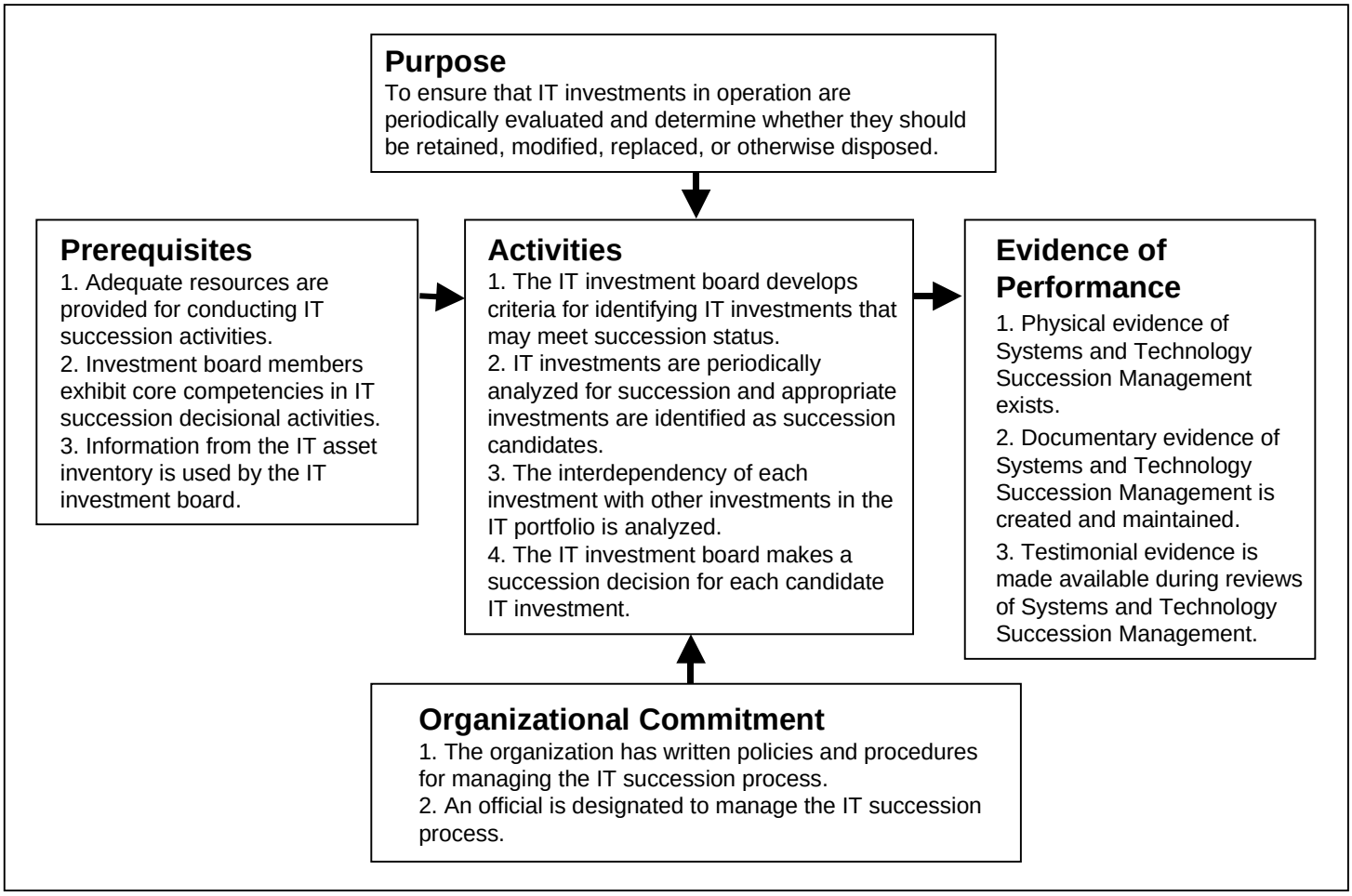
- board member interviews and
- working group interviews.

Systems and Technology Succession Management

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. Also, this critical process enhances the organization's ability to forecast, plan, and manage the migration to new system investments.

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 while 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 for it. The organizations at this maturity stage develop investment "exit criteria" such that investments can be "de-selected" appropriately. The critical process supports a migration to a forward-looking, solution-oriented view of IT investments.

Figure 5.14: Systems and Technology Succession Management



Purpose	**To ensure that IT investments in operation are periodically evaluated and determine whether they should be retained, modified, replaced, or otherwise disposed.**
Organizational Commitment	**Commitment 1: The organization has written policies and procedures for managing the IT succession process.** The organization has written policies and procedures that define how IT investments are identified, evaluated, and selected for succession. These policies and procedures typically specify • that each IT investment board is the cognizant authority for making IT succession decisions for investments within its domain, • that the enterprisewide IT investment board is the cognizant authority for making final IT succession decisions, • the coordination of succession decisions across multiple IT 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 activities.** These resources typically involve • the attention of executives involved in this process, • staff to support this process, and • supporting tools and equipment for the staff to use.

Prerequisite 2: Investment board members exhibit core competencies in IT succession decisional activities.

To make competent succession decisions, board members must have sufficient training to carry out their role. Since 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: Information from the IT asset inventory is used by the IT investment board.

The asset inventory is necessary to ensure that each board is aware of all of the investments and resources for which it is responsible and to be aware of the cognizant system owner/manager(s) affected by succession decisions.

(See also Stage 2–IT Asset Tracking for a description of the activities associated with developing an IT asset inventory.)

Activities

Activity 1: The IT investment board develops criteria for identifying IT investments that may meet succession status.

Each IT investment board develops the criteria that determine which types of investments are candidates for succession. 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 candidate criteria might include investments

- at, near, or exceeding their planned life cycles;
- in their O&M phases;
- which have encountered significant data conversion problems;

- which 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 3–Authority Alignment of IT Investment Boards for a description of the manner in which multiple investment boards interact.)

Activity 2: IT investments are periodically analyzed for succession and appropriate investments are identified as succession candidates.

The defined criteria are applied to the IT portfolio to identify the succession 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 as successor investments. The analysis should be based on the CBSR 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 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–IT Asset Tracking 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 succession candidates may be interdependent on other investments and projects. The purpose of this activity is to identify potential investment interdependencies and analyze the effects and severity of succession. Potential solutions to these interdependencies and secondary effects should also be devised. The board may find it necessary to revise the succession plans of some investments based on the analysis of effects on secondary investments.

Activity 4: The IT investment board makes a succession decision for each candidate IT investment.

Succession decisions will usually fall into the following categories:

- Retain/continue – Take no succession 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 the investment apart into pieces 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 investment succession within the context of the overall IT investment management process.

Evidence of Performance

Evidence 1: Physical evidence of Systems and Technology Succession Management exists.

Physical evidence could include, for example,

- board members who are involved with IT succession issues,
- the existence of an IT succession manager,
- the identification of a pool of IT succession candidates,
- CBSR analysis of each succession candidate including candidate's future status and system interdependency, and
- the succession decision for selected IT candidates.

Evidence 2: Documentary evidence of Systems and Technology Succession Management is created and maintained.

Documentary evidence could include, for example,

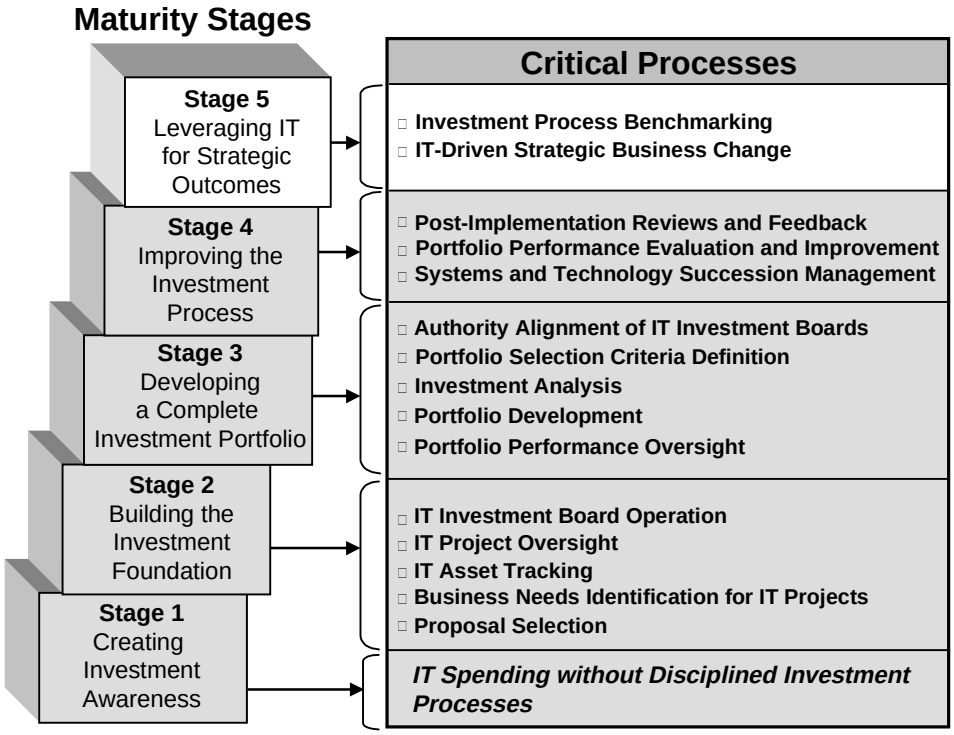
- a written policy for Succession Management;
- IT succession criteria, such as life cycle milestones, O&M phases, significant data or processing conversion problems;
- a list of IT investment succession candidates;
- IT investment succession candidate analysis reports, including CBSR, future status, and system interdependency analysis; and
- an IT succession decision list.

Evidence 3: Testimonial evidence is made available during reviews of Systems and Technology Succession Management.

Testimonial evidence could include, for example,

- board member interviews and
- IT succession manager interviews.

ITIM Stage 5: Leveraging Information Technology for Strategic Outcomes



At Stage 5, an organization leverages its IT investment capabilities to both 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 achieve major business transformations to better achieve their mission. 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 more 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.

- **Investment Process Benchmarking** 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.

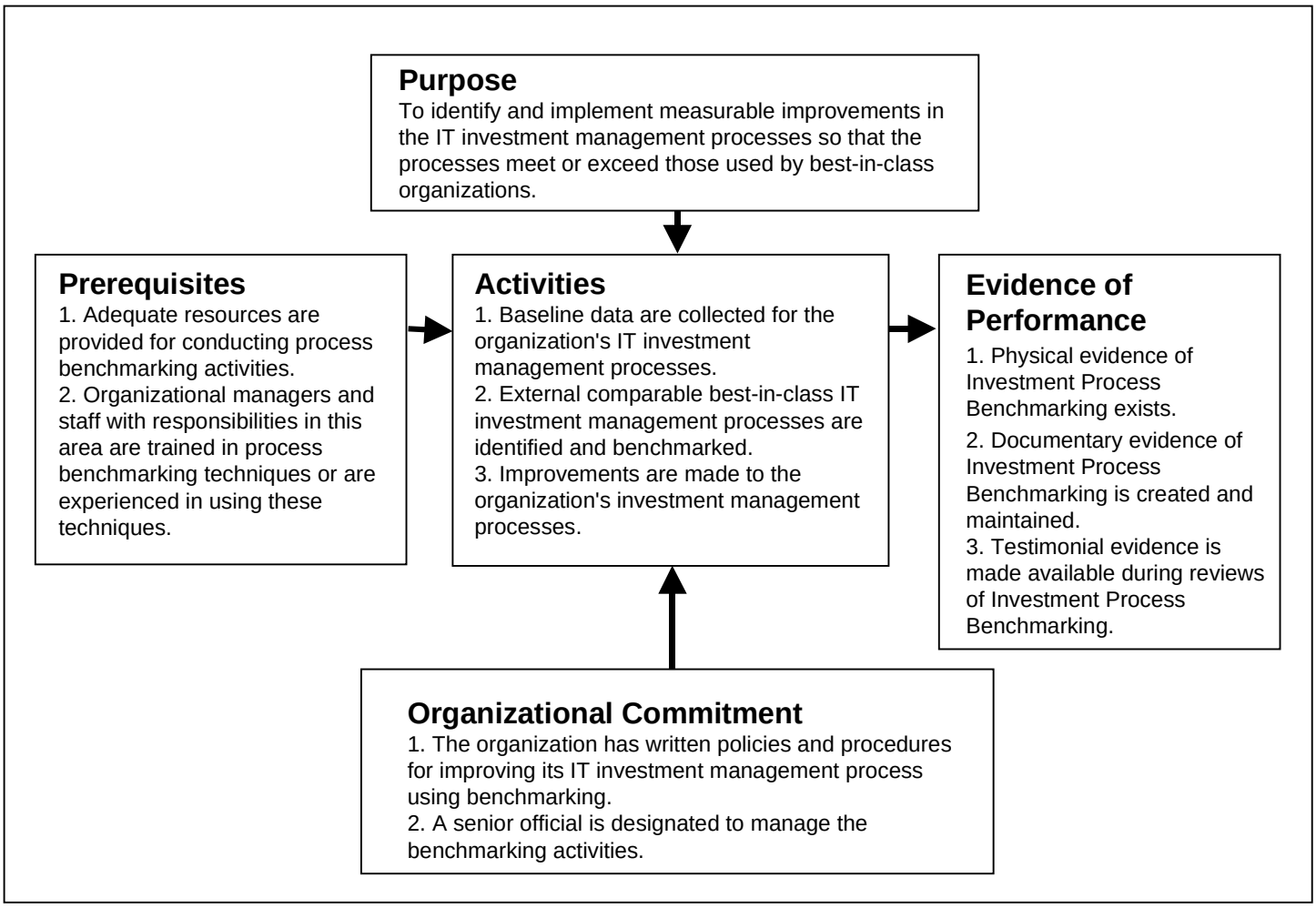
  Criteria: CCA, Section 5123 (5); *Breakthrough Process Redesign: New Pathways to Building Customer Value*, Charlene Adair and Bruce Murray; *Transforming the Public Sector*, David Osborne and Ted Gaebler; *The Innovator's Dilemma*, Clayton M. Christensen; *Quality is Free: The Art of Making Quality Certain*,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

Investment Process Benchmarking

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 competitors, industry averages, or a consultant's proprietary data. Once 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 the "best-in-class" organizations.

Figure 5.15: Investment Process Benchmarking



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

Organizational Commitment	**Commitment 1: The organization has written 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, IT investment management process performance measurements are collected and analyzed to form a process baseline. The investment management process baseline should include
	  • the current documented IT investment management process,
	  • performance measurement definitions, and
	  • the expected performance measurement range.
	• Historical data should be used to analyze current performance.
	• External organizations are evaluated to identify potential process improvement opportunities.
	• 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.

Prerequisites	**Prerequisite 1: Adequate resources are provided for conducting process benchmarking activities.** These resources can include the following:

- Individuals who are responsible for measuring investment process performance. External organizations may also be used to perform this measurement.

- Tools to support investment process measurement are made available.

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 benchmarking competency, team members must either receive training or have recent benchmarking expertise.

Activities

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

The study team measures the current state of the investment management process to provide a baseline for evaluating expected and actual process changes. Creating this baseline usually involves identifying and gathering process data on the investment management process components. These data typically include

- the level of resources an organization expends 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 mission achievement contributions, and

- the predefined range of expected performance measurement values.

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 the best-in-class organization's investment management process components.

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 measurable process improvement target activities, 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.

Evidence of Performance

Evidence 1: Physical evidence of Investment Process Benchmarking exists.

Physical evidence could include, for example,

- the identification of an investment process benchmarking manager;
- the identification of a benchmarking team;
- the identification of and baselining of the organization's IT investment management processes;

- the identification, selection, and benchmarking of external best-in-class investment management processes; and
- the development of benchmark-based improvement action plans.

Evidence 2: Documentary evidence of Investment Process Benchmarking is created and maintained.

Documentary evidence could include, for example,

- a written benchmarking policy,
- the organization's IT investment management process baselines,
- IT investment management process performance data,
- benchmarks of external best-in-class investment processes,
- benchmark data analysis reports, and
- improvement action plans.

Evidence 3: Testimonial evidence is made available during reviews of Investment Process Benchmarking.

Testimonial evidence could include, for example,

- investment process benchmarking manager interviews and
- benchmarking team interviews.

IT-Driven Strategic Business Change

In the previous 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 this maturity stage, 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.

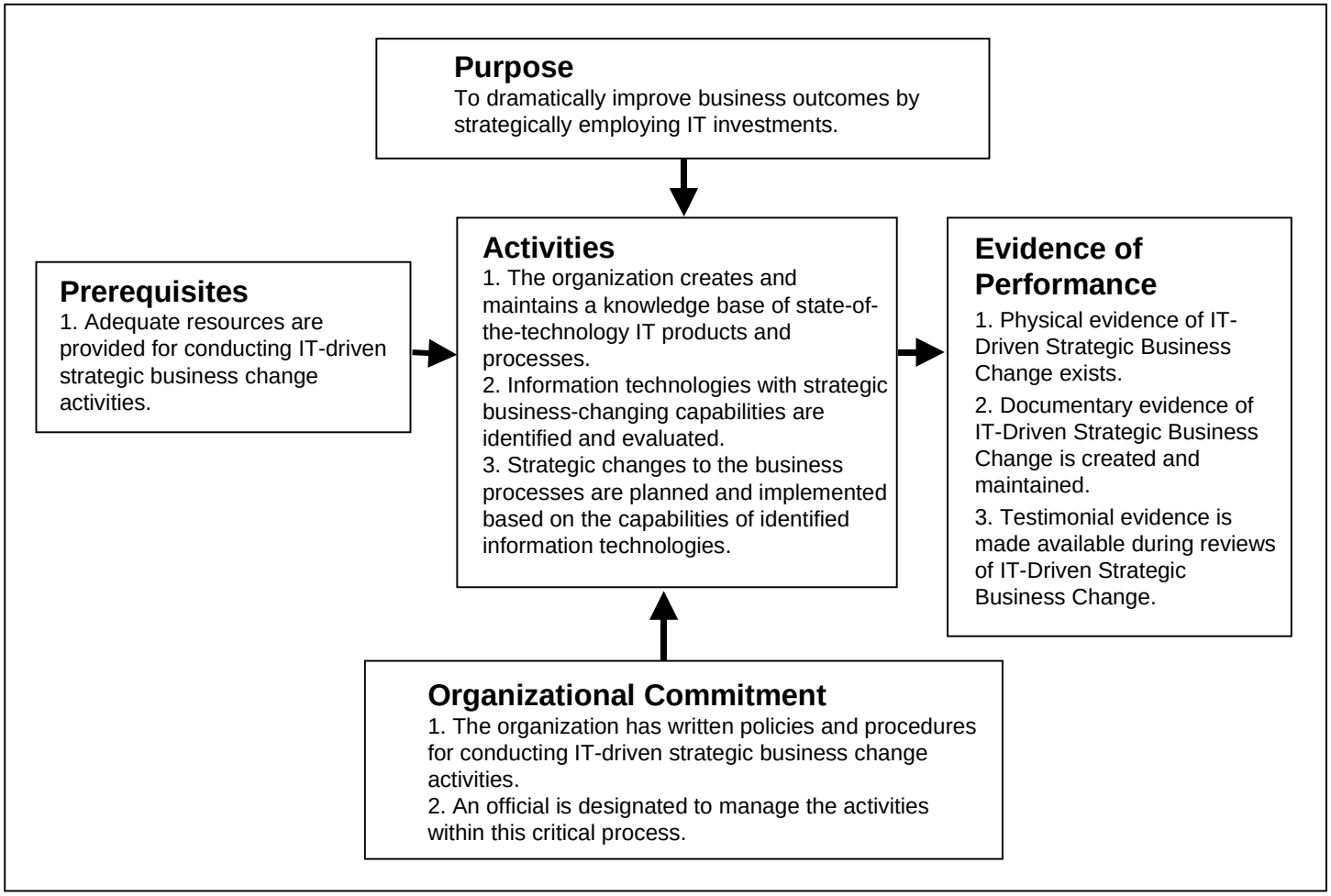
- Citizens and countries are using widely available computer encryption tools to secure their communication. These tools can be used for creating "digital signatures" which support legally binding electronic transactions and help prevent fraud.

- The Internet has created opportunities for (1) organizations to "move closer" to their customers; (2) business partners to reduce, if not eliminate the need for a third-party distribution network; and (3) government agencies to present one common 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).

- "Smart munitions" that can find their target in any weather, that can be reprogrammed in flight, or that can 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 strategic direction and outlook for the organization. The organization must develop mechanisms to actively scan its environment for new opportunities to utilize technology. This critical process describes the activities associated with strategically employing IT investments to change the core processes of the organization.

Figure 5.16: IT-Driven Strategic Business Change



Purpose	**To dramatically improve business outcomes by strategically employing IT investments.**
Organizational Commitment	**Commitment 1: The organization has written 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. Since business managers may be resistant to changing current business processes based on the promises of new technology, these policies should include incentives for management participation in this critical process. **Commitment 2: An official is designated to manage the activities within this critical process.** An official is designated to manage the creation and maintenance of IT state-of-the-technology awareness, identifying new information technologies, and using selected technologies to plan and manage changes to the organization's business processes.
Prerequisites	**Prerequisite 1: 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 and maintaining the knowledge base and associated IT awareness capacity.

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

Emerging trends, events, and technologies that have the potential to strategically change 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 to 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 a conclusion has been reached 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, they might wish to create a separate organizational entity that is (1) uniquely positioned to take advantage of the set of technologies and (2) not beholden to 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 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. Also, the

organization should involve stakeholders from business, IT support, oversight, and customer groups when planning the change.

Evidence of Performance

Evidence 1: Physical evidence of IT-Driven Strategic Business Change exists.

Physical evidence could include, for example

- the rewards for supporting IT-driven strategic business change activities,
- the identification of an IT state-of-the-technology awareness manager,
- the creation and maintenance of a knowledge base of applicable state-of-the-technology IT products and processes, and
- the identification of applicable strategic IT investments.

Evidence 2: Documentary evidence of IT-Driven Strategic Business Change is created and maintained.

Documentary evidence could include, for example,

- a written policy for conducting IT-driven strategic business change activities,
- documentary evidence of incentives to conduct IT-driven strategic business change activities, and
- a knowledge base of applicable state-of-the-technology IT products and processes.

Evidence 3: Testimonial evidence is made available during reviews of IT-Driven Strategic Business Change.

Testimonial evidence could include, for example,

- IT state-of-the-technology awareness manager interviews and
- board member interviews.

Development of ITIM

ITIM expands the widely accepted federal management framework for IT investment decision-making embodied in OMB and GAO guidance[15] and shifts the content from a guidance-based focus to an activity- and maturity-based focus. This shift reflects both the maturation of the thinking in the area of IT investment management and the feedback we received from organizations based upon their experiences creating their IT investment mechanisms and processes.

After learning about several leading evaluation approaches and talking with experts familiar with these approaches, we decided to develop a maturity-based framework. Important factors leading us to this decision were (1) general industry familiarity and acceptance of maturity-based frameworks (such as the Software Engineering Institute's Capability Maturity Model[SM]) and (2) our own working experience in applying maturity model-based methods in IT audits and evaluations.

After deciding on a maturity-based framework, we began to construct ITIM by combining the content of existing investment guidance with our knowledge of how leading organizations implement IT investment management processes. To get early feedback on this idea, we informally presented our initial concept to members of several leading IT management consulting firms in the Washington, D.C., area who are engaged with federal, state, and private sector clients in evaluating or designing IT investment management processes.

After receiving favorable initial reviews, we proceeded to develop the maturity-based IT investment management framework by

- defining five levels of IT investment maturity by stratifying investment management processes into maturity stages,
- identifying and documenting the processes critical for success at each maturity level,
- decomposing each critical process into key practices based on a common hierarchy, and

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

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

- providing relevant examples and discussion for each key practice grounded in our research of leading organizations.

To ensure that ITIM would provide value to the federal IT community, we engaged in an ongoing review process during the development and drafting of ITIM. Our staff experienced in conducting maturity model-based assessments reviewed initial drafts. Later, we met with and received comments from a selected group of federal CIOs and their representatives. Also, we briefed members of the federal CIO Council and its relevant subcommittee. Finally, we provided early drafts to members of a GAO-sponsored advisory group of IT executives from private industry and federal and state governments.

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, solicitation and selection of sources, award of contracts, contract financing, contract performance, contract administration, and those technical and management functions 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.

Activities: An ITIM core element that describes the procedures necessary to implement a critical process. An activity occurs over time and has recognizable results. This core element 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 determine 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 items owned by the organization. Investments typically create assets.

Benchmarking: A structured approach for identifying the best practices from industry and government and comparing and adapting them to the 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 reducing costs, increasing productivity, decreasing cycle time, or improving service quality. 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 decisionmakers typically compare business cases when 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 produce 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 sub-processes within a process management approach.

Capability Maturity Model[SM]**:** A descriptive model of the stages through which organizations progress as they define, implement, evolve, and improve their organizational processes. This model serves as a guide for selecting process improvement strategies by facilitating the determination of the current process capabilities and the identification of issues 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.

Core Element: The five standard parts common to each critical process that provide for its successful implementation. The five core elements are purpose, prerequisites, activities, organizational commitment, and evidence of performance.

Cost: A term used to indicate the expenditure of funds for a particular investment alternative over an expected time period. Cost may include

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

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. Each critical process is structured using the five core elements.

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

End User: The individual or groups who will operate the system for its intended purpose when it is deployed.

Evidence of Performance: An ITIM core element that describes the artifacts, documents, or other proofs that support a contention that the key practices within a critical process have been or are being executed. This core element typically consists of physical, documentary, or testimonial evidence.

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

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 similar procedures, services (including support services), and related resources 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: The organized and itemized list of assets e.g., IT products, services, or contracts.

IT Architecture: An integrated framework for evolving or maintaining existing IT and acquiring new IT to achieve the organization's strategic and business goals. A complete IT architecture should consist of both logical and technical components. The logical architecture provides the high-level description of the agency'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.

IT Investment: The decision by the organization to expend resources or the actual expenditure of resources on selected information technology or IT-related initiatives with the expectation that the benefits from the expenditure exceeds 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 between 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: An approach used by IT project managers to direct, control, administer, and regulate a project team creating an IT asset such that the resultant product meets its requirements upon delivery.

IT Project: An organizational initiative employing or producing IT or IT-related assets. Each project has or will incur costs for the initiative, has expected or realized benefits arising from the initiative, has a schedule of project activities and deadlines, and has or will incur risks associated with engaging in this initiative.

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

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 identification of the issues most critical to 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: The act of changing 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 core element that describes the management actions that ensure that the critical process is established and will endure. This core element typically involves establishing organizational policies and senior management sponsorship.

Outcome: The actual results, effects, or impacts of a business initiative, program, or support function. Actual outcomes typically are compared to expected outcomes.

Performance Measurement: The process of developing measurable indicators that can be systematically tracked to assess progress 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.**

Prerequisites: An ITIM core element that describes the conditions that must exist within an organization to successfully implement a critical process. This core element typically involves resources, organizational structures, and training.

Procedure: A written description of a sequence of actions to be taken 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 effective. Maturity implies a potential for growth in capability and indicates the sophistication of an organization's process and the consistency with which it conducts these processes.

Project Manager: The individual with business responsibility for an entire project. This individual typically directs, controls, administers, and regulates a project 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 and may exercise a level of autonomy in managing their activities in pursuit of those objectives. 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 each critical process.

Return on Investment (ROI): A financial management approach used to explain how well a project delivers benefits in relationship 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 affect on the investment's output or outcome (typically an adverse affect 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 help define preventive measures to reduce the probability of these factors from occurring and identify countermeasures to successfully deal with these constraints if they develop.

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/retirement.

Selection Criteria: Factors that are identified for use by an investment review board to identify and discriminate 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 the organization's products and services. Stakeholders influence programs, products, and services.

Strategic Plan: A document used by an organization to align its organization and budget structure with organizational priorities, missions, and objectives.

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

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.

Guidance for Conducting an ITIM Assessment

This appendix describes the assessment process that individuals and teams should adopt when conducting an organizational review using the Information Technology Investment Management (ITIM) framework. ITIM is a structured framework that uses a growth and maturation approach to assess an organization's IT investment management capability.

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

Each critical process, in turn, consists of five core elements (Purpose, Prerequisites, organizational Commitment, Activities, and Evidence of Purpose). The core elements serve to define, establish, and institutionalize the critical process. The core elements contain key practices. These key practices are the infrastructure and activities that are essential to effectively implementing and institutionalizing a critical process.

Using ITIM to Assess IT Investment Decision-making Processes

This assessment process guidance is designed to be embedded in 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 agency for the assessment,
- collects evidence of agency activities,
- evaluates the agency based on the ITIM framework, and
- briefs the agency on its findings.

Using this assessment approach facilitates a widely accepted, repeatable, criteria-based assessment process for auditors and agency managers when conducting IT investment management assessments. It also provides the organization with an understanding of any investment management process gaps 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

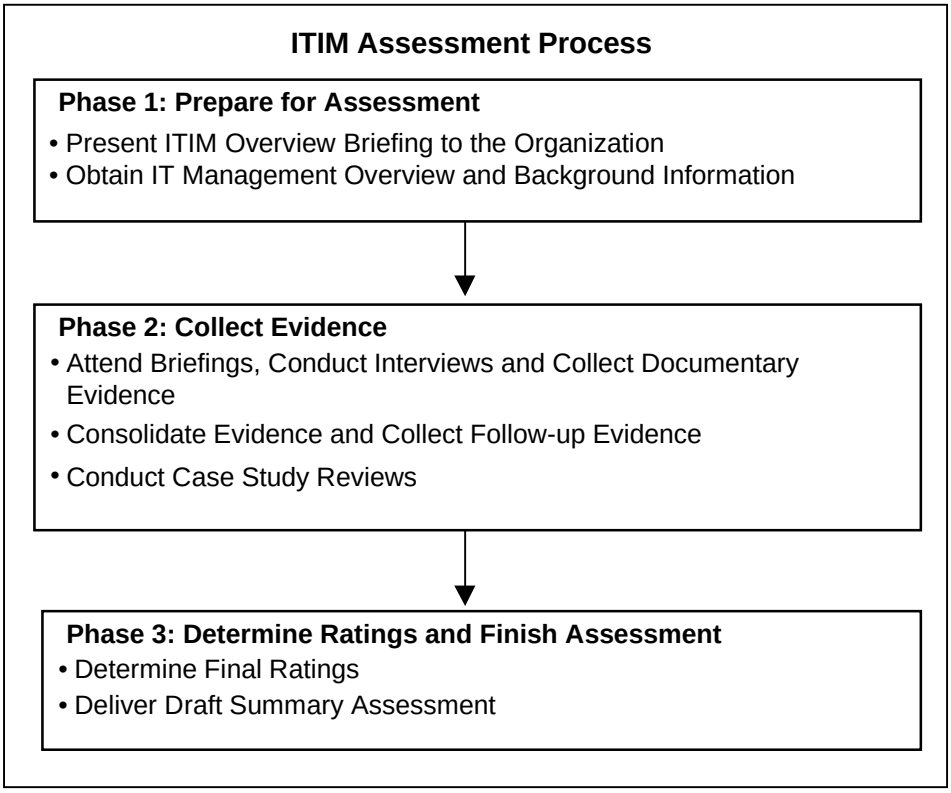
greater insight into the developmental history, key issues, and critical success factors associated with the IT investment approach.

- Become familiar with generally accepted capital decision-making approaches and associated analytical tools.
- Gain an understanding through training or experience with the basic concepts behind 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 III.1 summarizes the three phases of the ITIM assessment process. Each phase is necessary to assure 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 III.1: Phases in an ITIM Assessment



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 assessment scope will influence the location of the assessment (i.e., the physical place where the majority of or most critical people and activities are located), who the team will brief, and the extent of documentation required. Once the assessment scope is 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, this assessment process, and any organizational-specific factors 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.

It is important that the organization provides the appropriate personnel to participate in the briefing and the subsequent ITIM assessment. The key factor to consider in ensuring proper representation is the role(s) of the participants in the organization's IT investment activities. The following participants will typically be involved:

- the Chief Information Officer (CIO),
- the Deputy CIO,
- representatives from the organization's IT investment board,
- 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 be sufficiently early in the assessment process to allow the organization to learn from the presentation and prepare for the assessment. This typically means that the briefing should occur at least 1 month before the on-site assessment activities begin. 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* (GAO/OCG-94-4; also known as the "Yellow Book").

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

Obtain IT Management Overview and Background Information

The organization should provide the team with one or more information briefings about the organization's overall 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 of 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 changes that have occurred recently or that are anticipated);
- A description of how responsibility, accountability, and authority of the IT investment management process are distributed; and
- An index of relevant documents (the IT investment management processes contained in written policies, procedures, and guidance, etc.). The index should describe how the organization's documents are laid out and how they relate to each other.

The organization should also supply other documents and background information to the team to increase the team's efficiency and prevent misunderstanding 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);
- terminology unique to the organization; and
- the organization's current investment performance and process improvement plan.

Refine Assessment Plan

Based upon the initial information it receives from the organization, the team may refine its assessment plan. For instance, the team should reach consensus on the critical processes and/or maturity stages that are not applicable. Specifically, if the organization has only one IT investment board, then the "Authority Alignment of IT Investment Boards" critical process is presumed to be rated as "not applicable," and no further rating is necessary.

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 that 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 techniques to collect evidence. These alternative techniques 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 one 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 Commitment).

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 which it is supposed to supplement.

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

Obtain Briefings

Briefings at this point should be focused on those critical processes and key practices which lack sufficient documentation 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 actually 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 agency officials and 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 evidence collection. (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 the investment management processes are actually implemented, and how well the evidence correlates to the ITIM key practices. This activity is repeated for each key practice that is conducted within 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 process 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, core elements, critical processes, and maturity stages under consideration, they 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 the follow-up evidence required to make a rating judgment and 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. The team can either send written questions, requests for specific evidence, or conduct follow-up interviews to collect this required evidence.

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

- 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 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 Evidence

Consolidation helps the team sift through 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 their progress toward their goals and reviews the evidence collected to that point in time. 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 of whether to conduct case studies will depend on whether 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 process is executed,
- evidence of whether the organization's policies and procedures have been communicated to the project-level,
- the commitment that the organization has to the investment process, 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 lifecycle 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 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 selected from other organizational components (e.g., IT investment oversight staff).

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

- Process conformance–the degree to which the project being reviewed went through the agency'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 executed–the type of decision made and the degree to which it was executed.

Reconcile Differences
In some situations, the results of the case studies may contradict the preliminary ratings 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 reached during the organization-level ITIM assessment.

Phase 3: Determine Ratings and Finish Assessment

Determine Final Ratings

Once evidence collection is complete, the team must assess the consolidated evidence and decide whether each key practice, core element, 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 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 their way up the hierarchy. The sequence of ratings is as follows:

- key practices are rated first,
- core elements are rated second,
- critical processes are rated third, and
- the ITIM stage is determined last.

The team members should devise a method and 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.

<u>Determine Each Key Practice Rating</u>

Key practices are rated as being

- "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 executed 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 no adequate alternative is in place. If the team has found no evidence of a practice during the assessment process,

that result may constitute physical evidence of a key practice "not executed" rating.

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 Each Core Element Rating
Core elements are rated as being

- "fulfilled" or
- "not fulfilled."

A core element is successfully "fulfilled" if the (1) team judges that each of the key practices within the core element is executed or (2) the organization presents the team with convincing evidence that an alternative approach achieves the same outcome. A core element is "not fulfilled" if there are significant weaknesses in execution of any of the key practices within the core element and no adequate alternative is in place.

Determine Each Critical Process Rating
Critical processes are rated as being

- "implemented,"
- "not applicable,"
- "not implemented," or
- "not implemented, but improvements underway."

An ITIM critical process is "implemented" if its underlying key practices and core elements are successfully implemented or if a satisfactory alternative is in place. The ITIM critical process "Authority Alignment of IT Investment Boards" is "not applicable" if the organization has only one IT investment board. An ITIM critical process is "not implemented" if there are significant weaknesses in the assessed organization's implementation of the underlying key practices and core elements and no adequate alternative is in place. An ITIM critical process is "not implemented, but improvements underway" if over half, but not all, of its underlying key practices and core elements are rated as being 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 key practices and core elements, can be implemented by alternative means. The crucial point to 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 used to assess the adequacy of an organization's execution of a practice, core element or critical process described in the ITIM framework.

Determine 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 rating. 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 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 judged 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 other areas.

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